Bogan Shire Council Nyngan

Bogan Shire Local Housing Strategy 2025 - 2045

DRAFT FOR EXHIBITION

NSW GOVERNMENT

An initiative funded by the NSW Government through the NSW Regional Housing Strategic Planning Fund.

Prepared by Blue Sky Planning and Environment Pty Ltd

Rev.	Date.	Description
1	December 2024	First draft. Excludes biodiversity study.
2	March 2025	Draft for exhibition

CONTENTS

ACKNOWLEDGEMENT OF COUNTRY

Bogan Shire Council acknowledges the traditional custodians of the land to which this plan applies. We pay our respect to all Aboriginal people of the land and to Elders past, present and future.

EXECUTIVE SUMMARY

This Local Housing Strategy (LHS) for the Bogan Shire has been prepared in accordance with the *Local Housing Strategy Guideline and Template* produced by the (then) NSW Department of Planning and Environment.

The purpose of the LHS is to establish the strategic framework for residential growth and change within the Shire over the next 20 years.

The LHS links Council's visions for housing to the various federal, state, regional and local strategic planning documents that apply to the Shire and establishes a vision for the provision of housing in the Shire.

The LHS examines the recent census data available for the Shire, and although the population of the Shire is predicted to slightly decline, consistent with other rural areas, complex housing pressures have been identified. These include growth in local industry, resulting in significantly fluctuating worker numbers that require temporary housing, an ageing housing stock, low rental vacancy numbers, a lack of diversity in housing and constraints to the development of some residential zoned land.

Community and stakeholder engagement was undertaken during the preparation of the LHS and helped to inform the housing vision for the Shire. A biodiversity study and flood study were also undertaken to understand land use constraints affecting residential development.

The recommendations in this LHS will guide future amendments to the Bogan Local Environmental Plan (LEP) 2011 and the Bogan Shire Development Control Plan 2012, as well as other actions to encourage and facilitate residential development when and where it is required.

This LHS makes it clear that no single organisation can resolve the complexity of local housing issues in isolation. However, Council can work in partnership with key stakeholders to take a lead role in advocacy initiatives and ensuring that planning controls contribute to good housing outcomes and do not create barriers to the provision of appropriate housing.

This LHS will contribute to informing budget and investment decisions by Council regarding the funding of infrastructure and opportunities for partnerships.

SECTION 1
INTRODUCTION

This section describes the characteristics of the Bogan Shire and the way our community lives and functions, including its history, culture and day to day living. It examines the planning and policy context for housing provisions, as well as our population and demographics now, and the way they may change over time.

1.1 PLANNING POLICY AND CONTEXT

This LHS has been developed within the planning and policy context of the day. This includes federal, state and local government legislation and policies, regional and district plans and other policies relating to planning, housing, employment and infrastructure for Bogan Shire. Whilst the focus of this LHS is housing, it is necessary to integrate planning for housing with broader local planning for infrastructure, employment, cultural assets and open space to provide liveable communities.

FEDERAL

The Australian Government is developing a National Housing and Homelessness Plan that will set out a shared vision to inform future housing and homelessness policy in Australia. The Plan will set out the reforms and strategies needed to address housing challenges across Australia.

The Plan is a part of the Australian Government's reform agenda which includes a series of funds, financial incentives and investment opportunities.

At the time of preparing this LHS, the Plan was not available. Future updates of the LHS will consider the Plan.

STATE

Housing 2041– NSW Housing Strategy
Housing 2041 aims for NSW residents to have housing that supports independence and choice for all people at all stages of their lives with the following four pillars:

- Supply— housing delivered in the right location at the right time.
- Diversity—housing is diverse, meeting the changing needs of people across their life.
- Affordability—housing that is affordable and secure.
- Resilience—housing that is resilient to natural and social change.

Environmental Planning and Assessment (EP&A) Act 1979
The EP&A Act sets out the laws for town planning in NSW. It also sets up how development is assessed according to those laws.

State Environmental Planning Policies (SEPPs)
SEPPs specify planning controls for certain areas and/or types of development. The SEPPs most relevant to the provision of housing are:

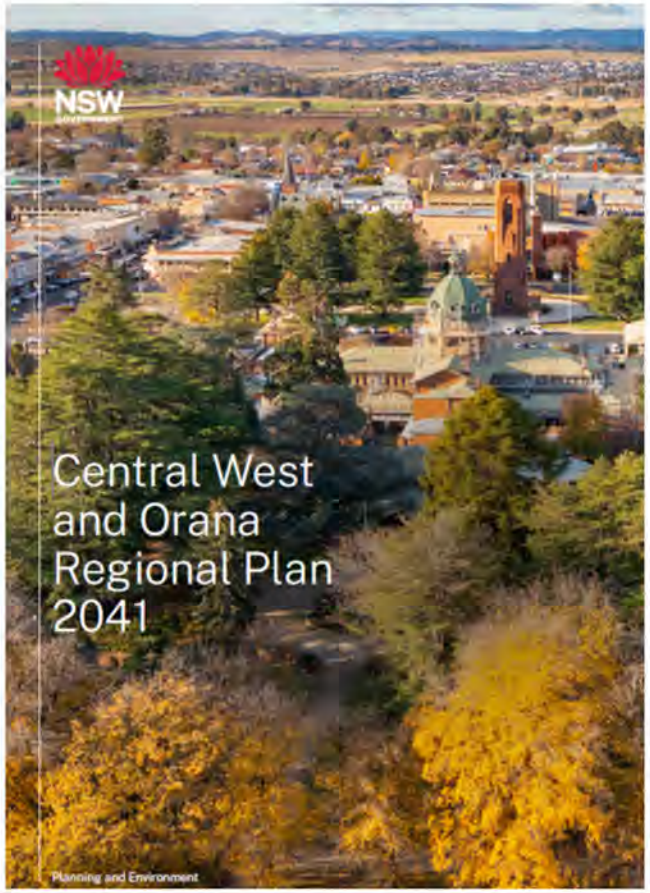
- SEPP (Exempt and Complying Development Codes) 2008
- SEPP (Housing) 2021

Both SEPPs allow some forms of housing to utilise the Complying Development approval pathway. The purpose of these SEPPs is to enable simpler approval pathways for forms of housing that can comply with specified standards.

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Central West and Orana Regional Plan 2041

The Central West and Orana Regional Plan 2041 is the strategic framework for the region. It applies to several local government areas, including Nyngan. This LHS will assist with implementing that Plan. The Regional Plan 2041 includes a set of objectives and strategies. The following Parts of that Plan are of particular relevance to Bogan Shire and have been considered in this LHS.



Part 2 of the Regional Plan 2041 – A sustainable and resilient place

This part focusses on the region's natural resources and systems.

Objective 6: **Support connected and healthy communities. Western NSW rivers:** Inland rivers, and related groundwater sources face competing demands for recreation, town water supply, rural uses and environmental needs. The LHS must recognise the interdependencies with human and non-human use of the land and water, and the need to protect the Bogan River. Development pressures for residential subdivision could, if not well planned, decrease public access to rivers and waterways, decrease natural amenity and increase clearing in the river corridors, which can impact runoff and ultimately water quality.

Objective 7: Plan for resilient places and communities: The changing climate is increasing the impact of natural hazards on communities. Building resilient communities requires us to consider hazards from a people-centred, cultural, economic, built form and environmental perspectives. New development must avoid areas affected by relevant hazards or mitigate the effects.

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Part 3 of the Regional Plan 2041 – People, centres, housing and communities

By 2041 the population of the region will need at least an additional 21,664 new homes. Existing housing stock in the region is mostly large, detached housing with three or more bedrooms. This housing is not well suited for the projected shift in housing demand with approximately 60% of families in the region expected to be singles or couples without children by 2041.

Objective 12: Sustain a network of healthy and prosperous centres. While the population of centres like Nyngan are projected to remain stable, these are dynamic communities with temporary worker populations that fluctuate. These centres will continue to reflect the growth aspirations of their local communities, support new industries and provide housing, services, attractive lifestyles and jobs in agribusiness, mining, and tourism.

Online access to services creates opportunities for Nyngan to reverse population decline and foster new economic opportunities. When combined with long-term trends such as the ageing of the population, the opportunity exists for council to rethink the role and function of smaller centres and ensure their ongoing vitality. This could mean providing a greater mix of housing in and around centres.

Objective 13: Provide well located housing options to meet demand. The Shire needs an adequate supply of affordable housing. Future residential growth can be predominantly accommodated in existing urban areas. Strengthening centres like Nyngan can be supported through better utilisation of existing infrastructure and prioritising the development of unused or underutilised land and identifying new areas for growth.

Councils should identify where urban growth should be avoided, including areas with high biodiversity values and hazards. Upfront consideration of infrastructure provision and biodiversity approvals will create more certainty. Avoiding areas of high biodiversity value, when planning, limits the need for costly offsetting at the development stage and repurposing sites avoids the cost of developing new infrastructure. This process is important for smaller centres such as Nyngan.

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Objective 14: Plan for diverse, affordable, resilient and inclusive housing. While regional NSW continues to experience economic growth there is growing evidence of housing stress and homelessness. Housing affordability is becoming an increasing issue for the region. Between 2017 and 2020 average house prices in the region grew by 10%, which is above the NSW average of 6% for the same period.

The supply of a diverse housing range also needs to reflect the needs of Aboriginal communities. Collaboration with the region's Local Aboriginal Land Councils (LALCs), native title holders and Commonwealth and State agencies will ensure Aboriginal people's housing needs and demands across the region are understood and supported.

People older than 65 will make up a quarter of the region's population by 2041. Housing for seniors should be built to specifically meet the needs of people as they age, from communal independent living arrangements, residential aged care facilities, and high-care hospital and palliative care facilities. Slow growth in the provision of seniors housing and infrastructure in the region may be attributed in part to economies of scale and economic viability. Smaller housing types, dual occupancy and multi-dwelling housing are filling this gap in some areas.

Increased housing affordability will result from better and more diverse housing designs, delivered in the right places, with alignment to infrastructure and community services.

Objective 14 includes relevant strategies, actions and collaboration activities as follows:

Strategy 14.1

- Allow a diversity of housing, including affordable housing, shop top housing, more dense housing types and housing choices for seniors close to existing services, and on land free from hazards.
- Improve certainty of development outcomes and streamline development processes.

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Strategy 14.2
Social housing assists people who are unable to access suitable accommodation in the private rental market. Investment into social housing can provide a strong economic stimulus mechanism.

Plan for a range of sustainable housing choices in strategic planning and local plans including:

- A diversity of housing types and lot sizes, through appropriate development standards.
- Housing that is more appropriate for seniors, including low-care accommodation.
- Consider development incentives or reduced contributions to boost construction of secondary dwellings.
- Innovative solutions for people with different needs or demographic backgrounds.
- Sustainable housing solutions that can reduce costs and environmental impacts of household operations.

Strategy 14.3
Assess the potential to renew social housing sites to increase social housing stock and create greater diversity and vibrancy in local communities.

Strategy 14.4
Use strategic planning and local plans to consider responses to homelessness, including the role of new development areas and publicly-owned land.

Collaborative and inclusive planning will build trust and integrity and empower Aboriginal communities. This requires mechanisms that acknowledge the diversity of communities and the resources needed to participate.

Strategy 14.5
Prepare local housing strategies and Local Environmental Plans (LEPs) in consultation with Aboriginal communities, in addition to the Aboriginal Housing Office (AHO), the NSW Department of Communities and Justice (DCJ) and the Land and Housing Corporation (LHC).

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Objective 15: Manage rural residential development.

Strategy 15.1
When planning for new rural residential development consider:

- Proximity to existing urban settlements to maximise the efficient use of existing infrastructure and services.
- Avoiding primary production land and mineral resources and consider land use conflict.
- Avoiding areas of high environmental, cultural or heritage significance, or areas affected by natural hazards.
- Provision of a sustainable water supply.
- Impacts on the groundwater system.
- Context in terms of supply and demand across the subregion.
- Cost effective service supply.

Objective 16: Provide accommodation options for seasonal, temporary and key workers. The demand for and supply of temporary worker accommodation impacts local housing markets. Ensuring adequate accommodation is available for residents, workers and the tourism industry is a priority for councils.

Addressing the demand for housing and the associated needs of workers will provide safe, secure, and suitable housing while also contributing to the economic growth of towns, particularly those near large investment projects. Short-term accommodation can provide legacy infrastructure or be adapted into alternative uses such as tourism accommodation or low-cost housing for vulnerable people, as demand for accommodation fluctuates. This may also provide opportunities for growth of towns in the medium to long term and reduce pressure on social and affordable housing provision.

Councils need to ensure a variety of housing types, particularly in areas accessible to construction projects and areas which will be the focus of ongoing employment.

1.1 PLANNING POLICY AND CONTEXT - REGIONAL

Strategy 16.1
Strategic and statutory planning should consider:

- The provision of housing for workers by employers, including state agencies, by providing flexible controls.
- The capacity of existing and planned infrastructure to service accommodation for workers.
- Provision for workers' accommodation sites such as caravan parks, manufactured home estates, tiny homes and manufactured homes on land in or adjoining existing centres, new development areas and publicly owned land.

Strategy 16.2
Development applications for large-scale projects should be supported by a workforce accommodation strategy that:

- Assesses anticipated impacts on the local housing market.
- Shows how potential employees can access accommodation, without detrimentally affecting existing housing availability and affordability.
- Illustrates how the project will contribute to the supply of local housing and support the nearest centre.
- Allows for the plan to be monitored and updated over the life of the project.

Objective 17: Coordinate smart and resilient utility infrastructure. Urban growth should be directed to areas with infrastructure capacity, or where upgrades or new infrastructure is cost-effective. Proposals for land release or development should demonstrate that servicing can occur from existing infrastructure or that new infrastructure can be provided.

1.1 PLANNING POLICY AND CONTEXT - LOCAL

Bogan Shire Council Local Strategic Planning Statement (LSPS)

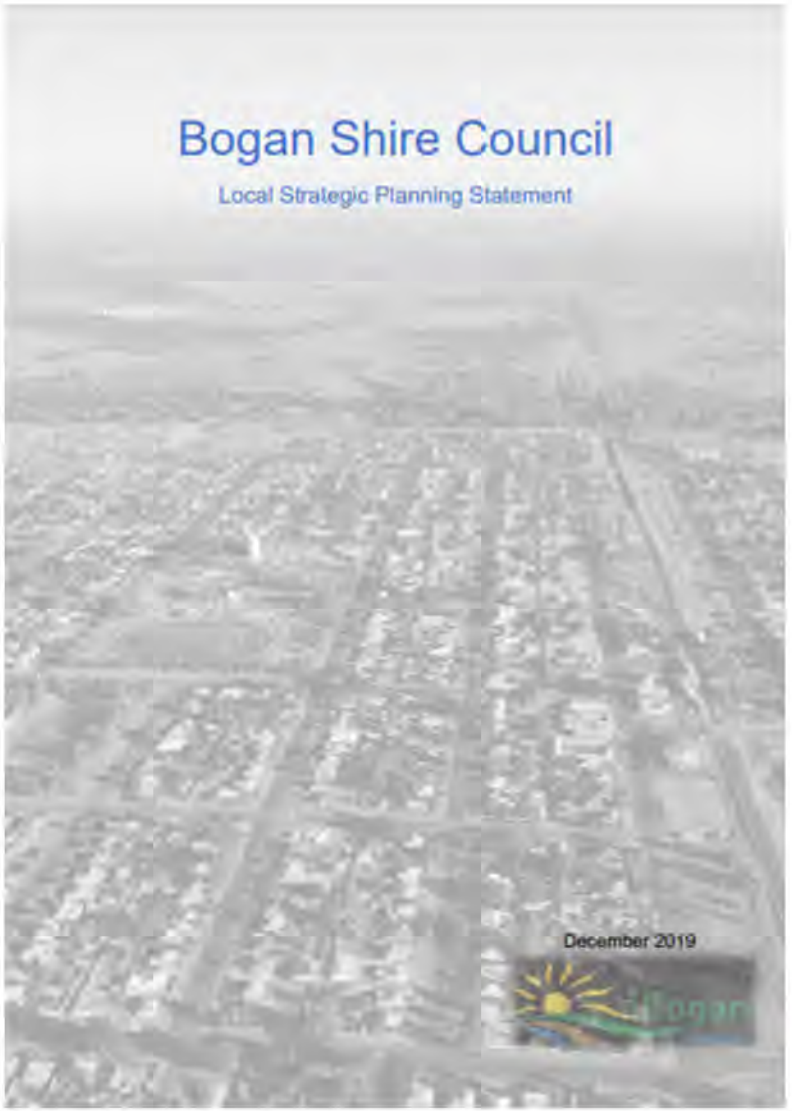
The LSPS (December 2019) sets the framework for Bogan Shire's economic, social and environmental land use needs over the next 20 years. A number of priorities in the LSPS are relevant to housing:

Priority 4 – Safe and Liveable Communities: Providing housing choice and enough suitably located residential land, particularly rural residential, is a key to attracting and retaining a diverse population.

Comparatively, housing affordability is a strength of the region, but there are also ongoing housing demands that need to be addressed.

The predominant character of the surrounding rural lands of Bogan Shire is productive agriculture, particularly grazing and cereal crops. Bogan Shire relies heavily on its agricultural income and rural industries for its gross domestic product, but it also provides locals with a strong sense of place.

Ensuring that planning controls are in place to prevent fragmentation of these productive rural lands and reducing land use conflict by identifying suitable locations for rural residential development will assist in retaining the Shire's rural character.



1.1 PLANNING POLICY AND CONTEXT - LOCAL

The following policies and actions from the LSPS are relevant:

- Utilise existing zoned and serviced land for a range of urban development outcomes, particularly the provision of housing for older people and affordable housing near existing services and amenities.

- Locate new rural residential areas:
  - close to existing urban settlements to maximise the efficient use of existing infrastructure and services including roads, water, sewer and waste services, and social and community infrastructure;
  - to avoid and minimise the potential for land use conflicts with productive, zoned agricultural land and natural resources; and
  - to avoid areas of high environmental, cultural or heritage significance, regionally important agricultural land or areas affected by natural hazards.

- Encourage a range of housing options, including affordable housing, housing for older people, family housing and temporary worker accommodation in Nyngan.

- Support aging in place in Nyngan to make best use of existing infrastructure and services in the town.

- Collaborate with other Councils to investigate a business case to operate an integrated holistic age care service in Nyngan to improve ageing in place options.

- Investigate the options for new housing release having regard to servicing and hazards.

1.1 PLANNING POLICY AND CONTEXT - LOCAL

P**riority 6 – Attracting and retaining business and industry:** Aeris Resources is a major employer in Bogan Shire. The company has identified the availability of housing for its employees as a business constraint. The following actions and policies are relevant:

- Include appropriate residential land use controls in the Bogan LEP 2011 to accommodate employment housing needs.
- Investigate housing trends to identify appropriate strategies in order to accommodate housing needs for emerging industries and services.

Priority 7 – Water Security: Water security is a major challenge for the growth and resilience of the Shire which is heavily dependent on water from other areas and there is a risk that water supply could come under pressure in the future due to droughts, higher temperatures and increasing demand. Better understanding water supply and demand and protecting its key water supply assets will assist Council in providing greater land use certainty . The following actions and policies are relevant:

- Undertake review of the Bogan DCP 2012 to include guidance and controls on water sensitive urban design.

Priority 9: Adapting to climate events: This priority recognises that in the future the Shire will be subjected to a rapidly changing climate which will result in warmer and drier conditions causing reduced stream flows, more severe droughts, extreme storm events and increased bushfire risk. The following actions and policies are relevant:

- Avoid development in areas subject to natural hazards or, where natural hazards cannot be avoided, mitigation or adaptation measures are adopted.
- Support innovative building materials and design, which maximise energy efficiency and improve health and resilience outcomes for households and businesses to cope with extreme weather events and climate change.
- Consider incorporating controls into the Bogan Development Control Plan 2012 for enhanced environmental outcomes such as energy efficiency, rain water tanks and 'green star communities'.
- Undertake a flood study update for Nyngan and review the Bogan LEP 2011 as required.

1.1 PLANNING POLICY AND CONTEXT - LOCAL

Bogan Local Environmental Plan 2011 (LEP)

The LEP contains the key planning provisions relating to development at the local level.

The residential areas within Nyngan are zoned R1 General Residential. The outlying residential areas are zoned R5 Large Lot Residential. The villages are zoned RU5 Village.

There are a large number of small residential-sized lots surrounding the villages that are zoned RU1.

There are no principal development standards in the LEP that apply to the R1 General Residential parts of Nyngan or to the villages. The R5 Large Lot Residential areas of Nyngan have a minimum lot size of 4000sqm.

There are several mapped Urban Release Areas (URAs) included in the LEP in the southern part of the Nyngan township. Prior to development of these areas, satisfactory arrangements are to be made for the provision of designated State public infrastructure and a Development Control Plan (DCP) must be prepared for the land.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT

Area: 14,610 square kilometres. Equivalent to 1.8% of the total area of NSW.

Settlements: Main town of Nyngan and villages including Girilambone 45km north-west of Nyngan, Coolabah 75 kilometres north-west of Nyngan and Hermidale 45 kilometres west of Nyngan.

Neighbours: Cobar Shire to the west, Bourke Shire to the north-west, Brewarrina Shire to the north, Warren Shire to the east, Lachlan Shire to the south.

Education: one high school, four primary schools, two pre-schools or early learning centres, TAFE campus.

Medical: Modern multi-purpose health centre (with allied services) and an aged care complex as well as a medical centre incorporating allied services . General practitioners, dentists and other health professionals.

Recreation: Multiple facilities and infrastructure for activities including bowls, golf, tennis, dancing, rugby league and union, touch football and league tag, cricket, netball, fishing, water-based activities, soccer, little athletics, pony club.

Enterprises: One of the State's most productive areas for wool, cattle and cropping. Key area for copper mining and solar farming.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR HISTORY

The Bogan Shire has a unique history and is home to various Aboriginal nations including traditional custodians, the Wangaaypuwan (Wongaibon), Ngemba, Ngiyampaa, and Wayilwan (Weilwan) peoples.

The locality of Canonba was the first non-indigenous settlement in the area, established 30 km north-west of Nyngan. Nyngan was reserved for a town site in 1882 when the Dubbo-Bourke railway was under construction. Nyngan became a municipality in 1891.

Mining has always been a strong economic base in the Shire with the first copper discovered at Girilambone in 1875.

The town received a secure water supply in 1942 when water was relayed along a 62km channel from the Macquarie River at Warren.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR ECONOMY

The data on the following pages is sourced from the Australian Bureau of Statistics (ABS) Census of Population and Housing, the NSW Department of Planning, Housing and Infrastructure 2022 CPA Projections and the NSW Department of Communities and Justice Local Government Housing Kit. The data is relevant to understanding the housing needs of the community.

Our average household income in 2021 was $1444 / week. This is consistent across other census periods (adjusted for inflation). The average household income in Australia in 2021 was $1124 / week. The Shire has a slightly higher than average household income and a higher proportion of residents in the "high income" category than other nearby local government areas.

Our average mortgage repayment for the most recent census period (2021) was $1083 / month. This is consistent across other census periods (adjusted for inflation). Within NSW the average monthly mortgage repayment in 2021 was $4000 / month meaning that the Shire has significantly lower mortgage repayments, reflecting significantly lower land and house prices than other parts of the State.

In 2021 the average weekly rent in the Shire was $200, though there is great disparity between the high and low ends of the rental market. In 2021 the NSW average weekly rent was $475. Rental prices in the Shire and across the State are predicted to have risen consistently since the last census in 2021.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR LABOUR FORCE

Working full time: 836 people in 2021.

Unemployment: 3.5% in 2021. In the previous census period 5.7% of residents were unemployed. The unemployment rate in Australia in 2021 was 5.11%. The Shire has a better than average employment rate.

Employment industries (2021 census):
Agriculture: 271 people.
Mining: 188 people.
Education and training: 135 people.

Employment industries (2016 census):
Agriculture: 265 people
Mining: 166 people.
Health care and social assistance: 102 people.

Distance to work: 112 people travelled less than 2.5km to work in 2021, meaning that there is very little commuting to or from other LGAs. The next most common distance travelled to work was in the category 50km to less than 250km (52 people). These figures are reasonably consistent with rural and remote LGAs and reflect the distances travelled to the major industries and employers.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR POPULATION AND THE WAY WE LIVE

Visitors in the Shire on census night 2021: 245 persons. Most in the 45 – 64 year age group. This is a relatively high proportion of visitors in comparison to the population and is likely to reflect the high proportion of temporary workers.

Average household size census period 2021: 2.4 persons. This is consistent across the other census periods and slightly lower than the Australian average.

Family composition census period 2021: Most common family composition is a couple family with dependents under 15. This is consistent across Australia.

Number of motor vehicles per dwelling census period 2021: Most commonly two (310 dwellings). The majority of dwellings owned at least one vehicle. This indicates that there is unlikely to be a heavy reliance upon public transport in the Shire.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR POPULATION AND THE WAY WE LIVE

Occupied private dwellings 2021 census period: 840 detached houses (2110 persons). Next most common was a single storey semi-detached home / townhouse at 51 (69 persons).

Residential development approvals 2021 census period: In the most recent census period there were 12 development approvals for new houses. By comparison, the neighbouring LGA of Warren had 2 new houses approved and both Cobar and Bourke had no residential dwellings approved.

Tenure and landlord type 2021 census period: Owned outright: 356 dwellings, owned with a mortgage: 217 dwellings, rented: 33 dwellings. This is relatively consistent with 2016 but in 2011 425 dwellings were owned outright.

Most common dwelling size 2021 census period: 3 bedrooms (355 dwellings) followed by 4 bedrooms (259 dwellings). This is consistent across the other census periods. It indicates that large detached dwellings consistently remain the most common forms of housing in the Shire.

Social Housing properties (2021 census):

- Aboriginal Community Housing – 29 properties
- Aboriginal Housing - 12 properties
- Community Housing – 4 properties
- Public Housing – 47 properties

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR POPULATION AND THE WAY WE LIVE

Homelessness: In the 2021 census 4 people reported being homeless.

Housing costs and affordability: There were 30 recipients of Rent Assistance in 2021 in rental housing stress (i.e. they had difficulty paying rent). By comparison, the neighbouring area of Warren had 45 recipients or 26.5% of recipients in rental stress. In Bogan Shire there were no households reported to be in purchase stress, by comparison 14.4% of moderate income households in Warren were reported to live in purchase stress.

Waiting times for social housing (June 2023):
One or two bedroom property – 2 to 5 years.
Three bedroom property- up to 2 years.
Four bedroom property – 5 to 10 years.

Migration (into Shire) over previous 5 years:
699 persons.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - WHAT WILL WE LOOK LIKE IN THE FUTURE?

The Department's 2022 Population, Housing and Implied Dwelling Projections have been used to consider what the Shire's demographic future may look like. These are scenarios based on available evidence and are not a target or a representation of Government intent. The projections reflect current planning frameworks and strategies in place and the potential demographic outcomes of current decisions. Population projections provide a picture of the population as it may develop in the future. They do not take into account potential major disruptors such as the introduction of a new industry or the expansion of existing industries as these are generally unknown variables.

Households: In 2024 the most popular household type in the Shire was forecast to be a total family household (two parents with dependants), with 631 households being of this type. The forecast for 2041 is that this will not change. The average household size for projected households will remain consistent, with 2.36 persons in 2024 and 2.34 persons in 2041. The large majority of households are forecast to be privately owned, with non-private dwellings (community housing etc.) making up only a minor proportion of housing types.

Implied dwelling demand (number of dwellings required to house the projected population): The forecast for 2024 was that 976 dwellings would be required to house the projected population and in 2041 658 dwellings will be required to house the projected population. The forecast does not allow for disruptors such a major industry expansion.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT- HOW HAS COUNCIL CONTRIBUTED RECENTLY?

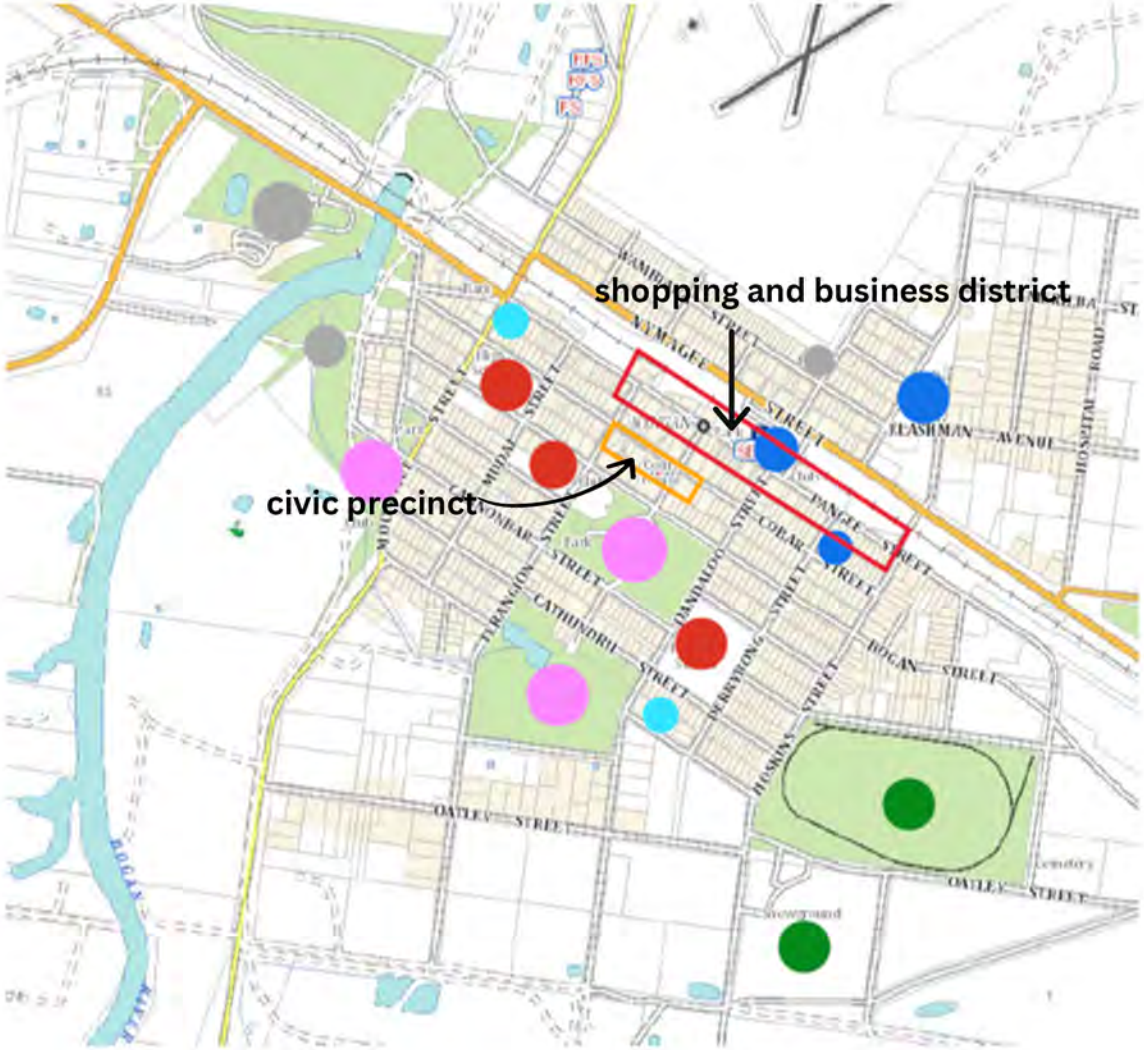
- Four independent living units owned by Council are rented out to senior members of the community meeting certain criteria. The units were constructed using a state government grant.

- Council are in the process of reclassifying land on Tabratong Street from Community to Operational land which could then potentially be used for housing.

- Council allocates $100,000 into a fund to progress the demolition of dilapidated homes and the subsequent sale of the land to recover unpaid rates in exceptional circumstances.

- Using a state government grant, Council are progressing a thirty-three lot residential subdivision in the southern part of Nyngan.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - OUR URBAN STRUCTURE

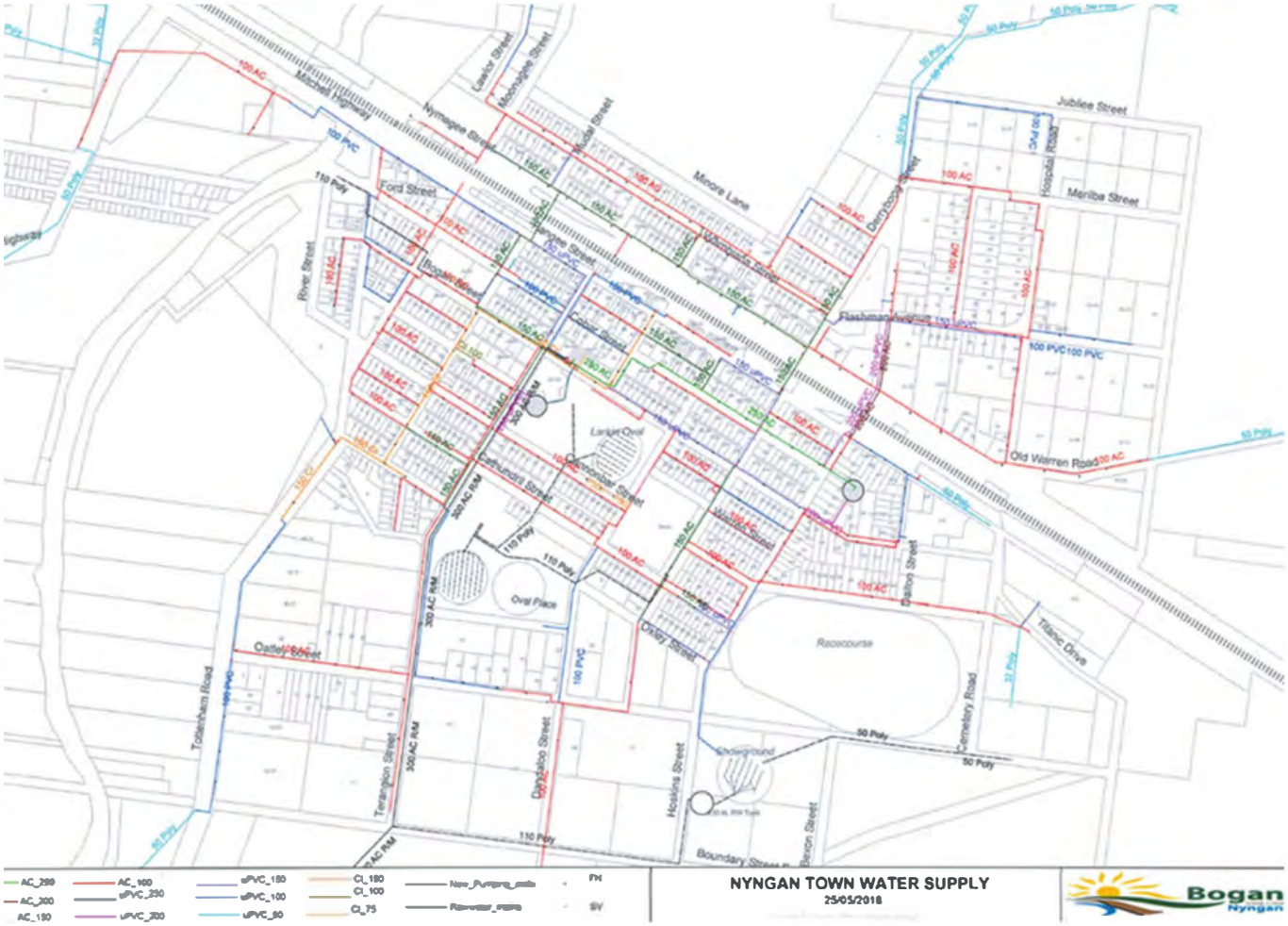


Nyngan is well serviced with key community places and spaces. Most nodal points are within either walking distance or a short drive from the residential areas. This contributes to community cohesion and liveability. Nyngan provides the higher order services for the outlying villages.

There is a NSW Trainlink bus service to Dubbo two times per day, taking approximately two hours. Higher order specialist services are available in Dubbo. There are currently no train services from Nyngan. Public transport to Sydney would be via Dubbo.

dark blue = medical and allied heath services
light blue = early childhood centres
red = education facilities
grey = passive recreation
green = racecourse and showground (recreation)
pink = active recreation

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - INFRASTRUCTURE CONSTRAINTS: WATER

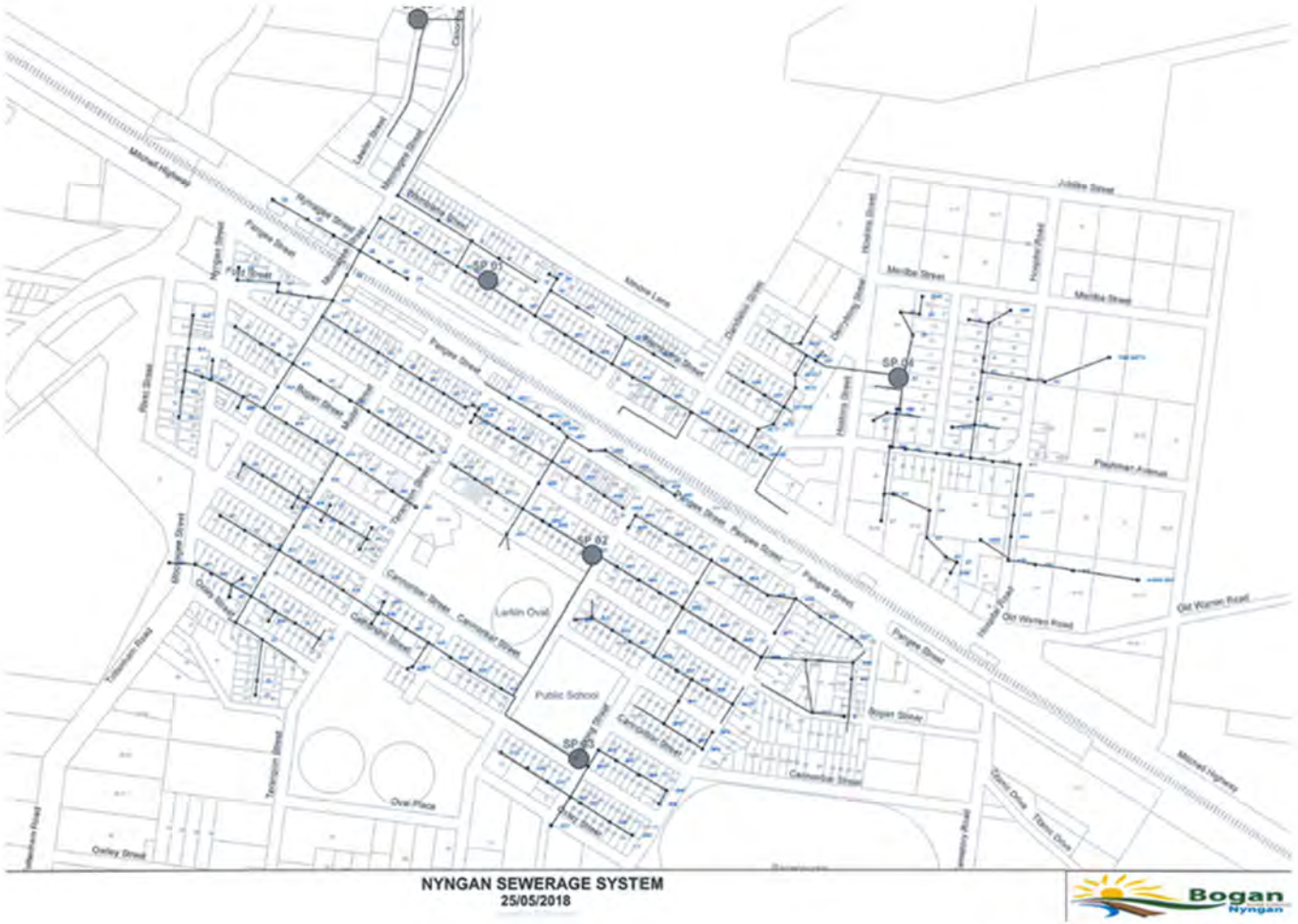


Essential services such as water, electricity and sewerage are needed to support housing delivery.

Within the villages the provision of essential services is limited to reticulated water (non-potable) and electricity. Council has no current plans to provide either reticulated potable water or sewer infrastructure outside of Nyngan due to the high cost of construction and operation. This will limit the potential for expansion of the villages.

The plan to the left shows the existing reticulated water supply infrastructure within Nyngan. There is some capacity remaining for additional residential development, however an analysis of capacity would be required prior to additional areas being released in the future.

1.2 LOCAL GOVERNMENT AREA SNAPSHOT - INFRASTRUCTURE CONSTRAINTS: SEWER



The plan to the left shows the existing reticulated sewerage infrastructure within Nyngan.

Residential development not connected to the reticulated sewerage infrastructure will be required to have a large land area suitable for an on-site sewerage management system and sufficient area for disposal. This is generally suited to the R5 Large Lot Residential zone.

There is some capacity remaining for additional residential development, however an analysis of capacity would be required prior to additional areas being released in the future.

1.3 HOUSING VISION

Our vision for housing in the Bogan Shire is of a vibrant inclusive community that offers a variety of sustainable, affordable, and flexible living options for everyone. With access to essential services and facilities, our homes are fit-for-purpose for all life stages. Our housing encourages a connected, safe and welcoming environment whether for the short, medium or long-term.

Source: Attendees at The Local Housing Strategy Community Engagement Workshops, Nyngan, June 2024.

SECTION 2
EVIDENCE

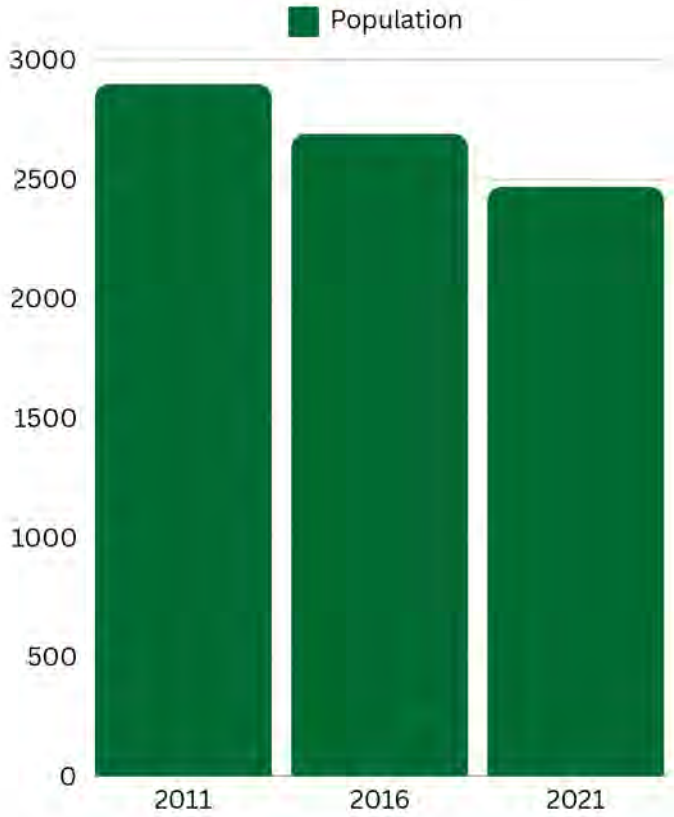
This section establishes the demographic, housing and affordability context for Bogan Shire. It comprises an overview of the data on population, housing and infrastructure that is required to inform the type of housing that is needed in the Shire.

2.1 DEMOGRAPHIC OVERVIEW

The following data on Bogan Shire's demographics is sourced from:

- **The Australian Bureau of Statistics (ABS) 2021 Census of Population and Housing**
- **The NSW Department of Planning, Housing and Infrastructure CPA projections**
- **The NSW Department of Communities and Justice Local Government Housing Kit**

The data is relevant to understanding the housing needs of the community.



Largest adult age group in 2021: 45 – 54 years with 336 people. In 2016 the largest adult age group was also 45-54 years. In 2011 the largest adult age group was 35-44 years. This data indicates that there is a continuously high proportion of people of working age, but that the average age of the population in the Shire is (as for other areas of the State) increasing.

Projected population totals: The population for the Shire is forecast to decrease over time from 2371 in 2024 to 1581 in 2041. Between 2021 and 2041 this is a decrease of around 2.3%.

The median age in 2024 was projected to be 38, whilst in 2041 it is expected to be 42 years of age. This change in age is consistent with demographic data across NSW.

2.2 HOUSING DEMAND

Housing demand can be influenced by factors in the broader market generally including influences such as household growth, infrastructure availability, industries and employment, local and regional amenity, interest rates and migration (in and out).

An analysis of the census data and demographic trends indicates that the Shire has an ageing population and a high number of temporary residents who live in the Shire for work, primarily mining.

Many market factors are outside the control of local government. In establishing housing demand there are two main considerations:

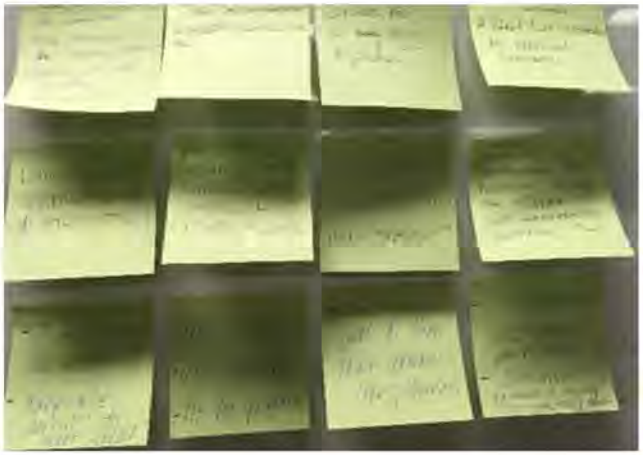
1. **Effective demand:** This is the size, type and location of dwellings that people are able and willing to buy and rent in an area. It is influenced by factors including:
   - Desirability of the area.
   - Affordability – reflecting house prices and income levels.
   - Proximity to employment and local services.
   - Access to public transport and infrastructure and services.
   - Land values, taxes, interest rates and government incentives (First Home Buyers grant etc).
   - Family unit demographics.
   - Investor demand.
   - Construction costs and availability of trades.
   - Land availability.

2. Underlying demand: This is the theoretical need or number of new homes that are required based on the projected number of households. The level of underlying demand is primarily driven by migration and demographic factors.

2.2 HOUSING DEMAND

During the community engagement phase of the LHS the following concerns were raised by the community and other stakeholders in relation to the housing demand in Bogan Shire:

Housing Shortage: There are limited housing options in Bogan Shire, and this is particularly affecting singles and retirees.
Diversity in Housing: Housing diversity to cater to different demographics and household types is low.
Planning Process: The current planning framework is perceived as restrictive and complicated, hindering development.
Transportation Issues: Poor transportation options contribute to residents relocating for better health care access.
Utilisation of Vacant Properties: There are high numbers of vacant properties that are only intermittently occupied.
Land and Development Costs: A shortage of land and high development costs further complicate the housing crisis.
Housing Condition: Many houses are uninhabitable - they take up valuable residential land.
Natural Hazards: Homes need to be resilient to natural hazards



2.3 HOUSING AFFORDABILITY

Housing affordability refers to the capacity of residents to enter both the rental and privately owned housing markets. "Affordable Housing" is specifically defined in the *Environmental Planning and Assessment Act 1979* to be:

housing for very low income households, low income households or moderate income households, being such households as are prescribed by the regulations or as are provided for in an environmental planning instrument.

State Environmental Planning Policy (Housing) 2021 (the Housing SEPP) provides that a household is taken to be a very low income household, low income household or moderate income household if it has a gross income within the following ranges of percentages of the median household income:

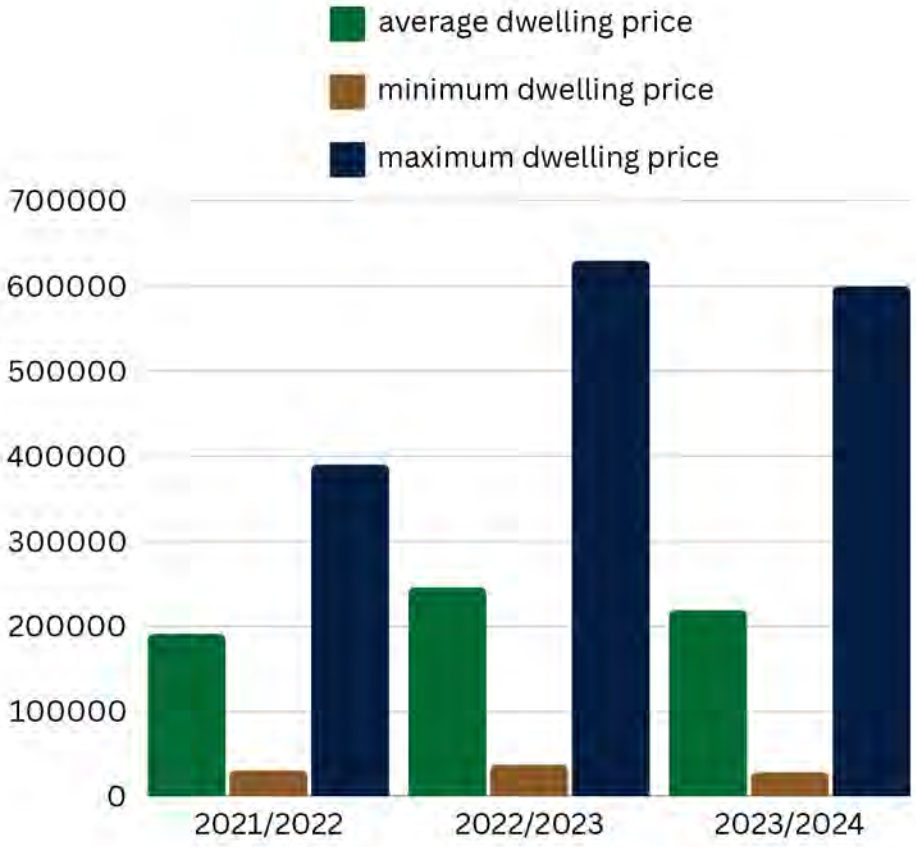
(A) very low income household: less than 50%,
(B) low income household: 50–less than 80%,
(C) moderate income household: 80–120%, and
    a. pays no more than 30% of the gross income in rent, or
    b. the household:
        i. is eligible to occupy rental accommodation under the National Rental Affordability Scheme, and
        ii. pays no more rent than the rent that would be charged if the household were to occupy rental accommodation under the Scheme.

In considering the demand for affordable housing (as defined by the Act) Council needs to consider aspects such as affordable housing stock, incomes, rent and sale prices, housing stress, employment and homelessness.

To complement the consideration of affordable housing and housing affordability, the concept of affordable living is relevant. Affordable living recognises that there are additional costs for households associated with housing choices, besides rental or mortgage payments. The location and type of dwelling can impact ongoing household costs including costs related to transport and energy consumption. In some cases, these costs may offset the benefits of lower mortgage or rental payments. While "affordable housing" and housing affordability are measured by the cost of housing relative to income, affordable living considers the cost of housing in conjunction with the cost of accessing employment and services, and paying for utilities.

2.3 HOUSING AFFORDABILITY

House and land prices have remained relatively stable in the Shire over the last three years. Participants in the community engagement phase of the LHS (surveys and workshop attendees) reported that houses were relatively affordable to buy, but there was a lack of "suitable" housing and diversity. Feedback related to rental housing also reported a shortage of options, with extremely low rental vacancies and high rental prices.



2.3 HOUSING AFFORDABILITY

As discussed in Section 1 there were 30 recipients of Rent Assistance in the Shire in 2021 in "rental housing stress" (i.e. they had difficulty paying rent). By comparison, the neighbouring area of Warren had 45 recipients in rental housing stress.

In Bogan Shire there were no households reported to be in purchase stress, by comparison 14.4% of moderate income households in Warren were reported to live in purchase stress.

The evidence suggests that housing affordability is not a major constraint in the Shire. However, like most areas of the State, affordable living is a growing concern as inflation and the cost of living increases.

Relative to other neighbouring areas, the Shire has reasonable access to employment, services and utilities.

Housing affordability in the Shire is a more complex set of inter-related issues caused by factors such as temporary worker fluctuations, access to trades, housing condition, natural hazards and the financial feasibility of development.

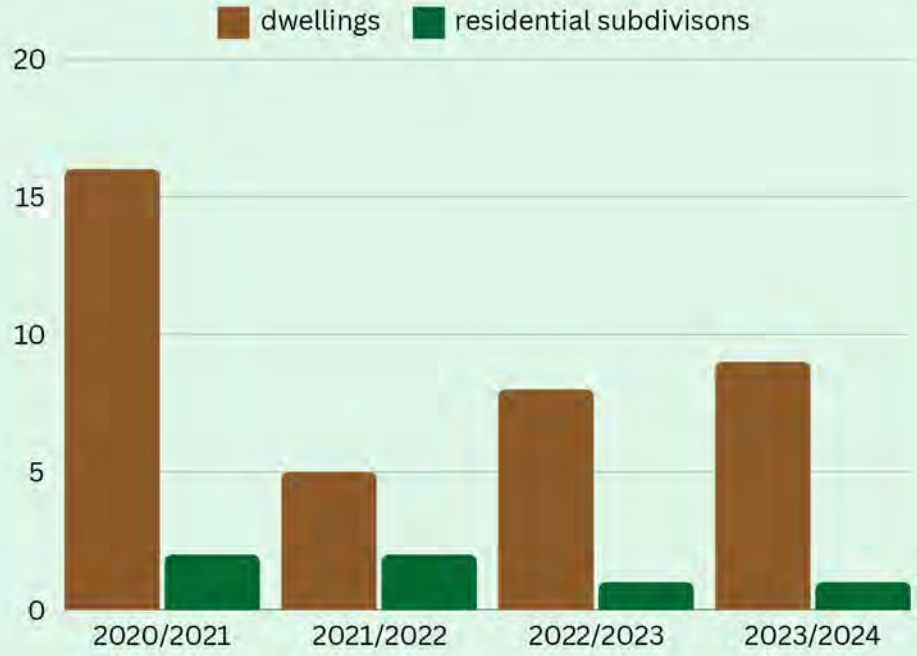
2.4 HOUSING SUPPLY

Rateable dwellings in the Shire in 2024: 798

The number of households required to house the projected population in 2024 (NSW Department of Planning, Housing and Infrastructure CPA projections) was 976.

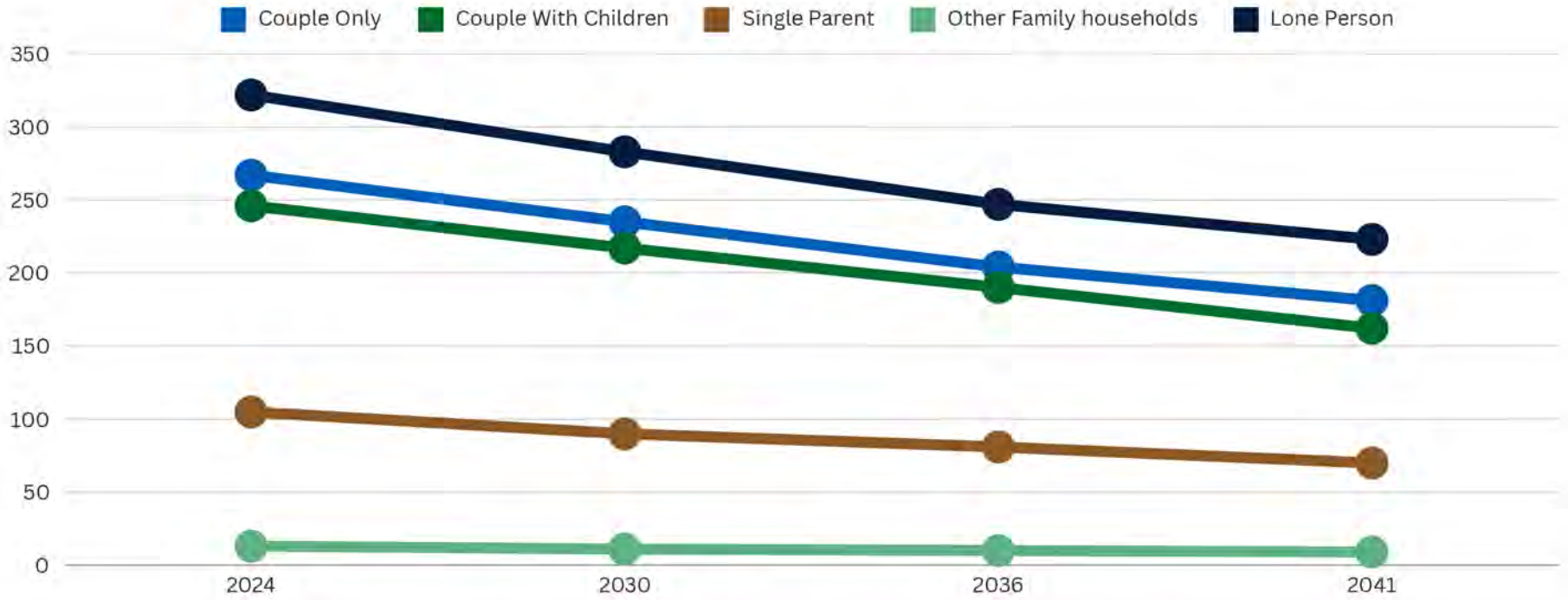
Of the 798 rateable dwellings in the Shire, there are approximately 40 properties in Nyngan that are in a state of dilapidation. It is likely that a small number of dwellings in the villages will also require demolition or major renovation to be habitable.

Residential approvals in the Shire have fallen over time as shown in this graph, but may be starting to gradually increase again:



There is a chronic shortage of rental vacancies in the Shire. In July 2024 only one property was listed for rent. Rental property waiting lists regularly have up to 10 applicants. The community have also noted that many rental properties are vacant for much of the year as they are leased by local industry for workers that do not live in the area.

2.4 HOUSING SUPPLY



The graph above shows the projected households by Type of Household (number of households required to house the projected population). Notably, lone person households are the highest projected household type.

In 2024 the number of dwellings required to house the population was estimated to be 976. In 2041 the number of dwellings required to house the population is estimated to be 658 due to the forecast population decrease. The forecast does not take into account disruptors and stressors on housing demand such as industry growth and the associated need for fluctuating temporary workers accommodation.

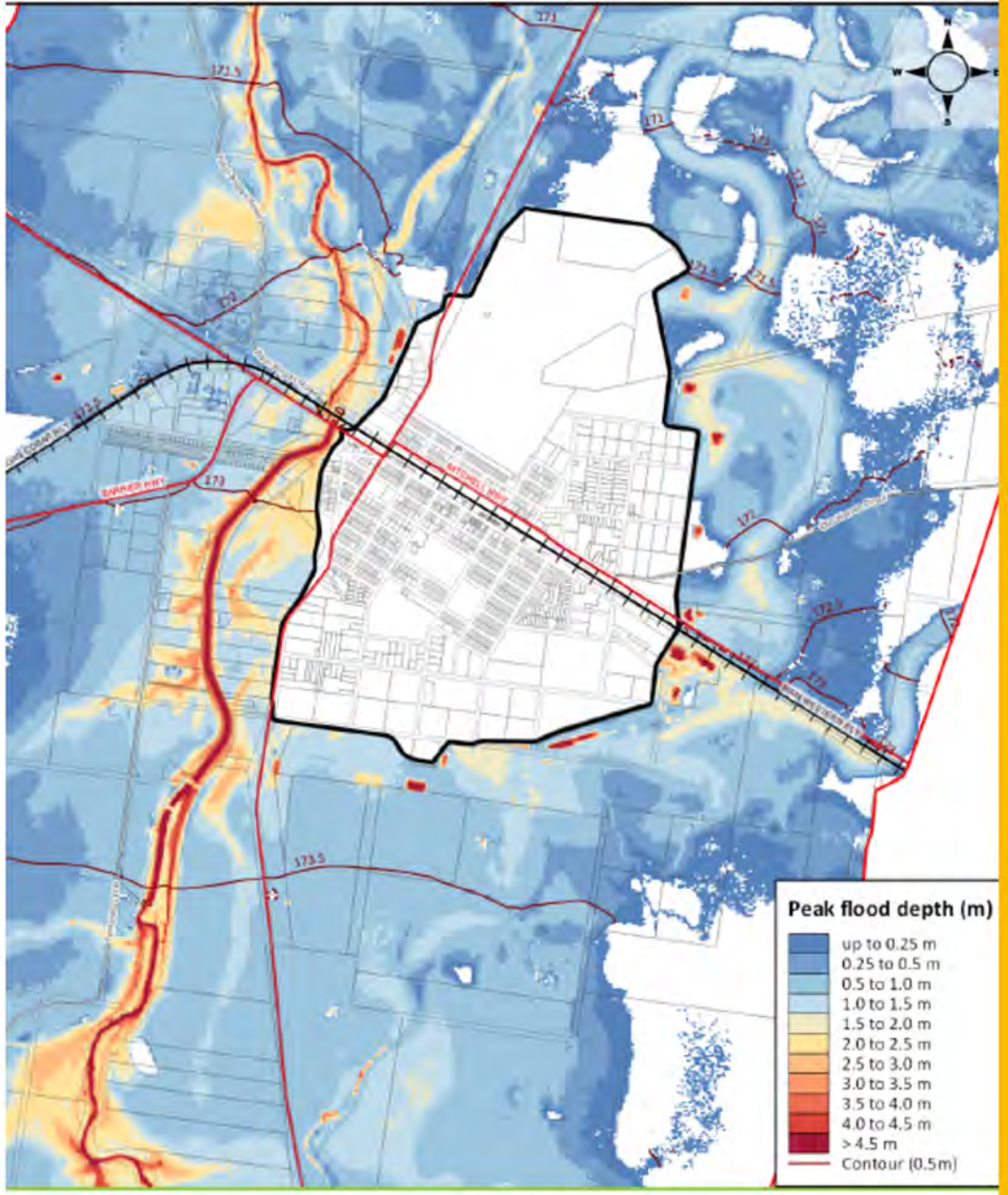
2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

FLOODING

A flood study update has been prepared for this LHS. It is included at Attachment B.

The Bogan River at Nyngan has been subject to large flooding events, most notably the 1990 event where the town was inundated with flood waters. Following the 1990 flood event, the Nyngan town levee was realigned and extended to encircle the town over its 11km length, and upgraded to a height exceeding the 1990 peak flood level by 1m. Flood warning systems were augmented.

The flood study undertaken for this LHS shows that land within the Nyngan levee is not constrained by flooding, as the levee remains above the 1 in 100 flood level, incorporating climate change. Large areas of R5 Large Lot Residential Land outside the levee are shown to be inundated, and are not suitable for development unless supported by a specific flood study and updates to the Bogan Shire LEP and DCP to include flood hazard risks and controls.



2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

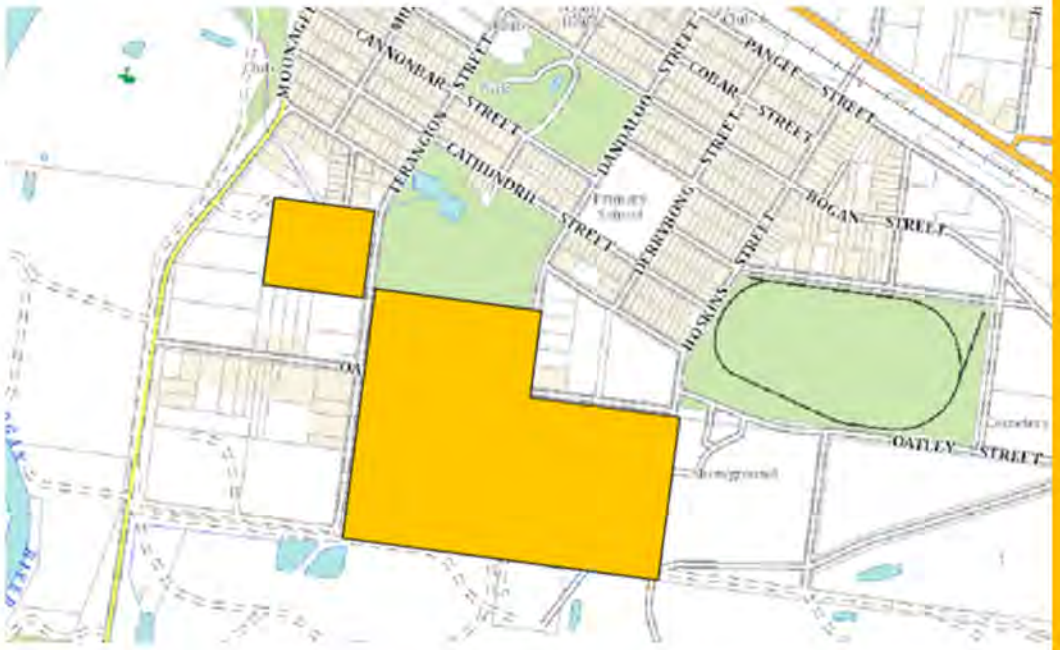
FINANCIAL FEASIBILITY and COST OF DEVELOPMENT

The average price for a block of vacant residential land in Nyngan in the 2023/24 financial year was around $36,000. The recent residential subdivision approved by Council on Hoskins Street in Nyngan estimated that the cost of constructing and servicing each lot was around $57,000. This means that there is currently little financial incentive for the private development of residential land.

Council has a Section 7.12 development contributions plan that applies to development valued at $500,000 or above. The contribution is set at 1% of the development cost.

There are two areas within the Shire which are included on the LEP Urban Release Area (URA) maps as shown in yellow on the figure to the right. Satisfactory arrangements are to be made for the provision of State public infrastructure before the subdivision of land for intensive urban purposes in areas included on URA maps. In addition, land included on a URA map is required to have a site-specific development control plan in place prior to its development.

The inclusion of land on a URA map may provide a disincentive for residential development in situations where the return on land sales does not justify the cost of development. The potential for removal of the URA layer from the LEP should be investigated and discussed with relevant State agencies.



2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

HERITAGE, IDENTITY AND CULTURE

There are four heritage items listed on Schedule 5 of the Bogan Local Environmental Plan 2011. They are:

1. Chinese graves and burner at Nyngan Cemetery
2. Nyngan Court House
3. Nyngan Railway Station
4. Railway overhead footbridge and goods shed

Although none of the listed items have an impact on the provision of housing as none are residential buildings or have the potential to be re-purposed for residential development, “heritage” includes the places, objects and stories that the community has inherited from the past and want to protect for future generations. It gives the community a sense of history and contributes to the culture, identity and liveability of a place.

The Shire’s heritage includes tens of thousands of years of Aboriginal culture and landscapes, as well as more recent historic buildings and structures, monuments, gardens, archaeological sites, streetscapes, conservation precincts and intangible heritage.

A Heritage Strategy for the Shire, and protection of important heritage places in the LEP would contribute to reinforcing the Shire’s identity and preserving its history and culture, thus contributing to liveability and a sense of community.

2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

BIODIVERSITY

The Biodiversity Conservation Act 2016 (BC Act) outlines the framework for addressing impacts on biodiversity from development and land clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Thresholds for entry into the scheme are:

- Whether the impacts occur on an area mapped on the Biodiversity Values Map; or
- Whether the amount of native vegetation being cleared exceeds a threshold area or
- Whether the proposal would have a significant impact on threatened communities or species.

Most of the land zoned in the Shire for residential development is of low biodiversity value, though a few areas are likely to be constrained by biodiversity credit obligations and would be financially unfeasible to develop in the current market.

2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

TEMPORARY WORKERS ACCOMMODATION

Aeris Resources is a mining company that plays a significant role as a major employer within the Bogan LGA.

Recent exploration activities have led to the discovery of additional deposits, which is likely to result in a major new production centre in the short to medium term.

At present around 80% of permanent employees of the mines in the Shire live locally. Relocation packages are made available by the Aeris mining company to encourage employees to live locally. Around 20 % of employees need to be sourced from outside of the Shire due to skill and workforce shortages. At certain stages of mine development large numbers of contractors are required to be accommodated temporarily in the Shire to provide specialist services. The remaining 20% of employees, that do not reside in the Shire, are Fly-in Fly-out (FIFO) or Drive-in Drive-out (DIDO) employees.

To accommodate employees and contractors that do not live locally Aeris currently has 162 rooms within its accommodation mix made up of:

- A “mine camp” on the western edge of Nyngan with 30 motel-style rooms that are occupied on a rotational basis.
- Long-term bookings with several local hotels, with the majority of rooms booked out on an almost-permanent basis. This amounts to 69 rooms in total.
- 18 homes in Nyngan owned by Aeris, primarily used by senior management but unoccupied for much of the time.
- Twelve homes in Nyngan with long-term rental agreements.

2.5 LAND USE OPPORTUNITIES AND CONSTRAINTS

With new work planned for the Tritton operations, there will be a requirement to provide an expanded accommodation portfolio for mine employees and contractors.

Whilst it will continue to source its employees from the local community as a first preference, Aeris has indicated its preference to house its FIFO and DIDO employees on the mine site in temporary worker's accommodation.

Agriculture is also a large employer in the Shire. Seasonal workers are required at various times of the year for processing, production and harvesting jobs, amongst others. Influxes of temporary workers in the agriculture industry also require temporary accommodation whilst they are in the Shire.

2.6 ANALYSIS OF EVIDENCE-BASE

This section analyses the data presented in the previous sections to determine what the current housing needs are, where the gaps are and where the gaps are likely to be in the future. This section has two parts:

1. Housing supply gaps, and
2. Identification of areas with development capacity.

Housing Supply Gaps

An analysis of the data presented in the previous sections tells us that the demand for housing in the Shire will fluctuate in line with industry expansion and contraction. There is a current shortfall in housing supply, though the demand is expected to reduce over time as the permanent population reduces, according to State government projections.

The demographic analysis has identified that the average age of the population is increasing and there is a large proportion of lone person households within the Shire. The figures indicate that the current housing supply and type does not match the needs of the community, with a lack of smaller dwellings.

Residential house and land prices indicate relative housing affordability and a lack of mortgage stress, however there is a significant lack of rental housing available.

Identification of Areas with Development Capacity

An analysis of the data presented in the previous sections tells us that there is currently enough residential zoned land in the Shire to meet the forecast demand.

The flood study shows that large areas of land zoned R5 Large Lot Residential outside of the Nyngan levee are flood-prone and can not be developed without further investigation and appropriate controls.

The biodiversity study shows that some areas of residential land are constrained by biodiversity requirements, in particular the payment of credits for clearing, though most residential zoned land has minimal biodiversity requirements.

2.6.1 HOUSING SUPPLY GAPS - TEMPORARY WORKERS ACCOMMODATION

Providing housing for temporary workers presents challenges for the community and the industries that require temporary worker housing. These have been identified as:

- Accommodation is often needed within a short timeframe for significant and fluctuating numbers of workers and contractors.
- Currently temporary workers accommodation supply falls short of the demand.
- Accommodation for mine workers needs to move with a project – as one pit ends its life another one may be expanding, meaning that accommodation needs to be "portable".
- Significant numbers of dwellings within Nyngan are owned or leased by Aeris Resources (mining), resulting in low rental vacancies and high rental prices. Local agents advise that at most points in time there is no rental accommodation available in the Shire and waiting lists can be long.
- Occupation of tourist accommodation by temorary workers means that tourists are often not able to stay overnight in Nyngan as no tourist accommodation is available. This impacts the Shire's visitor economy.
- Employee accommodation provided at Nyngan is a significant distance from the mining operations, providing a risk to workers who often work shifts and are driving at night when road conditions (due to wildlife strike etc) are hazardous.

2.6.1 HOUSING SUPPLY GAPS - SMALLER HOUSES

There is a housing supply gap for small dwellings and universal housing that is designed to meet the changing needs of residents over their lifetime.

The lone person household makes up the greatest proportion of household types in the Shire and this is generally consistent across NSW. However, the most common dwelling type in the Shire is a 3 bedroom detached house.

The data indicates that large detached dwellings consistently remain the most common form of housing, though there is likely to be a need to offer a greater range of home sizes and designs to cater for smaller households as well as seniors and people with limited mobility. To complement this, smaller homes should be located where services and infrastructure can be easily accessed so that they are suitable for everyone, including people with a disability or on low incomes who need to minimise living costs.

The Nyngan Multi Purpose Service is a residential aged care facility with around 36 beds. It is provided by the Western NSW Local Health District and has full time nursing care and secure dementia facilities. It is expected that any supply gap in this form of housing would be addressed by the local health district, as this is a specialised form of housing subsidised by the Commonwealth.

2.6.1 HOUSING SUPPLY GAPS - VACANT LAND

There is a large supply of available general residential (R1) zoned land for new greenfield (undeveloped land) housing, however the subdivision and development of new lots is significantly constrained by the cost of development, in particular infrastructure provision, which in the current market has made development financially unviable in most cases.

Although there is a large supply of available large lot residential (R5) zoned land for new greenfield housing, much of it is located outside of the Nyngan levee on flood prone land, and will require further consideration of flood risk and controls in the Bogan LEP and DCP. Although R5 land does not need to be connected to reticulated water and sewer, upgrades required to roads and drainage systems can still make development of R5 lands financially unviable in the current market.

The costs of providing infrastructure to residential zoned land will need to be addressed, to ensure an adequate supply of land for greenfield housing.

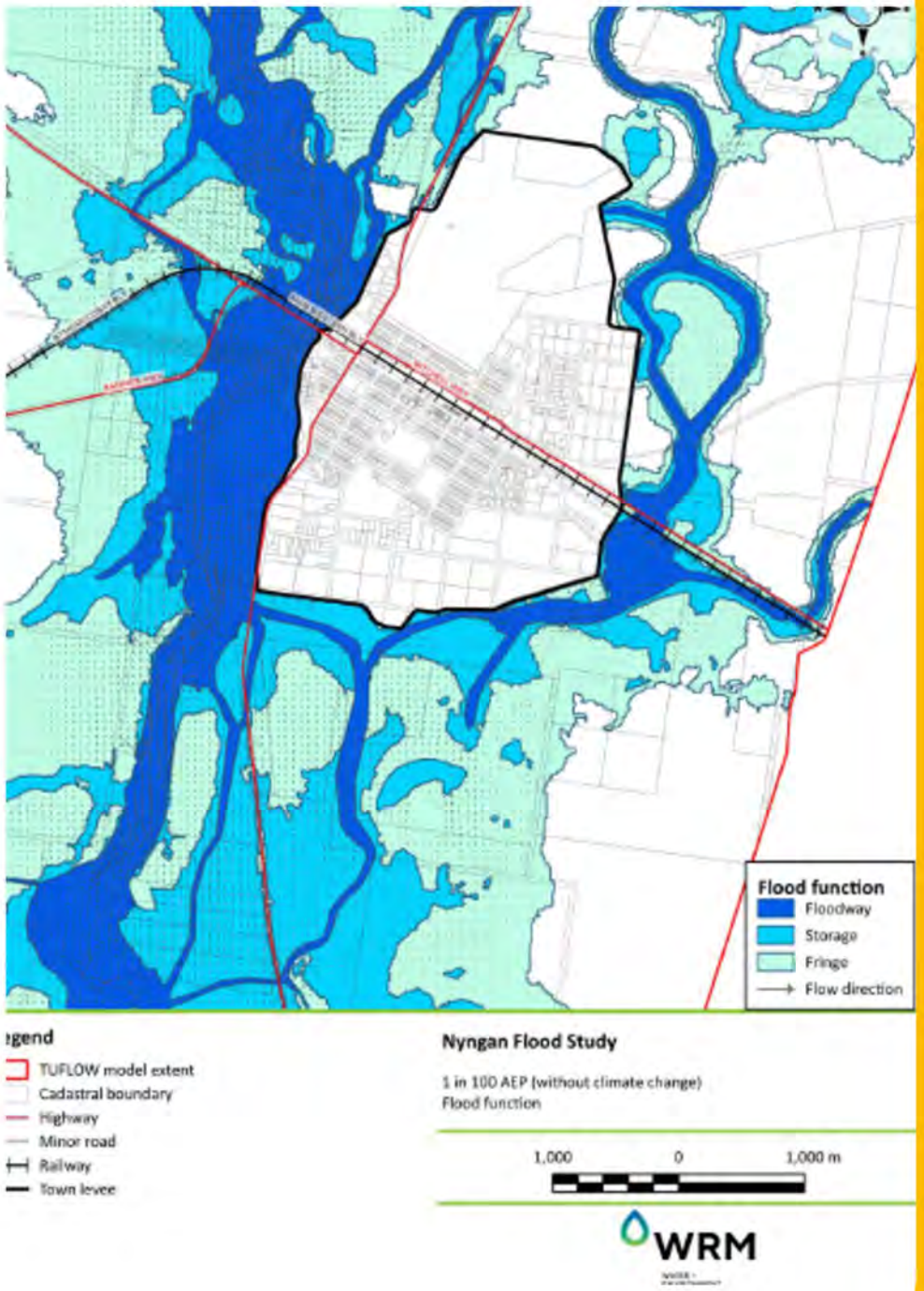
During the community engagement for the LHS, the NSW State Emergency Service (SES) requested:

- *Strategic plans are underpinned by current, robust constraints analysis and mapping undertaken by relevant experts to identify the suitability of different lands for different uses, such as the Flood Risk Management Process, and thereby ensuring that appropriate statutory controls are in place to protect the community and the environment from adverse impacts such as flooding.*
- *Recommend the set of principles developed for Bogan Shire Council Housing Strategy include resilience to natural hazards (including flooding and storms) and climate change.*
- *Recommend that any fast-track planning process for the Housing Strategy in Bogan Shire Council would still require consideration of flood risk for development located on flood prone land and demonstrate consistency with Local Planning Direction 4.1 Flooding. This includes ensuring there is no significant increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures.*
- *Support measures to ensure "sensitive and hazardous development" is not permitted on land between the Flood Planning Area (FPA) and the Probable Maximum Flood (PMF) in recognition of those uses having a higher risk to life and warranting the consideration of the impacts of rarer flood events on land located outside the FPA.*
- *Support the consideration of climate change in flood modelling using the best available science for climate risk assessments. The NSW SES encourages the sharing of this risk information, which will enable other organisations, such as NSW SES, to plan for extremes in climate events and sequences.*

2.6.1 HOUSING SUPPLY GAPS - VACANT LAND

The Bogan Local Environmental Plan (LEP) 2011 includes *Clause 5.21 Flood Planning* which contains matters for consideration by Council when it considers a development application. The clause is not supported by any flood mapping. Flood Planning Maps could be included in the LEP and flood level and hazards details from the flood study made available for flood affected land.

Council's Development Control Plan (DCP) 2012 contains standards for flood affected land. The standards will require updating to be consistent with the updated Flood Study (WRM, 2024) and any future works or studies relating to the management of flood risk.



2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY

Areas with a capacity for development have been identified through an analysis of the opportunities and constraints across the Shire. Development opportunity areas consist of areas that:

- Are already zoned for a residential land use.
- Are unconstrained for development or have constraints that can be overcome or managed.
- Meet the aims of Local and Regional Plans.

The analysis shows that there is a generous supply of residential zoned land available in the Shire. No additional land is required to be rezoned to meet the housing demand to 2045.

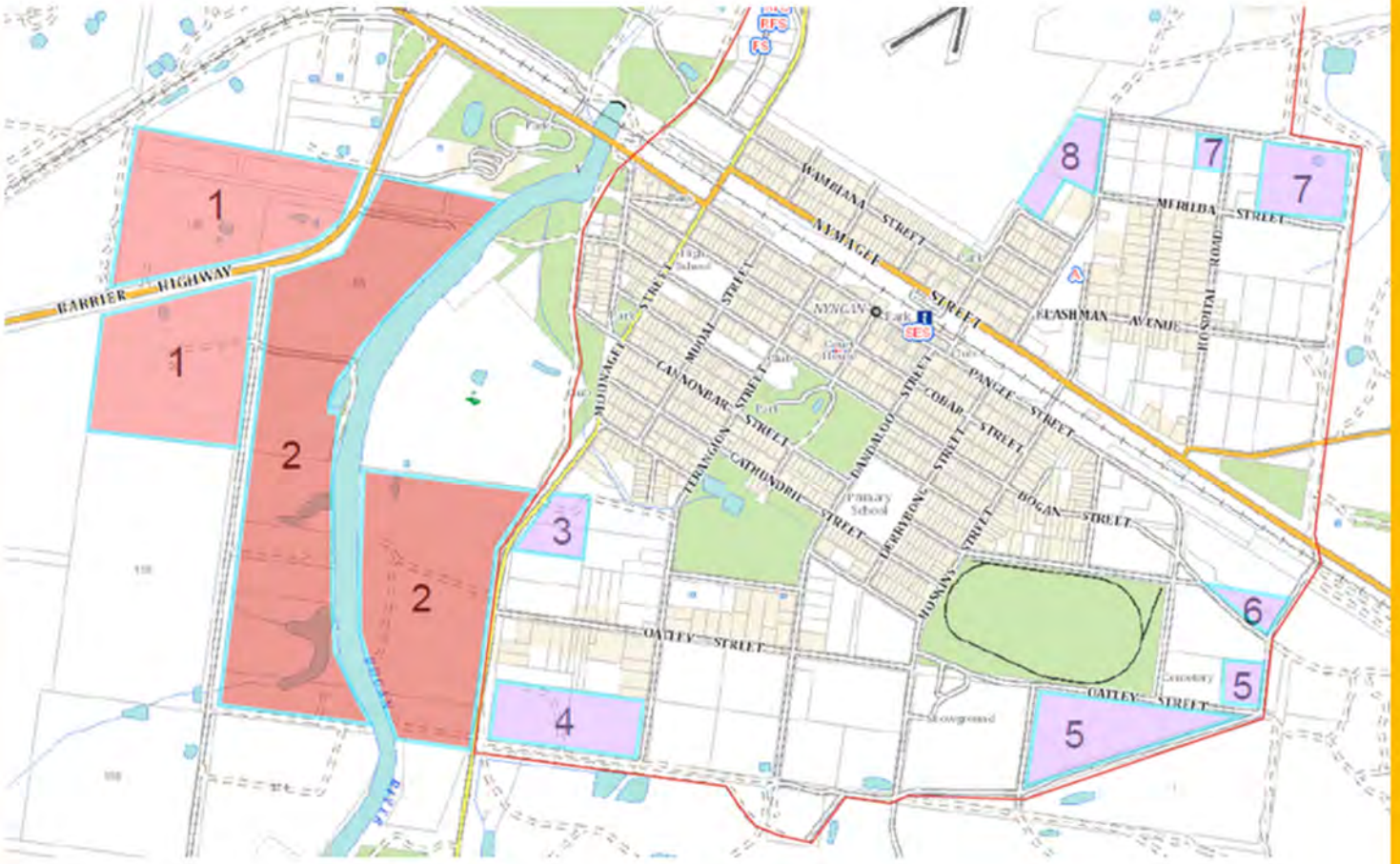
The ultimate decision to develop a private parcel of land is at the discretion of the land owner. Market forces such as interest rates, cost of living and lack of trades are outside of Council's direct control, with Council's role generally limited to facilitating land use planning processes and the provision of services that incentivise land development.

Any further land development would require an analysis of infrastructure capacity.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING:
R5 LARGE LOT RESIDENTIAL ZONE

The marked up map of Nyngan in the figure to the right shows the current large lot residential development potential in the town.

There are other areas of R5 land in Nyngan but most have already been developed to their potential. The areas are marked in no particular order of priority but have been grouped together to reference a common set of constraints and opportunities discussed in the following pages.



2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING:
R5 LARGE LOT RESIDENTIAL ZONE

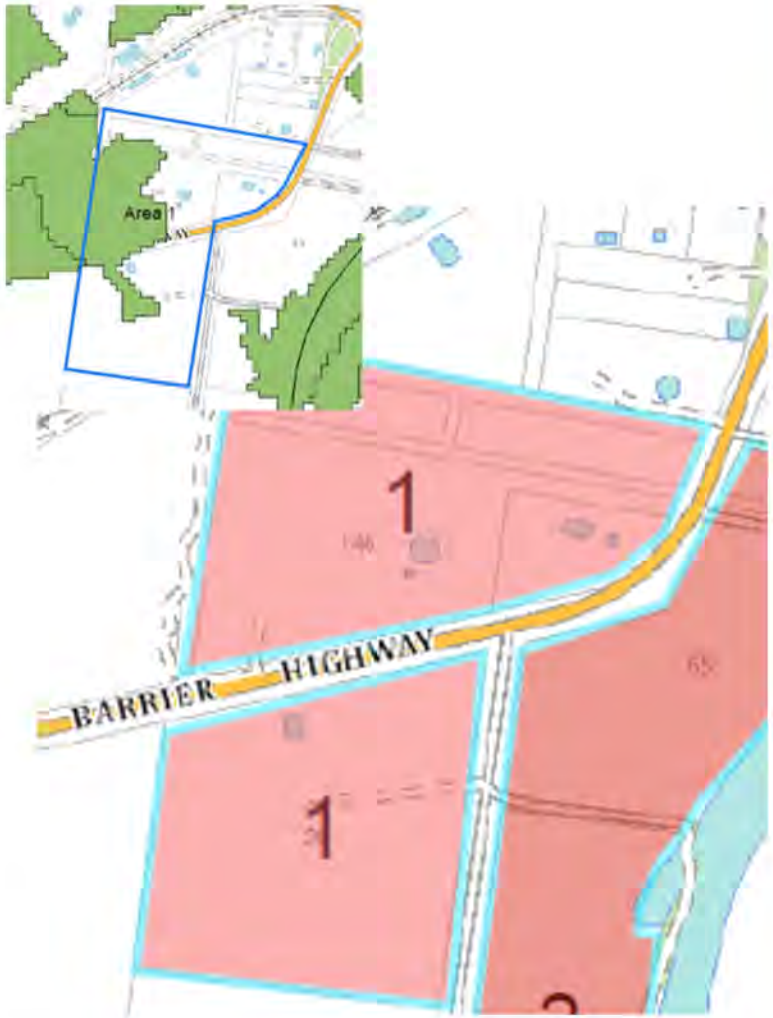
AREA 1

Approximate land area: 584,000sqm
Mapped minimum lot size: 4000sqm
Potential lot yield excluding biodiversity constrained land: 105 lots

Constraints and opportunities:

- In a 1 in 100 year flood with climate change the majority of the area has a hydraulic hazard category of H3, meaning it is unsafe for vehicles, children and the elderly.
- Road access into Nyngan is only available via the Mitchell Highway which is inundated during the 1 in 20 year flood event.
- The area straddles the Barrier Highway and would require generous setbacks to manage noise and amenity impacts.
- Lot numbers would be limited through requiring direct access on to the Barrier Highway.
- The area is in close proximity to a grain processing plant resulting in potential land use conflicts which would require buffer areas.
- The area is mapped as bush fire prone and asset protection zones (APZs) would need to be included in the lot layout.
- The north-western part of the land is included on the terrestrial biodiversity mapping (approximately 162,000sqm) as shown in green in the inset to the right.
- The land has good amenity and is characteristic of rural lifestyle living.

The land is not suitable for residential development without a further flood study and appropriate flood controls.



2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 2

The majority of Area 2 has a flood hydraulic hazard category of H3 – H6 meaning that it is generally unsafe for people and vehicles and all building types would be considered vulnerable to failure.

A small number of rural properties are located in Area 2. An increase in dwelling density is unlikely to be appropriate.

A rural zone would be more appropriate for this land.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 3

Approximate land area: 39,600sqm
Mapped minimum lot size: 4000sqm
Potential lot yield: 9 lots

Constraints and opportunities:

- Can be connected to the town water supply, with services running along Tottenham Road. The sewer infrastructure does not extend this far but is located in close enough proximity to be easily extended.
- The site has good road access.
- The land is mapped as bushfire prone and APZs would need to be included in the lot layout.
- The land is of low biodiversity value and credit obligations would be likely to be low or nil.
- Adjoins R1 General Residential zoned land.

This area is a logical extension of the urban area of Nyngan and could be considered for an increase in density via upzoning to an R1 zone, resulting in around 40 lots approximately 900sqm in size (if reticulated sewer can be provided).

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 4

Approximate land area: 112,500sqm
Mapped minimum lot size: 4000sqm
Potential lot yield: 27 lots

Constraints and opportunities:

- Area 4 could be connected to the town water supply, with services running along Terangion Street and Tottenham Road. The sewer infrastructure does not extend this far, and would require a reasonably large extension.
- The site has good road access.
- The land is mapped as bushfire prone and APZs would need to be included in the lot layout.
- Areas in the eastern portion of the land have high biodiversity value.
- A BDAR would be required for development of the land and development of some parts would attract high credit obligations, though across most of the site credit obligations would be low or moderate.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 5

Approximate land area: 140,800sqm
Mapped minimum lot size: 4000sqm
Potential lot yield excluding the portion to the north of Oatley Street: 26 lots

Constraints and opportunities:

- The part of Area 5 on the northern side of Oatley Street is Crown land and part of the cemetery. It would be more appropriate in an SP2 zone.
- The area has good road access.
- The area is mapped as bushfire prone and APZs would need to be included in the lot layout.
- There may be land use conflicts with the off-road racing track located to the south, requiring significant buffers to mitigate potential noise impacts.
- Development of the north-western portion of the land would require a BDAR and would likely attract some credit obligations.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 6

Area 6 adjoins an industrial site, with a high likelihood of land use conflict.

The area is heavily vegetated, with approximately half of the area included on the Terrestrial Biodiversity mapping layer.

Development of the land would require a BDAR and high offsets would likely be required for development of the land, making it economically unfeasible to develop in the current economic climate.

The land is mapped as bushfire prone, which would require almost complete removal of the vegetation for APZs.

The land is not appropriate for residential uses, and a non-residential land use zone would be more appropriate.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING:
R5 LARGE LOT RESIDENTIAL ZONE

AREA 7

Approximate land area: 85,400sqm
Mapped minimum lot size: 4000sqm
Potential lot yield: 19 lots

Constraints and opportunities:

- A minor extension of the town water supply could be achieved to provide reticulated water. The area is not in close proximity to the reticulated sewer.
- The area has good access off Merilba and Jubilee Streets.
- The land is bushfire prone and APZs would need to be included in the lot layout.
- Small portions around the northern boundary are affected by the Terrestrial Biodiversity mapping.
- Development of the land would require a BDAR and would likely attract low credit obligations.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - RURAL LIFESTYLE LIVING: R5 LARGE LOT RESIDENTIAL ZONE

AREA 8

Approximate land area: 49,700sqm
Mapped minimum lot size: 4000sqm
Potential lot yield including excluded area for Terrestrial Biodiversity mapping: 5 lots

Constraints and opportunities:

- A minor extension of the town water supply could be achieved to provide reticulated water.
- A minor extension of the reticulated sewer system could be achieved to provide reticulated sewer.
- The area has good road access.
- There may be land use conflict with the area's proximity to the airport.
- The land is bushfire prone and APZs would need to be included in the lot layout.
- The north-western part of the land is included on the Terrestrial Biodiversity mapping as shown in the inset to the right. The approximate land area included on the Terrestrial Biodiversity map is 28,400sqm.
- Development of the land would require a BDAR and would likely attract high offsets in the northern portion.

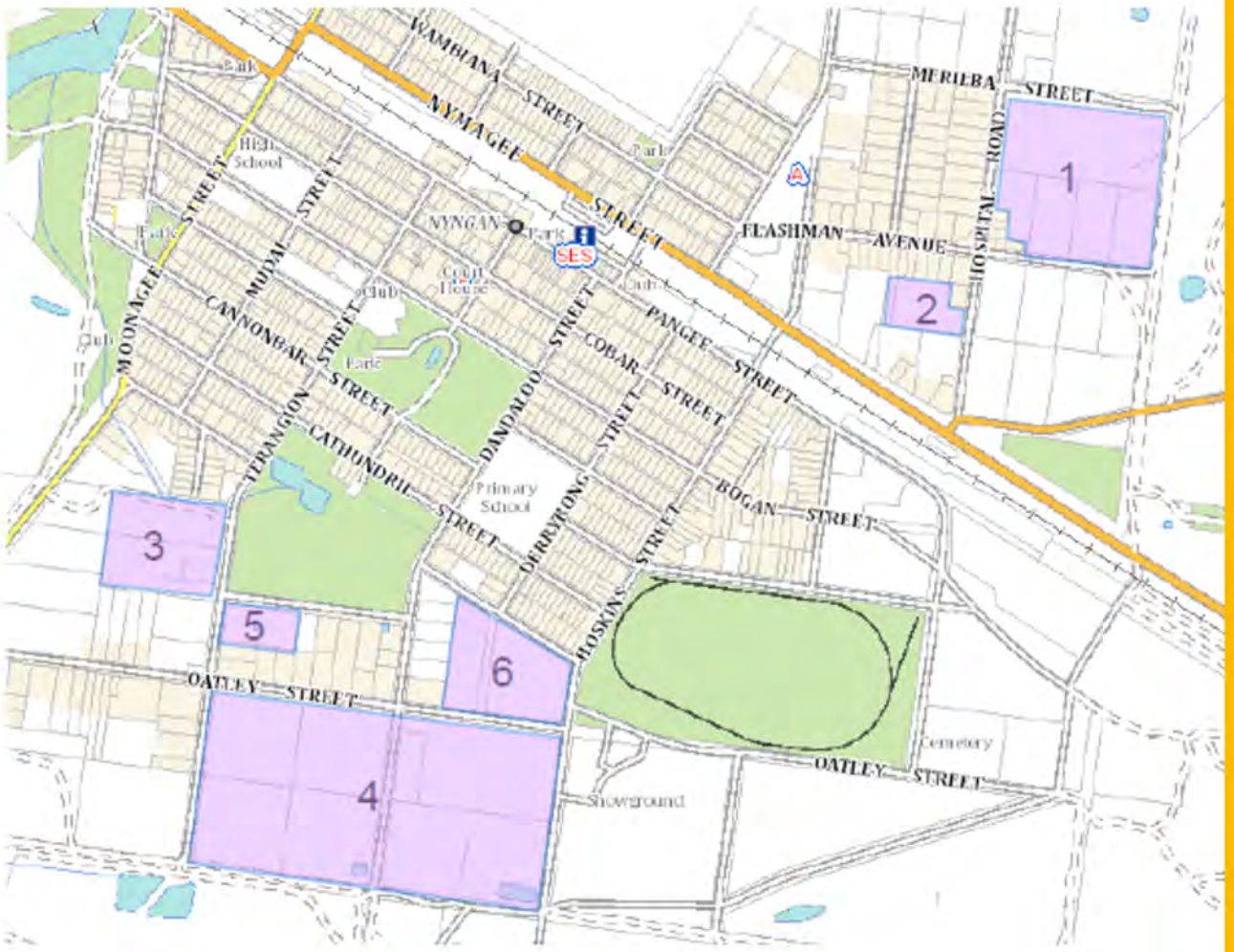
2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

The marked-up map of Nyngan shown in the figure to the right highlights current development potential. The shaded areas are all zoned R1 General Residential. There are other areas of R1 land in Nyngan, but most of them have already been developed to some extent. There is no R1 land outside of Nyngan. All R1 land is located inside of the Nyngan flood levee.

There is no minimum lot size or height restrictions applying to the R1 land.

The areas are marked in no particular order of priority. This land has not been developed to its potential and has been identified as an opportunity for the provision of further R1 lots.

All R1 land is capable of being serviced either by Council's existing services or through a minor extension of services.



2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 1

Approximate land area: 149,000sqm.
Average surrounding lot size: 800sqm.
Potential lot yield: 183 lots

Constraints and opportunities:

- Area 1 adjoins R5 zoned land and should provide a variety of lot sizes to provide a suitable transition to surrounding land uses.
- The land is mapped as bushfire prone and APZs would need to be included in any future subdivision.
- The northern part of the land is vegetated and a BDAR would need to be prepared for any development of the land.
- Development of the northern part of the land would likely attract high biodiversity credits, making the development of that part of the land likely to be economically unfeasible.
- There are a number of dwellings already on the land in the southern half, and the land is currently developed more characteristic of R5 land.
- The northern part of the land has potential remediation issues that would need further consideration and investigation (based on previous land uses).

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 2

Approximate land area: 22,000sqm.
Average surrounding lot size: 1500sqm.
Potential lot yield: 12 lots

Constraints and opportunities:

- Area 2 is Council-owned land that has been investigated previously for residential potential.
- Area 2 adjoins employment lands (E4 General Industrial) to the south and large setbacks combined with building envelopes would be required to minimise land use conflict. Smaller lots may be achieved in the northern half of the land to allow for larger lots adjoining the E4 lands to the south.
- The land is not subject to any mapped natural hazards.
- The land has good access off Hospital Road.
- The land is largely cleared, with only isolated trees remaining. Biodiversity credit obligations are unlikely.
- The land is constrained by service easements and overhead powerlines. Consultation with Essential Energy would be required prior to any development of the land.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 3

Approximate land area: 65,300sqm.
Average surrounding lot size: 900sqm.
Potential lot yield: 70 lots

Constraints and opportunities:

- There are a small number of dwellings already located on the land.
- The area is included on the Urban Release Area (URA) mapping in the LEP which may provide a disincentive for development.
- The land is mapped as bushfire prone and APZs would need to be included in the lot layout.
- The land has good access off both Collins and Terrangion Streets.
- A BDAR would be required for development of the land, with development in the eastern part likely to attract high biodiversity credits. Development of the remainder of the land would be likely to have low credit obligations.
- There is a drainage line along the northern side of the land which would need to be considered in the lot layout.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 4

Approximate land area: 351,000sqm.
Average surrounding lot size: 3000sqm.
Potential lot yield: 117 lots

Constraints and opportunities:

- There are a small number of dwellings already located on the land.
- The area is included on the URA mapping in the LEP which may provide a disincentive for development.
- The land is mapped as bushfire prone and APZs would need to be included in the lot layout.
- The land has access off Oatley, Hoskins and Terrangion Streets.
- The land is largely cleared, with only isolated trees remaining. Biodiversity constraints are likely to be low with a low likelihood of credit obligations.
- There are no services in close proximity.
- An R5 zone may be more appropriate for the land.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 5

Approximate land area: 16,700sqm.
Average surrounding lot size: 3000sqm.
Potential lot yield: 6 lots

Constraints and opportunities:

- There is a dwelling already located on the land.
- There is a waterbody on the land.
- The area is included on the URA mapping in the LEP which may provide a disincentive for development.
- The land is mapped as bushfire prone and APZs would need to be included in the lot layout.
- The land has good access off Terrangion Street and Oval Place.
- Development of the land is unlikely to require a BDAR or attract credit obligations.
- The land is ideally located close to an area of public recreation.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - TOWN LIVING:
R1 GENERAL RESIDENTIAL ZONE

AREA 6

Approximate land area: 61,900sqm.
Average surrounding lot size: 900sqm.
Potential lot yield: 67 lots

Constraints and opportunities:

- A development application is currently being considered by Council for a thirty-three lot subdivision across part of the land.
- The land is ideally located close to an area of public recreation and in close proximity to Nyngan Public School.
- The land has good access off Oxley Street and Hoskins Street, with an unformed road reserve through the centre of the land.
- A BDAR was prepared for the land subject to a current subdivision and has attracted a low credit obligation. It is likely that the development of the remainder of the land would also require a BDAR and would have a low credit obligation.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - VILLAGE LIVING:
RU5 VILLAGE ZONE

GIRILAMBONE

Distance from Nyngan: 44km
Population (2021 census): 86 people.

Girlimabone is located close to the Murrawombie Mine. Additional accommodation in Girilambone is likely to be considered in the future for any mine extensions.

As shown in the figure to the right it has a substantial area zoned RU5 with most lots still undeveloped.

The village has a primary school and basic facilities for residents. Higher order services are available half an hour's drive away in Nyngan.

There is no minimum lot size applying to the village area, however reticulated sewer is not available and lots would need to be large enough to accommodate on-site sewage management systems.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - VILLAGE LIVING:
RU5 VILLAGE ZONE

HERMIDALE

Distance from Nyngan: 45km
Population (2021 census): 127 people.

Hermidale has a substantial area zoned RU5 Village as shown in the figure to the right, with most lots currently undeveloped.

Lots to the east of Youngee Street and lots between Quanda Street and Walwa Street are vegetated and may be unfeasible to develop due to biodiversity constraints.

The village has a primary school and basic facilities for residents and travellers. Higher order services are available half an hour away in Nyngan.

There is no minimum lot size applying to the village area, however Hermidale is not serviced by reticulated sewer and lot sizes would need to be large enough to accommodate on-site sewage management systems.

Additional workers accommodation is likely to be considered in the future for any mine extensions.

2.6.2 IDENTIFYING AREAS WITH DEVELOPMENT CAPACITY - VILLAGE LIVING:
RU5 VILLAGE ZONE

COOLABAH

Distance from Nyngan: 75km
Population (2021 census): 32 people.

Coolabah has a substantial area zoned RU5 Village as shown in the figure below, with most lots remaining undeveloped.

There is no school in Coolabah, though it has basic services for residents and travellers.

There is no minimum lot size applying to the village area, however Coolabah is not serviced by reticulated sewer and lot sizes would need to be large enough to accommodate on-site sewage management systems.

SECTION 3
PRIORITIES

This section describes how all of the previous information has been brought together to produce an integrated picture of what the current housing situation is in Bogan Shire, what the future should look like for housing and what the road map is for getting there.

3.1 THE LOCAL HOUSING STRATEGY OBJECTIVES

1. **Accommodation for people of different ages, family composition and demographics.**
2. **Better planning and approval pathways to manage spikes in housing demand so that housing is available for everybody.**
3. **Remove dilapidated homes to make more residential land available in the urban area for new homes.**
4. **Manage natural hazards on residential land.**
5. **More infill development and repurposing of land for residential uses in appropriate locations.**
6. **Reduce financial feasibility barriers to residential development.**

3.2 OPTIONS


INCREASE HOUSING DIVERSITY
PROVIDE TEMPORARY WORKERS ACCOMMODATION
IMPROVE HOUSING STOCK
MANAGE FLOOD RISKS
ENCOURAGE INFILL DEVELOPMENT
IMPROVE FINANCIAL FEASIBILITY

3.3 LAND USE PLANNING APPROACH

There is no minimum lot size applying to the R1 General Residential areas of the Shire. Given the infrastructure and servicing constraints associated with developing the urban fringes, infill development and higher density living should be encouraged within the main urban area where essential services are available. The following issues are of relevance:

- Public lands that are not being used for a public purpose may be suitable for partnerships with community housing providers for the development of social, universal and affordable housing to address the supply gap for this form of housing. This is already being considered in Nyngan and has occurred successfully in other local government areas.
- Lots in the Nyngan urban area are often large, 1000sqm or more, making them suitable for housing forms such as dual occupancies, secondary dwellings or units. These forms of housing would be beneficial for encouraging more housing in the urban area and increasing housing diversity. This may be of particular benefit for the ageing population, with opportunities for families to be housed on the same parcel of land when circumstances of 'life stage' require it.

The rates recovery fund applied in the Shire's urban area has facilitated the demolition of uninhabitable dwellings, thereby making land available in serviced areas for new houses and providing opportunities for improved housing stock.

3.3 LAND USE PLANNING APPROACH

There is currently no clear approval pathway in the NSW planning system for temporary workers accommodation. A new planning framework and guidelines (Toolkit) was exhibited by the NSW government in late 2023 to help regional councils plan housing for temporary workers accommodation. The expectation was that the final toolkit would be released in 2024, however at the time of preparing this Housing Strategy the Toolkit had not been released.

A provision in the Bogan LEP to allow temporary workers accommodation would address this supply gap.

If this land use planning approach was available for major employers with temporary workers it is likely that:

- Properties currently leased by major employers would be released back into the general rental market addressing both the general rental shortage and key worker accommodation shortage (nurses, teachers etc.) in Nyngan.
- Tourist accommodation would be available for tourists, thus boosting visitor spend in the Shire.
- Expansion of major industries in the Shire would not be limited by availability of accommodation for contractors and employees.
- Housing for employees can be provided closer to the place of work, thus addressing safety and efficiency concerns.

Prior to any LEP amendment to allow temporary workers accommodation in the Shire, a socio-economic impact assessment would be required to determine the potential impacts on businesses and the community.

3.3 LAND USE PLANNING APPROACH

Flood risk is a factor for consideration for local land use opportunities and constraints in the Shire. The predicted flood behaviour for the Bogan River has been included in the supporting documentation for this LHS at Attachment B. The study includes design event mapping, flood hazard analysis and a flood planning area, consistent with current guidelines and statutory planning requirements. The updated study shows that land within the Nyngan levee is flood free up to the Probable Maximum Flood (PMF) level.

Significant areas of R5 Large Lot Residential zoned land outside of the Nyngan levee are mapped as flood prone. Consistent with the 2022 *NSW Flood Inquiry* and the Department's *Planning Circular PS 24-001* (1 March 2024) Council needs to move forward with the findings of the flood study update and apply a risk-based approach when addressing flooding in planning decisions. As Bogan Shire Council is primarily responsible for managing flood risk in the Shire it needs to ensure that:

- the level of assessment undertaken for development applications is proportionate to the flood risk of the proposal; and that
- planning decisions are based on a balanced consideration of the merits, risks and impacts of a given proposal; and that
- appropriate measures are in place to limit impacts to an acceptable level and achieve a tolerable flood risk level.

Clause 5.21 of the LEP includes several matters that must be considered by Council when assessing development applications on flood prone land. Currently Council has no publicly available flood mapping to enable efficient and transparent consideration of those matters.

3.3 LAND USE PLANNING APPROACH

The costs of developing land in the Shire have been demonstrated to outweigh the value of the land when it is sold, particularly in situations where services (water, sewer, roads) are required to be provided as part of the development. In addition, there are large areas of R1 General Residential zoned land that have an urban release area (URA) layer across them, requiring satisfactory arrangements for State infrastructure prior to it's development. It is not clear what State infrastructure is to be provided via the URA layer and further consultation will be required with the State in any future planning proposal to remove the URA layer.

During the community engagement phase of the LHS, a lack of trades available in the Shire was identified as a barrier to housing construction. A lack of skilled labour in rural and remote communities can have a significant effect upon sustainability and renewal. Although this is an issue that is beyond the direct control of local government, planning laws and controls can either restrict or promote new housing development. Local governments can provide support for the delivery of housing through accelerated approval processes or potential planning bonuses, the provision of grants, other types of support, and by encouraging and promoting housing outcomes through their strategic planning activities.

The following issues are of relevance:

- The provision of essential services including roads, water and sewer are a significant barrier to the financial feasibility of residential development in the Shire and mechanisms for funding the provision of services could be explored further.
- The URA layer across residential land in Nyngan provides an additional barrier to the development of the land as it potentially requires financial contributions to State infrastructure and the preparation of a Development Control Plan (DCP) for the land. An LEP amendment to remove the layer (subject to State agency consultation) could be explored.

3.4 LIVEABILITY

Although liveability does not directly affect the provision of housing, it refers to the degree to which a place supports quality of life and the health and wellbeing of the people who live in, work in, or visit that place. Places that have a high degree of liveability tend to have a high level of amenity. Amenity includes features such as open and green space, educational, social, recreational and cultural facilities and places. Liveability encompasses these features of amenity as well as other characteristics of the built environment that reflect the way places are planned, constructed and connected. These characteristics of the built environment include the arrangement, design and construction of dwellings and other buildings, public transport systems, road networks and public spaces, walkability and accessibility to goods and services, and high quality communication technology. Liveability also refers to the elements of the natural environment, such as low air pollution and the presence of natural areas and views.

During the community engagement phase of this LHS the survey and workshop participants noted that the following liveability issues were related to the provision of housing in the Shire:

- Limited access to medical services contributes to people leaving the Shire.
- Public transport is not readily available for travel to larger centres.
- Visitors don't stay in the town due to a lack of visitor accommodation.
- Employers can't attract staff as they can't find anywhere to live in Nyngan. This has a big impact on the availability of key workers such as teachers and nurses.
- Employment uncertainty prevents people from moving to the Shire.
- Accommodation is not available for crisis situations.

The Shire has a rich cultural and built heritage. Heritage helps to create a special sense of place, which can lead to attachment to place. Both tangible and intangible heritage are integral parts of engendering a sense of place identity and of belonging and cohesion. Culture and heritage tourism also plays a critical role in building the visitor economy, particularly in Western NSW. The Shire would benefit from a Cultural Heritage Strategy to promote and improve it's sense of place and thus its liveability.

3.4 MECHANISMS TO DELIVER THE OPTIONS

A. Identification of suitable public land for community housing

Council owns numerous parcels of land in the Shire. While most are used for a community or operational purpose, there are likely to be parcels that serve little public benefit and would be suitable for social housing or community housing, whereby Council forms a partnership with a social or community housing provider. An audit of Council-owned land would be required first, to identify suitable land and in some cases a land reclassification would be required via a Planning Proposal to allow the land to be used for housing. Criteria would need to be set in relation to the potential of public lands to use existing essential services, social infrastructure, proximity to amenities and enhancement of the local economy.

B. Community education campaign to encourage dual occupancies and secondary dwellings

Residential lots in the Shire are generally large - 900 square metres or more. The NSW planning system is a complex array of legislation, policy and public authorities, such that opportunities for land development are unlikely to be known to much of the community. A community education campaign via advertising and workshops would inform the community about options for increasing the density of development on larger lots, particularly in relation to dual occupancies and secondary dwellings where housing for family members on the same lot may be a desirable outcome.

C. Update of DCP 2012 residential development controls

To accompany any campaign to encourage infill development, dual occupancies or secondary dwellings, updates to the residential development controls in DCP 2012 would be required to ensure that this form of development does not adversely affect neighbours or the character of the area.

D. Continuation of Council's rate recovery fund to remove uninhabitable dwellings

A fund has been successfully run by Council to remove buildings in the Nyngan residential area that are no longer habitable. This fund is available in exceptional circumstances in order to recover unpaid rates via sale of the land.

3.4 MECHANISMS TO DELIVER THE OPTIONS

E. Additional Local Provision for temporary worker's accommodation

Part 7 of the Bogan Local Environmental Plan (LEP) 2011 includes additional local provisions not covered elsewhere in the LEP. Subject to a Planning Proposal an additional local provision could be inserted into the LEP to enable development for temporary workers accommodation where there is a demonstrated need to accommodate employees due to the nature of the work or the location of the land on which the work is to be carried out. This would contribute to relieving the fluctuating housing shortage and high rental costs in the Shire caused by temporary and seasonal workers, as well as freeing up tourist accommodation to boost the visitor economy. Any LEP amendment to include a temporary workers accommodation clause would need to be supported by a soco-economic impact assessment to determine the likley effects on local businesses.

F. Flood Planning

Flood mapping should be prepared for inclusion in the LEP and a set of development controls in its DCP to guide development on flood prone land. This will provide the community with information on the location of flood-prone land, flood behaviour and constraints, including flood hazard. These will form the basis for setting flood planning levels for Council and the community to use in planning applications and decisions.

G. Extension of essential services

The cost of extending essential services such as water and sewer to the urban fringes makes development in residential areas financially unfeasible in the current economic climate. Council could investigate funding mechanisms and models to extend infrastructure to the residential zoned land on the urban fringes of Nyngan. The importance of using existing and proposed infrastructure effectively needs to be understood so that servicing of land can be aligned to housing development and growth via (for example) development contributions, grants, budget allocations, user fees and charges and public-private partnerships.

H. Removal of URA layer on residential zoned land in the southern part of Nyngan

Subject to consultation with relevant State agencies, the URA layer could be removed from the LEP via a Planning Proposal as it provides an additional financial barrier to land development.

3.5 EVALUATION OF THE OPTIONS

Options	Alignment with Strategic Plans	Alignment with community and stakeholder priorities	Achieves
Increase housing diversity	• NSW Housing Strategy pillars 2, 3, 4. • Regional Plan objective 14 and strategies 14.1, 14.2, 14.3, 14.4, 14.5. • LSPS priority 4.	Community Engagement Report Recommended actions 2 and 5.	The need for a greater variety of housing types to accommodate the changing demographic including smaller households and people looking for smaller, more affordable housing and universal housing to suit all life stages.
Provide temporary workers accommodation	• Regional Plan objective 16 and strategies 16.1, 16.2. • LSPS priority 4, 6.	Community Engagement Report Recommended action 1.	Release of rental properties back into the general rental market to relieve rental availability and affordability pressures. Increased availability of tourist accommodation. Safer and more flexible options to support temporary worker accommodation, thereby supporting industry growth.
Improve housing stock	Regional Plan objectives 13, 14 and strategies 14.2, 14.3	Community Engagement Report Stakeholder Input point 5.	Increases the availability of residential land in the existing urban area by removing the large number of houses that are uninhabitable, thereby freeing up an infill development resource.
Manage flood risks	• NSW Housing Strategy pillar 4. • Regional Plan objective 7. • LSPS priority 9.	SES correspondence.	Housing that is resilient to natural hazards and avoids areas where life and property is at risk. This may allow some housing on large lot residential land outside of the Nyngan levee where risks can be adequately managed.
Encourage infill development	• Regional Plan objectives 12, 13, 14. • LSPS priority 4.	Community Engagement Report Recommended Actions 2, 5 and 6.	The housing of people in areas with better access to services and transport. Promotes the efficient use of infrastructure and reduces sprawl.
Improve financial feasibility	Regional Plan objective 17.	Community Engagement Report Stakeholder Input Point 6 and Recommended Action 3.	Promotes greenfield land release for additional housing.

SECTION 4
ACTIONS

This section identifies actions required to deliver the right amount and type of housing over the life of the Strategy, who will be responsible for achieving these actions and a timeframe for when they will be achieved.

4.1 IMPLEMENTATION AND DELIVERY PLAN

Action	Responsibility	Timing
Identification of suitable public land for social / community housing	Council / social and community housing providers	short
Land reclassification process for lands identified as suitable for social / community housing		
Flood risk study and update to LEP and DCP flood controls	Council	short
Update to DCP residential controls to facilitate infill housing and other forms of diverse housing	Council	short
Continuation of Council's demolition fund to remove uninhabitable dwellings	Council	short
Additional local provision for temporary worker's accommodation	Council / industry	short
Removal of URA layer on residential zoned land in the southern part of Nyngan	Council / State agencies	Short-medium
Community education campaign to encourage dual occupancies and secondary dwellings	Council	medium
Extension of existing essential services	Council	medium - long

The allocation of timing has been based on the significance of the benefits that would be achieved by the action combined with a realistic assumption of Council's likely ability to deliver the action. All of the actions require funding, some significant, therefore all of the actions are at risk of not being delivered if funding is not available.

Short term = within the first 5 years after the LHS is adopted
Medium term = within the first 10 years after the LHS is adopted
Long term = within the timeframe of the Strategy (20 years)

4.3 MONITORING AND REVIEW

Review of housing delivery and supply against the implementation and delivery plan to ensure that the actions are achieving the LHS's objectives	Annually
Review of the evidence base and housing stock against the Regional Plan and LSPS to ensure that the LHS is still aligned with these.	Five yearly
Review of the Strategy and re-engagement with the community to ensure that the vision and objectives are still aligned with the goals of the community and that the evidence base and planning contexts are still relevant.	Ten yearly

ATTACHMENT A - STAKEHOLDER ENGAGEMENT REPORT

Bogan Shire Council Housing Strategy Stakeholder Engagement Report

A Strategy to Address Bogan Shire's Housing Challenges and Opportunities

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Contents

Executive Summary

The development of a Local Housing Strategy (LHS) is an action that councils across NSW are encouraged to undertake as part of their long-term strategic planning. The LHS will give a picture of the state of housing in the Bogan Shire Local Government Area (LGA), the types of housing that are needed and the potential barriers to meeting those needs.

Input to this report was gathered from members of the community, State Government agencies and employers during May, June and July 2024. We hosted stakeholder meetings, workshops, and a community survey. We also heard from people via email and phone.

A common theme was the current shortage of housing in Bogan Shire, with a secondary issue being the cost of rental accommodation and lack of land. Both issues are linked to competition for available housing from major employers, the age of the current housing stock, and complexity and costs associated with planning approvals.

We heard a range of ideas, such as zoning new areas for housing, providing better information on how to navigate the planning system, encouraging private landowners to develop land and make housing available to rent, and finding ways to speed up approvals.

This is a summary of what we heard:

1. There is a shortage of houses to rent and land to develop, that is affordable and in the right location.
2. Developing land for housing is expensive and the planning process is complex and takes too long, discouraging residential development.
3. Reduced or limited access to services such as medical care and childcare has contributed to people leaving the area.
4. A shortage of land zoned for housing, combined with high development costs and shortage of skilled labour is contributing to the shortage of housing.
5. Some properties remain vacant for long periods of time, either because they need renovation or are reserved for staff, resulting in underutilised housing.
6. To encourage investment in housing, Council could provide more information about what is allowed under current land use zoning, as it is often less restrictive than people think.

There is consensus that the shortage of land and housing is resulting in the following:

- Financial pressure on residents
- Employers having difficulty in attracting staff from outside the LGA
- Shortage of skills needed to help build or renovate houses
- Visitors having difficulty finding short term accommodation, so they don't stay

The vision that emerged from the engagement with stakeholders can be summarised as follows:

Our vision for housing in the Bogan Shire is of a vibrant inclusive community, that offers a variety of sustainable, affordable, and flexible living options for everyone. With access to essential services and facilities, our homes are fit-for-purpose for all life stages. Our housing encourages a connected, safe and welcoming environment whether for the short, medium or long-term.

Introduction

This report summarises feedback gathered from the community and other stakeholders as input into a long-term vision and strategy for housing for Bogan Shire. The findings highlight the need to solve an immediate housing shortage, as well as plan for long term supply. While the community expressed a wide range of views, the feedback focused on the following:

1. The current housing supply is not meeting demand in Bogan Shire.

2. The shortage of houses to rent and buy is impacting on the ability of employers to attract staff, across a range of sectors.

3. The shortage of housing is compounded by a shortage of appropriately zoned land, a complex planning system and high development costs.

4. People wanting smaller houses or needing aged care accommodation are adversely affected.

5. Solutions such as incentivising property owners and speeding up the planning process should be considered.

6. Members of the community should be encouraged to make their properties available for rent and consider residential development opportunities by educating them about the planning system.

7. Council should be working with local employers and neighbouring councils to support job certainty and attract potential employees.

Background

Bogan Shire Council is currently preparing a Local Housing Strategy that will integrate the community's vision for housing with State Government led strategic plans and Council's own strategic plans.

The Local Housing Strategy will present Council's response for how the housing components of District and Regional Plans will be delivered locally and how any shortfalls in housing numbers or types could be addressed in the Shire.

Council invited community, industry, employers, and government agencies to provide views, and share data and other information that could assist in the preparation of the strategy.

All input is being considered in preparation of the strategy which will be exhibited for public comment.

In developing the housing strategy, Council will consider the evidence base, including demographic factors and the supply and demand for housing, as well as local land use opportunities and constraints and the community's aspirations for the character and growth of the area.

As part of the process to develop the draft housing strategy for Bogan Shire, in May, June and July 2024 Bogan Shire Council invited the community and other stakeholders to a conversation about housing across the local government area. We asked people to about current and future housing needs, challenges, and opportunities. This report documents what people said.

Stakeholder Input

Input provided by the community and other stakeholders about housing in Bogan Shire can be summarised as follows:

1. Housing Shortage: This is a recent phenomenon. It's not something that many in the shire have experienced before however it has become acute over the past few years, particularly for those looking to rent or downsize. Urgent solutions are needed.

2. Diversity of Housing Types: As well as a need for more housing, there is a need for a greater variety of housing types to accommodate different needs including smaller households, families and people looking for smaller, more affordable housing.

3. Planning Process: The planning process is perceived as complicated and slow. Costs to service land for new homes is prohibitive. Examples include removal of asbestos and connecting to sewer and water. The planning regulations should consider local conditions. A small, regional LGA should not be required to meet the same requirements as a bigger council area.

4. Services: For some residents, having to travel to a larger centre such as Dubbo to access health care, childcare and other services resulted in them choosing to leave the LGA. The lack of information, cost and inconvenient timetables were given as reasons for not using available services.

5. Condition of Properties: Properties in the LGA are under-utilised, some sitting vacant for years when they could be made available for rent. The reasons given for this were the cost of making homes habitable, and workers renting properties and only using them for short periods of time. There should be strategies to incentivise property owners to occupy or lease these spaces.

6. Land Shortage and Development Costs: There is a shortage of land zoned for residential development available within the levee. Also, lot sizes are too large. The large size, limited availability and planning requirements were given as some of the reasons for the high costs associated with developing new lots.

Actions Recommended By Stakeholders

1. Incentivise Property Utilisation: Implement programs to encourage property owners to rent or sell vacant properties, reducing the number of unoccupied homes.

2. Promote Diverse Housing Options: Develop policies that support the construction of various housing types, particularly targeting single individuals and retirees.

3. Streamline Planning Processes: Simplify and speed up the planning and approval processes to facilitate quicker development of housing.

4. Enhance Transportation Infrastructure: Invest in transportation solutions to improve access to health care facilities, thereby retaining residents.

5. Encourage Smaller Lot Developments: Allow for smaller lot sizes and subdivisions to maximise land use and increase housing availability.

6. Public Awareness Campaigns: Launch initiatives to inform the community about available transport options and permissible developments to foster engagement and utilisation.

Vision

The following statement brings together ideas expressed by stakeholders for a long-term vision for housing in Bogan Shire.

Our vision for housing in the Bogan Shire is of a vibrant inclusive community, that offers a variety of sustainable, affordable, and flexible living options for everyone. With access to essential services and facilities, our homes are fit-for-purpose for all life stages. Our housing encourages a connected, safe and welcoming environment whether for the short, medium or long-term.

Conclusion

Concerns raised by the community and other stakeholders in relation to the housing situation in Bogan Shire reveals the following challenges and opportunities:

1. Housing Shortage: There are limited housing options in Bogan Shire, and this is particularly affecting singles and retirees.

2. Diversity in Housing: There is a pressing need for a variety of housing types to cater to different demographics.

3. Planning Process: The current planning framework is perceived as restrictive and complicated, hindering development.

4. Transportation Issues: Poor transportation options contribute to residents relocating for better health care access.

5. Utilisation of Vacant Properties: Many vacant properties remain unused, indicating a need for strategies to incentivise their occupancy.

6. Land and Development Costs: A shortage of land and high development costs further complicate the housing crisis, necessitating innovative solutions.

Engagement Results

The engagement undertaken included:

- Online article on Council website.
- Individual stakeholder emails, phone calls and meetings.
- Media release, social media.
- Online and paper copy surveys distributed via email, in libraries and council offices.
- Workshops advertised in local newspaper (see appendix for newspaper ad), promoted on Council's website and in emails to community and industry stakeholders.
- Formal exhibition of the draft strategy.

Participation Results

Who participated

- Community members – residents and visitors.
- Landowners.
- People who work in Bogan Shire LGA.
- Business owners/managers.
- Students.
- Developers.
- Community groups.
- Councillors.
- Council staff.

How they participated

Stakeholder Feedback

Industry and State Government organisations were invited to contribute information and views on housing in Bogan Shire. We received written responses from the following organisations:

- NSW Department of Climate Change, Energy, the Environment and Water
- SES

A copy of the letters to stakeholders and their written responses are include in the appendix.

Survey

A community survey was made available on the website and in hard copy from 23 May to 25 June 2024. We received a total of 51 digital and hard copy responses.

The survey included questions about people's current and future housing needs, including housing size, type, tenure, and location. The survey also included questions about housing affordability, and housing for staff. A copy of the survey is included as an appendix to this report.

Workshops

Two workshops were held, one during the day and the other in the evening, on Wednesday 24 July 2024 at the Bogan Shire Council Youth and Community Centre. Participants included residents, business owners, workers, Council staff, visitors, retirees and managers. 16 members of the community attended the daytime workshop, and eight attended the evening workshop.

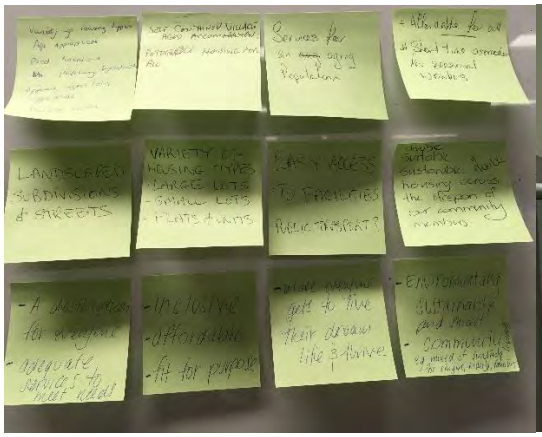
Participants were provided with an overview of the purpose of the housing strategy and invited to provide feedback on what they see as the challenges and opportunities facing Bogan Shire in relation to housing today, and what they see as the challenges and opportunities over the next 20 years.

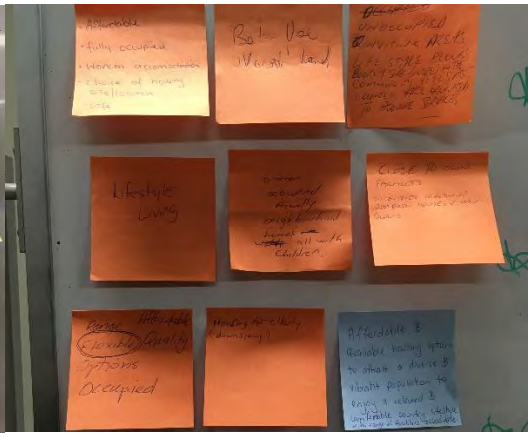
They were then asked to come up with a short statement of what their vision is for housing in the Shire for the next 20 years. Words that they used included affordable, safe, secure, shelter, everyone, basic needs, warmth, and access.

Participants were also asked about the challenges and opportunities they experience in relation to having a place to live, and how these impact day-to-day life. They provided recommendations for overcoming the challenges, making the most of the opportunities, and what should be prioritised.

A copy of the workshop agenda and run sheet can be found in the appendix.

The following photos are of notes from the workshops:





Feedback From Workshops

The feedback received in the two workshops from community and other stakeholders is grouped around the following themes:

1. Housing supply
2. Housing diversity
3. Planning system and development costs
4. Access to services
5. Employment and investment impacts

Each theme is classified as either a pain point, or as a desire, providing an opportunity to drive action through the delivery of the housing strategy.

Theme	Insight	Type	Highlight
Housing Supply	Existing houses are in poor condition and not attractive to potential tenants.	Pain point	Planning system is difficult to navigate making costs to renovate / update prohibitive. Difficulty finding skilled tradespeople adds to cost of updating housing and means investing in housing doesn't financially stack up. Too much uncertainty over future employment opportunities means investing in housing doesn't financially stack up. People are not aware of what's allowable and what's not.
Housing Supply	Accommodation is booked up for months, making it difficult for tourists to find somewhere to stay.	Pain point	Vacant properties could be made available instead of sitting empty. Accommodation in Nyngan is attractive to tourists as it's seen as a safe destination, compared to towns in nearby LGAs. Good to see new short-term accommodation places opening in recent months.
Housing Supply	Shortage of land suitable for residential development	Pain point	Lots that could be made available for new housing are not serviced, and servicing lots is expensive. Lot sizes inside the levee that are zoned residential are often large and therefore not affordable for many people.

Theme	Insight	Type	Highlight
Housing Diversity	Current housing stock doesn't support multi-generational households.	Pain point	Families, older people are leaving the area in search of more appropriate housing. Multiple generations should be able to find suitable housing to enable them to stay together.
Housing Diversity	There is a desire for housing that is affordable, and attractive to a diverse population.	Desire	A place where everyone can live their dream and thrive. Where everyone has housing with access to services and facilities. Housing that supports a relaxed and comfortable country lifestyle with services and facilities close by.
Housing Diversity	Safe, affordable, and sustainable housing solutions are needed	Desire	We want everyone to have housing that is safe, affordable, and sustainable with access to adequate services and facilities. Housing needs to be adaptable to different life stages.
Housing Diversity	There is a need for family-friendly, quality housing.	Desire	Greater diversity of housing at a variety of price points would make it easier to attract staff. Greater investment is possible when employment opportunities are more certain. Families would move here if housing was available and affordable. Development in lane ways could increase the quantity of housing stock available for those wanting a smaller dwelling, freeing up 3-4 bedroom housing for families.
Planning System and Development Costs	The planning system is difficult to navigate, adding to the cost to develop.	Pain point	Planning process seems unnecessarily slow – what can Council do to speed things up? Existing houses are in poor condition and not attractive to potential tenants.
Planning System and Development Costs	People are unaware of what they can and can't do regarding development.	Pain point	Council can help by providing information on how to navigate the planning system, including what's permissible and what's not. Granny flats, smaller lot sizes, subdividing lots for smaller homes – Council is able to consider all these.

Theme	Insight	Type	Highlight
			Development in lane ways could make use of existing infrastructure.
Planning System and Development Costs	The cost to develop existing or new lots is high, making it financially unfeasible for many developers.	Pain point	Costs mean investing in housing doesn't stack up discouraging investment in housing. Consider making lots outside the levee available for housing. Connect potential developers with employers to provide more certainty, encourage investment. Can the cost to develop be reduced, for example by subsidising removal of asbestos?
Access to Services	Due to inadequate and lack of affordable transport, people have left the area to access specialist medical facilities.	Pain point	Due to inadequate / lack of affordable transport, people have left the area to access specialist medical facilities. Timetables of existing transport services don't fit with need to travel for example to Dubbo or Sydney for medical appointments.
Access to Services	People are not aware of services that are available.	Pain point	Public transport is available but not well-publicised or scheduled conveniently.
Access to Services	Better access to health and medical facilities is needed.	Desire	Reducing the need for people to leave the area to access health and medical facilities would support a more diverse community. Providing information about what is available and how to access it could discourage some people from leaving.
Access to Services	There is a need for comprehensive services and facilities that cater to different life stages.	Desire	Look at ways of making services available locally, rather than needing to bring them to the area, or travel a long way away. For example, digital services, shared services.
Employment and Investment Impacts	Uncertainty over future employment opportunities makes people hesitant to invest in the area.	Pain point	Uncertainty over future employment opportunities makes it less likely that staff will move themselves and their family here. Currently missing out on potential investment in the area due to lack of available land for development.

Theme	Insight	Type	Highlight
Employment and Investment Impacts	Lack of available and affordable housing adds to the difficulty of attracting staff.	Pain point	Existing houses are in poor condition and not attractive to potential purchasers or tenants. Range of housing types is not diverse enough to meet everyone's needs. Difficulty attracting staff has potential to negatively impact on the local economy. Difficulty attracting skilled tradespeople is negatively impacting the cost of building.

Feedback From Survey

The community survey was available from 23 May to 25 June 2024, with 51 surveys returned either fully or partially completed.

Key themes that emerged from the surveys were:

- Standard of housing is declining due to ageing housing stock
- Cost of renovating / developing is prohibitive for many
- Tight housing market driven by demand from handful of employers
- Ageing community needs different type of housing
- Need to attract younger people, families to the area
- Visitors and tourists need somewhere to stay

Survey Demographics

Survey question	# responses	Results
Q5 I am: A home owner A renter Looking for a place to buy Looking for a place to rent	51	 Home owner 73% Renting 20% Looking to buy 4% Looking to rent 4%
Q6 In your opinion, is there enough housing in Bogan Shire to meet current demand?	51	Yes 2% No 98%
Q8 Is there a need for a wider range of housing in Bogan Shire? If yes, what types of housing are needed? (Tick all that apply).	51	Large homes 3-4+ bedroom 78% Lifestyle / retirement housing 55% Short term or temporary housing workers 53% Studio, 1 or 2 bedroom dwellings 49% Rural lifestyle opportunities 45% Apartments or townhouses 41% Housing suitable for people with a disability 31% Other 8%

Survey question	# responses	Results
Q10 Where is housing most needed in Bogan Shire? (Tick all that apply)	51	Nyngan 96% Girilambone 20% Hermidale 16% Coolabah 4% Rural areas outside Nyngan and villages 20% Other 2%
Q12 Is housing in Bogan Shire affordable for most people?	49	Yes 37% No 63%
Q14 If you could live anywhere in Bogan Shire, where would you most like to live? (Tick only one).	51	Nyngan 74% Rural areas outside Nyngan and villages 20% Girilambone 4% Coolabah 2% Hermidale 0%
Q15 In the past twelve months, if you have looked to rent or buy in Bogan Shire, and were unsuccessful, please advise why. (Tick all that apply).	29	Condition - I couldn't find anything in suitable condition 55% Size - I couldn't find anything the right size 48% Location - I couldn't find anything in the right location 38% Cost - I couldn't afford anything to buy 28% Cost - I couldn't afford anything to rent 10% Accessibility - I couldn't find anything suited to my needs 7% Other 14%
Q17 If you are a business owner/employer, have you had trouble recruiting staff due to a lack of suitable housing?	26	Yes 85% No 15%

The following summarises the main themes from the surveys.

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
Housing supply				
	Shortage of properties to rent or buy (houses and apartments)	There is a high demand for rentals, but very few rentals or places to buy in Nyngan. Rentals are highly priced due to the demand, making it difficult for low-income individuals to afford housing. Many people experiencing housing stress / insecurity (families, singles, elderly, low income earners). Many people looking to purchase. Rentals being taken up by mine workers.	Encourage residential development by making more land available and reducing development costs Council should not discount rents if providing housing for unemployed Council housing should go to employed / retired / disabled first	"There is a shortage of houses to rent for long and short term occupation… there is a shortage of properties for sale, particularly in the upper end of the market." "There is simply not enough housing in Nyngan. As a result, short-term accommodation is being made available to fill the gap. This allows people to come here and work but not bring their families here to live." "I manage residential properties in Nyngan and have a substantial wait list." "Rarely any available especially for essential workers such as paramedics"
	Rentals are unaffordable	Prices from $350 - $500 most locals can't afford	Encourage residential development by making more	"…. there are next to no rents so home owners can set what price they want because people are desperate."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
			land available and reducing development costs	
	Shortage of available land	New builds - can't find land to build on.	Smaller lot sizes should be allowed closer to town. Amend LEP to allow more lifestyle blocks.	"…costs of demolition are prohibitive… Council could look at incentives, loans or fee reductions to anyone demolishing an old home to put something new on it." "…if there were vacant blocks available inside the levee, they would be easily sold to people looking to build a new home."
	Lack of housing for locals	There is a shortage of quality rentals available, making it difficult to market the area as a viable option for employees. Available housing is taken by mines, who leave them vacant. Homes snapped up as soon as they hit the market. Some rentals are overcrowded due to shortage.	Encourage residential development by making more land available and reducing development costs Amend LEP to allow more lifestyle blocks. Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	"Rarely any available especially for essential workers such as paramedics" "Development in Bogan Shire should be encouraged, and I commend the council on efforts to improve land availability around Nyngan particularly the recent changes regarding rural residential land. However, in saying this if approval could be made easier and costs could be minimised this may also encourage development."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Vacant blocks / dwellings	There is vacant land that could be built on, also vacant properties that could be used for housing	Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time Encourage residential development by reducing development costs	"There are so many vacant lots in Nyngan why not build more houses" "I believe if there were vacant blocks available inside the levee, they would be easily sold to people looking to build a new home."
	Planning restrictions	Need to allow more land to be developed	Amend LEP to allow more lifestyle blocks. Reduce size of lot that residential development is allowed within the levee – quarter acre block up to three-acre blocks Encourage residential development by making more land available and reducing development costs	"Development in Bogan Shire should be encouraged, and I commend the council on efforts to improve land availability around Nyngan particularly the recent changes regarding rural residential land. However, in saying this if approval could be made easier and costs could be minimised this may also encourage development."
	Young people can't get into housing market	Lack of vacant land to purchase. There is no land available to purchase to build.	Look at ways of making demolition cheaper to free up land for development.	"A lot of young people in town (first home buyers) wanting to buy and build in town to stay here long term and there is basically no vacant blocks to purchase and only 3-4 houses on the market."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
			Reduce lot sizes allowed within the levee – quarter acre block up to three-acre blocks	
	Council requirements too restrictive	Makes it expensive to build DA process a nightmare Council restrictions make it difficult to build outside levee Limited places to build within levee	Council could help by directing people to information about the planning system and making Council staff available to answer questions Reduce lot sizes allowed within the levee – quarter acre block up to three-acre blocks	"Development in Bogan Shire should be encouraged and I commend the council on its efforts to improve land availability around Nyngan particularly the recent changes regarding rural residential land. However, in saying this if approval could be made easier and costs could be minimized this may also encourage development."
	Condition of existing stock	The condition of available houses is poor, making them unsuitable for purchase.	Improving the condition of houses would make them more appealing to potential purchasers	"…costs of demolition are prohibitive and Council could maybe look at incentives, loans or fee reductions to anyone demolishing an old home to put something new on it."
Economic impacts				
	Impacts on services and businesses	The shortage of rental properties affects the ability of organisations to provide housing for employees, impacting their operations. Can't get staff due to high cost of rentals.	Allowing more people to build on lifestyle blocks would attract higher income jobs and improve socio-economic status of town.	"Struggling to find employees as there is a shortage of accommodation" "Nyngan provides fantastic industry and employment opportunities compared to the other small towns in the region, but it will not continue to grow if our young adults are leaving,

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
		Workers can't find anywhere to live, threatens economic stability and growth of region. Young people will continue to leave if can't find anywhere to live. Nurses coming to Nyngan for hospital can't find appropriate accommodation.		and new families don't come here to live because there is nowhere for them."
	Can't attract professionals, State Government workers	Essential workers, such as paramedics, struggle to find available housing. State Government employees would move here if they could find somewhere affordable and of sufficient quality Workers with families won't come due to lack of affordable, long-term rentals	Improving the overall condition of housing stock and encouraging property owners to make their houses available for long term rent would make it more appealing for professionals to move here	"Increasing the capacity for middle income owners to build new dwellings on lifestyle blocks would … entice professionals to base themselves here." "Rarely any available especially for essential workers such as paramedics" "…. shortage of available housing and high cost of rentals has resulted in people being unable to take up offers of employment. My organisation also looks for local rentals to provide housing for employees, however there is a shortage of quality rentals

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
				available making it difficult to market the Bogan Shire as a viable option.
	Less disposable income	Low-income people struggle with the cost of living and sourcing the deposit to purchase a home. Locals must spend more on housing, so have less to spend on food, electricity, etc People are forced to live in substandard accommodation as it is all they can afford to rent.	Council should investigate how it can reduce the cost of its services to help those who are struggling to pay rent	"Most people's cost of living is higher than normal with limited services and sports travelling takes people's money. Housing market is high for small rural community"
Housing types				
	Granny flats, singles living, accessible housing	Need more of these. Would free up some larger dwellings for families. Older dwellings not suitable for people with limited mobility or a disability.	Demolish older dwellings and free up land for new houses and apartments. Costs of demolition could be subsidised by Council, or fees could be reduced	"There needs to be retirement housing available close to the CBD to facilitate the independence of elderly people no longer able to drive and/or with compromised ease of mobility"

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Retirement housing	Needed to house aging population	Needs to be retirement housing available close to the CBD Demolish older dwellings and free up land for retirement housing. Costs of demolition or other fees could be subsidised by Council.	"I have heard that people wanting to live in Nyngan in retirement housing have trouble finding accommodation." "…if there was lifestyle/ retirement housing, or more smaller dwellings made available for retirees to down size this could free up much bigger family homes for young families to purchase."
	Housing for professionals	Attract more professionals such as nurses and teachers	Allowing more lifestyle blocks outside the levee, also smaller lots inside the levee, would entice professionals to base themselves here.	"There is simply not enough housing in Nyngan. As a result, there is much short-term accommodation being made available to fill the gap. This allows people to come here and work but not bring their families here to live."
	Lack of choice	Shortage of long-term rentals. Shortage of lifestyle blocks due to LEP restrictions Council restrictions make it difficult to build outside levee	Amend LEP to allow more lifestyle blocks and smaller lots in the LGA Consider allowing housing to be developed outside the levee.	"I believe if there was lifestyle/ retirement housing, or more smaller dwellings built or land made available for retirees to down size this could free up much bigger family homes to become available for young families to purchase."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
Housing affordability				
	Minimum block size	Makes it difficult to build in some locations	Allowing smaller lot sizes would reduce the cost of land and make more land available Reduce lot size allowed within the levee – quarter acre block up to three-acre blocks	"Policy of acreage size close to town for building needs to be changed to allow building on smaller lots."
	Availability of homes to rent for families	Lack of 3-4 bedroom homes to rent	Free up larger homes by providing retirement and other diverse housing options. Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	"I believe if there was lifestyle/ retirement housing, or more smaller dwellings built or land made available for retirees to down size this could free up bigger family homes for young families to purchase." "We have been looking for a 3-4 bedroom house to rent since Dec 2023…. We are currently renting a small 2 bedroom flat, myself my Husband and 3 young kids. We have lived in Nyngan our whole lives and want to raise our children here but how there is no suitable living."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Shortage of affordable properties to buy or rent	Shortage of properties is pushing prices up (both rent and purchase price) Non-locals can't find rentals or buy properties = pushes prices up	Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	"The lower end of the market is having difficulty finding affordable accommodation. The more pressing issue however is the general lack of supply, with the current cost of construction and lack of available land not encouraging new building."
	Demand from mine employees	Demand from mine workers pushes prices up, low-income locals can't afford to rent or buy	Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	"With the mines no longer doing FIFO more people are wanting to live in the Bogan Shire with their family to save travelling and or receive the bonus from the mines (if they still do that)."
	Cost of living	Many community members, including those on pensions or benefits, are paying over $350 a week for rentals. Cost of living in regional area impacts people's ability to pay for housing.	Provide short term, affordable rental accommodation in central location	"Compared to prices offered in Warren for similar housing and rentals, Nyngan is expensive and unaffordable for many people." "Single tenants are struggling to find affordable rental properties, often leading to overcrowded living conditions or the need to relocate far from their places of work and social support networks."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Rentals are unaffordable	Mine workers only ones who can afford to live here. Nurses moving to area can't find accommodation.	Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	"Compared to prices offered in Warren for similar housing and rentals, Nyngan is expensive and unaffordable for many people." "It's not affordable as there are next to no rents so the home owners can set what price they want because people are desperate to get a rental."
Substandard and poor housing conditions				
	Quality of housing not up to scratch	Poor quality housing for the price. Housing in poor condition, needing to be demolished	Council to fund demolition to encourage purchases of older houses	…. we are aware of a distinct lack of supply of quality accommodation. "I think the costs of demolition are prohibitive and Council could look at incentives, loans or fee reductions to anyone demolishing an old home to put something new on it."
	Public housing	Detracts from appeal of Bogan Shire to professionals.	Need to provide suitable accommodation options and childcare to attract professional workers	"We do not need any more public housing projects in Nyngan."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Lack of available land	Discourages families from moving here	Reduce lot size allowed within the levee – quarter acre block up to three-acre blocks	"I believe if there were vacant blocks available inside the levee, they would be easily sold to people looking to build a new home."
	Shortage of tradespeople	Homes in poor repair / badly designed due to shortage of skilled tradespeople	Council should find ways to reduce the cost to develop	"Cost of development is out of control…. Controlling inflation and building costs is the only answer. However, if we subsidise builders…. it just increases the costs because they have more work than they can do so they inflate their prices."
	Community well-being	Challenged due to housing stress, insecurity	Provide short term, affordable rental accommodation in central location	"The lack of available housing is not only causing financial strain but also impacting the well-being and stability of our community members." "Single tenants are struggling to find affordable rental properties, often leading to overcrowded living conditions or the need to relocate far from their places of work and social support networks."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Safety	Nowhere for those experiencing domestic violence to go	Provide short term, affordable rental accommodation in central location	"The shortage of affordable and adequate housing options has reached an alarming level, making it increasingly difficult for many residents to secure stable and safe living arrangements."
	Pet-friendly accommodation	Difficult to find / not suitable	Pets should be allowed in-rental accommodation	"Difficult to find pet friendly accommodation, or if found yard not suitable or secure."
Industry				
	Affordability	Accommodation is provided by some employers, making it affordable for staff	Employers could subsidise staff moving from outside the LGA, although this can put pressure on available housing	Employer: Yes… if people wish to be permanent resident, accommodation is affordable Real estate agent: "The Small Fibro homes that come on the market are not expensive. However, majority of people want to live in newer brick home or weatherboard home. These newer homes are in short supply and there's rarely a vacant block to build on that comes on the open market. As a result, the top end of the market is less affordable."

Theme	Issue	Detail	Stakeholder recommendations	Stakeholder comments from surveys
	Location	Location of housing is important. It's not all needed in Nyngan.	Consult with industry to understand where the housing is needed	Employer: "we would prefer to have accommodation that is close to our operations to reduce travel and mitigate the opportunity of road accidents"
	Supply	If housing isn't available potential employees will reject job offers if they can't find somewhere to live	More rental accommodation is needed within the LGA. Investigate ways of discouraging property owners from leaving their properties vacant for long periods of time	Employer: "…. there has been on many occasions people rejecting job offers because they cannot find rental accommodation in the first instance"

Appendices

Appendix 1: Letter to stakeholders

"Comfortable Country Living"

11/07/2024

Dear Stakeholder,

Local Housing Strategy (LHS) - Workshops

Bogan Shire Council invites you and/or a representative from your organisation/business to attend Council hosted workshops to further explore the housing needs of the Shire.

All input gathered through workshops and the recent survey and will be considered in the preparation of the draft LHS.

To accommodate people's work and other commitments, one workshop will be held during business hours and the other in the early evening of Wednesday 24th July 2024.

Details for the workshops:

Date: Wednesday 24 July 2024
Time: 11am – 12.30pm
6pm – 7.30pm
Venue: Bogan Shire Youth and Community Centre
38 Cannonbar Street
Nyngan NSW 2825

To assist Council prepare for the workshops, please RSVP by COB Monday 22 July 2024 to admin@bogan.nsw.gov.au or phone 68359000 during office hours with an indication of the number of people planning to attend.

Cathy Black
Director
Development and Environmental Services

Telephone: (02) 6835 9000
Facsimile: (02) 6835 9011
Email: admin@bogan.nsw.gov.au
www.bogan.nsw.gov.au
ABN: 68 886 242 083

Address all communications to:
The General Manager
PO Box 221
Nyngan NSW 2825

Council Chambers
81 Cobar Street
Nyngan
New South Wales
Australia

Appendix 2: Written responses from stakeholders

Our Ref: ID2529
Your Ref:

28 June 2024

Cathy Black
Bogan Shire Council
PO Box 221
Nyngan NSW 2825

email: admin@bogan.nsw.gov.au
CC: craig.ronan@one.ses.nsw.gov.au;

Dear Cathy,

Bogan Shire Council Housing Strategy Community Survey 2024

Thank you for the opportunity for the NSW SES to participate in the Bogan Shire Council Housing Strategy Community Survey 2024 and provide comment. Nyngan is the main service centre of the Bogan Shire and supports the smaller settlements of Girilambone, Coolabah and Hermidale. It is understood that the population is forecast to grow by 350 people by 2036 and the Housing Strategy seeks to set the vision for housing delivery over the next 20 years.

The NSW State Emergency Service (NSW SES) is the agency responsible for dealing with floods, storms and tsunami in NSW. This role includes, planning for, responding to and coordinating the initial recovery from floods. As such, the NSW SES has an interest in the public safety aspects of the development of flood prone land, particularly the potential for changes to land use to either exacerbate existing flood risk or create new flood risk for communities in NSW.

The NSW SES recommends that consideration of flooding issues is undertaken in accordance with the requirements of NSW Government's Flood Prone Land Policy as set out in the Flood Risk Management Manual 2023 (the Manual) and supporting guidelines, including the Support for Emergency Management Planning and relevant planning directions and circulars relating to the *Environmental Planning and Assessment Act, 1979*. Key considerations relating to emergency management are outlined in Attachment A.

The NSW SES recommend that strategic plans are underpinned by current, robust constraints analysis and mapping undertaken by relevant experts to identify the suitability of different lands for different uses, such as the Flood Risk Management Process, and thereby ensuring that appropriate statutory controls are in place to protect the community and the environment from adverse impacts such as flooding.

In summary, the NSW SES:

- **Recommend** The set of principles developed for Bogan Shire Council Housing Strategy include resilience to natural hazards (including flooding and storms) and climate change. This should consider the principles outlined in the Support for Emergency

Management Planning Guideline[1] and the State Disaster Mitigation Plan, where relevant.

- **Recommend** that any fast-track planning process for the Housing Strategy in Bogan Shire Council would still require consideration of flood risk for development located on flood prone land and demonstrate consistency with Local Planning Direction 4.1 Flooding. This includes ensuring there is no significant increased requirement for government spending on emergency management services, and flood mitigation and emergency response measures.
- **Support** measures to ensure "sensitive and hazardous development" is not permitted on land between the Flood Planning Area (FPA) and the Probable Maximum Flood (PMF) in recognition of those uses having a higher risk to life and warranting the consideration of the impacts of rarer flood events on land located outside the FPA.
- **Support** the consideration of climate change in flood modelling using the best available science for climate risk assessments. The NSW SES encourages the sharing of this risk information, which will enable other organisations, such as NSW SES, to plan for extremes in climate events and sequences.

You may also find the following Guidelines, originally developed for the Hawkesbury Nepean Valley and available on the NSW SES website useful:

- Reducing Vulnerability of Buildings to Flood Damage
- Designing Safer Subdivisions
- Managing Flood Risk Through Planning Opportunities

Please feel free to contact Gillian Webber via email at rra@ses.nsw.gov.au should you wish to discuss any of the matters raised in this correspondence. The NSW SES would also be interested in receiving future correspondence regarding the outcome of this referral via this email address.

Yours sincerely,

Elspeth O'Shannessy
Manager Emergency Risk Assessment
NSW State Emergency Service

[1] NSW Government. 2023. Principles Outlined in the Support for Emergency Management Planning Guideline

ATTACHMENT A: Principles Outlined in the Support for Emergency Management Planning Guideline[2]

Principle 1 Any proposed Emergency Management strategy should be compatible with any existing community Emergency Management strategy.

Any proposed Emergency Management strategy for an area should be compatible with the evacuation strategies identified in the relevant local or state flood plan or by the NSW SES.

According to the NSW State Flood Plan[3] and the Bogan Shire Flood Emergency Sub Plan, evacuation is the primary emergency management strategy for people impacted by flooding.

'Shelter in place' strategy is not an endorsed flood management strategy by the NSW SES for future development. Such an approach is only considered suitable to allow existing dwellings that are currently at risk to reduce their risk, without increasing the number of people subject to such risk. The flood evacuation constraints in an area should not be used as a reason to justify new development by requiring the new development to have a suitable refuge above the PMF. Allowing such development will increase the number of people exposed to the effects of flooding.

Emergency services are also exposed to greater risks than if flood-free access was available. This unnecessarily exposes emergency service personnel to flood situations which may lead to the injury or death. In recognition of this possibility, emergency services are under an increasing demand to consider the safety of personnel.

Unfortunately, our experience is that people change their mind about sheltering in buildings after they have been surrounded by flood water or when essential services such as water, power and sewer cease to function. As we have observed in recent floods, communications and power outages often accompany floods.

Principle 2 Decisions should be informed by understanding the full range of risks to the community.

Decisions relating to future development should be risk-based and ensure Emergency Management risks to the community of the full range of floods are effectively understood and managed. We recommend that strategic plans for the Bogan Shire Housing Strategy are underpinned by robust constraints analysis and mapping undertaken by relevant experts, for example through the Flood Risk Management Process. This analysis should inform the suitability of different lands for different uses and thereby ensuring that appropriate statutory controls are in place to protect the community and the environment from adverse impacts such as flooding.

Principle 3 Development of the floodplain does not impact on the ability of the existing community to safely and effectively respond to a flood.

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[2] NSW Government. 2023. Principles Outlined in the Support for Emergency Management Planning Guideline

[3] NSW Government. 2021. NSW State Flood Plan. Section 1.6 – Key Principles. 1.6.2, page 5.

The ability of the existing community to effectively respond (including self-evacuating) within the available timeframe on available infrastructure is to be maintained. It is not to be impacted on by the cumulative impact of new development. The consent authority should consider the cumulative impacts any development will have on risk to life and the existing and future community and emergency service resources in the future.

Risk assessment should have regard to flood warning and evacuation demand on existing and future access/egress routes. Ideally evacuation routes should be designed to be able to provide access and egress up to and including the 1 in 500-year local flooding. This criterion has been adopted in the Hawkesbury Nepean Valley. In addition, to reduce risk to life, development should consider ensuring rising road access to enable safe evacuation away from the flood threat. Consideration should also be given to the impacts of localised flooding on evacuation routes. Evacuation must not require people to drive or walk through flood water.

Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES.

Principle 4 Decisions on development within the floodplain does not increase risk to life from flooding.

NSW SES is opposed to development strategies that transfer residual risk, in terms of emergency response activities, to NSW SES and/or increase capability requirements of the NSW SES.

During flooding it is likely that there will be a reduced capacity for the relevant emergency service agency to respond in these times. Even relatively brief periods of isolation, in the order of a few hours, can lead to personal medical emergencies that have to be responded to. Development strategies relying on an assumption that mass rescue may be possible where evacuation either fails or is not implemented are not acceptable to the NSW SES.

Furthermore, if there is an identified need for emergency services in the area, including NSW SES facilities, these should be located above the PMF, in accordance with the Special Flood Considerations Clause 5.22.

Principle 5 Risks faced by the itinerant population need to be managed.

Any Emergency Management strategy needs to consider people visiting the area or using a development.

Principle 6 Recognise the need for effective flood warning and associated limitations.

An effective flood warning strategy with clear and concise messaging understood by the community is key to providing the community an opportunity to respond to a flood threat in an appropriate and timely manner. At first glance it may seem that if people live in an area where frequent low-level floods occur, they would be more flood aware. Unfortunately, although they may be aware of flooding, they generally come to the view that they are not at risk because they think all floods are like the small ones they often see. This is not true and big floods will almost always catch people by surprise and exceed their capacity to deal with the situation unless they have considered this scenario in their planning and preparedness.

NSW SES utilises the Australian Warning System[4], which is a nationally consistent, three-tiered approach to issue clear warnings and lead people to take action ahead of severe weather events. The three warning tiers consist of Advice, Watch and Act and Emergency Warning. These warnings can be viewed on the SES website and the HazardWatch website and app.

Principle 7 Ongoing community awareness of flooding is critical to assist effective emergency response.

Development in a floodplain will increase the need for NSW SES to undertake continuous community awareness, preparedness, and response requirements. Residents and users of the proposed development should be made aware of their flood risk, the Hazards Near Me app (a tool to receive flood warnings as part of the Australian Warning System) and the NSW SES website which contains comprehensive information for the general community about what to do before, during and after floods as well as in-language resources and HazardWatch (NSW SES interactive information and warnings site).

[4] Australian Government National Emergency Management Agency (accessed 26/06/2024) - https://www.australianwarningsystem.com.au/

Your ref: LHS
Our ref: DOC24/529613

Cathy Black
Director Development and Environmental Services
Bogan Shire Council
81 Cobar Street
Nyngan NSW 2825
By email: admin@bogan.nsw.gov.au

Dear Cathy

BCS response – Bogan Shire Draft Local Housing Strategy – initial consultation

Thank you for your e-mail dated 18 June 2024, to the Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning and Environment inviting comments on the initial drafting of the Bogan Shire Draft Local Housing Strategy.

We acknowledge that the Strategy is at the early stages, and future development sites are yet to be identified. In summary we recommend considering the following key constraints in identifying sites for future housing within the Strategy:

- Proposed housing sites should be assessed for High Environmental Values (HEV) and development in these areas avoided wherever possible, in accordance with the Central West Orana Regional Plan 2041. Where development in HEV areas cannot be avoided, further site-specific assessment may be useful in development of this strategy.
- While development within the town levee of Nyngan is considered capable of accommodating further development across a range of flood events, it is recommended you consider updating the latest flood study (WRM 2014) taking into account latest information available to inform future housing options outside the levee within the strategy.

Further detailed comments are provided at **Attachment A**.

We have developed a standard approach for planning proposals to assess biodiversity impacts on HEV land. The approach is set out in the three attachments to this letter:

- **Attachment B** describes our recommended steps for assessing and addressing biodiversity as part of a strategic plan. This aims to ensure that a plan can demonstrate consistency with the strategic planning framework including the relevant Regional Plan, particularly in identifying and protecting HEV lands.
- **Attachment C** describes the HEV criteria and provides our recommended method for investigating lands for the presence of the HEV criteria at the property scale

If you require any further information regarding this matter, please contact Nikki Pridgeon, Senior Conservation Planning Officer, via nikki.pridgeon@environment.nsw.gov.au or 5852 6807.

Yours sincerely

Calvin Houlison
Senior Team Leader, Planning
North West Branch

17 July 2024

Attachment A – BCS Detailed Comments
Attachment B – BCS Steps for Assessing Biodiversity in Planning Proposals
Attachment C – BCS HEV Criteria and Identification Methods

BCS's Detailed Comments and Recommendations

Bogan Shire Local Housing Strategy

BCS has four areas of interest relating to strategic land use:

1. The impacts of development intensification on biodiversity;
2. Adequate investigation of the environmental constraints of affected land;
3. Avoiding intensification of land use and settlement in areas of high environmental value (HEV); and
4. Ensuring that development within a floodplain is consistent with the NSW Government's Flood Prone Land Policy, the principles set out in the Floodplain Development Manual, and applicable urban and rural floodplain risk management plans.

We generally support strategic planning proposals which:

- Avoid settlement intensification in areas of HEV and environmental hazards;
- Aligns with state, regional and local strategic planning frameworks and includes objectives, such as 'no net loss of native vegetation';
- Update planning controls to reflect the environmental values and constraints present; and
- Minimise flood risk to human life, property and the local environment while maintaining floodplain connectivity for environmental benefit.

1. Biodiversity

Consistency with the Central West Orana Regional Plan 2041

Objective 5 and Strategy 5.1 of the Central West and Orana Regional Plan 2041 identifies that areas of HEV should be protected in strategic and local planning. The HEV criteria applies to land that includes one or more of the following:

- Sensitive biodiversity values
- Native vegetation of high conservation value, including vegetation types that have been over-cleared or occur within over-cleared landscapes, threatened ecological communities, old growth forest and rainforest
- Key habitat of threatened species
- Important wetlands
- Areas of geological significance

Explicitly linking the strategy to the relevant provisions of the Regional Plan and Bogan LSPS will ensure there is a clear line of sight across the regional planning policy framework. This is particularly important for addressing matters in the strategy such as HEV lands, which have relevant provisions in the regional plan.

For a quick visual of potential HEV areas, use of online spatial mapping or GIS software, with suitable environmental layers is recommended, for example the SEED Map, available at https://www.seed.nsw.gov.au/. Suitable environmental layers, includes but is not limited to, Biodiversity Values Map, State Vegetation Type Map, threatened species sighting records and recent aerial imagery to display patches of remnant vegetation. Detailed HEV identification methods, including additional suitable database searches can be found at **Attachment C**.

2. Flooding

Background information

The latest Flood Study (FS) was prepared by WRM in 2014 to define the flood risk for the areas outside of the Town Levee. Such FS was undertaken based on data collected in 1990 from the Department of Water Resources (DWR), following the April 1990 flood when the complete town was evacuated.

The FS used LiDAR coverage from May 2011. Unfortunately, there was no bathymetry data for the lower weir pool and in the Box Cowal downstream of Nyngan. As a result, a 3 km channel was created using a bi-dimensional software tool. Also, DRW provided hydraulic geometry data for more than 50 stormwater culverts (some of these structures were repaired after the April 1990 flood) and three bridge structures. The FS pointed out that several culverts have been upgraded since the 1990 flood.

Existing risk of flooding

The flood modelling found that most of the eastern and western study areas are inundated by the 1% AEP flood (Figure 1). Therefore, all the eastern and western study areas are within the *Flood Planning Area* as defined by the *Flood Planning Level* plus a 0.5m freeboard and thus, it would be subject to development controls. Fortunately, the Town Levee offers a 0.5% Annual Exceedance Probability (AEP) level of protection for the main urban footprint inside the embankment.

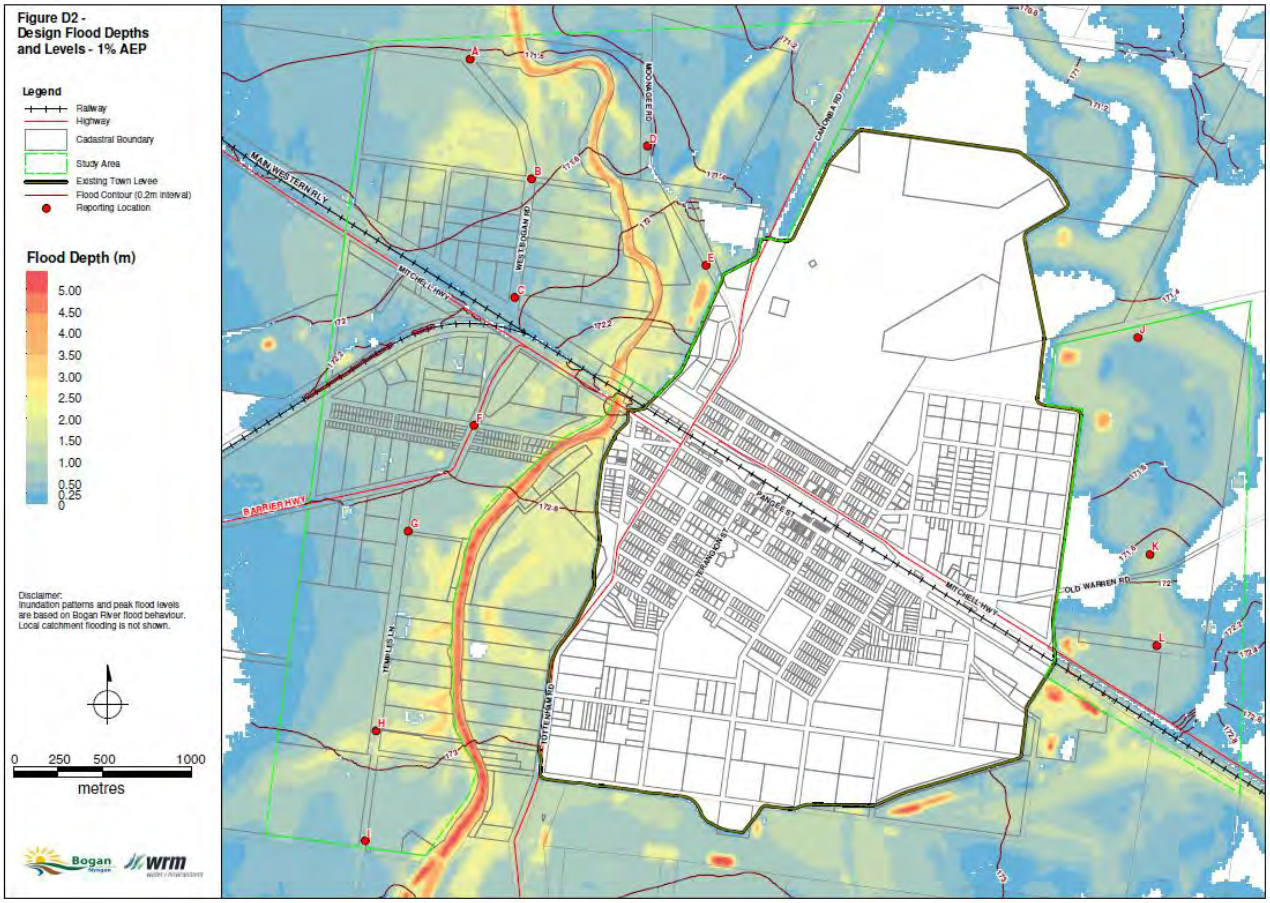


Figure 1. 1% AEP Design Flood Depths and Levels (WRM, 2014)

The FS defined preliminary flood hazard categories zones (high/low) and recommended flood mitigation options each area (Figure 2). Finally, the FS recommended to refine these zones as well as the risk management measures in a subsequent FRMS&P.

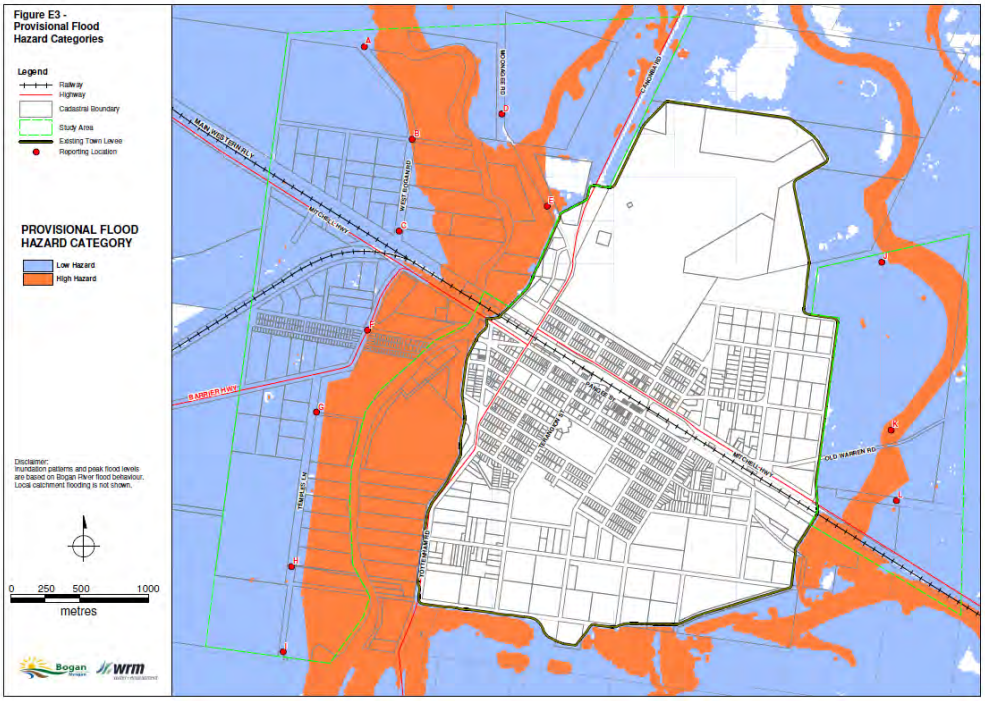


Figure 2. Provisional Flood Hazard Categories (WRM, 2014)

Recent participation in the NSW Floodplain Management Program

While Bogan Shire Council's recent application during the 2023-24 grant funding round to prepare a Floodplain Risk Management Study and Plan (FRMS&P) was unsuccessful, we encourage Council to work with BCS on a further application and reapply under a future funding round.

Future housing alternatives

It is understood that the latest *LEP 2011* recognised the flood protection provided by the built levee. Hence, future housing has two alternatives:

a) **Inside the Town Levee**. As found in the FS, the Town Levee offers flood immunity up to a 0.5% AEP flood event inside the embankment. However, additional housing would need to investigate internal drainage patterns. *Public Works* was commissioned by Council to undertake a drainage upgrading study in 1991 (*Nyngan Drainage Upgrading Study*). However, Council may have more recent flood investigations to better define FPA/FPL.
b) **Outside the Town Levee**. Since the FS was prepared in 2014, additional information is now available: updated LiDAR data, Australian Rainfall and Runoff Guidelines 2019, recently updated *Flood Risk Management Manual 2023* and climate change sensitivity analysis. Also, after 10 years, it is likely that hydraulic structures and embankment upgrades have modified the flood patterns and probable new bathymetric cross sections downstream Nyngan is available.

Recommendations

- Update the flood study (WRA 2014) and adjust the FPA/FPL for areas accordingly, based on the new information.
- Consider future grant applications to the NSW Floodplain Management Program to prepare a Floodplain Risk Management Study & Plan, in consultation with BCS flooding specialists, which may then inform future development options.

BCS NW Branch Steps for Assessing Biodiversity

Introduction

Local strategic planning documents should demonstrate consistency with the State, regional and local strategic planning framework including the relevant Regional Plan and Local Strategic Planning Statement. To be consistent with the relevant Regional Plan for areas with High Environmental Value (HEV) (see **Attachment C** for identifying HEV), strategic planning documents should identify areas of HEV at the property scale and avoid intensification of development and land uses in those areas.

Avoiding and minimising land use intensification in HEV areas may also facilitate future development by avoiding triggering the Biodiversity Offset Scheme (BOS) at the development application stage; or simplifying the application of the Biodiversity Assessment Method (BAM) and reducing future biodiversity credit liability.

Consideration of HEV

Biodiversity assessment for strategic planning should implement the following steps:

Step 1: Identify HEV

The plan should identify and map areas of HEV with desktop analysis and site investigations when required, as set out in **Attachment B**.

Step 2: Avoid and minimise impacts on HEV

The plan should take into consideration any impacts throughout the life of the proposal and all possible future land uses. Once all impacts are identified, the proposal can be located and designed to maximise avoidance of land use intensification in HEV areas and adhere with the guidance in **Attachment C**.

Step 3: Protect HEV

The plan should maintain or improve existing planning provisions to protect HEV, while permitting land use intensification on certain parts of the land suitable for development. Updates to planning controls should reflect the environmental values and constraints present on the land, rather than permitting development intensification uniformly across an entire site. Areas of HEV should instead be better protected by updating LEP provisions, such as through:

- an appropriate zone which has strong conservation objectives and limited land uses
- an appropriate minimum lot size (MLS) so the land cannot be subdivided
- updating terrestrial biodiversity mapping
- creating local provisions which:
    - contain site specific constraints such as buffers, objectives and considerations for future development consents and limits certain development or land uses
    - identifies land with "high biodiversity significance[i1]" to preclude exempt or complying development from occurring on any ESAs
    - require future management actions through a Development Control Plan (DCP) or Biodiversity and Vegetation Management Plan (BVMP).

[1] *State Environmental Planning Policy (Exempt and Complying Development Codes) 2008* – cl.1.5(g) and *Standard Instrument – Principal Local Environmental Plan (2006 EPI 155a)* cl.3.3(g) “environmentally sensitive area” includes land identified in an environmental planning instrument as being of high biodiversity significance.

Optional step for large or complex sites which affect HEV

Step 4: Identify biodiversity values and entities at risk of Serious and Irreversible Impacts (SAII)

The plan could apply Stage 1 of the Biodiversity Assessment Method (BAM) to identify Plant Community Types, threatened species and ecological communities, as well as SAII entities likely to be present. Application of Stage 1 of the BAM can also be beneficial at the planning proposal stage as, if in the opinion of Council any:

- clearing associated with future subdivision or development of the land is likely to impact native vegetation and exceed the thresholds in Part 7 of the *Biodiversity Conservation Regulation 2017,* then a biodiversity development assessment report will be required at the development application stage.
- future development is likely to have a serious and irreversible impact on a SAII entity, then under section 7.16 of the *Biodiversity Conservation Act 2016* a consent authority must refuse to grant consent to the development. Further advice regarding determination of serious and irreversible impacts is available via the *Guidance to assist a decision-maker to determine a serious and irreversible impact (2019)*.

By applying Stage 1 of the BAM, the proponent can further identify and avoid areas of biodiversity value that will generate a biodiversity credit liability or contain SAII entities in the development application planning phase. When biodiversity is considered strategically at planning stage, future development assessment can be simplified and credit obligations reduced.

Attachment C

BCS NW Branch HEV Criteria and Identification Methods at the Property Scale

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method
Criterion 1. Sensitive Biodiversity Mapped on the Biodiversity Values Map		
1.1 Biodiversity Values Map		a. Identify the parts of the land on the Biodiversity Values map which can be viewed at https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity-offsets-scheme/about-the-biodiversity-offsets-scheme/when-does-bos-apply/biodiversity-values-map. b. Include any BV map areas as HEV.
Criterion 2. Native vegetation of high conservation value		
2.1 Vegetation in over-cleared landscapes (Mitchell landscapes)		a. Identify over-cleared Mitchell landscapes by viewing map data from the SEED portal https://www.seed.nsw.gov.au/ – selecting NSW (Mitchell Landscapes) – latest version, selecting 'Show on Seed Map' and viewing the 'View Over Cleared Land Status'. b. Map all native vegetation on the land as HEV if it is in an over-cleared Mitchell landscape.
2.2 Over-cleared vegetation types		a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the Vegetation Information System (VIS) database at vis@environment.nsw.gov.au. c. Use the VIS to determine whether the % cleared status of the PCTs identified through field work on the land is above 70%. d. Map all PCTs on the land with the % cleared above 70% as HEV.
2.3 Threatened Ecological Communities - any vulnerable, endangered, or critically endangered ecological community listed under the BC Act, the FM Act 1994 or the EPBC Act and not mapped on the BV map		a. Identify Plant Community Types (PCTs) on the land through field work. b. Register and visit the VIS database at vis@environment.nsw.gov.au. c. Use the VIS to determine whether the PCTs on the land have Threatened Ecological Community (TEC) Status. d. If not identified as a TEC from steps a – c above, then refer to the NSW Threatened Species Scientific Committee determinations to consider whether the any of the PCTs accords with the determinations. e. Map all PCTs on the land that are TECs as HEV.
Criterion 3. Threatened species		
3.1 Key habitat for threatened species (vulnerable, endangered, or critically endangered species listed under BC Act)	Key breeding habitats with known breeding occurrence	a. Search BioNet for threatened species records on and within 10km of the land b. Undertake field work to identify potential breeding habitats on the land for threatened species. c. Either assume breeding occurrence and map identified breeding habitats on the land as HEV or undertake targeted surveys during the applicable breeding season(s) and map theses habitats as HEV if breeding occurs there.
	Core Koala Habitat	a. Check council records for approved comprehensive or individual property Koala Plans of Management (KPoM). b. Identify areas of core koala habitat on the land mapped in any approved KPoM and map these areas as HEV. c. If there are no approved KPoMs, then undertake field work in accordance with the relevant State Environmental Planning Policy (SEPP) for koalas, e.g. SEPP (Biodiversity and Conservation) 2022, to determine whether Core Koala Habitat is present on the land. d. Map any core koala habitat identified on the land through field work as HEV.

High Environmental Value (HEV) Criteria and Components		Property Scale HEV Identification Method
	Habitat for known populations of flora and fauna species-credit-species and SAII entities (species-credit species and SAII entities are identified in the Threatened Biodiversity Data Collection)	a. Search BioNet for threatened species records on and within 10km of the land. b. Undertake field work to identify populations of threatened species credit species on the land and their habitats. c. Map all habitats of known populations of species credit species on the land as HEV. The Biodiversity Assessment Method and the Department's survey assessment guidelines should be referred to for suitable habitat assessment methodologies and can be found here. If a recent Biodiversity Development Assessment Report has been prepared for the land, then this could be referred to in support of demonstrating how this criterion has been considered.
	Key habitats for migratory species	a. Search BioNet for threatened migratory species records on and within 10km of the land. b. Undertake field work to identify habitats of threatened migratory species on the land. c. Map all habitats of threatened migratory species on the land as HEV.
Criterion 4. Wetlands, rivers, estuaries & coastal features of high environmental value		
4.1 Nationally important wetlands **Note:** Rivers and their riparian areas comprising HEV are already included in the Biodiversity Values Map under HEV Criterion 1 as protected riparian land		a. Search the Directory of Important Wetlands in Australia for those occurring in NSW available at http://www.environment.gov.au/cgi-bin/wetlands/search.pl?smode=DOIW. b. Identify any nationally important wetlands listed in the directory that occur on the land and map these areas as HEV.
Criterion 5. Areas of geological significance		
5.1 Karst landscapes		a. Identify whether limestone outcrops or caves occur on the land. b. Consider any additional Karst landscapes that occur in the vicinity of the land, with reference to the NSW Government's *Guide to New South Wales Karst and Caves* available at https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Land-and-soil/nsw-karst-cave-guide-110455.pdf and any other available karst mapping, such as karst maps associated with local environmental plans. c. Map any limestone outcrops or caves on the land and any other karst landscapes that occur in the vicinity of the land as HEV.
5.2 Sites of geological significance included in the State Heritage Register or Heritage Inventory		a. Map any sites of geological significance that occur on, or in the vicinity of, the land as HEV. Refer to the State Heritage Inventory and map at https://www.environment.nsw.gov.au/topics/heritage/search-heritage-databases/state-heritage-inventory

Appendix 3: Survey questions

Proudly funded by the NSW Government in association with Bogan Shire Council

Bogan Shire Council Housing Strategy Community Survey May 2024

Bogan Shire Council is seeking the community's input into a Draft Housing Strategy for the Shire.

Your input is important as it will help to set the vision for housing delivery over the next 20 years. By completing the survey, you will be helping to inform the Draft Housing Strategy, which will be publicly exhibited for comment in the near future.

Privacy statement

We will not use any of your personal information, such as your name, email or postcode in reports to Council or in the strategy. Your information will be aggregated and used solely for the purposes of preparing the strategy.

First Name:

_____

Last Name:

_____

What is your postcode?

_____

I am a home owner ☐

I am a renter ☐

I am looking for a place to live ☐

1. In your opinion, is there enough housing in Bogan Shire to meet current demand?

Yes ☐

No ☐

If you answered No to Q1 above, please provide details:

2. Is there a need for a wider range of housing in Bogan Shire? If yes, what types of housing are needed? (Tick as many as you like).

Lifestyle / retirement housing ☐

Studio, one or two bedroom dwellings ☐

Apartments or townhouses ☐

Housing suitable for people with a disability ☐

Short term or temporary housing for workers ☐

Rural lifestyle opportunities ☐

Large homes 3-4+ bedroom dwellings ☐

Other ☐

If you ticked "Other", please provide details:

3. Where is housing most needed in Bogan Shire? (Tick all that apply).

Nyngan	☐
Girilambone	☐
Hermidale	☐
Coolabah	☐
Rural areas outside the towns and villages	☐
Other	☐

If you ticked "Other", please provide details:

4. Is housing in Bogan Shire affordable for most people?

Yes	☐
No	☐

If you answered No to Q4 above, please provide details:

5. If you could live anywhere in Bogan Shire, where would you most like to live? (Tick only one).

Nyngan	☐
Girilambone	☐
Hermidale	☐
Coolabah	☐
Rural areas outside the towns and villages	☐

6. ***In the last twelve months, if you have looked for housing to rent or buy in Bogan Shire, and were unsuccessful, please advise why. (Tick all that apply).***

Cost – I couldn't afford anything to rent or buy	☐
Size – I couldn't find anything the right size	☐
Location – I couldn't find anything in the right location	☐
Accessibility – I couldn't find anything suited to my needs	☐
Condition – I couldn't find anything in suitable condition	☐
Other	☐

If you ticked "Other", please provide details:

7. ***If you are a business owner/employer, have you had trouble recruiting staff due to a lack of suitable housing?***

Yes	☐
No	☐

8. ***Is there anything else you would like to tell us about in relation to housing in Bogan Shire?***

Yes	☐
No	☐

If you ticked "Yes" please provide details:

Appendix 4: Advertisement for workshops

ADVERTISEMENT IN NYNGAN WEEKLY

BOGAN SHIRE COUNCIL

WORKSHOPS - LOCAL HOUSING STRATEGY

Bogan Shire Council has funding from the Department of Planning, Housing and Infrastructure for a Local Housing Strategy. This will set the framework for Council's priorities when planning for future housing within the Shire.

To supplement responses from our recent survey, Council invites community members, business owners and organisations to attend a workshop to further explore the housing needs of the Shire.

Date: Wednesday 24 July 2024
Time: 11am-12.30pm or 6pm -7.30pm
Venue: Bogan Shire Youth and Community Centre
38 Cannonbar Street Nyngan NSW 2825

To assist Council to prepare for the workshops, please **RSVP by COB Monday 22 July 2024** to admin@bogan.nsw.gov.au or phone 68359000 during office hours.

Appendix 5: Workshops agenda and run sheet

Bogan Shire Council Housing Strategy
Stakeholder Workshops Wednesday 24 July 2024
Workshop Design and Run Sheet

Workshops

This document provides the objectives and methodology for two workshops to support the development of the Bogan Shire Local Housing Strategy. The outputs and findings from the workshops and feedback from Government and other stakeholders will supplement the findings from a recently concluded community survey.

The survey was undertaken to hear from the community about current challenges in relation to housing in Bogan Shire. In the workshops we will seek to explore the findings of the survey in more detail.

There will be two workshops. Both will include a discussion on community aspirations in relation to housing as well as land use planning and will be open to anyone in the community with an interest in attending and contributing.

Objectives

Through the workshops we hope to build on the evidence base that is currently being assembled as part of the preparation of the draft strategy. The workshops will include discussions about the following:

- gaps in general housing supply
- gaps in housing for specific needs – such as housing diversity and affordable rental housing
- any barriers to supply
- areas in the LGA with development capacity.

In addition to identifying priorities for community, industry and government stakeholders and helping to identify options for the delivery of new housing, the outputs from the two workshops will also help to inform Council's vision for housing in Bogan Shire.

Not everything that the community recommends will appear in the Housing Strategy or be actioned by Council. There are many influences on housing outcomes that are not the responsibility of local governments. Council's ability to influence housing outcomes is largely limited to three key areas:

1. Statutory approvals and housing regulations
2. Availability of land for housing (through the acquisition and sale of Council-owned land)
3. Strategic land use planning

There are other levers that councils can use to indirectly influence housing outcomes, for example infrastructure and services delivery, as well as advocating on behalf of the community.

Methodology

The workshops are being held on one day. Each workshop is essentially the same, although we can adjust the focus to accommodate the mix of attendees if needed.

The following outlines each workshop.

Check in at the end of the workshop to see that we've accurately captured the community's recommendations and priorities. How comfortable is the group with what they've prioritised? Do they want to adjust anything?

- *Workshop outline*
    - Warm up exercise: in table groups:
    - Ask participants to come up with a short statement of what their vision is for housing in the Shire. Feel free to use these to prompt your thinking:
        - Shelter
        - Everyone
        - Basic needs
        - Warmth
        - Access
        - Affordable
        - Safe
        - Secure
        - Within a half hour drive

Examples:

"In 2041 XXXX will be the residential location of choice in the Central West because of its thriving town centre, recreational opportunities and diverse economy"

"Xxxx is a fair and inclusive region, where everyone has access to affordable and sustainable housing"

“Residential areas provide a range of housing styles, sizes and tenures that suit people of all ages, income levels and household sizes and enable communities to stay connected and healthy as people move through the various stages in life.”

“By 2036, we will have a diversity and choice of housing types and sizes to accommodate the growing community.”

“In the future we will have adequate secure and affordable housing for families and individuals, and the range of accommodation that meets the needs of the elderly population.”

From the Bogan Shire Council Community Strategic Plan 2032:

“The Bogan Shire community’s vision for the future is “Comfortable Country Living”. This vision covers a wide variety of aspects that make up the reason so many people are proud to call Bogan Shire their home.”

- Activity 1. How does the availability and affordability of housing in impact day-to-day life in the LGA? How does it affect residents, businesses and business owners in the LGA? (Participants are asked to consider a ‘day in the life of Bogan Shire’ and show this on a map using post-it notes. Invite them to discuss what this raises for them.) **Output:** Concerns (mapped spatially)
- Activity 2. What vulnerabilities exist within the Shire because of these impacts? (Provide a list of vulnerabilities for participants to map spatially. Encourage them to engage using open questions such as “tell us more about X” and “are we missing any vulnerabilities?”) **Output:** Insights into what’s not working from an industry perspective in relation to housing and the potential implications (mapped spatially)
- Activity 3. What strengths does the Shire have in relation to housing that might help reduce these impacts? (As above)

  Output: Insights into what’s working in relation to housing in the shire (mapped spatially)
- Activity 4. What are your recommendations for overcoming our top weaknesses, and what should the priority be? What are your recommendations for making the most of our top strengths and what should be prioritised?

  Output: Insights into what’s working in relation to housing in the shire and what needs to change and what to prioritise

- *Post Workshops*

- Workshop 1 and Workshop 2. Summary of the following:
    - What we learned about current strengths and weaknesses in relation to housing in Bogan Shire.
    - Insights and recommendations from stakeholders – are there any differences between workshops or groups?
    - Output: Recommended actions from stakeholders summarised
- *Briefing participants*
    - Briefing for workshop participants
        - Workshop context (i.e. where does today's conversation fit in the development of the Strategy and what will we do with your contributions)
        - Our understanding of the current situation in relation to housing in Bogan Shire and forecasts for the future
        - *To be provided at the start of the workshop*

Materials

- Background information
- Presentation
- Maps of Bogan Shire
- Butchers paper for capturing feedback
- Post-it notes, markers

Room set up

Venue – Bogan Shire Youth and Community Centre

- Groups of up to eight at each table
- Council staff members available to assist
- Participants choose where to sit
- Room layout is banquet style (tables with chairs facing each other)
- Presenter / facilitator
- Tea/coffee/water available

On tables:
Maps
Butchers paper
Markers
Post-it notes

Agenda

Time/duration	Agenda	Lead
10 minutes	Welcome and commencement of workshop Acknowledgment of Country Introduction of workshop team	Sara Wilson / Mayor Greg Neill or Deputy Mayor Victoria Boag
15 minutes	Setting the scene and Q&A	Sara Wilson Cathy Black Jackson Williams-Hedges
55 minutes	Workshop activities (includes 5 minute break)	Sara Wilson
5 minutes	Next steps and close workshop	Sara Wilson

Run Sheet

Time / duration	Item	Lead
11am 6pm 2 minutes	Welcome participants and open workshop: Introduce Mayor / Deputy Mayor	Mayor Glen Neill / Deputy Mayor Victoria Boag
3 minutes	Acknowledgment of Country I'd like to begin by acknowledging the Traditional Owners of the land on which we meet today, the Ngiyampaa people who are the traditional custodians of the land and pay respect to Elders both past and present.	Sara Wilson
11.05am 6.05pm 5 minutes	Acknowledge Councillors and other elected representatives Introduce Council's team Cathy Black, Director, Planning and Environmental Services, Bogan Shire Council Jackson Williams-Hedges, Senior Health and Building Surveyor, Bogan Shire Council Haylee Martin, Community Services Manager, Bogan Shire Council Sara Wilson, The Engage Studio Today's agenda: Workshop 1: 11am – 12.30pm Workshop 2: 6pm – 7.30pm Invite participants to introduce themselves	Sara Wilson

11.10am 6.10pm 15 minutes	**Setting the scene** Bogan Shire Council is currently preparing a Local Housing Strategy that will integrate the community's vision for housing with State Government led strategic plans and Council's own strategic plans. The Local Housing Strategy will present Council's response for how the housing components of District and Regional Plans will be delivered locally and how any shortfalls in housing numbers or types could be addressed in the Shire. Council has invited community, industry, employers, and government agencies to provide views, and share data and other information that could assist in the preparation of the strategy. All input will be considered in the preparation of the strategy which will be exhibited for public comment later. In developing the housing strategy, Council will consider the evidence base, including demographic factors and the supply and demand for housing, as well as local land use opportunities and constraints and the community's aspirations for the character and growth of the area. The housing strategy will align housing growth with supporting infrastructure and social services such as schools and health facilities, and requirements specific to Bogan Shire, including the need for specific housing types to support the growth of industry sectors, and provide affordable housing options for low-income earners. While the strategy will focus on housing, factors such as employment, open space and infrastructure provision will also be considered as contributing factors to housing demand and location.	Sara Wilson (facilitator) Cathy Black Lisa Proctor

	The recommendations in the Strategy will form the basis for revised residential zoning and development standards. The Strategy will also inform budget and investment decisions regarding infrastructure funding, as well as opportunities for private public partnerships and grant funding opportunities to ensure appropriate infrastructure is provided to support the Strategy. The Bogan Shire Local Housing Strategy will be in line with the NSW Department of Planning, Housing and Infrastructure's Local Housing Strategy Guideline (2018). **Recently completed community survey findings - summary** On the table in front of you, you'll find the following that you may want to refer to during our discussions: • LGA snapshot • Demographic data including population forecast • Maps of Nyngan, Coolabah, Girilambone, and Hermidale Note key points in data: • Forecast declining population • Nodes on Nyngan map	
11.25am 6.25pm	Workshop activities (includes 5 minute break) • A housing vision for Bogan Shire:	Sara Wilson

55 minutes	• Ask participants to come up with a short statement of what their vision is for housing in the Shire. Imagine it's the year 2044, twenty years from now, and you're reflecting on how successful your community has been in achieving the ambitions set out in the Housing Strategy that you contributed to back in 2024. What words are you using?
	• Feel free to use these to prompt your thinking:
	  • Shelter
	  • Everyone
	  • Basic needs
	  • Warmth
	  • Access
	  • Affordable
	  • Safe
	  • Secure
	  • Within a half hour drive
	
	Examples:
	"In 2041 XXXX will be the residential location of choice in the Central West because of its thriving town centre, recreational opportunities and diverse economy"
	
	"Xxxx is a fair and inclusive region, where everyone has access to affordable and sustainable housing"
	
	"Residential areas provide a range of housing styles, sizes and tenures that suit people of all ages, income levels and household sizes and enable communities to stay connected and healthy as people move through the various stages in life."	

	"By 2036, we will have a diversity and choice of housing types and sizes to accommodate the growing community." "In the future we will have adequate secure and affordable housing for families and individuals, and the range of accommodation that meets the needs of the elderly population." From the Bogan Shire Council Community Strategic Plan 2032: *"The Bogan Shire community's vision for the future is "Comfortable Country Living". This vision covers a wide variety of aspects that make up the reason so many people are proud to call Bogan Shire their home."* • Activity 1. Use post-it notes to map positive and negative aspects of housing in the Shire • What challenges do you experience in relation to having a place to live? How do these impact your day-to-day life and the life of those you love and care about? (Invite participants to consider a 'day in their life' and show this on a map using post-it notes.) • Activity 2. What vulnerabilities does your community have because of these impacts? (For example, difficulty attracting staff, young people leaving the area, lack of affordable housing options due to mismatch of housing types). Encourage them to engage using open questions such as "tell us more about X" and "are we missing any vulnerabilities?") **Output:** Insights into what's not working for the community in relation to housing and the potential implications (mapped spatially) • Activity 3. What strengths does your community have in relation to having somewhere to live that might help reduce these impacts? (As above) **Output:** Insights into what's working in relation to housing in the shire (mapped spatially)	

	• Activity 4. What are your recommendations for overcoming our top weaknesses, and what should the priority be? What are your recommendations for making the most of our top strengths and what should be prioritised? **Output:** Insights into what's working in relation to housing in the shire and what needs to change and what to prioritise Questions to explore further in workshops, for facilitator to use as prompts: Questions for community What opportunities exist for community-led initiatives to take pressure off current housing supply? Should we be looking outside Nyngan for opportunities to expand housing supply? Community grants are available to support housing supply. What opportunities exist for community groups to apply for these? What ideas have you seen elsewhere that could be applied here? Questions for industry What opportunities exist for industry to encourage greater supply? What ideas have you seen elsewhere that could be applied here?	
12.20pm 7.20pm 5 minutes	Next steps and close workshop	Sara Wilson

Appendix 6: Workshop photos

ATTACHMENT B - FLOOD STUDY UPDATE

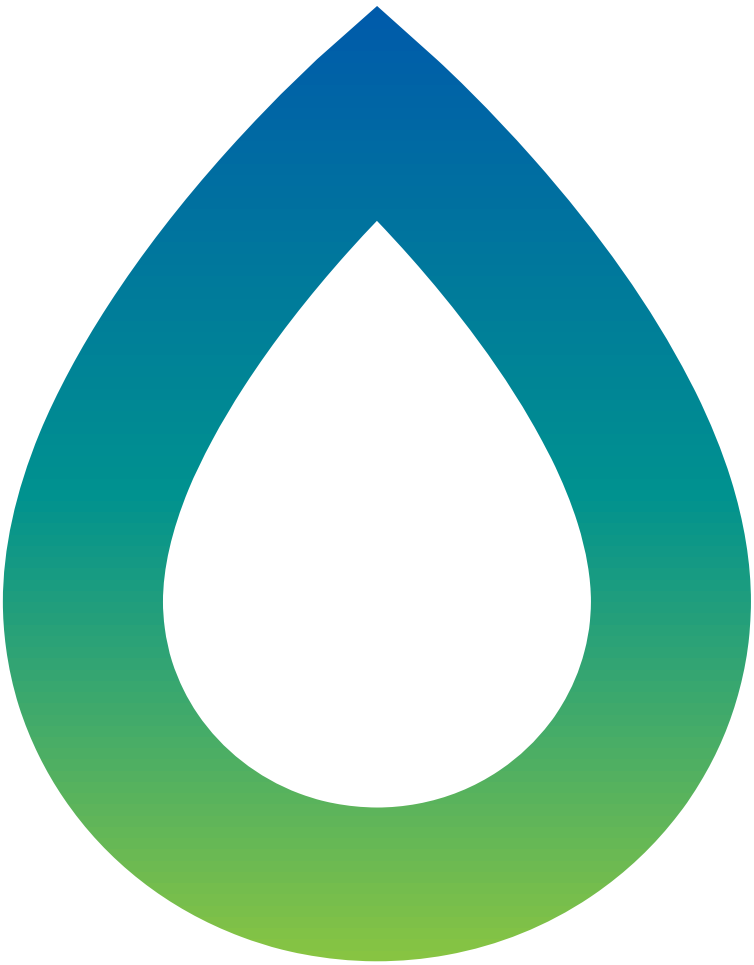
BOGAN RIVER AT NYNGAN

Flood Study Update

Bogan Shire Council via Blue Sky Planning

21 November 2024

0953-07-C2



Funded by:

NSW GOVERNMENT

An initiative funded by the NSW Government through the NSW Regional Housing Strategic Planning Fund.

DETAILS

Report Title	Bogan River at Nyngan, Flood Study Update
Client	Bogan Shire Council via Blue Sky Planning

THIS REVISION

Report Number	0953-07-C2
Date	21 November 2024
Author	LM/JF/CB
Reviewer	CB/GR

Revision number	Revision date	Reviewer	Author
C_DRAFT	5 Sep 2024	GR	CB/JF
C1	25 Oct 2024	CB	CB/JF
C2	21 Nov 2024	CB	CB/JF

TABLE OF CONTENTS

FIGURES

TABLES

GLOSSARY

Term	Shortened form	Definition
Annual exceedance probability	AEP	The chance of a flood of a given or larger size occurring in any one year, usually expressed as a percentage or a "1 in X" e.g. a 1% AEP or a 1 in 100 AEP.
Australian height datum	AHD	A common national surface level datum often used as a referenced level for ground, flood and flood levels
Average recurrence interval	ARI	The long-term average number of years between the occurrence of a flood equal to or larger in size than the selected event
Catchment		The area of land draining to a specific location
Chance		The likelihood of something happening that will have adverse or beneficial consequences
Defined flood event	DFE	The flood event selected as a general standard for the management of flooding to development
Design flood		The flood selected as part of the FRM process that forms the basis for physical works to modify the impacts of flooding
Development control plan	DCP	See Environmental Planning and Assessment Act 1979
Existing flood risk		The risk an existing community is exposed to as a result of its location on the floodplain
Flood		A natural phenomenon that occurs when water covers land that is normally dry. It may result from coastal inundation (excluding tsunamis) or catchment flooding, or a combination of both
Flood (hydrologic and hydraulic) modelling		Hydrologic and hydraulic computer models to simulate catchment processes of rainfall, run-off, stream flow and distribution of flows across the floodplain or similar
Flood constraints		Key constraints that flooding places on land
Flood fringe areas		That part of the flood extents for the event remaining after the flood function areas of floodway and flood storage areas have been defined
Flood function		The flood related functions of floodways, flood storage and flood fringe within the floodplain
Flood hazard		A flood that has the potential to cause harm or conditions with the potential to result in loss of life, injury and economic loss
Flood planning area	FPA	The area of land below the FPL
Flood planning level	FPL	The combination of the flood level from the DFE and freeboard selected for FRM purposes
Flood risk		Risk is based on the consideration of the consequences of the full range of flood behaviour on communities and their social settings, and the natural and built environment
Flood risk management	FRM	The management of flood risk to communities
Flood risk management	the manual	DPE, 2023b

Term	Shortened form	Definition
manual: the policy and manual for the management of flood liable land		
Flood storage areas		Areas of the floodplain that are outside floodways which generally provide for temporary storage of floodwaters during the passage of a flood and where flood behaviour is sensitive to changes that impact on temporary storage of water during a flood
Flood study		A comprehensive technical investigation of flood behaviour undertaken in accordance with the principles in this manual and consistent with associated guidelines A flood study defines the nature of flood behaviour and hazard across the floodplain by providing information on the extent, level and velocity of floodwaters, and on the distribution of flood flows considering the full range of flood events up to and including extreme events, such as the PMF
Floodplain		Equivalent to flood prone land
Floodways		Areas of the floodplain which generally convey a significant discharge of water during floods and are sensitive to changes that impact flow conveyance. They often align with naturally defined channels or form elsewhere in the floodplain
Flow		The rate of flow of water measured in volume per unit time, for example, cubic metres per second (m^3/s)
Freeboard		A factor of safety typically used in relation to the setting of minimum floor levels or levee crest levels
Frequency		The measure of likelihood expressed as the number of occurrences of a specified event in a given time
Future flood risk		The risk future development and its users are exposed to as a result of its location on the floodplain
Gauge height		The height of a flood level at a particular water level gauge site related to a specified datum
Hazard		A source of potential harm or conditions that may result in loss of life, injury and economic loss due to flooding
Hydraulics		The study of water flow in waterways and flowpaths; in particular, the evaluation of flow parameters such as water level and velocity
Hydrology		The study of the rainfall and run-off process; in particular, the evaluation of peak flows, flow volumes and the derivation of hydrographs for a range of floods
Likelihood		A qualitative description of probability and frequency
Likelihood of occurrence		The likelihood that a specified event will occur
Probability		A statistical measure of the expected chance of a flood
Probable maximum flood	PMF	The largest flood that could conceivably occur at a particular location, usually estimated from probable maximum precipitation (PMP), and where applicable, snow melt, coupled with the worst flood-producing catchment conditions

Term	Shortened form	Definition
Probable maximum precipitation	PMP	The greatest depth of precipitation for a given duration meteorologically possible over a given size storm area at a particular location at a particular time of the year, with no allowance made for long- term climatic trends (World Meteorological Organization 1986)
Rainfall intensity		The rate at which rain falls, typically measured in millimetres per hour (mm/h)
Risk		'The effect of uncertainty on objectives' (ISO 2018)
Scenario		A scenario may relate to current, historical or assumed future floodplain, catchment and climate conditions
Shared socioeconomic pathway	SSP	The latest version of 'what if' scenarios used to explore the consequences of greenhouse gases accumulating in the atmosphere. They further refine the previous emissions scenarios.
Velocity		The speed of floodwaters, measured in metres per second (m/s)

1 INTRODUCTION

1.1 BACKGROUND

Bogan Shire Council (Council) has engaged Blue Sky Planning & Environment (Blue Sky) to assist with the development of the Bogan Shire Local Housing Strategy (LHS). It is understood that in developing the LHS, Council will consider factors such as demographics, supply and demand for housing, local land use opportunities and constraints, and the community's aspirations for the character and growth of the area.

Flood risk is a factor of consideration for local land use opportunities and constraints. The Nyngan Flood Study (herein referred to as the '2014 Flood Study') was completed for Council by WRM Water & Environment (WRM) on 10 September 2014. This study developed a TUFLOW hydraulic model to predict Bogan River flood behaviour for a range of AEP (Annual Exceedance Probability) events (1 in 20, 1 in 100, 1 in 200 and the probable maximum flood (PMF)). Design event flows, with the exception of the PMF, were estimated using flood frequency analysis (FFA) techniques with derived flows from the Nyngan stream gauge. No consideration was given to the effects of climate change on peak flow estimates in the 2014 Flood Study. Inundation extents and depths as well as peak velocities were mapped and hydraulic hazards categorised for each AEP event.

About ten years have passed since the completion of the Flood Study, presenting an opportunity to update the Flood Study to ensure accuracy of the predicted flood behaviour such that it may inform the LHS. The following changes since 2014 may influence the predicted flood behaviour and study outcomes:

- Significant advancements in the TUFLOW hydraulic modelling software, including improvements in the computational speed and the functionality of the model inputs and outputs;
- Ten (10) years of additional peak flow data to extend the FFA; and
- Climate change considerations.

WRM has been engaged by Blue Sky to update the 2014 Flood Study to address the above changes. This report documents the flood model update, which included revising the model calibration to the 1990 historical event.

1.2 SCOPE AND OBJECTIVES

The scope of work was as follows:

- Update the existing hydraulic model using the latest TUFLOW software version and features, and include updated topographic data and hydrologic inflows;
- Determine a proxy event for the 1 in 100 AEP with climate change;
- Run the updated model for the 1 in 20, 1 in 100, 1 in 200 AEP and PMF (without climate change), as per the events included in the 2014 Flood Study, and for a proxy event for the 1 in 100 AEP with climate change; and
- Prepare a Flood Study addendum report detailing the adopted methodology and key findings of the study.

1.3 REPORT STRUCTURE

The report is structured as follows:

- Section 2 provides information on available data;
- Section 3 describes the hydraulic model updates;

- Section 4 outlines the design event modelling, which includes estimation of design event flows using flood frequency analysis (FFA);
- Section 5 describes climate change considerations;
- Section 6 summarises the results and mapping;
- Section 7 describes the limitations and recommendations;
- Section 8 contains the conclusions, which include a summary of findings;
- Section 9 is a list of references;
- Appendix A provides the 2020 levee survey overview;
- Appendix B describes the investigations of alterative topographic datasets;
- Appendix C provides the dataset used as basis of the Flood Frequency Analysis;
- Appendix D provides afflux figure of the model update process;
- Appendix E provides detail on the model recalibration process;
- Appendix F provides details on the update of the climate change guidance in the recent revision of the *Australian Rainfall and Runoff* guidelines; and
- Appendix G includes the design event mapping.

2 AVAILABLE DATA

2.1 OVERVIEW

Data used for developing the updated flood study (the current study) includes:

- Baseline data and reporting from previous studies; the 2014 Flood Study (WRM, 2014) and the 2017 Nyngan Floodplain Risk Management Study (the FRMS) (WRM, 2017);
- TUFLOW Classic Hydraulic Model from the 2014 Flood Study;
- Survey data for the town levee; and
- Extended historical peak flood level and flow data.

A locality overview is shown in Figure 2.1 and a locality zoom in Figure 2.2.

2.2 PREVIOUS STUDIES

The following three previous studies are summarised in order of relevance to the current study.

2.2.1 Nyngan Flood Study, Bogan River (WRM, 2014)

For the 2014 Flood Study (WRM, 2014), a TUFLOW hydraulic model (version 2013-12-AB) was developed to predict the Bogan River flood behaviour for the 1 in 20, 1 in 100 and 1 in 200 AEP events (without climate change), and the Probable Maximum Flood (PMF) event for the study area. The TUFLOW model was calibrated to the April 1990 and January 1976 historical events. Inundation extents and depths were mapped for each AEP and the calibration events. Hydraulic hazard categories were mapped for the 1 in 100 and 1 in 200 AEP events (without climate change).

Calibration to the 1990 historical event was undertaken using recorded flood levels across the floodplain and within Nyngan, which were obtained from the DWR (1990) study (refer Section 2.2.2). For the 1990 calibration event, the Nyngan town levee of the time was included in the model. The TUFLOW model for 2014 existing conditions incorporated the upgraded levee (since 1990) and new road and rail infrastructure that had been constructed/replaced since 1990.

With the exception of the PMF, design event peak flows were estimated using Flood Frequency Analysis (FFA). PMF discharge estimates were based on the previous estimates made by Lyall and Macoun (DWR, 1990) but factored to account for the latest Probable Maximum Precipitation (PMP) estimates from the Bureau of Meteorology (BoM).

2.2.2 Nyngan April 1990 Flood Investigation Summary Report (DWR, 1990)

The NSW Department of Water Resources (DWR) completed a report in 1990 documenting the 1990 flood event at Nyngan, including technical information on rainfall, flows and flood behaviour. This report was used to inform the 2014 Flood Study and is similarly used in the current study where relevant.

Following the 1990 flood event, the Nyngan town levee was realigned and extended to encircle the town over its 11 km length, and upgraded to a height exceeding the 1990 peak flood level by 1 m. Flood warning systems were augmented.

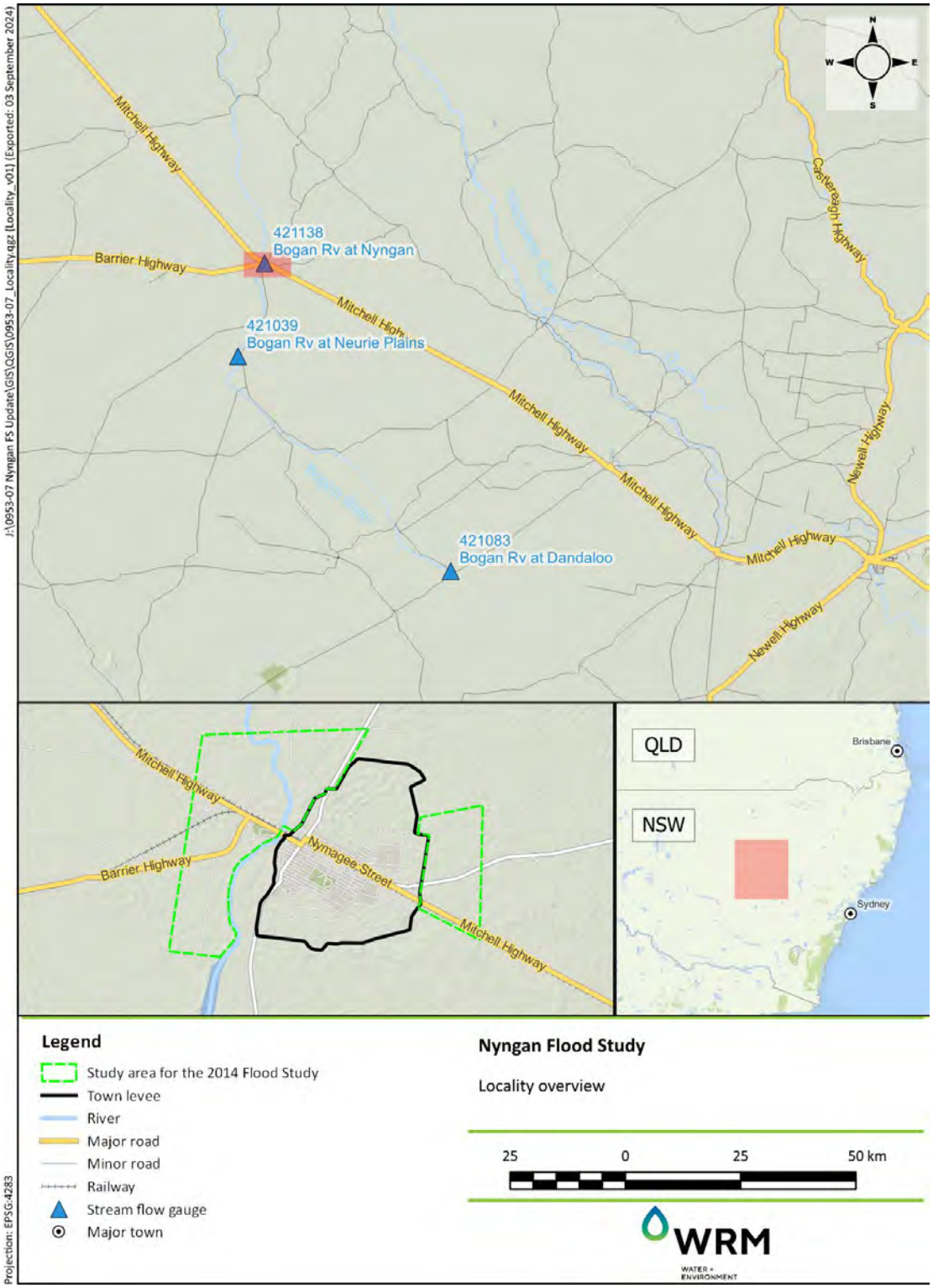


Figure 2.1 Locality overview

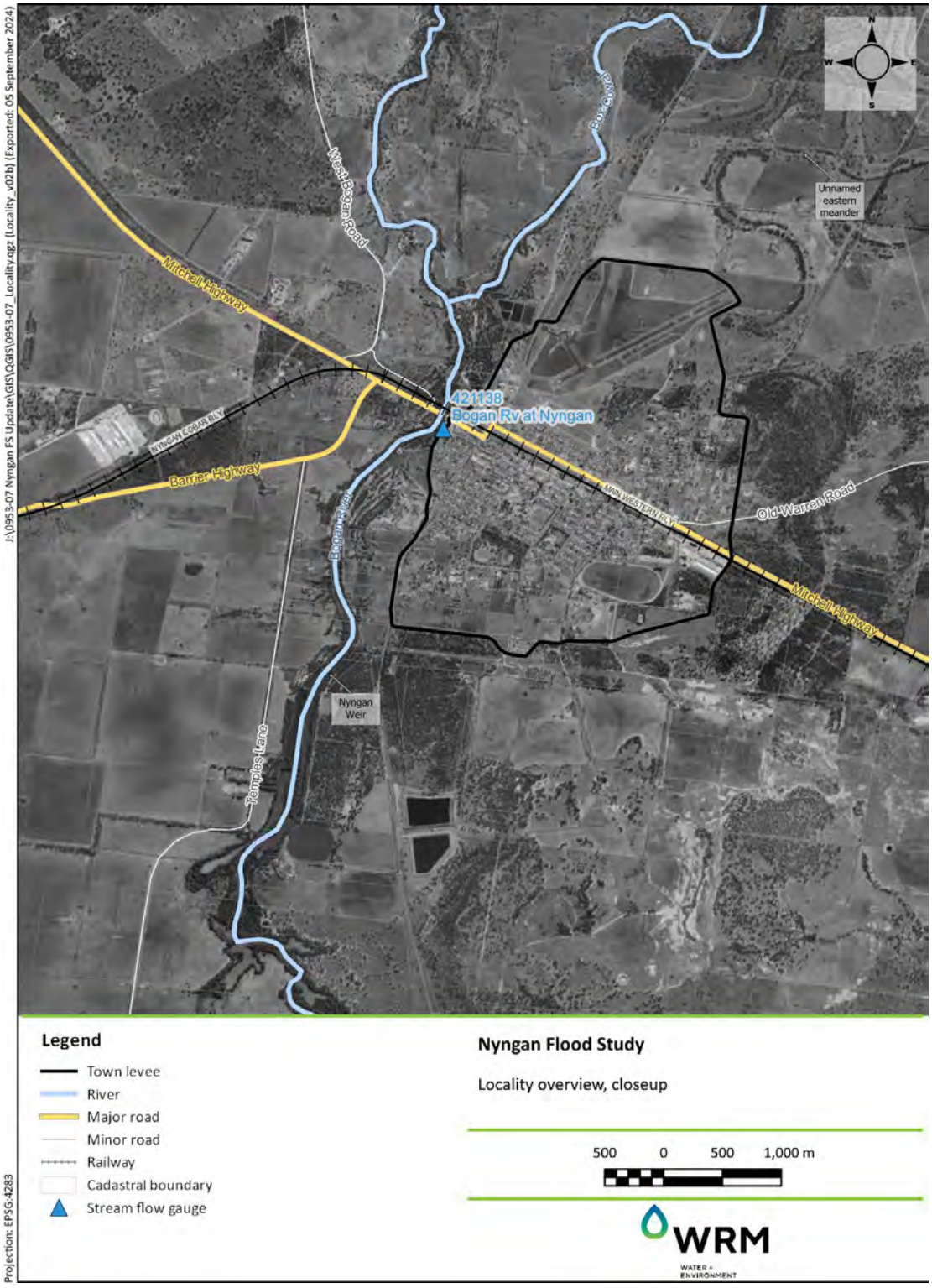


Figure 2.2 Locality closeup

2.2.3 Nyngan Floodplain Risk Management Study, Bogan River (WRM, 2017)

The FRMS (WRM, 2017) was based on the hydraulic model and results from the 2014 Flood Study. Recommendations from the FRMS are summarised as follows:

- Maintain the Nyngan Levee Bank Operations and Maintenance Manual;
- Monitoring the town levee regularly;
- Investigate potential rezoning of undeveloped land within the high hazard areas to recreation or rural land use zones;
- Update the Development Control Plan (DCP);
- Update the minimum lot size map to be consistent with hazard mapping; and
- Develop a public awareness and education programme, including encouragement for residents outside the levee to develop flood emergency evacuation/response plans.

2.3 TUFLOW CLASSIC HYDRAULIC MODEL

The TUFLOW hydraulic model configuration adopted in the 2014 Flood Study is reproduced here in Figure 2.3. The model schematisation has not changed for use in the current study.

The hydraulic model covers an area of 92 km^2, with a grid cell size of 15 m. The model includes one (1) 'discharge-time' (QT) type inflow boundary representing the inflows from the catchment upstream of Nyngan, and nineteen (19) 'stage-discharge' (HQ) type downstream outflow boundaries.

The TUFLOW model includes key hydraulic structures and drainage infrastructure within the model extent. Modelled drainage structures include thirteen (13) reinforced concrete pipes (RCP), seventeen (17) reinforced concrete box culverts (RCBC), one (1) levee around the Nyngan community, and three (3) bridges crossing the Bogan River at the Mitchell Highway and the Cobar Railway Line. Details on these structures are provided in Appendix B in the 2014 Flood Study.

The TUFLOW model uses Manning's 'n' values to represent hydraulic resistance. As mentioned in Section 2.2.1, the TUFLOW model was calibrated to two historical events; 1990 and 1976. Calibration informed the adopted Manning's 'n' values across the model domain.

Further details on the TUFLOW Classic hydraulic model can be found in the 2014 Flood Study (WRM, 2014).

Figure 2.3 TUFLOW Classic Model Configuration (reproduced from the 2014 Flood Study)

2.4 TOPOGRAPHIC DATA

The base model topography from the TUFLOW hydraulic model developed for the 2014 Flood Study included the following sources:

- Ground surface digital terrain model (DTM) of the floodplain around Nyngan provided by *Land and Property Information* via Bogan Shire Council, captured by remote sensing light detection and ranging (LiDAR) techniques in May 2011. This survey was provided at a 2m resolution with a horizontal/vertical accuracy of 1.8 m / 0.6 m;
- Bathymetry data for the Bogan River upstream of the Upper Nyngan Weir surveyed by WaterBiz in April 2007 and provided by Terrabyte Services; and
- Estimated bathymetry of the 3 km channel length of the lower weir pool through Nyngan and in the Box Cowal downstream of Nyngan. This bathymetry was estimated by WRM in 2014 to inform the model topography.

New topographic data was provided for the current study as follows:

- Updated levee crest elevations surveyed in 2020 as part of the levee audits by NSW Public Works. This data was provided as a geo-referenced dwg file (lines, points and elevations) by Council on 11 April 2024[1]. A figure of this survey is provided in Appendix A.

Additional topographic data was found during the current study, but not used. A summary of the investigations undertaken in relation to the other available datasets is provided in Appendix B.

2.5 STREAM GAUGE DATA

Historical flood data in the Bogan River catchment dates back to 1879. The 2014 Flood Study derived peak flows at Nyngan for the 135-year period from 1879 to 2013. The current study extends this record by 10 years (refer Appendix C for the combined dataset). Information on the stream gauges relevant for the flood study is provided in Table 2.1; the gauge locations are shown in Figure 2.1. The methodology and outcomes of extending the stream gauge records are detailed in Section 4.2.

Of note is that the 1990 flood was the largest flood event recorded in the Bogan River catchment, with an estimated peak flow of 2,080 m^3/s and a peak flood level of 5.23 m. This flood was about 5-times larger than the second largest flood, which occurred in 1955 (414 m^3/s).

Table 2.1 Relevant Bogan River gauging stations – period of record and catchment areas

Station location	Station number	Stream name	Period of record	Catchment area (km^2)
Dandaloo	421083	Bogan River	1971 - Current	5,440
Neurie Plains	421039	Bogan River	1960 - Current	14,760
Nyngan	421138	Bogan River	1993 - Current	18,040

[1] File name: C0020_NynganLevee_3d.dwg

3 HYDRAULIC MODEL UPDATE

3.1 OVERVIEW

The TUFLOW hydraulic model was originally developed as a TUFLOW Classic model in the 2014 Flood Study (WRM, 2014), as discussed in Section 2.3. The current study presented an opportunity to update the TUFLOW Classic model to current TUFLOW software and features, which are described below. Reference should be made to the 2014 Flood Study report (WRM, 2014) for further details on datasets used to build the model as only a high-level summary of input data is provided in this current report.

3.2 MODEL SOFTWARE AND FEATURES

The TUFLOW hydrodynamic software has undergone significant updates and improvements since the Flood Study was completed using TUFLOW Classic in 2014.

This updated flood study is based on the latest TUFLOW HPC solver[2]. HPC stands for Heavily Parallelised Compute and enables 2D models to be simulated on computers' Graphical Processing Units (GPU) rather than the traditional approach of using the Central Processing Units (CPU), as in TUFLOW Classic. Simulations using GPU hardware result in significantly quicker model run times.

TUFLOW HPC's Sub-Grid-Sampling (SGS) feature has also been included as part of the current assessment. SGS allows the model to make full use of the underlying topographic data. SGS samples elevation data at the finer resolution of the underlying DEM or TIN and develops storage and conveyance curves for cells and cell faces instead of single elevations.

In addition to the features mentioned above, other improvements have been made to the TUFLOW solver over time. One of many such improvements is an update to the weir flow solution scheme. This update was found to have implications for the way in which floodwater weir flows across the Nyngan town levee and elevated highways/rail lines in the 1990 event, as discussed in Section 3.4.1.

3.3 METHODOLOGY

It was expected that the update of the TUFLOW Classic model to TUFLOW HPC with SGS would produce differences in modelled flood behaviour. To understand the cause and significance of these differences, the following incremental updating process was adopted:

- Convert the TUFLOW Classic model to TUFLOW HPC and update to the newest TUFLOW solver version;
- Simulate the TUFLOW HPC model for the 1 in 100 AEP and 1 in 20 AEP design events (without climate change) and for the 1990 calibration event;
- Compare peak modelled flood levels from the TUFLOW Classic model with the TUFLOW HPC model;
- Enable SGS in the updated TUFLOW HPC model;
- Simulate the TUFLOW HPC with SGS model for the 1 in 100 AEP and 1 in 20 AEP events (without climate change) and for the 1990 calibration event; and

[2] https://wiki.tuflow.com/HPC_Introduction

The 2014 Flood Study used the available TUFLOW Classic version at the time (2013-12-AB-iSP-w64) while the current studyuses the latest TUFLOW HPC version (2023-03-AE-iSP-w64).

- Compare peak modelled flood levels from the TUFLOW Classic model with the TUFLOW HPC+SGS model.

Outcomes for Steps 1 to 3 are discussed in Section 3.4.1 and outcomes for Steps 4 to 6 are discussed in Section 3.4.2.

3.4 MODEL UPDATE OUTCOMES

3.4.1 Update to TUFLOW HPC

The 2014 Flood Study model was initially converted from TUFLOW Classic to TUFLOW HPC. No other changes were made to the model.

The TUFLOW HPC model was simulated for the 1 in 100 and 1 in 20 AEP design flood events (without climate change) as well as the 1990 calibration event. Peak flood level results for the three events were compared to the previous TUFLOW Classic 2014 Flood Study results. Afflux figures showing the difference in peak flood levels are provided in Appendix D.1, with the comparison summarised as follows:

- For the 1 in 100 AEP event (without climate change), an average increase in peak flood levels of 0.03 m is predicted throughout the entire model domain, with increases of up to 0.1 m upstream of the Mitchell Highway and the Main Western Railway.
- For the 1 in 20 AEP event (without climate change), an increase in peak flood levels of up to 0.25 m is predicted upstream the Upper Nyngan Weir, while an increase of up to 0.08 m is predicted between the weir and the Mitchell Highway. Downstream of the Mitchell Highway, impacts are less pronounced (approximately 0.03 m), but a new connection between flow paths is predicted. No outbreaks are predicted towards the east.
- For the 1990 calibration event, peak flood level increases are pronounced upstream of the Mitchell Highway and the Main Western Line (up to 0.1 m). Downstream of the Mitchell Highway and the Main Western Railway, impacts are less pronounced (approximately 0.01 m).

Improvements to the TUFLOW weir solution scheme between the previous TUFLOW Classic solver and the latest TUFLOW HPC solver were found to be primarily responsible for these differences.

The TUFLOW hydraulic model was subsequently revised to include SGS functionality. The results of this update are summarised in Section 3.4.2.

3.4.2 Update to SGS functionality

The TUFLOW HPC model was further refined to include the SGS Method C functionality and simulated for the 1 in 100 and 1 in 20 AEP design flood events (without climate change) as well as the 1990 calibration event. Peak flood level results for the three events were compared to the previous TUFLOW Classic 2014 Flood Study results. Afflux figures showing the difference in peak flood levels are provided in Appendix D.2, with the comparison summarised as follows:

- For the 1 in 100 AEP event (without climate change), increases in peak flood levels of 0.02 m are predicted approximately 3.6 km upstream of the Mitchell Highway to 1.4 km downstream of the Mitchell Highway and dissipate thereafter. Along the eastern outbreak upstream of the Main Western Line, water level increases of up to 0.06 m are predicted.
- For the 1 in 20 AEP event (without climate change), an increase in peak flood levels of up to 0.15 m is predicted upstream the Nyngan Weir. Predicted impacts dissipate between the weir and the Mitchell Highway. Downstream of the Mitchell Highway, impacts of 0.01 m extend over approximately 1 km. A shallow increase in flood extent is predicted within the downstream Unnamed Eastern Meander.

- For the 1990 calibration event, peak flood level increases are pronounced upstream of the Mitchell Highway and the Main Western Line (up to 0.1 m). Downstream of the Mitchell Highway and the Main Western Railway, impacts are less pronounced (approximately 0.01 m).

Due to the changes to peak flood levels in the 1990 calibration event caused by the software and feature upgrade, further investigation was undertaken to determine whether the changes compromised the calibration, as discussed in the following section.

3.4.3 1990 event calibration comparison

In the 2014 Flood Study, calibration of the TUFLOW Classic model to the 1990 event was undertaken using 68 surveyed flood marks. The locations of these survey marks are shown in Figure 3.4. Results from the updated TUFLOW HPC+SGS model's 1990 event simulation were also compared to the same surveyed flood marks to determine whether the updated model would still be regarded as being sufficiently calibrated. Results of this comparison are discussed below.

Two methods were used to determine how well the peak modelled flood levels for the 1990 event compared to the surveyed peak flood levels:

- Table 3.1 shows the mean and standard deviation of the differences between the modelled and surveyed peak flood levels. A perfect match would produce a mean and standard deviation of zero (0), indicating no difference between modelled and surveyed. The closer to zero (0), the better.
- Figure 3.1 shows a histogram comparison of the differences between the modelled and surveyed peak flood levels. A perfect match would produce a single bar in the centre of the histogram, indicating no difference between modelled and surveyed.

These comparisons show that the updated TUFLOW HPC+SGS model slightly overpredicts peak flood levels (mean difference higher and histogram skewed to the right) compared to the original TUFLOW Classic model. To maintain confidence in the model's ability to produce reliable results, a recalibration to the 1990 event has been undertaken, as presented in Section 3.5.

Table 3.1 Statistical difference between the modelled and surveyed peak levels for the TUFLOW Classic (original) and TUFLOW HPC+SGS (updated) model

Statistical Variable	ORIGINAL MODEL Difference – modelled minus surveyed levels (m)	UPDATED MODEL Difference – modelled minus surveyed levels (m)
Mean	0.011	0.043
Standard Deviation	0.088	0.091

3.5 MODEL RECALIBRATION TO THE 1990 EVENT

3.5.1 Model revision

To ensure adequate reproduction of the historic flood behaviour for a large event, the TUFLOW HPC+SGS model was recalibrated to the 1990 event to achieve an improved fit to the surveyed peak flood levels across the floodplain. An iterative approach was used to update the Manning's n values within accepted bounds to improve the model's calibration performance. Table 3.2 shows the final Manning's roughness values adopted for recalibration compared to the 2014 Flood Study TUFLOW Classic model.

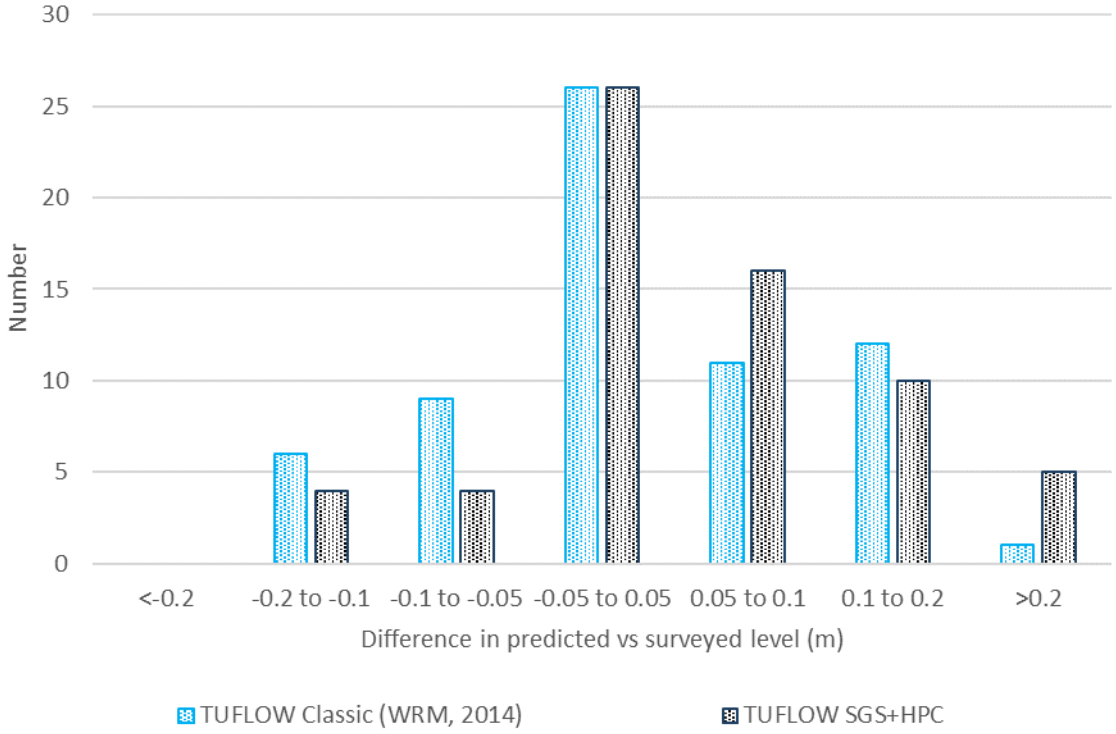


Figure 3.1 Histogram comparison of modelled minus surveyed peak flood levels, TUFLOW Classic and TUFLOW HPC+SGS model

Table 3.2 Adopted Manning's 'n' values, TUFLOW Classic vs TUFLOW HPC+SGS model

Ground Surface	Adopted Manning's 'n'	
	TUFLOW Classic (2014 Flood Study)	TUFLOW HPC+SGS (current study)
Grassed Overbank	0.050 (to 0.3m deep)	0.045 (to 0.3m deep)
	0.040 (>0.6m deep)	0.035 (>0.6m deep)
Vegetated Overbank	0.070	0.060
Urban Areas	0.100	0.100
Roads	0.025	0.025
Open Drains (river)	0.030	0.030

3.5.2 Model performance

3.5.2.1 Peak flood levels

The predicted peak flood levels from the recalibrated TUFLOW HPC+SGS model indicate a good fit to the surveyed peak flood levels across the floodplain, demonstrated by the following:

- The mean and standard deviation of the difference in modelled and surveyed peak flood levels is 0.003 m and 0.095 m, respectively.
- The histogram comparison of the difference between modelled peak flood levels and surveyed flood marks for both models shown in Figure 3.2 indicates a very good match of modelled to surveyed peaks.
- Figure 3.3 shows a longitudinal profile of the predicted April 1990 flood peak water level along the Bogan River together with locations and levels of nearby surveyed flood marks.
- Figure 3.4 maps the performance of the recalibrated model against the surveyed flood marks, with Table 3.3 showing a comparison of the surveyed and predicted flood levels. The predicted flood levels are in good agreement with the surveyed levels along the Bogan River upstream and downstream of the Mitchell Highway.

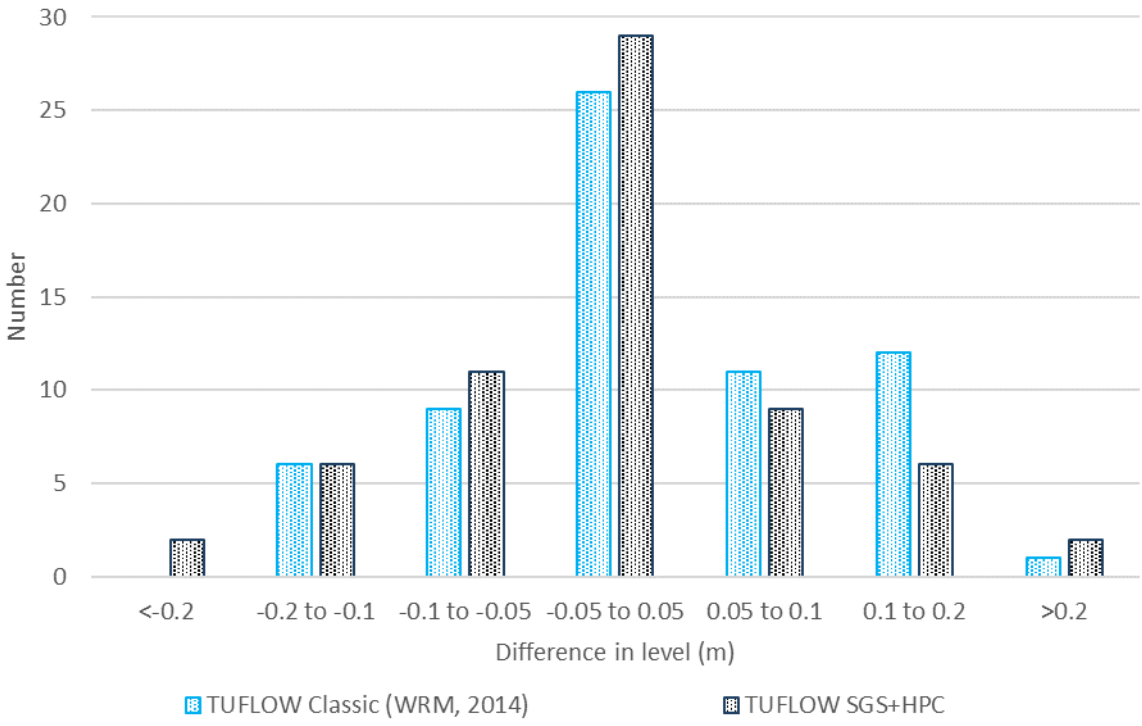


Figure 3.2 Histogram comparison modelled minus surveyed peak flood levels, TUFLOW Classic and recalibrated TUFLOW HPC+SGS

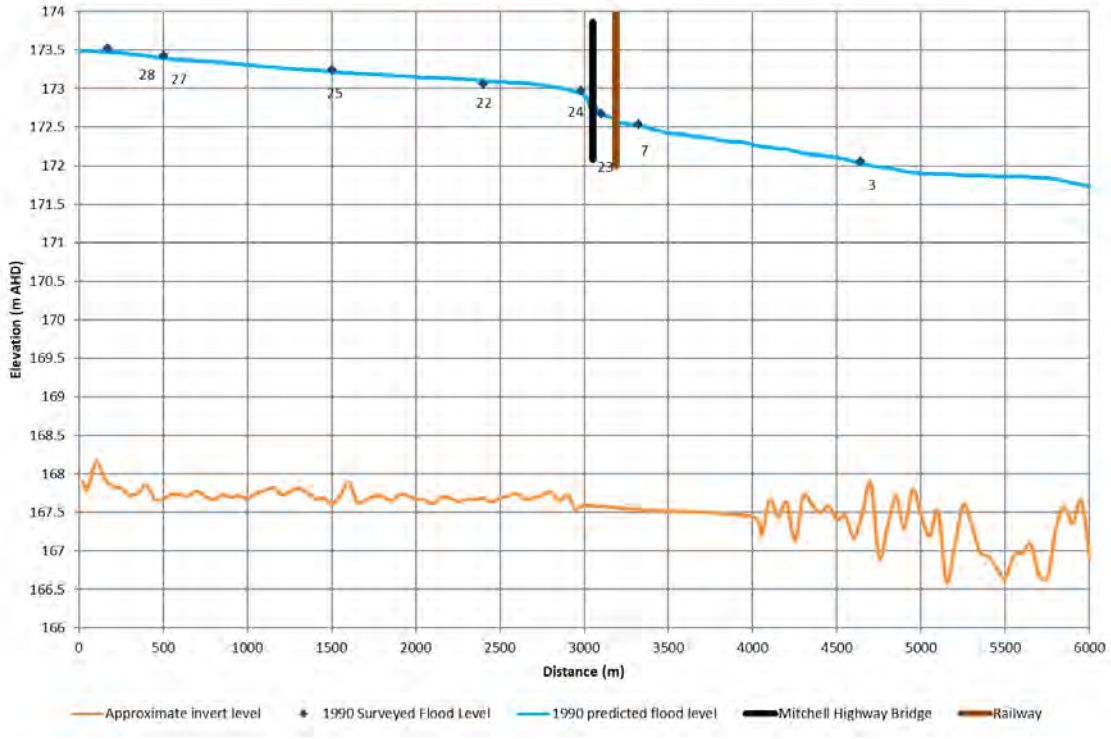


Figure 3.3 Recalibrated TUFLOW HPC+SGS longitudinal flood profile, 1990 flood event, Bogan River

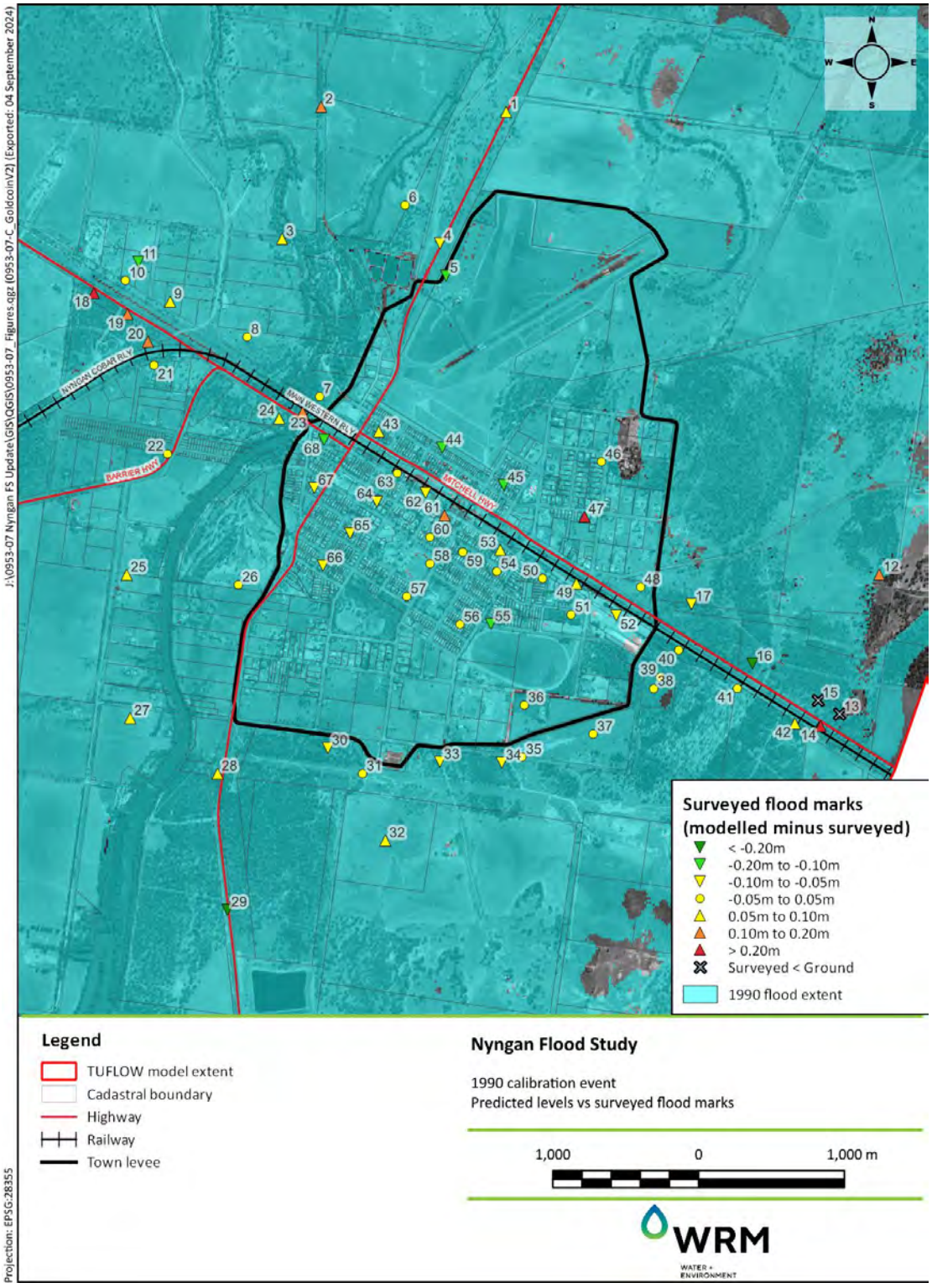


Figure 3.4 Recalibrated model performance against surveyed peak flood marks

Table 3.3 Surveyed and modelled peak water levels, April 1990 event

Location ID	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original TUFLOW Classic model		Recalibrated TUFLOW HPC+SGS model	
			Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990
1	170.76	171.33	171.44	0.11	171.35	0.02
2	170.74	171.29	171.53	0.24	171.45	0.16
3	171.3	171.94	172.06	0.12	172.03	0.09
4	171.28	171.55	171.58	0.03	171.48	-0.07
5	171.07	171.85	171.73	-0.12	171.69	-0.16
6	170.89	171.53	171.59	0.06	171.50	-0.03
7	170.94	172.48	172.53	0.05	172.52	0.04
8	171.46	172.16	172.22	0.06	172.20	0.04
9	171.53	171.97	172.08	0.11	172.04	0.07
10	171.08	171.98	172.04	0.06	171.96	-0.02
11	170.87	172.08	172.02	-0.06	171.95	-0.13
12	172.32	172.27	172.41	0.14	172.37	0.10
13	173.05	172.59	173.03	-	173.07	-
14	172.4	172.92	173.06	0.14	173.13	0.21
15	172.82	172.38	173	-	173.04	-
16	171.44	172.72	172.6	-0.12	172.48	-0.24
17	171.43	172.59	172.62	0.03	172.50	-0.09
18	171.08	172.62	172.8	0.18	172.87	0.25
19	171.59	172.7	172.85	0.15	172.89	0.19
20	171.66	172.8	172.88	0.08	172.90	0.10
21	171.83	172.99	172.96	-0.03	173.02	0.03
22	172.02	173.08	173.05	-0.03	173.07	-0.01
23	170.23	172.53	172.67	0.14	172.71	0.18
24	170.79	172.89	172.96	0.07	172.97	0.08
25	171.85	173.17	173.23	0.06	173.22	0.05
26	171.83	173.21	173.18	-0.03	173.18	-0.03

Location ID	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original TUFLOW Classic model		Recalibrated TUFLOW HPC+SGS model	
			Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990
27	171.8	173.31	173.41	0.1	173.37	0.06
28	171.85	173.43	173.51	0.08	173.48	0.05
29	172.73	173.94	173.79	-0.16	173.74	-0.20
30	172.05	173.59	173.57	-0.02	173.52	-0.07
31	172.34	173.54	173.58	0.04	173.53	-0.01
32	172.67	173.48	173.62	0.14	173.57	0.09
33	171.76	173.5	173.47	-0.03	173.43	-0.07
34	171.97	173.47	173.46	-0.01	173.42	-0.05
35	172.2	173.33	173.38	0.05	173.36	0.03
36	172.05	173.3	173.35	0.05	173.32	0.02
37	172.22	173.29	173.31	0.02	173.29	0.00
38	168.96	173.17	173.08	-0.09	173.15	-0.02
39	170.48	173.13	173.07	-0.06	173.15	0.02
40	171.18	173.1	173.06	-0.04	173.15	0.05
41	172.1	173.12	173.08	-0.04	173.15	0.03
42	171.19	173.07	173.07	0	173.13	0.06
43	171.49	171.92	172.04	0.12	171.99	0.07
44	171.71	172.25	172.1	-0.15	172.06	-0.19
45	170.87	172.34	172.28	-0.06	172.23	-0.11
46	171.27	172.16	172.18	0.02	172.13	-0.03
47	171.57	172.16	172.55	-	172.54	-
48	172.02	172.54	172.63	0.09	172.55	0.01
49	172.14	172.96	172.93	-0.03	173.02	0.06
50	171.59	172.99	172.92	-0.07	173.02	0.03
51	171.72	172.99	172.96	-0.03	173.04	0.05
52	171.78	173.04	172.89	-0.15	172.99	-0.05
53	171.27	172.96	172.94	-0.02	173.03	0.07

Location ID	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original TUFLOW Classic model		Recalibrated TUFLOW HPC+SGS model	
			Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Modelled - Surveyed) 1990
54	171.64	173	172.95	-0.05	173.03	0.03
55	172.23	173.21	173.04	-0.17	173.07	-0.14
56	172.26	173.14	173.1	-0.04	173.09	-0.05
57	172.21	173.16	173.15	-0.01	173.14	-0.02
58	172.93	173.13	173.16	0.03	173.10	-0.03
59	172.1	173.06	172.99	-0.07	173.04	-0.02
60	172.15	173.07	173.09	0.02	173.08	0.01
61	172.34	172.94	173.05	0.11	173.06	0.12
62	172.08	173.14	173.11	-0.03	173.09	-0.05
63	171.31	173.09	173.13	0.04	173.11	0.02
64	171.54	173.17	173.13	-0.04	173.12	-0.05
65	171.69	173.2	173.14	-0.06	173.13	-0.07
66	172.07	173.21	173.16	-0.05	173.14	-0.07
67	171.88	173.2	173.14	-0.06	173.12	-0.08
68	171.54	173.21	173.12	-0.09	173.10	-0.11

3.5.2.2 Flow distribution

Table 3.4 shows the modelled distribution of peak discharge between the main channel/western floodplain, the eastern floodplains, and through Nyngan (over the levee) for the April 1990 flood event and compares them to the DWR (1990) estimates. DWR (1990) derived the flow distribution using a waterway analysis (based on an extrapolation of stream gaugings) and from MIKE 11 modelling.

The total flow and flow distribution predicted by the recalibrated TUFLOW HPC+SGS model is in good agreement with the waterway analysis and MIKE 11 model estimates made by DWR (1990). It is likely that the two-dimensional nature of the TUFLOW model will provide a more accurate representation of flows than the previous waterway and MIKE 11 analysis. However, it is reassuring that each method produces similar flows.

Table 3.4 Peak Discharge Distribution, April 1990 Flood Event

Location	Discharge (m^3/s)			Difference Current study vs MIKE11
	Waterway Analysis	MIKE 11 Model	Current study	
Main Channel and western floodplain	1,176	1,276	1,297	2%
Eastern Floodplain	263	215	227	6%
Nyngan	539	589	532	-10%
Total	**1,978**	**2,080**	**2,056**	**-1%**

3.5.3 Recalibration Outcome

Based on the calibration results for the 1990 event presented in the preceding sections, the updated model is regarded as being well-calibrated.

3.6 UPDATE MODEL TOPOGRAPHY

The recalibrated TUFLOW hydraulic model was updated to include the updated levee crest elevations (refer Section 2.4 and Appendix A). There was no impact on 1 in 100 AEP flood levels (without climate change) of this update because the levee is not overtopped.

The recalibrated and updated TUFLOW hydraulic model was subsequently used for design event modelling.

3.7 MODEL BOUNDARY

Glass-walling is occurring along the model boundaries during the 1990 event simulation. When a model glass walls, the water in the model touches the edges of the model boundary without being able to escape. It can result in inaccuracies in modelled flood behaviour, particularly around the model boundaries where glass-walling is occurring. While this effect was acknowledged in the 2014 Flood Study (refer Section 6.1.4), the location of the model boundaries was constrained by the extent of the available topographic data and there was no option to extend the model boundaries outwards.

While it is beyond the scope of the current study to extend the model boundaries, the sensitivity of the 1990 event model results to the inclusion of additional model outflow boundaries was assessed and was found to be relatively localised in nature. However, Section 7 discusses the potential limitations of this on extreme events and provides a recommendation on extending the model boundaries in a future model update.

4 DESIGN EVENT MODELLING

4.1 BACKGROUND

The updated and recalibrated TUFLOW HPC+SGS model described in Section 3 was used to model flood behaviour for the 1 in 20, 1 in 100, 1 in 200 AEP and the PMF design events (without climate change). As detailed in Section 5, the 1 in 200 AEP was determined as a proxy for the 1 in 100 AEP event with climate change.

Design flood discharges at Nyngan for events up to the 1 in 200 AEP event (without climate change) were estimated by flood frequency analysis (FFA). All available flood information for the Bogan River catchment dating back to 1879 (146 years from 1879 to 2024) were included in the analysis.

The 1976 flood hydrograph shape was adopted for all design events (including the PMF) and scaled up to the peak design discharges determined by the FFA, consistent with the methodology adopted in the 2014 Flood Study. Local catchment flooding has not been considered as part of the current study.

4.2 UPDATED FLOOD FREQUENCY ANALYSIS

In the 2014 Flood Study, an annual series FFA was undertaken to estimate design inflows (1 in 20, 1 in 100 and 1 in 200 AEP (without climate change)). The FFA relied on data from a number of river gauges to create a spliced annual peak flow series from 1879 to 2013 at Nyngan. For the current study, this derived series was extended to the year 2024, and the FFA flows recalculated using methodologies consistent with recommendations of *Australian Rainfall and Runoff* (Ball et al (2019), hereafter referred to as ARR (Version 4.2)) and the *Floodplain Risk Management Guide* (NSW OEH, 2019).

The Annual Maxima Series (AMS) of peak annual gauge heights and discharges at Nyngan used to inform the FFA is provided in Appendix C. Further information on how this data was derived in provided in WRM (2014).

The FFA was undertaken using the BMT FLIKE software[3]. The advanced Bayesian methodology for estimation of distribution parameters was implemented, and data censoring was undertaken using the multiple Grubbs-Beck test for low outliers consistent with the methodology and limits adopted for the 2014 Flood Study.

The data fit was analysed for both the Generalised Extreme Value (GEV) and Log-Pearson Type III (LP III) probability models. The difference in peak discharge estimates between these models was found to be minimal, with the GEV probability model predicting the 1 in 100 AEP (without climate change) discharges to be 0.2% lower than those predicted using the LP III model, while 1 in 500 AEP (without climate change) discharges were predicted to be 4% lower.

The LP III probability model was adopted for the current study. Table 4.1 provides a comparison of the FFA discharge estimates of the original and extended data series. The additional years between 2014 to 2024, added to the data series to extend the record, recorded very few flood events of significance. This causes the frequency curve to flatten slightly, with rarer events predicted to have lower flows. This is demonstrated with the 1990 event, which is predicted to be a rarer event than previously estimated. With an estimated flow rate of approximately 2,000 m^3/s, the 1990 event is now estimated to be rarer than a 1 in 300 AEP event. The revised discharge estimates in bold in Table 4.1 have been adopted for the design event modelling in the current study.

[3] program version 5.0.306.0; file version 3.10

Figure 4.1 shows the results of the FFA and the FLIKE LP III frequency curve fitted to the available data. The estimated 1 in 100 AEP (without climate change) flood discharge at Nyngan is 796 m^3/s, and the 90% quantile probability limits range from 391 m^3/s to 2,207 m^3/s.

Table 4.1 FLIKE estimated flood discharges, comparison original and extended series

AEP [1]	2014 Flood Study (expected quantile)	Current study			Difference (expected quantile)
		expected quantile [2]	90% upper confidence	90% lower confidence	
1 in 5	37	**39**	25	66	7%
1 in 10	89	**93**	67	160	4%
1 in 20	192	**193**	136	369	0%
1 in 50	472	**448**	257	1,050	-5%
1 in 100	878	**796**	391	2,207	-9%
1 in 200 [3]	1,570	**1,360**	588	5,060	-14%
1 in 500 [4]	3,260	**2,620**	984	13,700	-19%
1 in 1000	5,490	**4,190**	1,300	27,500	-24%

[1] without climate change
[2] adopted for use in the current study
[3] adopted as proxy event for the 1 in 100 AEP with climate change – refer to Section 5
[4] adopted to provide the flood planning level (FPL) – refer to Section 6.3

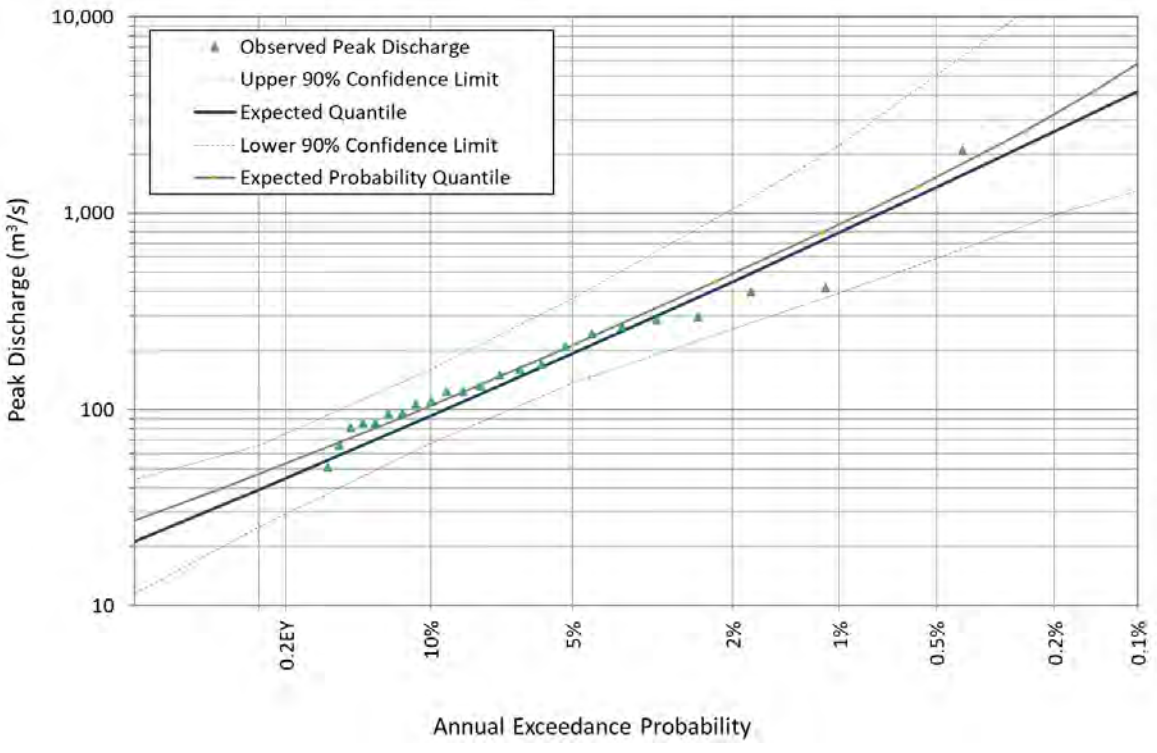


Figure 4.1 Flood Frequency Distribution (Log-Pearson III) of Peak Annual Discharges at Nyngan (extended series)

4.3 DESIGN EVENTS

The 1976 flood hydrograph shape was adopted for all design events (including the PMF) and scaled up to the peak design discharges determined by FFA (refer Table 4.1), consistent with the methodology adopted in the 2014 Flood Study. Figure 4.2 shows the discharge hydrographs adopted for the design events. Further explanation as to the appropriateness of this hydrograph shape is provided in the 2014 Flood Study (WRM, 2014).

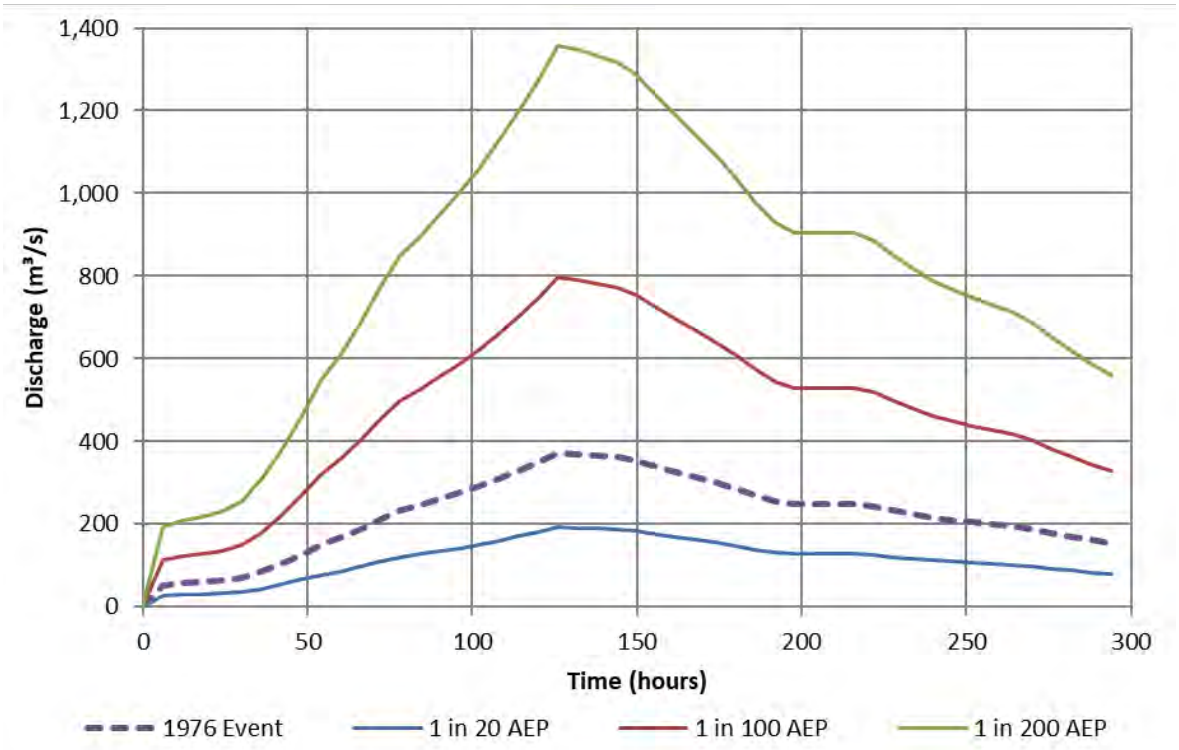


Figure 4.2 Adopted design discharge hydrographs

4.4 PROBABLE MAXIMUM FLOOD (PMF)

The probable maximum flood (PMF) is the upper limit of flooding used to inform flood risk management, particularly emergency management. In NSW, the *Floodplain Risk Management Guide* (NSW OEH, 2019) provides recommendations on three suitable techniques to estimate PMF for the purpose of flood risk management. Two of these techniques are rainfall-based estimations, which are not appropriate for the Nyngan model as it uses FFA flow estimates rather than rainfall-derived flows, noting that FFA-derived flow estimates are regarded as best practice in this location. The remaining technique is to use an equivalent extreme event for representing the PMF, such as a multiplier for the 1 in 100 AEP event flows.

The PMF at Nyngan has previously been estimated by Lyall and Macoun (DWR, 1990) as being 15,000m^3/s using a 48-hour rainfall depth of 429 mm. The 2014 Flood Study calculated a revised 48-hour PMP rainfall depth of 340 mm using the *Generalised Southeast Australia Method* (GSAM) (BOM, 2006). The PMF flow was then factored by 340/429 to yield a revised PMF flow of approximately 12,000m^3/s. As the GSAM is still best-practice and this technique is in alignment with the NSW OEH (2019) method, the PMF flow estimated in the 2014 Flood Study remains appropriate. Thus, a PMF discharge of 12,000 m^3/s was adopted for the current study.

5 CLIMATE CHANGE

5.1 BACKGROUND

The *Intergovernmental Panel on Climate Change's Sixth Assessment Report* (IPCC, 2021) presents unequivocal evidence for global warming caused by greenhouse gas emissions, with global temperatures already significantly increased above pre-industrial levels and further warming expected (refer Figure 5.1). As a result of increased global temperatures, flood risk is increased due to an intensification of rainfall events.

In the past, historical observations formed the basis for design flood estimation. Scientific evidence indicates that stationary flooding characteristics can no longer be assumed. Historic flooding does no longer form an adequate benchmark to inform future flood risk.

In August 2024, the advice in *Australian Rainfall and Runoff* (ARR, Version 4.2) on climate change considerations was revised to ARR (Version 4.2), informed by an extensive review of the current scientific literature. This revision is considered the best-practice approach for the consideration of climate change on flood estimation. Key conclusions and recommendations are summarised in the following sections. Further information on the ARR climate change guidance update is provided in Appendix F.

5.2 SHARED SOCIOECONOMIC PATHWAYS (SSP)

Figure 5.1 presents the IPCC (2021) temperature projections based on various Shared Socioeconomic Pathways (SSPs[4]), with the data period forming the baseline for the current[5] Intensity-Frequency-Duration (IFD) estimation shaded in green. Also shown is the increase in global mean temperatures (GMT) by 1.1 degrees Celsius since the baseline data was derived, as well as the continued projected temperature increase into the future, highlighting the necessity to account for these increases in the application of design rainfall estimates. Further information SSPs is provided in Appendix F.5.

5.3 RAINFALL UPLIFT FACTORS

For consistency with the IPCC projections, a scaling approach is recommended whereby design rainfalls are factored at a rate proportional to the global surface temperature increases (ARR, Version 4.2).

ARR (Version 4.2) recommend the consideration of *uplift factors* for two representative SSPs to account for the effect of the projected increase in global temperatures on rainfall intensities. As conservative estimates, SSP 3.0-7.0 and SSP 5.0-8.5 have been considered as part of the current study. The SSP 5.0-8.5 scenario would notionally represent a plausible upper bound on the projected climate impacts. Table 5.1 summarises the resulting *uplift factors* for different SSPs, assuming a mean global temperature projection and a median projected rate of change for long-duration storms.

A climate change rainfall uplift factor of 1.29 and 1.37 has been derived for SSP 3.0-7.0 and SSP 5.0-8.5, respectively, for the long-term (2081-2100) climate projection (refer Table 5.1).

[4] https://nesp2climate.com.au/wp-content/uploads/2024/01/Understanding-SSPs-1.pdf

[5] http://www.bom.gov.au/water/designRainfalls/ifd/

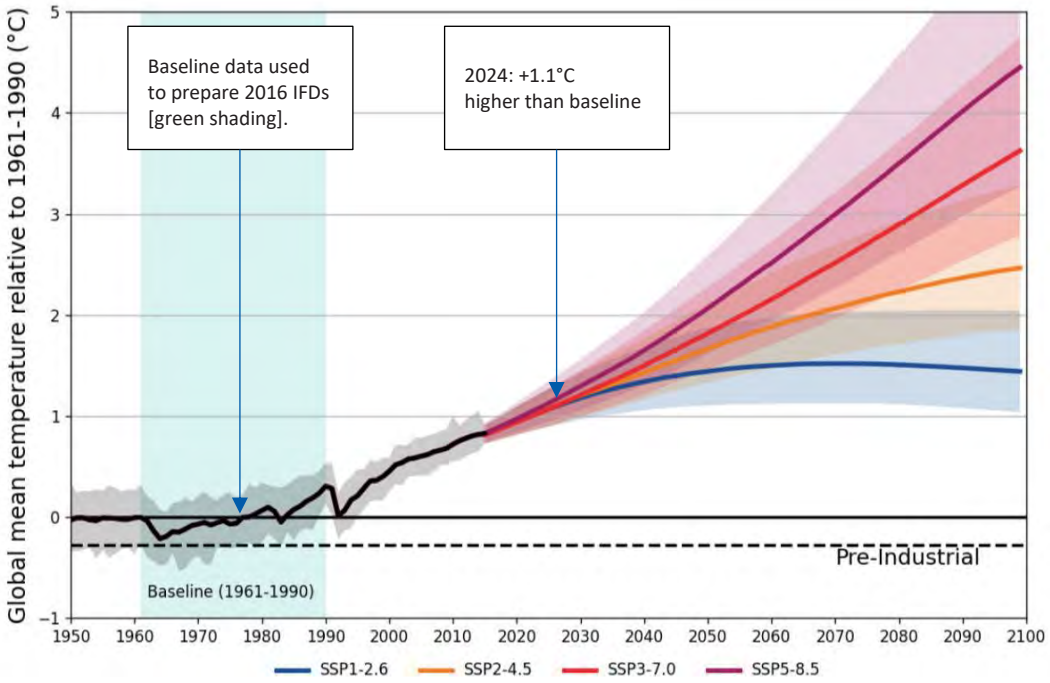


Figure 5.1 Projected temperature increases associated with AR6 socioeconomic pathways relative to 1961-1990 and their associated uncertainty (adapted) (ARR Version 4.2; IPCC, 2021)

Table 5.1 Climate change uplift factors for different SSPs

Climate scenario	SSP 1.0 – 2.6	SSP 2.0 – 4.5	SSP 3.0 – 7.0	SSP 5.0 – 8.5
Current and near-term (2021-2040)	1.10	1.10	1.10	1.11
Medium-term (2041-2060)	1.11	1.14	1.15	1.18
Long-term (2081-2100)	1.12	1.20	**1.29**	**1.37**

5.4 APPLICATION FOR NYNGAN

Whilst the *sensitivity* of modelling results to climate change has usually been included in recent past flood assessments, ARR (Version 4.2) now recommends embedding the effects of climate change within design events (rather than as a sensitivity test), particularly for event magnitudes informing planning decisions. For this current flood study concerning Nyngan, the effect of climate change on the 1 in 100 AEP is hence of particular relevance.

However, the latest guidance on incorporating climate change into flood estimation (ARR, Version 4.2) indicates that there is no clear consensus on how predicted increases in rainfall depths due to climate change should be reflected in direct flood-based procedures (e.g. FFA) for estimating design flows. This is because rainfall depth is only one of the causal drivers of floods, with the other primary drivers being antecedent catchment conditions (rainfall losses), rainfall temporal patterns, and sea level rise. While sea level rise is not relevant in Nyngan, the changes to rainfall losses and temporal patterns are.

NSW OEH (2019) propose that for direct flood-based procedures such as FFA, an event rarer than the design event of interest may be a suitable proxy for the design event with climate change. For

Nyngan, the 1 in 200 and 1 in 500 AEP events (without climate change) were considered as potential proxies for the 1 in 100 AEP with climate change. The FFA peak discharge estimates (refer Section 4.2) suggest a 1 in 200 AEP event to be 1.7-times the magnitude of a 1 in 100 AEP event, while a 1 in 500 AEP event would be 3.3-times the magnitude of a 1 in 100 AEP event. It is acknowledged that a direct application of the rainfall uplift factors to flows is not suitable. However, comparison of the 1 in 500 / 1 in 100 AEP flow ratio of 3.3 to the rainfall uplift factors 1.29 to 1.37 for the long-term climate scenario (Table 5.1) indicates the 1 in 500 AEP event may significantly overestimate the peak 1 in 100 AEP with climate change flows. The 1 in 200 AEP / 1 in 100 AEP flow ratio of 1.7 provides a more reasonable alignment with the rainfall uplift factors. Given the 1 in 200 AEP is the next rarest AEP event considered after the 1 in 100 AEP, it is recommended that this event be used as a proxy for the 1 in 100 AEP event with climate change for the long-term, conservative climate scenario (years 2081-2100 and SSP 5.0-8.5).

6 RESULTS

6.1 DESIGN EVENT MAPPING

Design event mapping is provided in Appendix G for the:

- 1 in 20 AEP and 1 in 100 AEP without climate change,
- 1 in 100 AEP with climate change (using 1 in 200 AEP as the proxy); and
- PMF without climate change.

The following mapped results are provided:

- Appendix G.1 – peak flood depth and extents;
- Appendix G.2 – peak flood velocities with flow vectors; and
- Appendix G.3 – flood hazard classification (AIDR, 2017).

6.1.1 1 in 20 AEP (without climate change) flood

The following is of note with regard to the 1 in 20 AEP without climate change flood event:

- Upstream of the Mitchell Highway, Bogan River floodwaters back up along a western flood runner to inundate Temples Lane to a depth of up to 0.5 m.
- Downstream of the Mitchell Highway, floodwaters are generally confined between West Bogan Road and the existing town levee. Backwater flooding occurs across West Bogan Road to a depth exceeding 1 m.
- The study area to the east of Nyngan is not inundated by the 1 in 20 AEP Bogan River flood.
- Peak flood velocities are generally approximately 0.8 m/s within the Bogan River channel and approximately 0.2 m/s in the overbank areas.

6.1.2 1 in 100 AEP (without climate change) flood

The following is of note with regard to the 1 in 100 AEP without climate change flood event:

- The 1 in 100 AEP event without climate change is no longer regarded as realistically representing an event with a 1 in 100 probability of exceedance due to the impacts of climate change. This event should be regarded as being superseded by the 1 in 100 AEP with climate change (estimated in the current study using the 1 in 200 AEP event as a proxy).
- Upstream of the Mitchell Highway, peak flood levels along the Bogan River are approximately 0.4 m lower than the 1990 peak flood levels.
- Downstream of the Mitchell Highway, peak flood levels along the Bogan River are approximately 0.2 m lower than the 1990 peak flood levels.
- Floodwaters directly to the west of the Nyngan levee:
  - range up to 4 m deep in places;
  - are generally about 0.7 m deep on average; and
  - vary from 0.2 m to a peak depth of 0.4 m along the Barrier Highway.
- Floodwaters directly to the east of the Nyngan levee:
  - are generally about 0.6 m deep on average;
  - overtop Old Warren Road by approximately 0.2 m; and

- overtop the Mitchell Highway by approximately 0.2m.

6.1.3 1 in 100 AEP with climate change flood

The following is of note with regard to the 1 in 100 AEP flood with climate change event:

- The 1 in 200 AEP event without climate change is used as a proxy for the 1 in 100 AEP event with climate change.
- The levee is not overtopped, and the levee freeboard ranges between approximately 1.1 m to 1.8 m.
- Peak flood levels are generally 0.1 m lower to the west of the levee and 0.2 m lower to the east of the levee than the 1990 peak flood levels.
- The Barrier Highway is overtopped by up to 0.5 m.
- The Mitchell Highway is overtopped by up to 0.6 m to the west of the levee and by up to 0.4 m to the east.
- Peak flood velocities in the overbank areas are generally below 0.4 m/s to the west of the levee and below 0.2 m/s to the east of the levee.
- Peak flood velocities of up to 0.6 m/s are predicted along the Barrier Highway, and up to 0.8 m/s along Old Warren Road.
- Peak flood velocities within the Bogan River channel are approximately 1 m/s, with local peaks at the Mitchell Highway of up to 1.8 m/s.

6.1.4 1 in 500 AEP (without climate change) flood

The following is of note with regard to the 1 in 500 AEP without climate change flood event (figures not reproduced as part of the current study):

- This event was initially simulated as a potential proxy for the 1 in 100 AEP with climate change. However, upon finalisation of the climate change guidance, it was found to be too large and the 1 in 200 AEP was adopted as the proxy instead (refer Section 5.4).
- Peak flood levels are generally 0.3 m higher on the southern side of the levee than the 1990 peak flood levels, indicating the 1990 event magnitude to be between a 1 in 200 and 1 in 500 AEP.
- The town levee is not overtopped in the event and a freeboard of approximately 0.8 m is maintained on the southern (upstream) side of the levee.

6.1.5 Probable Maximum Flood (PMF) (without climate change)

The following is of note with regard to the PMF event (without climate change):

- The 2014 Flood Study acknowledged that glass-walling occurs along the model code boundary for the PMF event. LiDAR availability at the time of model development in 2014 limited the extent of the hydraulic TUFLOW model.
- Given the PMF flood extent would extend beyond that of the hydraulic TUFLOW model extent, the predicted peak levels should be treated with caution. It is likely that the model may overestimate peak flood levels within the study area for this extreme event. A high-level review of storage areas outside the model boundary indicates that these areas are relatively minor compared to the floodplain within the model boundary. Therefore, it is possible that the impact on peak flood levels within the model boundary may be minor. A discussion on limitations and recommendations is provided in Section 7.

- Floodwaters overtop the southern (upstream) side of the town levee by up to 0.5 m. The entire township of Nyngan is inundated to peak flood depths of approximately 1 m higher than the 1990 flood event. It has been assumed that the levee does not fail (erode) for this event.
- Peak flood velocities are generally approximately 0.9 m/s to the west of the levee and approximately 0.8 m/s to the east of the levee.

6.2 FLOOD HAZARD

The Department of Planning & Environment's (DPE) *"Flood hazard, flood risk management guideline FB03"* (DPE, 2023a) builds on the advice provided in the *"Flood risk management manual: the policy and manual for the management of flood liable land"* (the Manual; DPE 2023b) and draws on the *"Australian disaster resilience guideline 7-3: Flood hazard"* (AIDR 2017a) that supports the *"Australian disaster resilience handbook 7: Managing the floodplain"* (AIDR, 2017b).

This advice is considered best-practice. Flood hazard mapping in accordance with the flood hazard vulnerability curves provided in AIDR (2017b) is provided in Appendix G.3.

6.3 FLOOD PLANNING AREA

The flood planning area (FPA) is land that is at or below the flood planning level (FPL). The FPL is defined as the level of the defined flood event (DFE) plus freeboard (FPL = DFE level + freeboard). Details are discussed in the following sections.

6.3.1 Defined flood event (DFE)

As discussed in Section 5.4, the latest climate change guidance released in August 2024 (ARR, Version 4.2) recommends that climate change be included in the DFE by default (rather than assessed as a sensitivity). Therefore, it is recommended that the DFE is the 1 in 100 AEP with climate change (using the 1 in 200 AEP as proxy), which aligns with guidance in ARR (Version 4.2), DPE (2023a) and AIDR (2017b).

6.3.2 Freeboard

Freeboard is a factor of safety used to account for uncertainty in the estimation of peak flood flows and levels, climate change, cumulative infill impacts, localised water level differences (e.g. surcharging) and wave/boat action. DPE (2023b) recommends that the freeboard should be assessed and chosen as appropriate to the location (noting it is "typically 0.5 m").

The challenge of using a fixed freeboard is that it does not always accurately represent the risk of increasing flows on flood levels. For example, in some locations flood levels are more sensitive to increasing flows (that is, a small increase in flow can produce a large increase in flood level). In addition, increasing flows may cause a new flowpath to develop or flow proportions between flowpaths to change. This is the case in Nyngan where the 2014 Flood Study found that the eastern floodplain is more sensitive to changes in flow than the western floodplain. These location-based risks are not always captured with the use of a fixed freeboard approach. Hence, a risk-based approach to freeboard is recommended whereby an event with flows larger than the DFE is used to define the FPL and FPA. For Nyngan, it is recommended that the 1 in 500 AEP event (without climate change) is used for this purpose. This captures location-based risks due to increasing flows.

Figure 6.1 maps the proposed risk-based freeboard, being the difference between the proposed FPL (1 in 500 AEP without climate change) and the DFE level (1 in 100 AEP with climate change). The magnitude of the freeboard varies across the model area from 0.1 m to 0.5 m, with the majority of the FPA having a freeboard of 0.4-0.5 m. This is slightly lower than the typical fixed freeboard of 0.5 m. However, it is proposed that uncertainty due to climate change is already incorporated in the conservative nature of the 1 in 100 AEP with climate change event (refer to Section 5) and the

freeboard built in with the use of the 1 in 500 AEP event (without climate change) as the FPL is appropriate.

This approach to freeboard and defining the FPA and FPL aligns with the current best practice outlined in DPE (2023a) and AIDR (2017b).

6.3.3 Flood planning area

The 1 in 500 AEP event (without climate change) has been used to define the FPA and the FPL, as mapped in Figure 6.2. Note that the FPA covers the majority of model code extent, with the exception of the western floodplain in the vicinity of the Nyngan Cobar Railway and a portion of the eastern floodplain north of Old Warren Road. Minor glass-walling is predicted along the model code boundary upstream of the Mitchell Highway to the east. While this effect may limit the true extent of flooding, it is not expected to be significant (refer Section 6.1) but it is important to be aware that the FPA will extend beyond the model boundaries in some locations.

6.3.4 Summary

In summary it is recommended that:

- The DFE is the 1 in 100 AEP with climate change (using the 1 in 200 AEP event as the proxy);
- A risk-based approach to freeboard is adopted;
- The FPA and FPL are provided by the 1 in 500 AEP event (without climate change); and
- Consideration be given to the fact that the FPA is constrained by the model boundary in some locations.

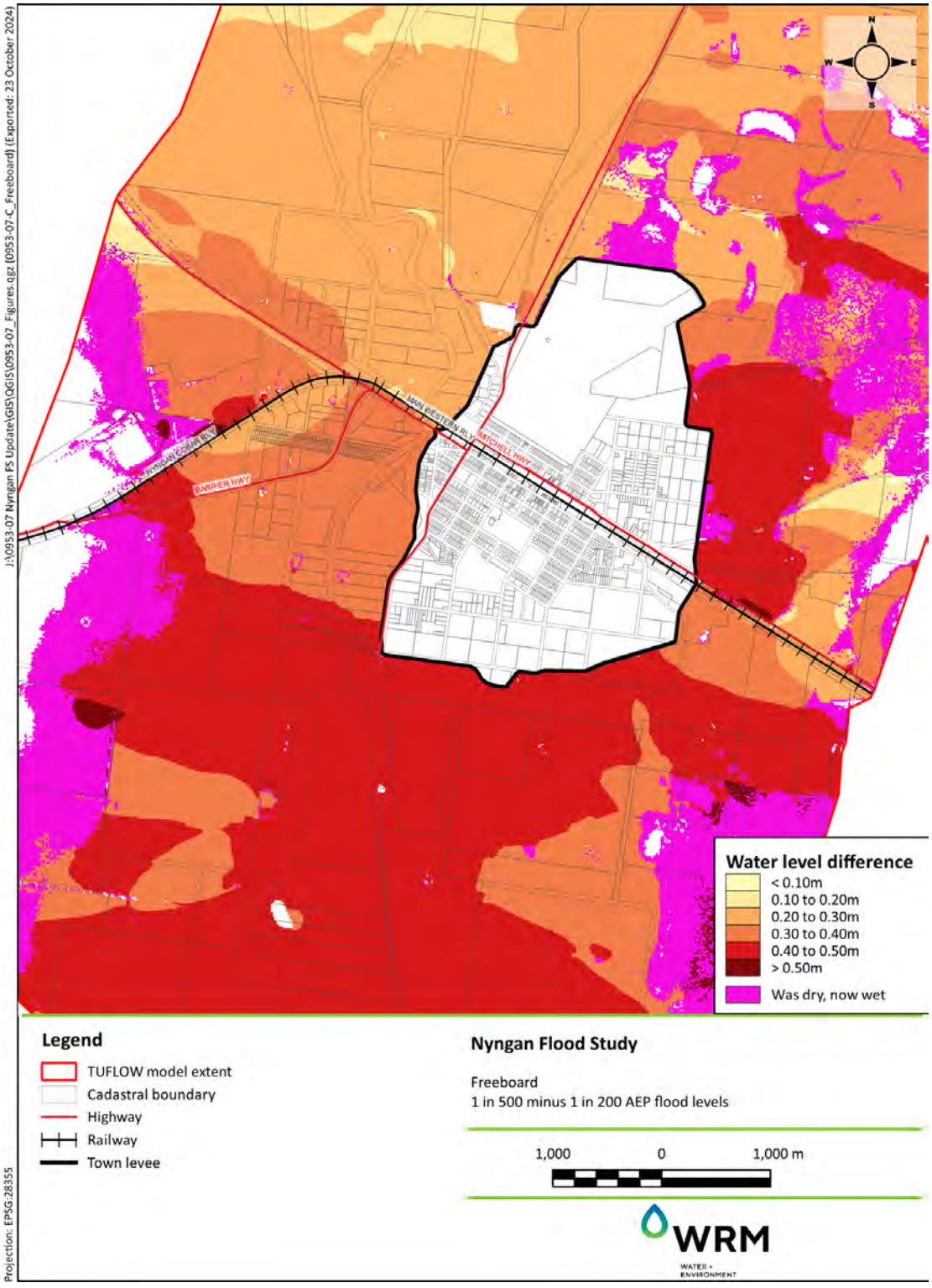


Figure 6.1 Risk-based freeboard (difference between the FPL and the DFE level)

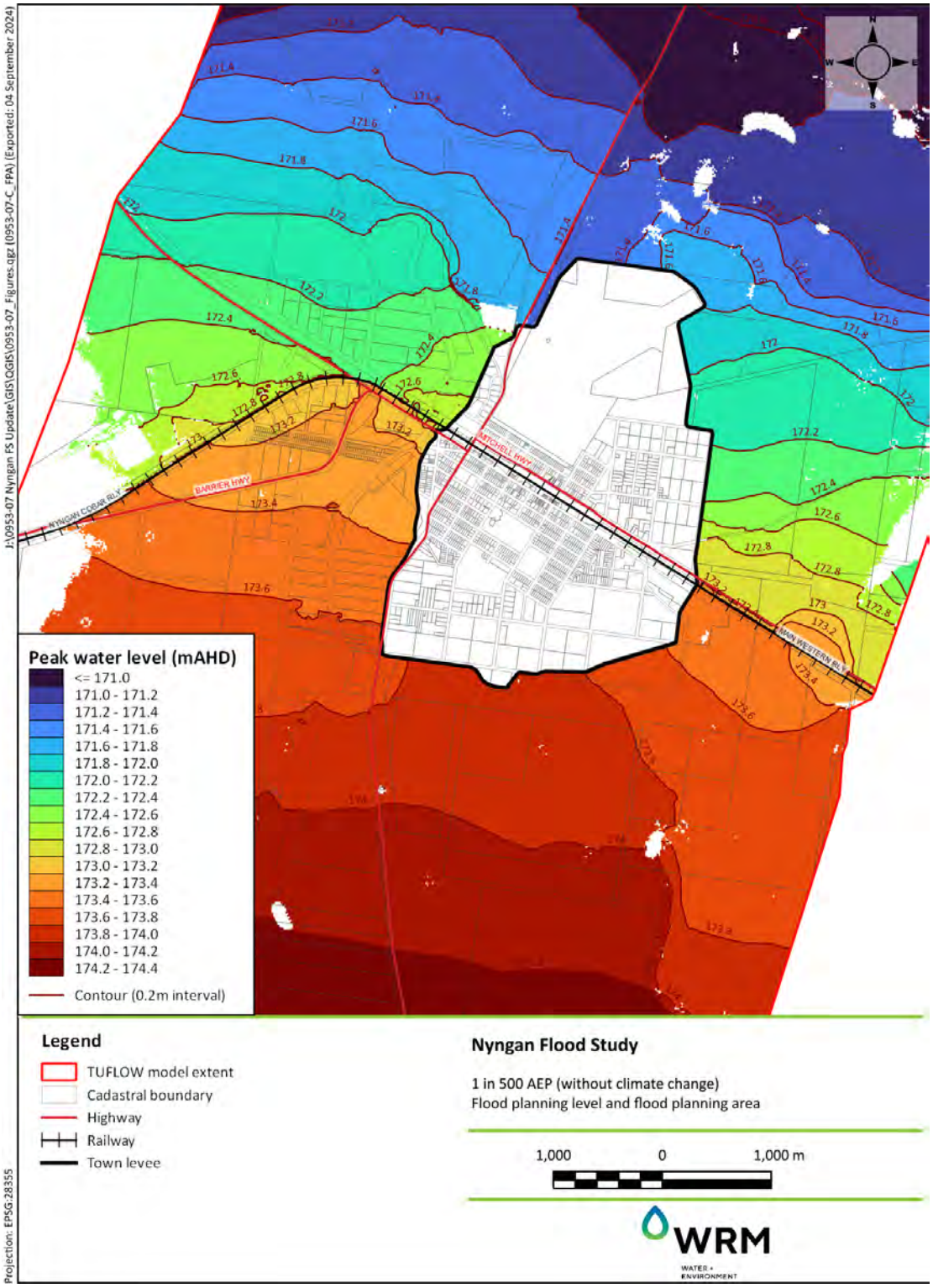


Figure 6.2 Flood planning level (FPL) and flood planning area (FPA)

6.4 FLOOD FUNCTION

The Manual (DPE, 2023b) defines the flood function categories as outlined in Table 6.1. The flood function was determined in accordance with the indicator technique outlined in the FB02 Flood Function Guideline (DPE, 2023c) with manual assessment and editing. This technique is considered appropriate for rural floodplains that have not been identified or zoned for future urban growth.

The depth-velocity-product and depth thresholds adopted for the mapping per the indicator technique are outlined in Table 6.2. These thresholds define the preliminary flood function category extents, which were then manually refined to ensure that the flood function areas are connected, continuous and hydraulically logical as (DPE, 2023b).

Flood function mapping was undertaken for the 1 in 100 AEP (without climate change), 1 in 100 AEP (with climate change, using the 1 in 200 AEP as proxy), and the PMF (without climate change) and is provided in Figure 6.3, Figure 6.4, and Figure 6.5, respectively.

Table 6.1 Flood function definitions (DPE Manual, 2023)

Flood function category	Description
Floodway	Areas of the floodplain which generally convey a significant discharge of water during floods and are sensitive to changes that impact flow conveyance. They often align with naturally defined channels or form elsewhere in the floodplain
Flood storage	Areas of the floodplain that are outside floodways which generally provide for temporary storage of floodwaters during the passage of a flood and where flood behaviour is sensitive to changes that impact on temporary storage of water during a flood
Flood fringe	That part of the flood extents for the event remaining after the flood function areas of floodway and flood storage areas have been defined

Table 6.2 Adopted flood function depth-velocity and depth thresholds

Flood function category	Floodplain area	1 in 100 and 1 in 200 AEP	PMF
Floodway	Western floodplain	d x v [1] > 0.3 m^2/s	d x v > 1 m^2/s
	Eastern floodplain	d x v > 0.2 m^2/s	
Flood storage	Western floodplain	d x v < 0.3 m^2/s d > 0.5 m	d x v < 1 m^2/s d > 0.5 m
	Eastern floodplain	d x v < 0.2 m^2/s d > 0.5 m	
Flood fringe		Areas outside the floodway and flood storage	

[1] d x v = depth-velocity-product

6.5 COMPARISON TO 2014 FLOOD STUDY RESULTS

The peak flood levels predicted by the revised and recalibrated model including the revision of FFA estimates and addition of climate change were compared to the results presented in the 2014 Flood Study for the 1 in 100 AEP design event[6], as shown in Figure 6.6.

As a result of all updates, the peak flood levels in the DFE[6] throughout the model domain are predicted to increase by approximately 0.1 m to 0.2 m, with localised increases of up to 0.3 m. Increases in peak flood levels are more pronounced upstream of the Mitchell Highway (0.20 to 0.25 m on average), while increases across the downstream floodplain are generally below 0.15 m.

6.6 LEVEE FREEBOARD

Following the 1990 flood event, the Nyngan levee was reconstructed to a height of 1 m above the 1990 peak flood levels. The 1 in 100 AEP with climate change event (the DFE) is predicted to result in peak flood levels that are lower than the 1990 event. Model results shows that a freeboard of 1.1 m to 1.8 m is maintained above the DFE (refer Section 6.1.3).

[6] Comparing 1 in 100 AEP (without climate change) from the 2014 Flood Study with the 1 in 100 AEP with climate change from the current study.

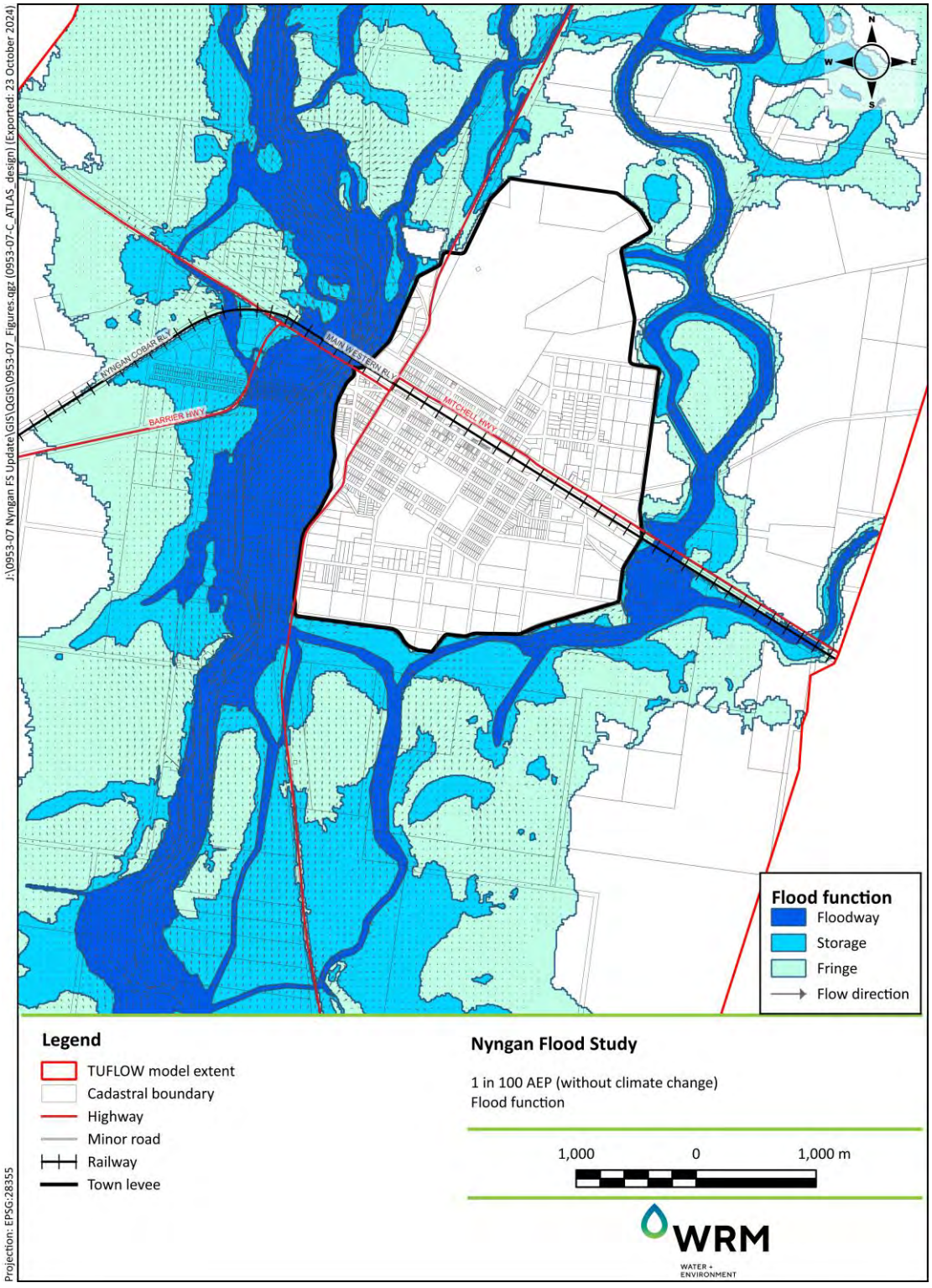


Figure 6.3 Flood function, 1 in 100 AEP event (without climate change)

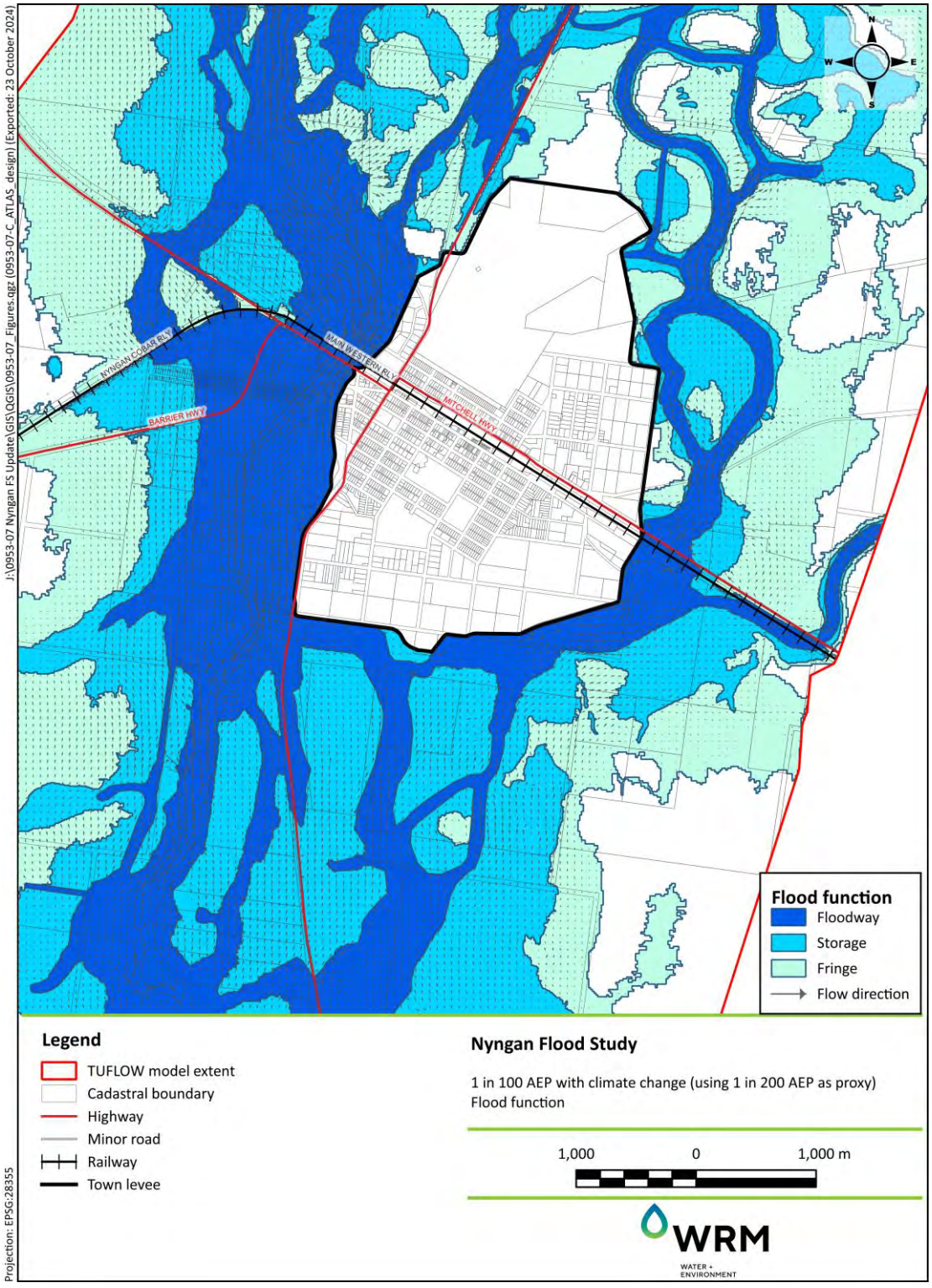


Figure 6.4 Flood function, 1 in 100 AEP with climate change (using 1 in 200 AEP as proxy)

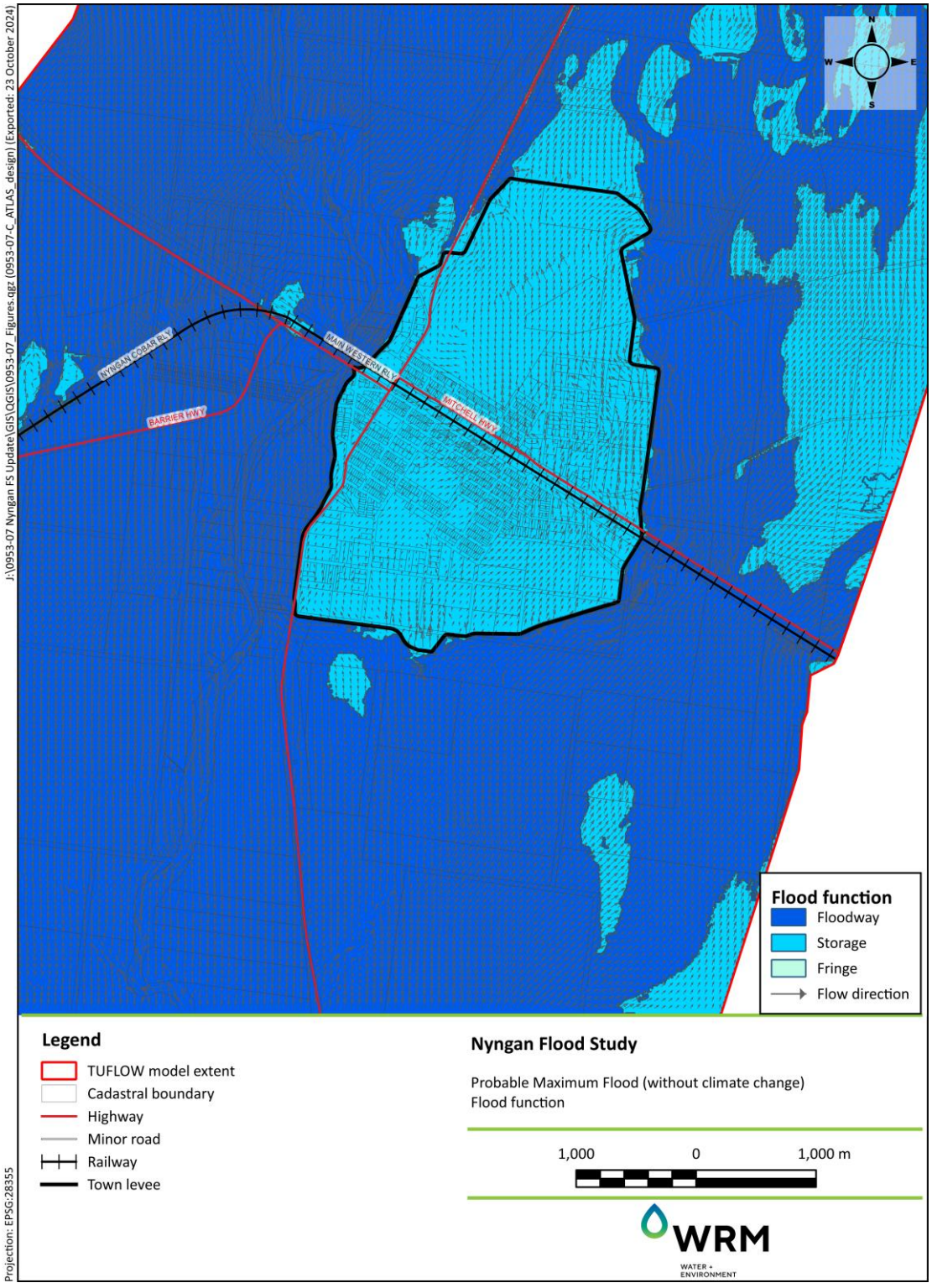


Figure 6.5 Flood function, PMF event (without climate change)

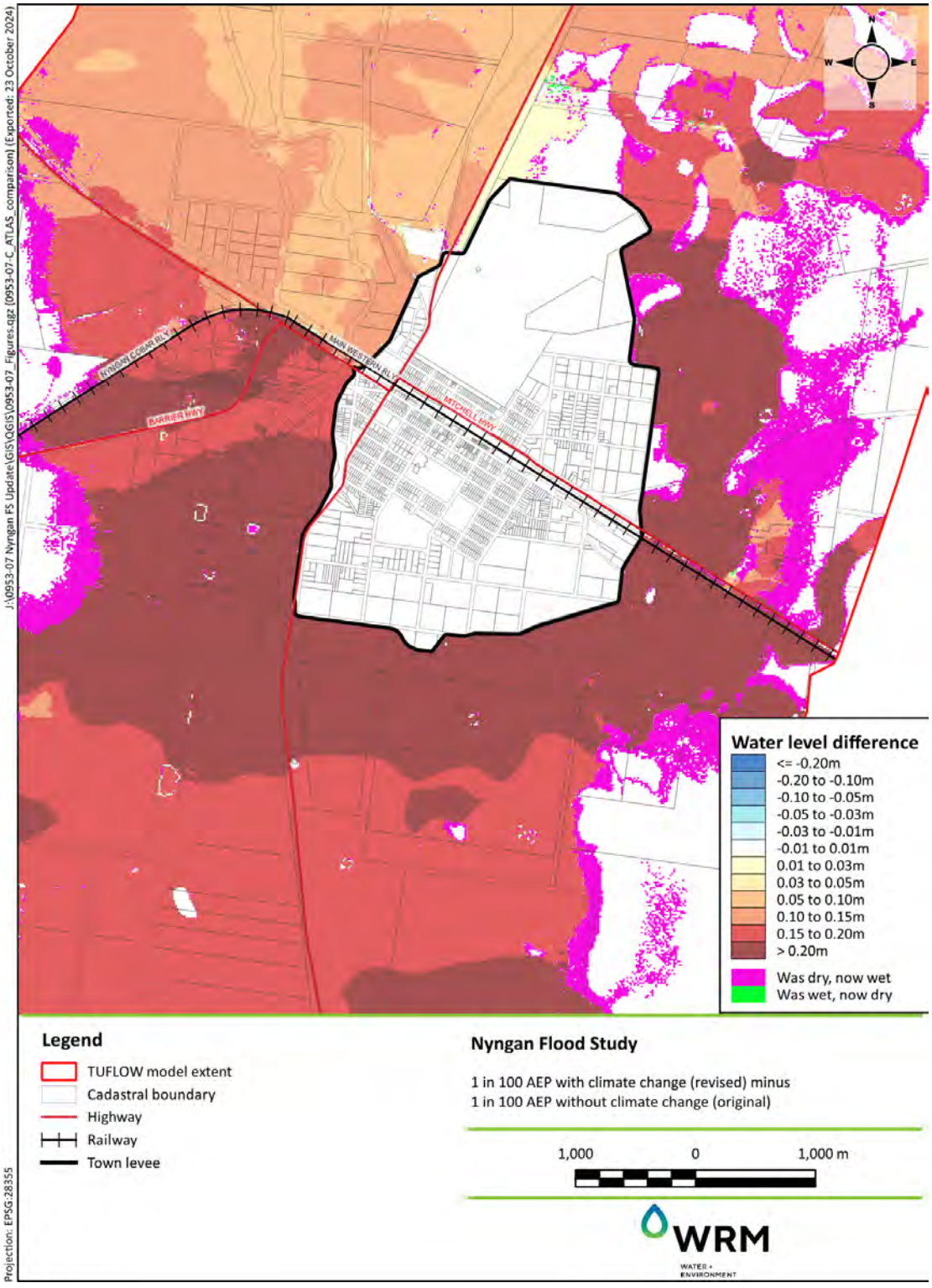


Figure 6.6 Peak water level difference - updated 1 in 100 AEP with climate change event minus original 1 in 100 AEP event without climate change (2014 Flood Study)

7 LIMITATIONS AND RECOMMENDATIONS

The following limitations and recommendations are relevant to the assessment and results presented in this report:

- The study has heavily relied upon investigations undertaken by the *Department of Water Resources* (DWR, 1990) following the April 1990 flood, especially with regard to flood marks. It has also relied on the data provided to WRM as part of the 2014 Flood Study, especially with regard to hydraulic structures and the definition of channel bathymetry. These datasets were assumed to be accurate and suitable for use in the current study.
- Due to limited LiDAR availability at the time, the TUFLOW hydraulic model boundaries in the 2014 Flood Study could not be extended to the full flood inundation extent. The effect of this in the model is referred to as "glass-walling", whereby the modelled water touches the model boundary. Review of additional topographic data and sensitivity testing of the model outflow boundary configuration suggests potential glass-walling impacts to be limited to extreme events (1 in 500 AEP and the PMF). Extreme event modelling results should be regarded as indicative, particularly the PMF which is glass-walling at some boundaries to depths > 1 m. Future work may consider the expansion of the model boundary with additional topography data to facilitate an improved understanding of the extreme flood extents and the complete extent of the flood planning area.
- No clear guidance is available for the application of the climate change rainfall uplift factors recommended in the update of the ARR guidelines (Version 4.2) to direct flood-based procedures such as flood frequency analysis. Climate change considerations in the current report align with the advice given in ARR (Version 4.2) and NSW OEH (2019) in the use of the 1 in 200 AEP (without climate change) as proxy for the 1 in 100 AEP with climate change event, which is recommended as the defined flood event (DFE). If other events are to be used for planning purposes, it is recommended that climate change is incorporated. According to the latest guidance, uplift is required for all events to adequately consider current climate conditions, not just future climate. That is, climate change has already occurred since the calculation of baseline IFDs.
- Flood function mapping is fit for purpose. If areas outside the levee are to be developed/filled, it is recommended that flood function is not relied upon solely to determine suitability for development, but that suitability is confirmed with a flood impact assessment.
- While all due effort has been made to ensure the reliability of flood model results, all models have limitations. The accuracy of any model is a function of the quality of the data used in the model development including topographical data, drainage structure data, and calibration data. Modelling is, by nature, a simplification of very complex systems, and results of flood model simulations should be considered as a best estimate only. There is, therefore, an unknown level of uncertainty associated with all model results that should be considered when utilising the outputs from the current study.

8 SUMMARY AND CONCLUSIONS

8.1 MODEL REVISION AND RECALIBRATION

Blue Sky has engaged WRM to update the *Flood Study of the Bogan River at Nyngan* originally prepared on behalf of Council in 2014, to assist with the development of the *Bogan Shire Council Housing Strategy* for which flood risk is a factor of consideration.

The TUFLOW hydraulic model developed for the 2014 Flood Study was revised as follows:

- Updated TUFLOW model solver version and related improvements to the underlying solution schemes;
- Updated TUFLOW model functionalities (HPC and SGS) and solver versions leading to improved representation of the model topography and flow behaviour;
- Recalibration of the updated TUFLOW model to the 1990 event to ensure adequate reproduction of the historic flood behaviour;
- Extended data series for flood frequency analysis (FFA) and revision of design discharge estimates;
- Inclusion of survey data of the town levee; and
- Climate change considerations and inclusion of the climate change in the 1 in 100 AEP event.

Recalibration achieved an improved fit to the surveyed peak flood levels across the floodplain compared to the 2014 Flood Study. The flow distribution across the floodplain is in good agreement with DWR (1990).

The annual maxima series used for the FFA was extended by an additional 10 years of data. The design discharge estimates at Nyngan have been updated based on the revised FFA using the methodology recommended in the latest *Australian Rainfall and Runoff* guidance (ARR, Version 4.2). The 1 in 100 AEP (without climate change) discharge at Nyngan was estimated to be 796 m^3/s, which is 9% less than the estimate made in the 2014 Flood Study, and less than half of the previous estimate made by DWR (1990). However, the inclusion of climate change within the 1 in 100 AEP in the current study brings the 1 in 100 AEP with climate change discharge to 1,360 m^3/s, which is over 50% higher than the discharge reported for the 1 in 100 AEP (without climate change) in the 2014 Flood Study.

8.2 FINDINGS

Hydraulic modelling of the study area has been undertaken to derive design flood levels, depths and extents as well as peak flood velocities and flood hazards for the 1 in 20, 1 in 100 and 1 in 200 AEP flood events (without climate change) and the probable maximum flood. The 1 in 200 AEP was determined as a suitable proxy event for the 1 in 100 AEP with climate change (long-term projection 2081-2100, SSP 5.0-8.5).

The 1990 historic event is greater than the 1 in 100 AEP with climate change but smaller than the 1 in 500 AEP event (without climate change). It is estimated to be rarer than the 1 in 300 AEP flood event.

The modelling found that for a 1 in 100 AEP with climate change event, the Nyngan levee is almost completely surrounded by floodwater but not overtopped. Both the Barrier Highway and the Mitchell Highway are predicted to be overtopped to a significant depth and the town of Nyngan is completely isolated.

The 1 in 100 AEP with climate change event is recommended as the defined flood event (DFE). The 1 in 500 AEP event (without climate change) is recommended as defining the flood planning area (FPA) and the flood planning level (FPL). The levee has a freeboard of greater than 1 m above the 1 in 100 AEP with climate change event.

9 REFERENCES

AIDR, 2017a	*Australian Disaster Resilience Handbook Collection, Flood Hazard, Guideline 7-3*, Commonwealth of Australia, second edition, 2017.
AIDR, 2017b	*Australian Disaster Resilience Handbook Collection, Managing the Floodplain: A Guide to Best Practice in Flood Risk Management in Australia, Handbook 7*, Commonwealth of Australia, third edition, 2017.
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DPE, 2023b	*Flood risk management manual: the policy and manual for the management of flood liable land,* NSW Department of Planning & Environment, 2023.
DPE, 2023c	*Flood Function, Flood Risk Management Guideline FB02*, NSW Department of Planning & Environment, 2023.
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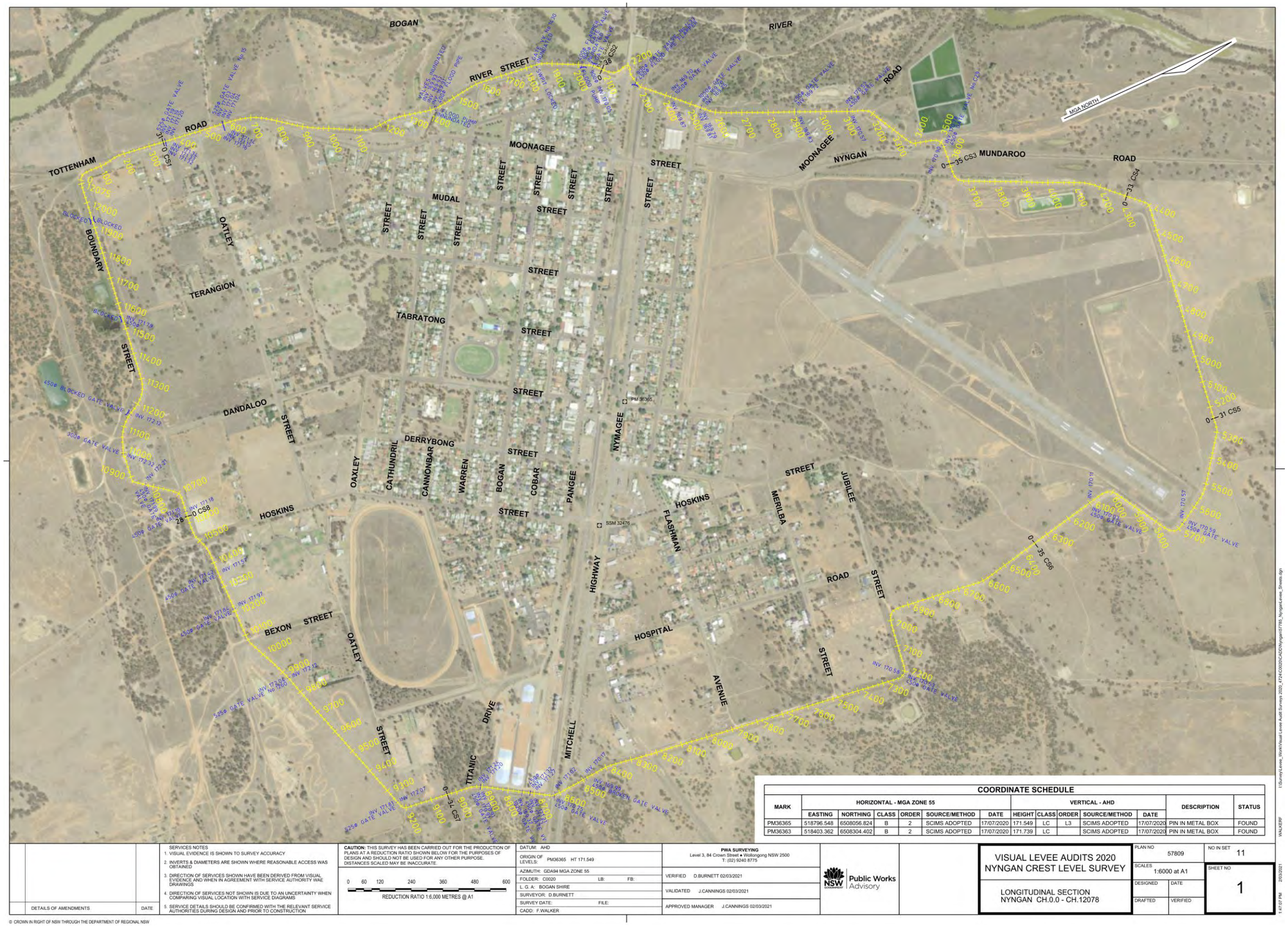
WRM, 2017	*Nyngan Floodplain Risk Management Study, Bogan River*, by WRM on behalf of Bogan Shire Council, WRM Report Reference 0953-02-J DRAFT, dated 1 September 2017.

APPENDIX A 2020 LEVEE SURVEY



COORDINATE SCHEDULE

MARK	HORIZONTAL - MGA ZONE 55						VERTICAL - AHD					DESCRIPTION	STATUS
	EASTING	NORTHING	CLASS	ORDER	SOURCE/METHOD	DATE	HEIGHT	CLASS	ORDER	SOURCE/METHOD	DATE		
PM36365	518796.548	6508056.824	B	2	SCIMS ADOPTED	17/07/2020	171.549	LC	L3	SCIMS ADOPTED	17/07/2020	PIN IN METAL BOX	FOUND
PM36363	518403.362	6508304.402	B	2	SCIMS ADOPTED	17/07/2020	171.739	LC		SCIMS ADOPTED	17/07/2020	PIN IN METAL BOX	FOUND

SERVICES NOTES
1. VISUAL EVIDENCE IS SHOWN TO SURVEY ACCURACY
2. INVERTS & DIAMETERS ARE SHOWN WHERE REASONABLE ACCESS WAS OBTAINED
3. DIRECTION OF SERVICES SHOWN HAVE BEEN DERIVED FROM VISUAL EVIDENCE AND WHEN IN AGREEMENT WITH SERVICE AUTHORITY WAE DRAWINGS
4. DIRECTION OF SERVICES NOT SHOWN IS DUE TO AN UNCERTAINTY WHEN COMPARING VISUAL LOCATION WITH SERVICE DIAGRAMS
5. SERVICE DETAILS SHOULD BE CONFIRMED WITH THE RELEVANT SERVICE AUTHORITIES DURING DESIGN AND PRIOR TO CONSTRUCTION

DETAILS OF AMENDMENTS | DATE

CAUTION: THIS SURVEY HAS BEEN CARRIED OUT FOR THE PRODUCTION OF PLANS AT A REDUCTION RATIO SHOWN BELOW FOR THE PURPOSES OF DESIGN AND SHOULD NOT BE USED FOR ANY OTHER PURPOSE. DISTANCES SCALED MAY BE INACCURATE.

0 60 120 240 360 480 600
REDUCTION RATIO 1:6,000 METRES @ A1

DATUM: AHD
ORIGIN OF LEVELS: PM36365 HT 171.549
AZIMUTH: GDA94 MGA ZONE 55
FOLDER: C0020 LB: FB:
L. G. A: BOGAN SHIRE
SURVEYOR: D.BURNETT
SURVEY DATE: FILE:
CADD: F.WALKER

PWA SURVEYING
Level 3, 84 Crown Street ♦ Wollongong NSW 2500
T: (02) 9240 8775

VERIFIED D.BURNETT 02/03/2021
VALIDATED J.CANNINGS 02/03/2021
APPROVED MANAGER J.CANNINGS 02/03/2021

NSW Public Works Advisory

VISUAL LEVEE AUDITS 2020
NYNGAN CREST LEVEL SURVEY

LONGITUDINAL SECTION
NYNGAN CH.0.0 - CH.12078

PLAN NO. 57809
SCALES 1:6000 at A1
DESIGNED DATE
DRAFTED VERIFIED
NO IN SET 11
SHEET NO 1

Figure A.1 Visual levee audits 2020, Nyngan crest level survey

APPENDIX B INVESTIGATION OF ALTERNATE TOPOGRAPHIC DATA

The following list summarises all available LiDAR topographic datasets available for Nyngan and immediate surrounds:

- May 2011 Original - The Original LiDAR data used to inform the topography in the 2014 Flood Study model captured in May 2011 at a 2 m resolution with a horizontal/vertical accuracy of 1.8 m / 0.6 m (referred to in this Appendix as the Original LiDAR).
- May 2011 - A 1 m resolution dataset captured in in May 2011 with a horizontal/vertical accuracy of 0.8 m / 0.3 m. This dataset does not cover the eastern or western floodplain (refer purple outline in Figure B.1).
- Nov 2012 - A 5 m resolution dataset captured in November 2012 with a horizontal/vertical accuracy of 2.6 m / 1 m.
- May 2014 - A 1 m resolution dataset was captured between November 2013 and May 2014 with a horizontal/vertical accuracy of 0.8 m / 0.3 m. This dataset covers most of the model domain with the exception of the western floodplain (refer blue outline in Figure B.1).

The following is of note with regard to the available topographic data:

- Differences between the Original LiDAR and the 1 m resolution dataset flown in 2011 are negligible (statistical mean difference < 0.001m). It is very likely that these are based on the same raw data but extracted at different resolutions.
- Differences between the Original LiDAR and the 5 m resolution dataset flown in 2012 are substantial. The 2012 LiDAR is approximately 0.3 m higher on average. The Original LiDAR is likely to be more accurate due to the higher resolution and accuracy.
- Figure B.1 shows the differences between the Original LiDAR and the 1 m resolution dataset flown in 2014. The red colour scale indicates that the Original LiDAR is lower than the 2014 LiDAR (upstream model area) while a blue colour scale indicates the opposite (downstream model area). The 2014 LiDAR is approximately 0.1 m higher on average, but this is not evenly spread (i.e. bias is evident) suggesting a datum issue with one of the datasets. It is not known which dataset is more accurate.
- The May 2014 LiDAR data appears to be hydrologically enforced or have been captured when water levels in the river were significantly lower than in the May 2011 Original LiDAR as the channel is deeper and flatter. The May 2011 data was manually hydrologically enforced within the TUFLOW model as part of the 2014 Flood Study using available (but sparse) survey data.

B.1 RECOMMENDATION FOR TOPOGRAPHIC DATA

Based on the above investigations, updating the model topography with May 2014 LiDAR data was not recommended as part of the current study for the following reasons:

- It is understood that there have been negligible changes to the Nyngan floodplain between May 2011 (Original LiDAR) and May 2014 (most recent LiDAR) with the exception of the water storages next to Tottenham Road.
- Differences between the Original LiDAR and the most recent May 2014 LiDAR are biased (that is, not evenly spread). It is not known which LiDAR dataset is more accurate.
- The May 2014 LiDAR does not cover the full study area. Patching of the Original LiDAR and May 2014 LiDAR would hence be required, particularly in areas where either dataset has been hydrologically enforced.

- The changes to the river channel conveyance due to the different methods of hydrologic enforcement between the 2014 Flood Study and the May 2014 LiDAR may impact the model calibration, particularly for the smaller January 1976 event. While a recalibration to the 1990 event was undertaken as part of the current study, if the May 2014 LiDAR was incorporated in the model, a recalibration to the 1976 event would be recommended.

Blue Sky Planning and Council agreed that the more recent May 2014 LiDAR should not be used to update the model topography. Hence, the only updates to model topography between the 2014 Flood Study and the current study were informed by the new levee survey only (see Section 2.4).

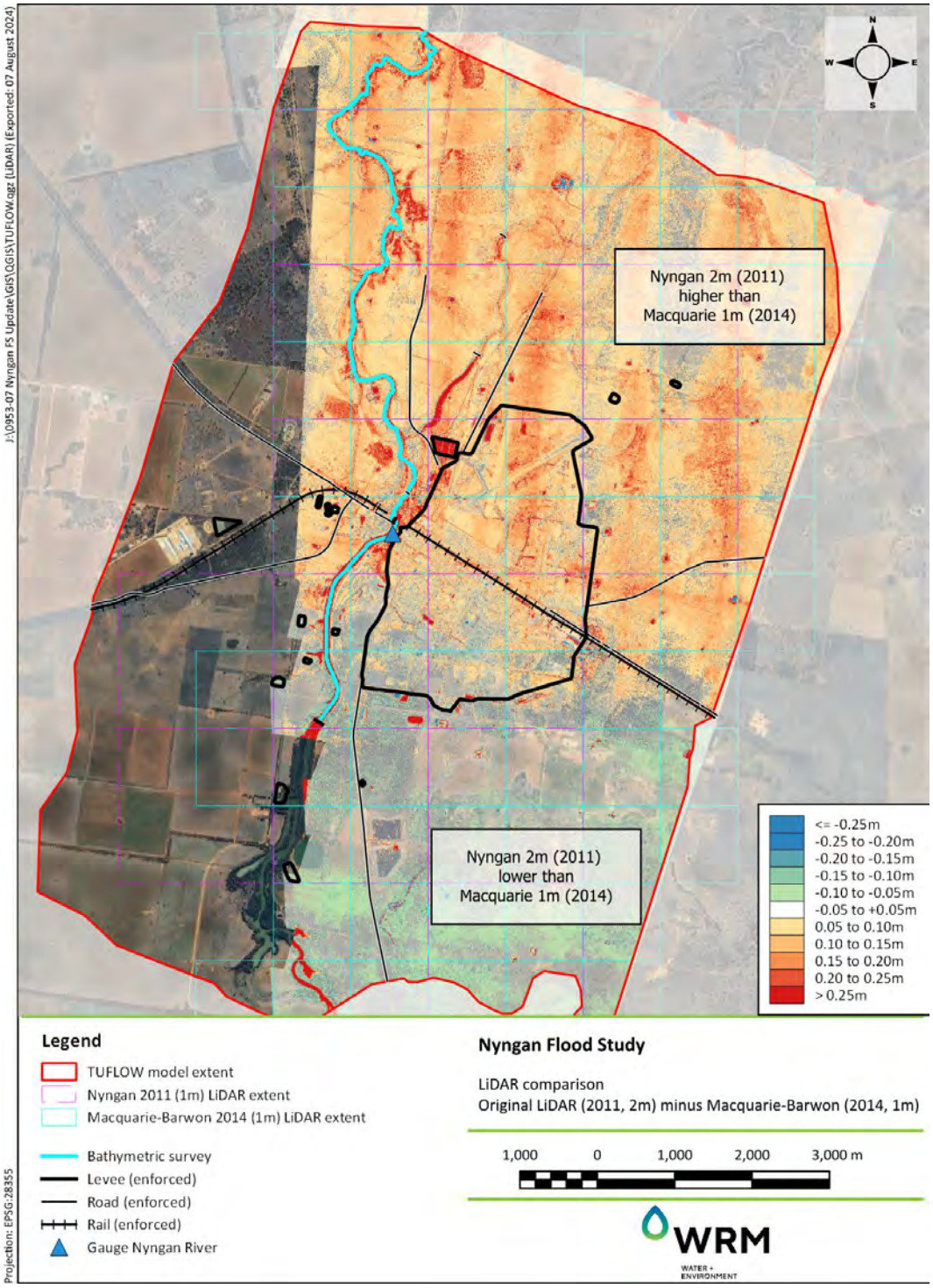


Figure B.1 LiDAR ground level comparison – Original 2011 LiDAR minus 2014 LiDAR

APPENDIX C COMBINED DATASET FOR PEAK ANNUAL DISCHARGES AT NYNGAN

Table C.1 Combined data set for peak annual discharges at Nyngan

Year	Peak Gauge Height (mGH)	Peak Discharge (m^3/s)	Data Source
1925	3.5	80.9	Correlation with Dandaloo [1]
1928	3.97	209.2	Correlation with Dandaloo [1]
1950	4.11	262.5	Pinneena 10.1
1955	4.42	414.1	Pinneena 10.1
1956	3.58	95.2	Pinneena 10.1
1960	<2.43	0	Correlation with Neurie Plains [1]
1961	<2.43	0	Correlation with Neurie Plains [1]
1962	<2.43	0	Correlation with Neurie Plains [1]
1963	<2.43	0	Correlation with Neurie Plains [1]
1964	<2.43	0	Correlation with Neurie Plains [1]
1965	<2.43	0	Correlation with Neurie Plains [1]
1966	<2.43	0	Correlation with Neurie Plains [1]
1967	<2.43	0	Correlation with Neurie Plains [1]
1968	3.2	42	Pinneena 10.1
1969	4.06	242.6	Pinneena 10.1
1970	<2.43	0	Correlation with Neurie Plains [1]
1971	3.53	85.6	DWR (1990)
1972	<2.43	0	Correlation with Neurie Plains [1]
1973	3.71	123.7	Pinneena 10.1
1974	2.7	4.1	Correlation with Neurie Plains [1]
1975	<2.43	0	Correlation with Neurie Plains [1]
1976	4.19	296.4	Pinneena 10.1
1977	3.58	95.2	Pinneena 10.1
1978	3.53	85.6	Pinneena 10.1
1979	<2.43	0	Correlation with Neurie Plains [1]
1980	<2.43	0	Correlation with Neurie Plains [1]
1981	<2.43	0	Correlation with Neurie Plains [1]
1982	<2.43	0	Correlation with Neurie Plains [1]
1983	<2.43	0	Correlation with Neurie Plains [1]
1984	3.71	123.7	Pinneena 10.1
1985	0	0	Correlation with Neurie Plains [1]
1986	0	0	Correlation with Neurie Plains [1]
1987	<2.43	0	Correlation with Neurie Plains [1]

Year	Peak Gauge Height (mGH)	Peak Discharge (m^3/s)	Data Source
1988	2.73	5.6	Correlation with Neurie Plains [1]
1989	2.47	0	Correlation with Neurie Plains [1]
1990	5.23	2080	DWR (1990)
1991	<2.43	0	Correlation with Neurie Plains [1]
1992	4.39	396.6	Pinneena 10.1
1993	3.27	49.8	NSW WaterInfo
1994	2.56	0.6	NSW WaterInfo
1995	3.8	150	NSW WaterInfo
1996	3.65	110	NSW WaterInfo
1997	2.58	0.9	NSW WaterInfo
1998	3.74	131.9	NSW WaterInfo
1999	3.15	36.9	NSW WaterInfo
2000	3.64	107.8	NSW WaterInfo
2001	2.89	15	NSW WaterInfo
2002	2.92	17.1	NSW WaterInfo
2003	2.62	1.7	NSW WaterInfo
2004	2.76	7	NSW WaterInfo
2005	2.86	12.9	NSW WaterInfo
2006	2.5	0.1	NSW WaterInfo
2007	2.54	0.4	NSW WaterInfo
2008	2.5	0.1	NSW WaterInfo
2009	2.67	3	NSW WaterInfo
2010	3.4	66.2	NSW WaterInfo
2011	2.96	20.1	NSW WaterInfo
2012	3.86	169.6	NSW WaterInfo
2013	2.57	0.8	NSW WaterInfo
2014	-	21	WaterNSW [2]
2015	-	0.3	WaterNSW [2]
2016	4.05	159.7	WaterNSW [2]
2017	-	29	WaterNSW [2]
2018	2.40	0	WaterNSW [2]
2019	2.14	0	WaterNSW [2]
2020	3.33	50.8	WaterNSW [2]
2021	3.31	48.4	WaterNSW [2]
2022	4.31	287.9	WaterNSW [2]
2023	2.46	0.02	WaterNSW [2]
2024	3.02	23.4	WaterNSW [2]

Year	Peak Gauge Height (mGH)	Peak Discharge (m^3/s)	Data Source

[1] Correlation as WRM (2014)
[2] https://realtimedata.waternsw.com.au/water.stm

APPENDIX D TUFLOW HYDRAULIC MODEL UPDATE, AFFLUX FIGURES

D.1 TUFLOW HPC VERSUS TUFLOW CLASSIC

The following figures in this section demonstrate the afflux (change in peak flood level) due to the update of the TUFLOW Classic model to TUFLOW HPC.

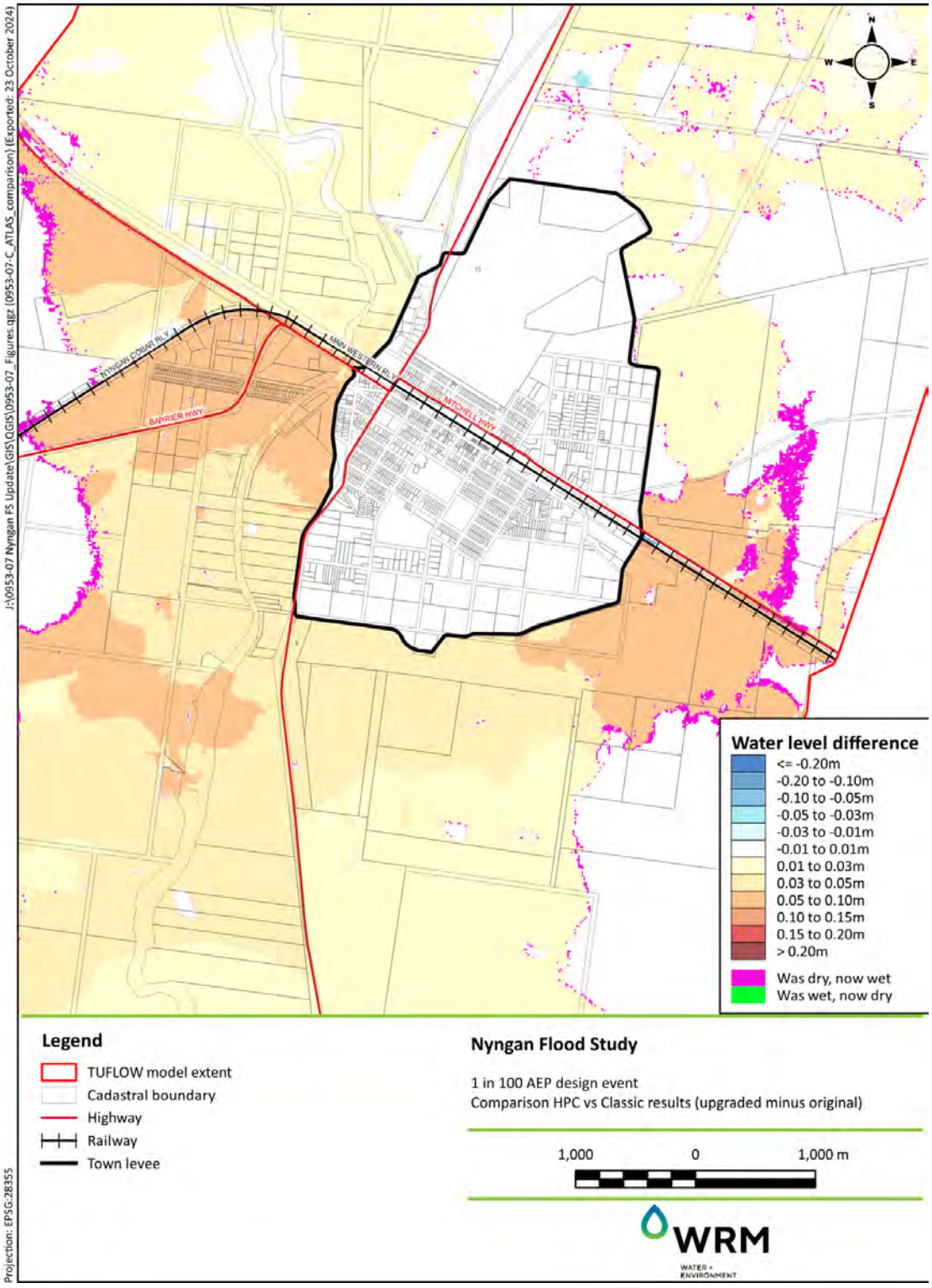


Figure D.1 Difference in peak flood levels - TUFLOW HPC minus TUFLOW Classic, 1 in 100 AEP event (without climate change)

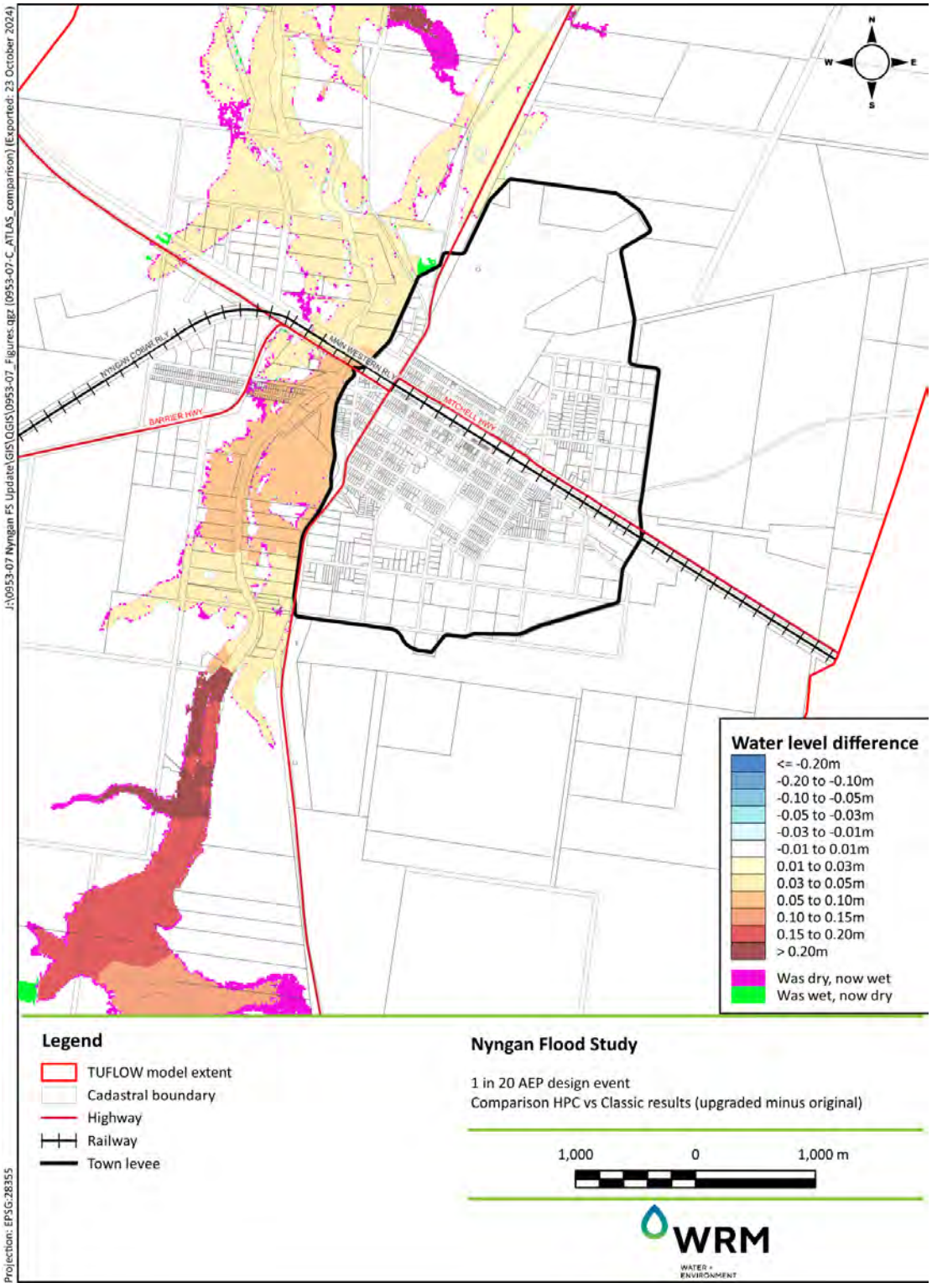


Figure D.2 Difference in peak flood levels - TUFLOW HPC minus TUFLOW Classic, 1 in 20 AEP event (without climate change)

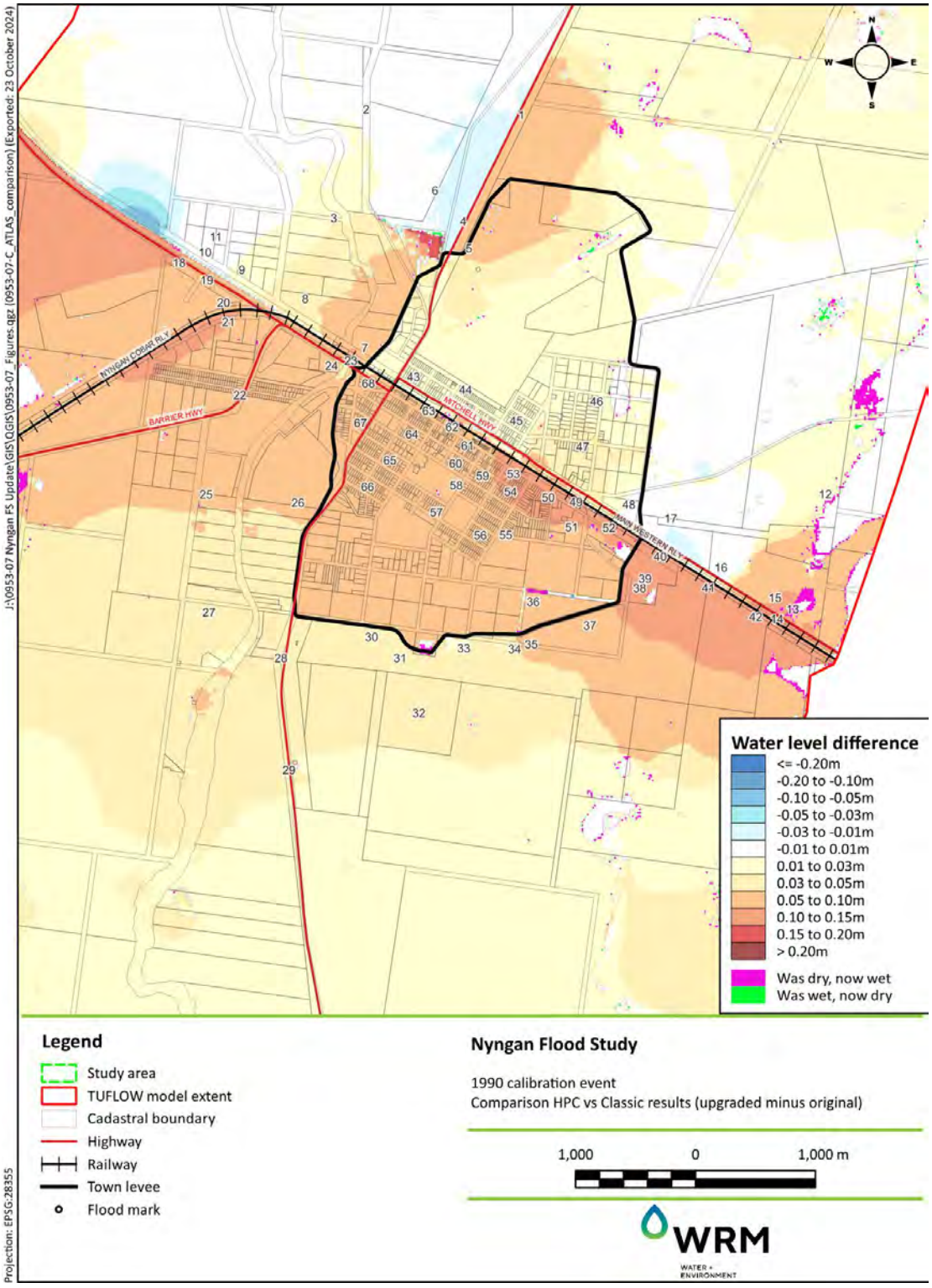


Figure D.3 Difference in peak flood levels - TUFLOW HPC minus TUFLOW Classic, 1990 calibration event

D.2 TUFLOW HPC+SGS VERSUS TUFLOW CLASSIC

The following figures in this section demonstrate the afflux (change in peak flood level) due to the update of the TUFLOW Classic model to TUFLOW HPC+SGS.

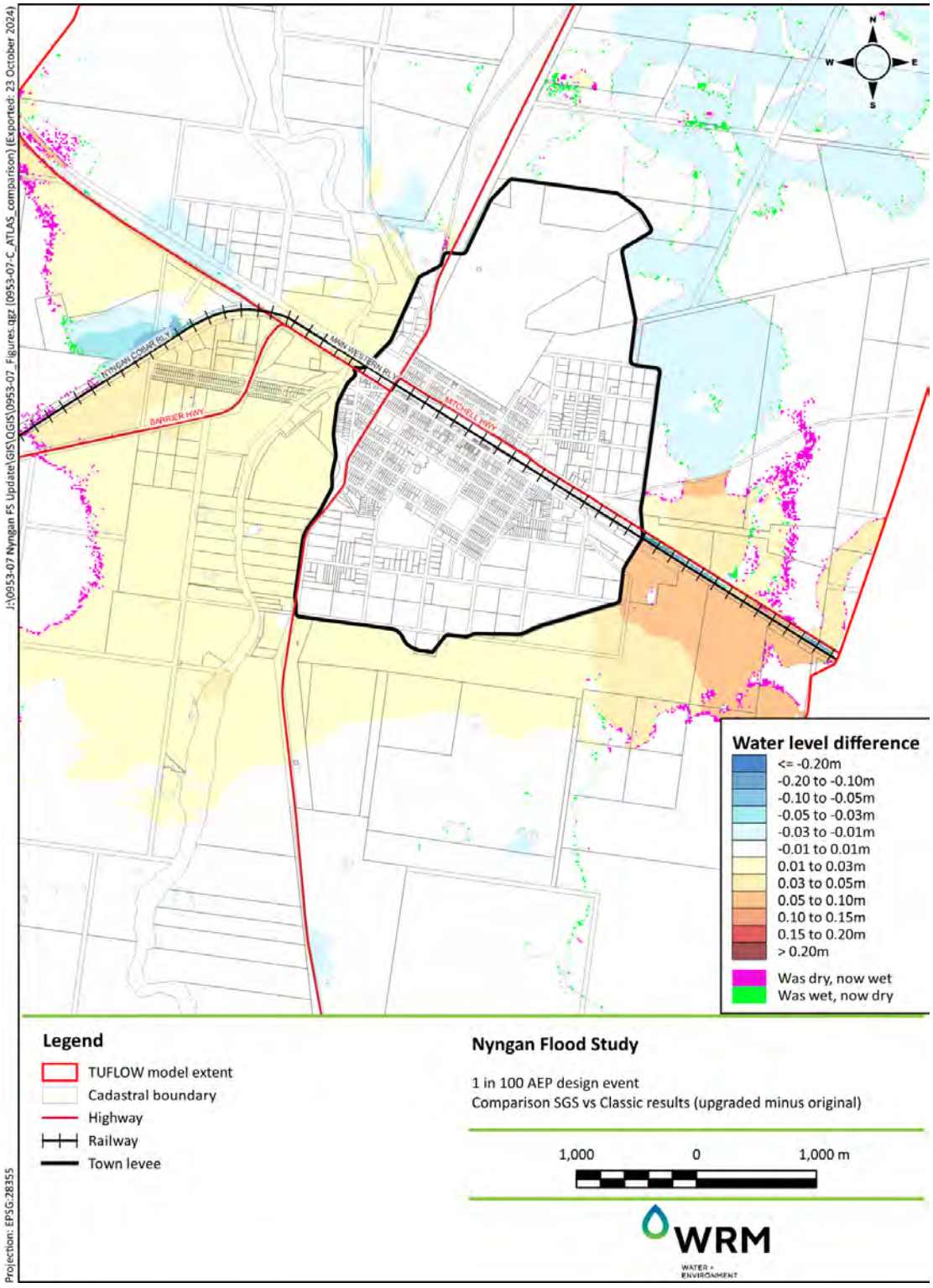


Figure D.4 Difference in peak flood levels – TUFLOW HPC+SGS minus TUFLOW Classic, 1 in 100 AEP event (without climate change)

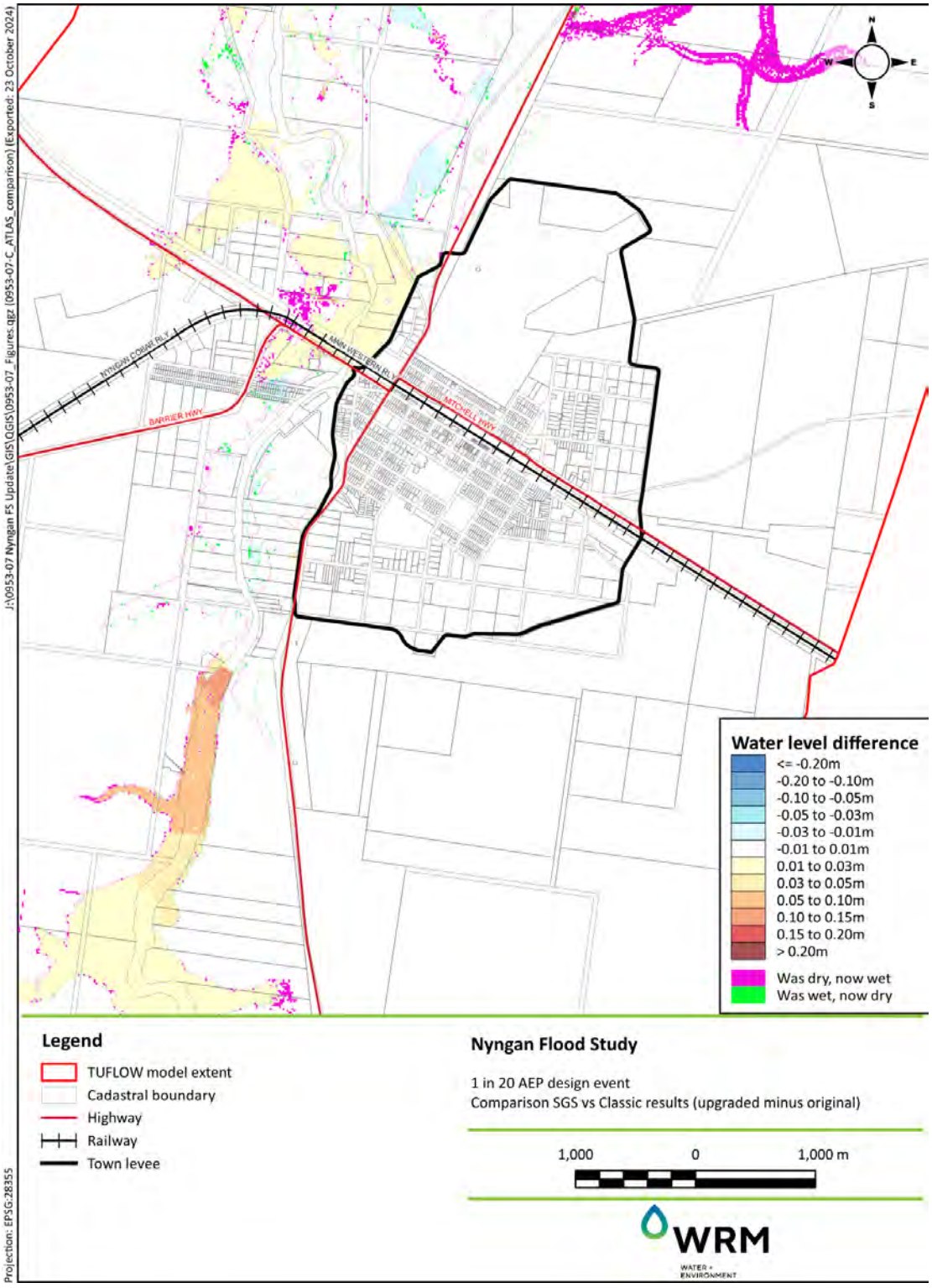


Figure D.5 Difference in peak flood levels – TUFLOW HPC+SGS minus TUFLOW Classic, 1 in 20 AEP event (without climate change)

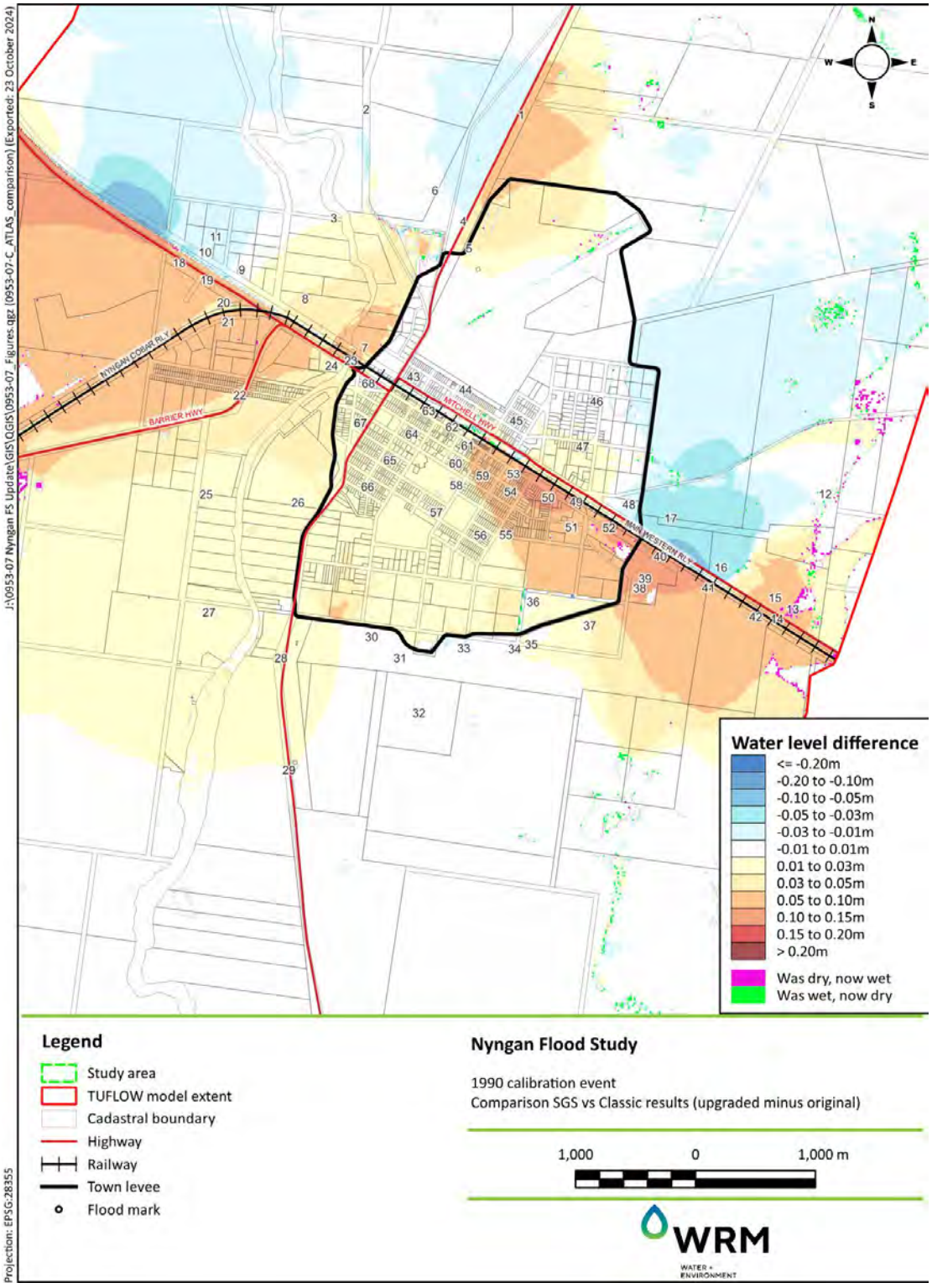


Figure D.6 Difference in peak flood levels – TUFLOW HPC+SGS minus TUFLOW Classic, 1990 calibration event

APPENDIX E 1990 CALIBRATION EVENT, IMPACTS OF UPDATE TO SGS FUNCTIONALITY

The 1990 calibration event was simulated using the SGS functionality. Peak flood level results were compared to the original model, as shown in Figure A6. In the 2014 Flood Study, the calibration of the original model to the 1990 event was undertaken using surveyed flood marks around Nyngan, with locations shown in Figure B1. The goal of a calibration is for the model to match the surveyed peak levels as closely as possible.

The performance of the original model in matching these flood marks is shown in the original 2014 Flood Study (Table 4.3) and reproduced in Table B1. TABLE B1 has been extended to include comparison of the upgraded flood model performance against the flood marks. A statistical summary and histogram comparison of the model performance is provided in Section 3.4.3.

The upgraded model demonstrates a worsening of the calibration results with differences between modelled and surveyed flood levels increasing, indicating the 1990 calibration to be compromised by the upgrade.

TUFLOW HPC with SGS functionality is a superior model software compared to the TUFLOW Classic software version used in the 2014 Flood Study. The investigations indicate that the upgraded model is providing robust and realistic results. A recalibration of the upgraded model to the 1990 event is recommended as part of the model upgrade process.

Table E.1 Recorded and Predicted Peak Water Levels, April 1990 Event

Location ID (see Figure B1)	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original model		Upgraded model	
			Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990
1	170.76	171.33	171.44	0.11	171.43	0.10
2	170.74	171.29	171.53	0.24	171.52	0.23
3	171.3	171.94	172.06	0.12	172.08	0.14
4	171.28	171.55	171.58	0.03	171.57	0.02
5	171.07	171.85	171.73	-0.12	171.76	-0.09
6	170.89	171.53	171.59	0.06	171.58	0.05
7	170.94	172.48	172.53	0.05	172.59	0.11
8	171.46	172.16	172.22	0.06	172.26	0.10
9	171.53	171.97	172.08	0.11	172.09	0.12
10	171.08	171.98	172.04	0.06	172.01	0.03
11	170.87	172.08	172.02	-0.06	172.00	-0.08
12	172.32	172.27	172.41	0.14	172.41	0.14
13	173.05	172.59	173.03	-	173.08	0.00
14	172.4	172.92	173.06	0.14	173.15	0.23
15	172.82	172.38	173	-	173.07	0.00
16	171.44	172.72	172.6	-0.12	172.55	-0.17
17	171.43	172.59	172.62	0.03	172.57	-0.02
18	171.08	172.62	172.8	0.18	172.89	0.27
19	171.59	172.7	172.85	0.15	172.91	0.21

Location ID (see Figure B1)	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original model		Upgraded model	
			Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990
20	171.66	172.8	172.88	0.08	172.93	0.13
21	171.83	172.99	172.96	-0.03	173.04	0.05
22	172.02	173.08	173.05	-0.03	173.09	0.01
23	170.23	172.53	172.67	0.14	172.76	0.23
24	170.79	172.89	172.96	0.07	173.00	0.11
25	171.85	173.17	173.23	0.06	173.26	0.09
26	171.83	173.21	173.18	-0.03	173.21	0.00
27	171.8	173.31	173.41	0.1	173.42	0.11
28	171.85	173.43	173.51	0.08	173.53	0.10
29	172.73	173.94	173.79	-0.16	173.80	-0.14
30	172.05	173.59	173.57	-0.02	173.58	-0.01
31	172.34	173.54	173.58	0.04	173.58	0.04
32	172.67	173.48	173.62	0.14	173.63	0.15
33	171.76	173.5	173.47	-0.03	173.47	-0.03
34	171.97	173.47	173.46	-0.01	173.46	-0.01
35	172.2	173.33	173.38	0.05	173.40	0.07
36	172.05	173.3	173.35	0.05	173.36	0.06
37	172.22	173.29	173.31	0.02	173.34	0.05
38	168.96	173.17	173.08	-0.09	173.18	0.01
39	170.48	173.13	173.07	-0.06	173.17	0.04
40	171.18	173.1	173.06	-0.04	173.17	0.07
41	172.1	173.12	173.08	-0.04	173.18	0.06
42	171.19	173.07	173.07	0	173.16	0.09
43	171.49	171.92	172.04	0.12	172.04	0.12
44	171.71	172.25	172.1	-0.15	172.11	-0.14
45	170.87	172.34	172.28	-0.06	172.29	-0.05
46	171.27	172.16	172.18	0.02	172.19	0.03
47	171.57	172.16	172.55	-	172.57	0.00
48	172.02	172.54	172.63	0.09	172.61	0.07
49	172.14	172.96	172.93	-0.03	173.03	0.07
50	171.59	172.99	172.92	-0.07	173.04	0.05
51	171.72	172.99	172.96	-0.03	173.05	0.06
52	171.78	173.04	172.89	-0.15	172.99	-0.05
53	171.27	172.96	172.94	-0.02	173.04	0.08
54	171.64	173	172.95	-0.05	173.04	0.04
55	172.23	173.21	173.04	-0.17	173.08	-0.13
56	172.26	173.14	173.1	-0.04	173.13	-0.01
57	172.21	173.16	173.15	-0.01	173.17	0.01
58	172.93	173.13	173.16	0.03	173.13	0.00

Location ID (see Figure B1)	Ground Level (m AHD)	Recorded Peak Flood Level (surveyed in 1990) (m AHD)	Original model		Upgraded model	
			Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990	Predicted Modelled Level (m AHD) 1990	Difference (Predicted - Surveyed) 1990
59	172.1	173.06	172.99	-0.07	173.06	0.00
60	172.15	173.07	173.09	0.02	173.10	0.03
61	172.34	172.94	173.05	0.11	173.08	0.14
62	172.08	173.14	173.11	-0.03	173.12	-0.02
63	171.31	173.09	173.13	0.04	173.15	0.06
64	171.54	173.17	173.13	-0.04	173.15	-0.02
65	171.69	173.2	173.14	-0.06	173.16	-0.04
66	172.07	173.21	173.16	-0.05	173.18	-0.03
67	171.88	173.2	173.14	-0.06	173.15	-0.05
68	171.54	173.21	173.12	-0.09	173.13	-0.08

APPENDIX F AUSTRALIAN RAINFALL AND RUNOFF CLIMATE CHANGE GUIDANCE UPDATE

F.1 BACKGROUND

Informed by an extensive review of the current scientific literature, the advice in *Australian Rainfall and Runoff* (ARR, Version 4.2) on climate change considerations has been revised based on input from Federal and State Government, academics and the industry and has undergone extensive consultation on the draft. *Australian Rainfall and Runoff* provides national guidance on flood estimation and represents the best-practice advice to be implemented for planning purposes.

With climate science rapidly evolving in the last decade, the guidance was revised following industry concerns on whether the current science was reflected in the guidance.

Climate science indicates that the climate, including rainfall, is already changing and is no longer a future issue but ought to be included in design and policy decisions now.

F.2 APPLICATION

To account for the improved understanding in climate science and increases in global surface temperatures, uplift factors are to be applied to the current intensity-frequency-duration (IFD) curves[7]. The uplift factors are based on degrees of warming from the baseline period (1961 to 1990) and vary with storm duration (i.e., different for shorter or longer storms). They apply to all flood event sizes, up to probable maximum precipitation (PMP).

Temporal patterns (i.e. the timing of rainfall) are likely to move more to “front loaded” storms, although this effect is expected to be small for extreme rainfall events. Loss values are also scaled based on degrees of warming.

While sea level rise is not addressed by new guidance, reference is made to other publications.

F.3 IMPLICATIONS

The current IFD curves applied in completed flood studies would be based on rainfall intensities which do not adequately represent the current climatic conditions. The current climate will have increased rainfall intensities, leading to higher flood levels. Rainfall intensity (and hence flood levels) will continue to increase in the future as the planet continues to warm. The design immunity of properties and infrastructure is likely not achieved, and more frequent flooding to be expected. The flood risk for properties and infrastructure in the floodplain is likely to increase due to increased flood depth and flood velocities. The flood characteristics may change, including the formation of new flow paths, faster onset of flooding, and faster rising flood levels. The floodplain size may increase, newly exposing existing properties and infrastructure to flood risk, and existing drainage systems may be insufficiently designed to manage high intensity flooding

F.4 TRENDS

Little regional variation to rainfall intensities is observed throughout Australia. However, the changes to flood levels will vary by catchment, with more incised catchments more prone to flood levels increases than broad floodplains. Changes to rainfall intensities are more significant for shorter duration events. Extreme rainfall is likely to change at a different rate to annual average rainfall.

[7] http://www.bom.gov.au/water/designRainfalls/ifd/

F.5 SHARED SOCIO-ECONOMIC PATHWAYS (SSP)

ARR (Version 4.2) suggests using SSPs because they are typically used in scientific literature (e.g. by the International Panel on Climate Change (IPCC)). Global warming levels tend to be used in the policy space and are used in the National Climate Risk Assessment.

Table E.1 outlines the current global temperature projections derived from the IPCC Sixth Assessment Report (IPCC, 2021). Figure 5.1 presents the latest Intergovernmental Panel on Climate Change (IPCC) temperature projections based on Shared Socioeconomic Pathways (SSPs) that cover a broad range of potential future development options often referred to as very low (SSP1-1.9), low (SSP1-2.6), medium (SSP2-4.5), high (SSP3-7.0) and very high (SSP5-8.5) emissions pathways. These projections are neither predictions nor forecasts but instead describe plausible scenarios that represent future climate uncertainty (ARR, Version 4.2).

Climate Systems[8] explain SSPs as follows:

> *"'SSP' stands for Shared Socio-economic Pathways. SSPs are the latest version of 'what if' scenarios used to explore the consequences of greenhouse gases accumulating in the atmosphere. SSPs are needed because we can't know what future greenhouse gas levels in the atmosphere will be, but we know the higher they are the more warming will occur. Each SSP outlines ways the world might change in the future, including different types of energy generation, rates of population growth, economic development and land uses. These lead to different levels of greenhouse gas emissions over time."*
>
> *"The SSPs further refine the previous emissions scenarios which are called the 'RCPs' (Representative Concentration Pathways). The RCPs described how future emissions might change over time and how much extra energy (W/m2) would be trapped by greenhouse gases. They did not consider social change or policies. By adding these societal choices, SSPs enable policy makers to identify efforts required to keep global warming below 2°C."*

Table F.1 Global mean surface temperature increase projections for different SSPs (relative to 1961-1990) (IPCC, 2021)

Climate scenario	SSP 1.0 – 2.6	SSP 2.0 – 4.5	SSP 3.0 – 7.0	SSP 5.0 – 8.5
Current and near-term (2021-2040)	1.2	1.2	1.2	1.3
Medium-term (2041-2060)	1.4	1.7	1.8	2.1
Long-term (2081-2100)	1.5	2.4	3.3	4.1

[8] https://nesp2climate.com.au/wp-content/uploads/2024/01/Understanding-SSPs-1.pdf

APPENDIX G DESIGN EVENT FLOOD MAPPING

G.1 PEAK FLOOD DEPTH AND EXTENT

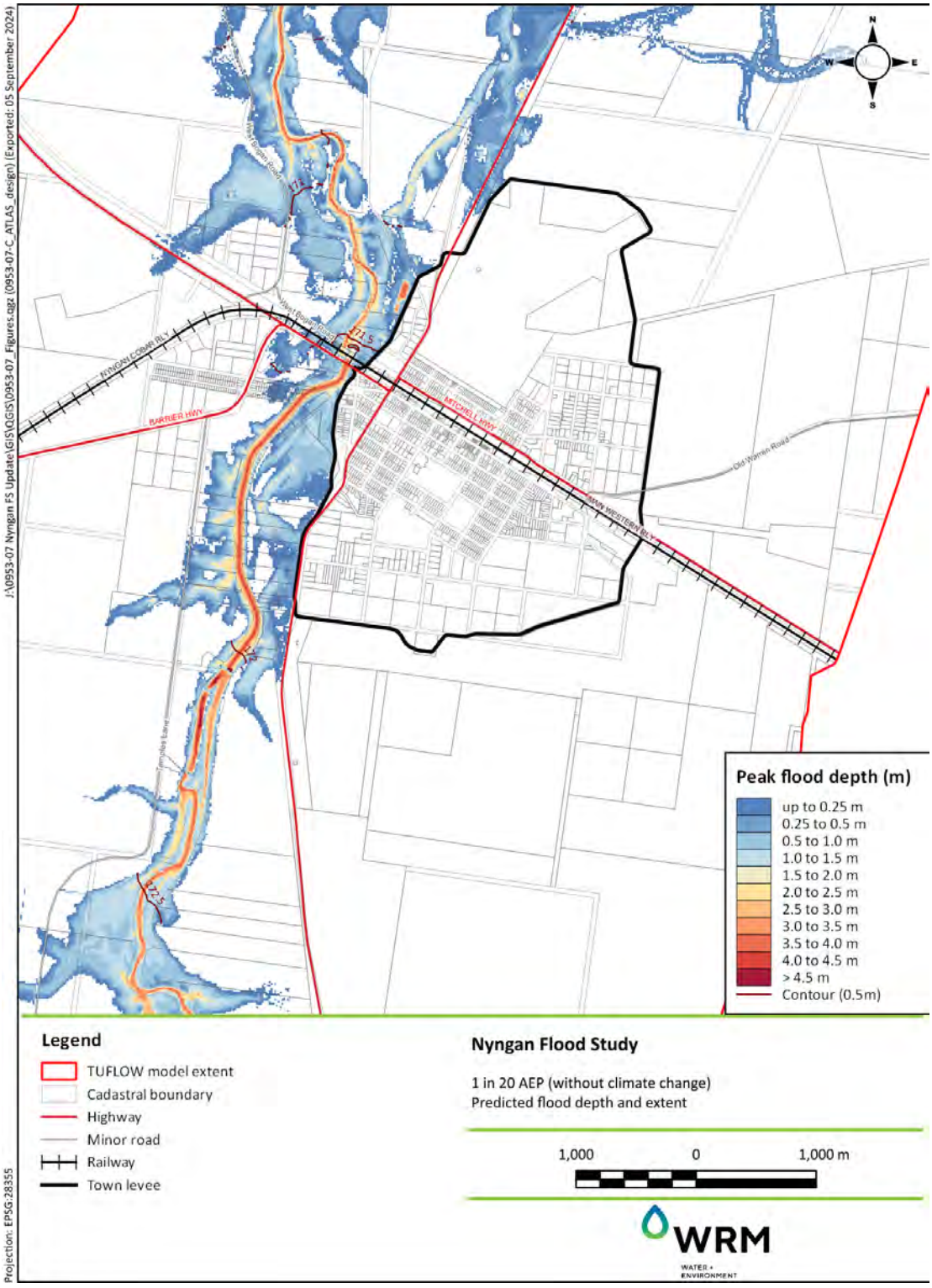


Figure G.1 1 in 20 AEP (without climate change) design event, peak flood depth and extent

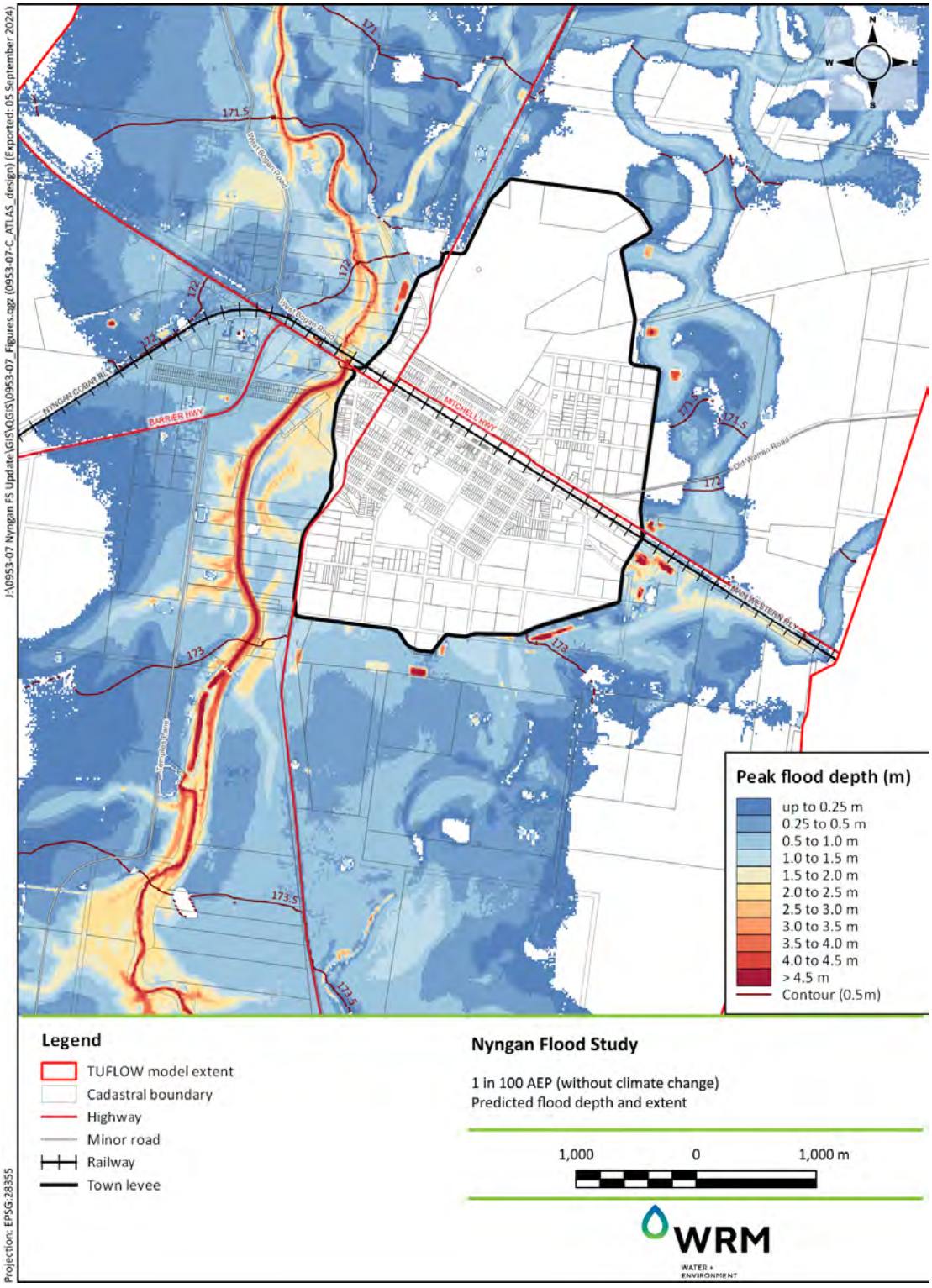


Figure G.2 1 in 100 AEP (without climate change) design event, peak flood depth and extent

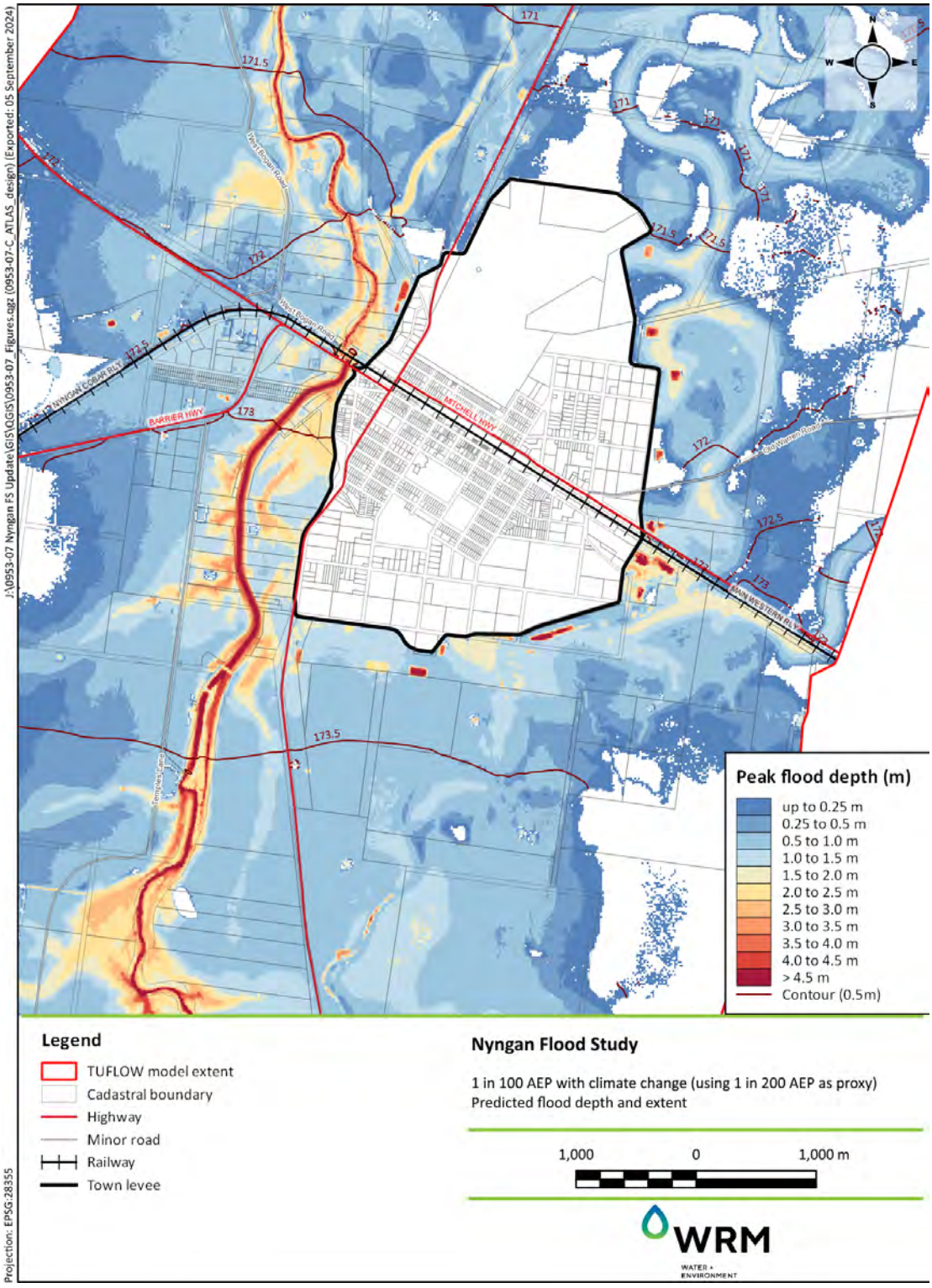


Figure G.3 1 in 100 AEP with climate change design event, peak flood depth and extent

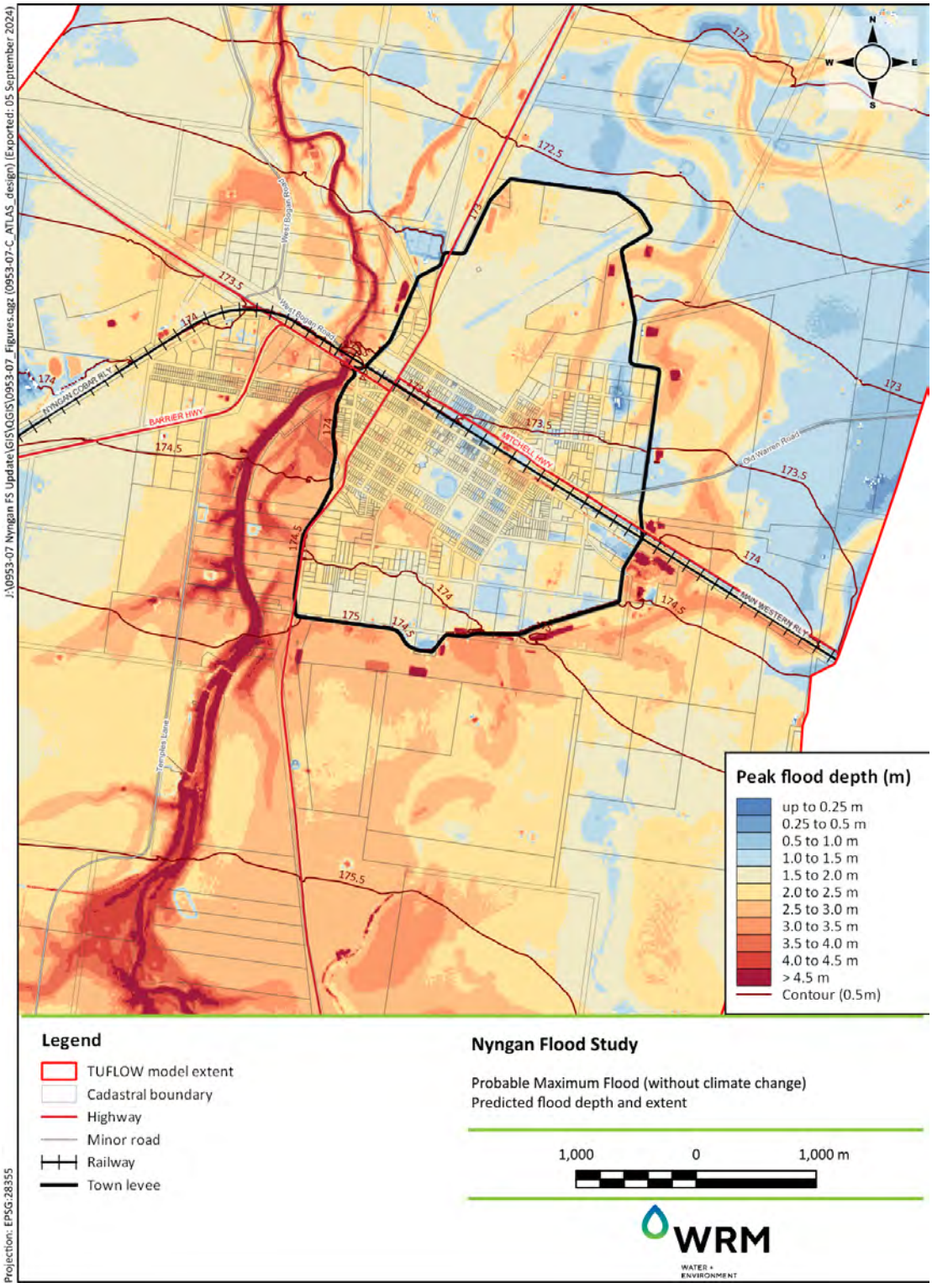


Figure G.4 **PMF (without climate change) design event, peak flood depth and extent**

G.2 PEAK FLOOD VELOCITIES

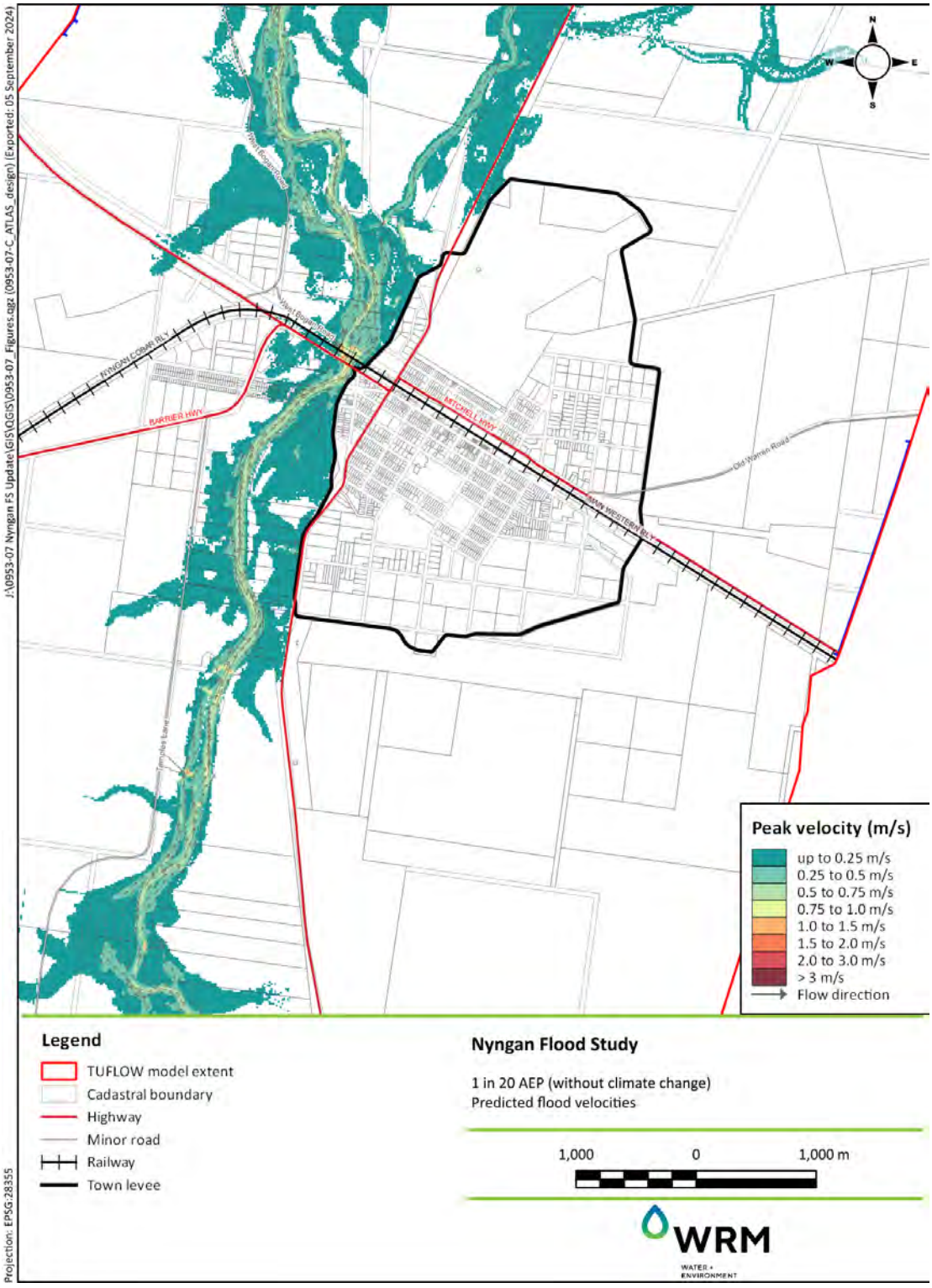


Figure G.5 1 in 20 AEP (without climate change) design event, peak flood velocities

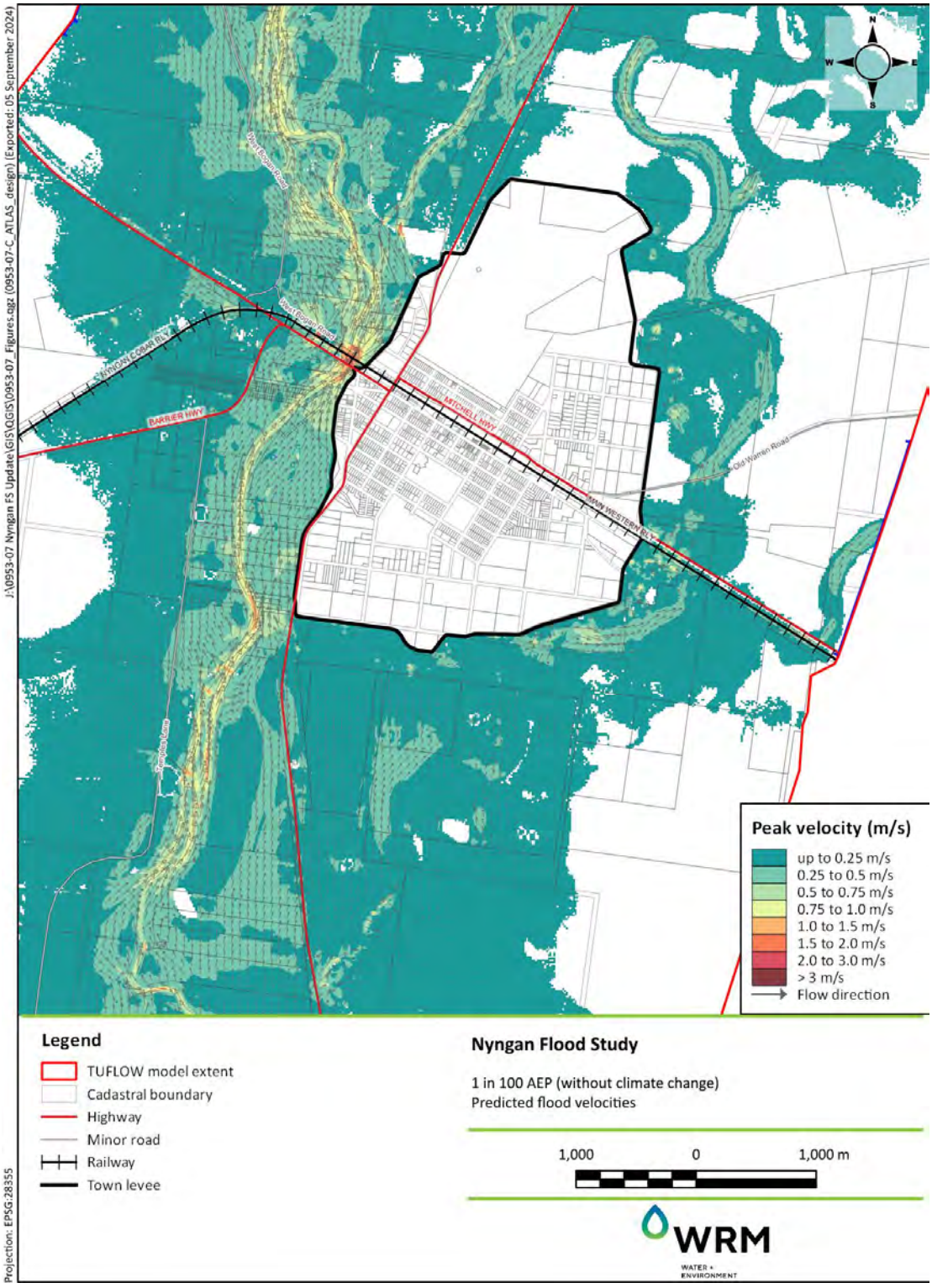


Figure G.6 1 in 100 AEP (without climate change) design event, peak flood velocities

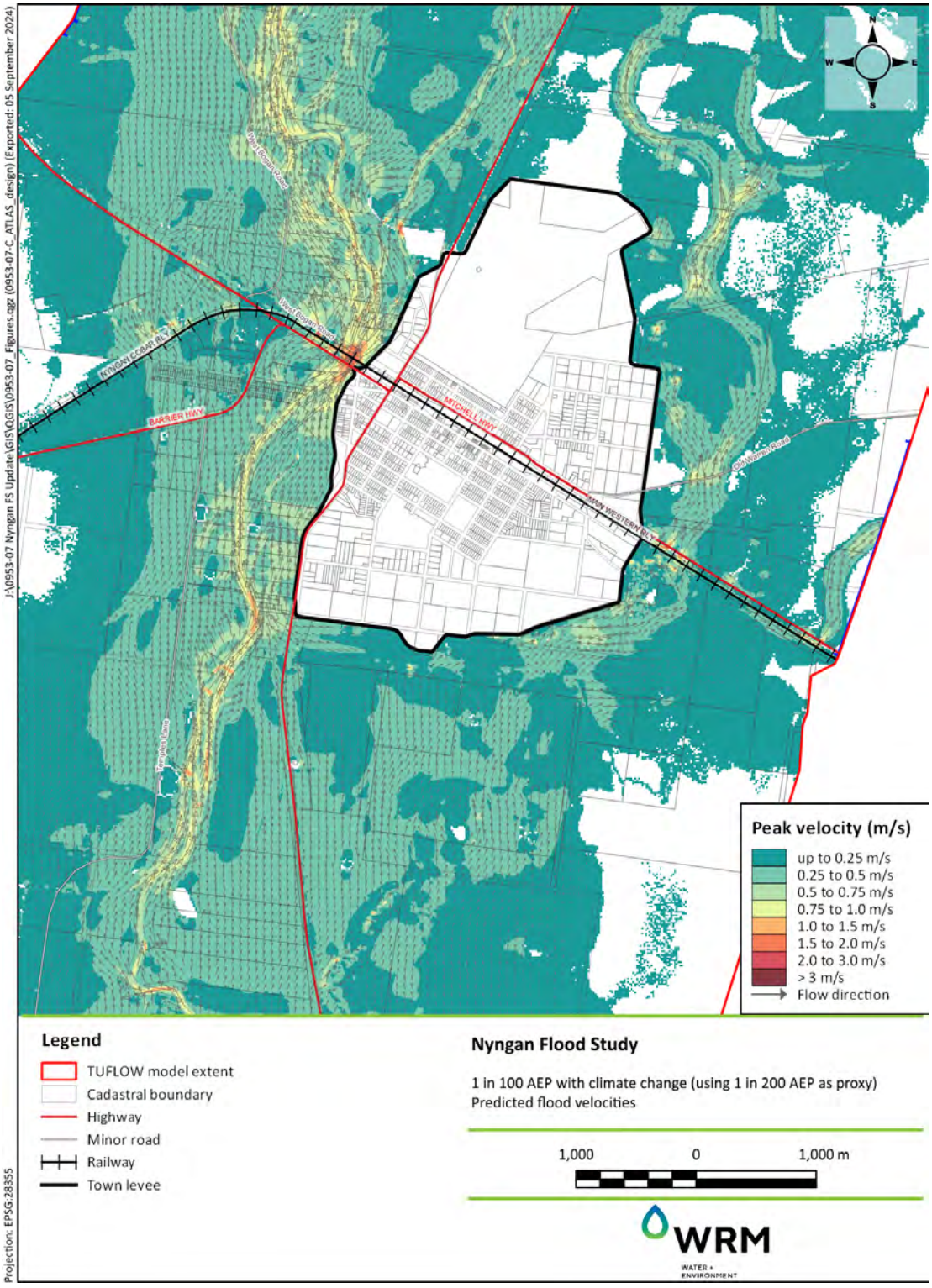


Figure G.7 1 in 100 AEP with climate change design event, peak flood velocities

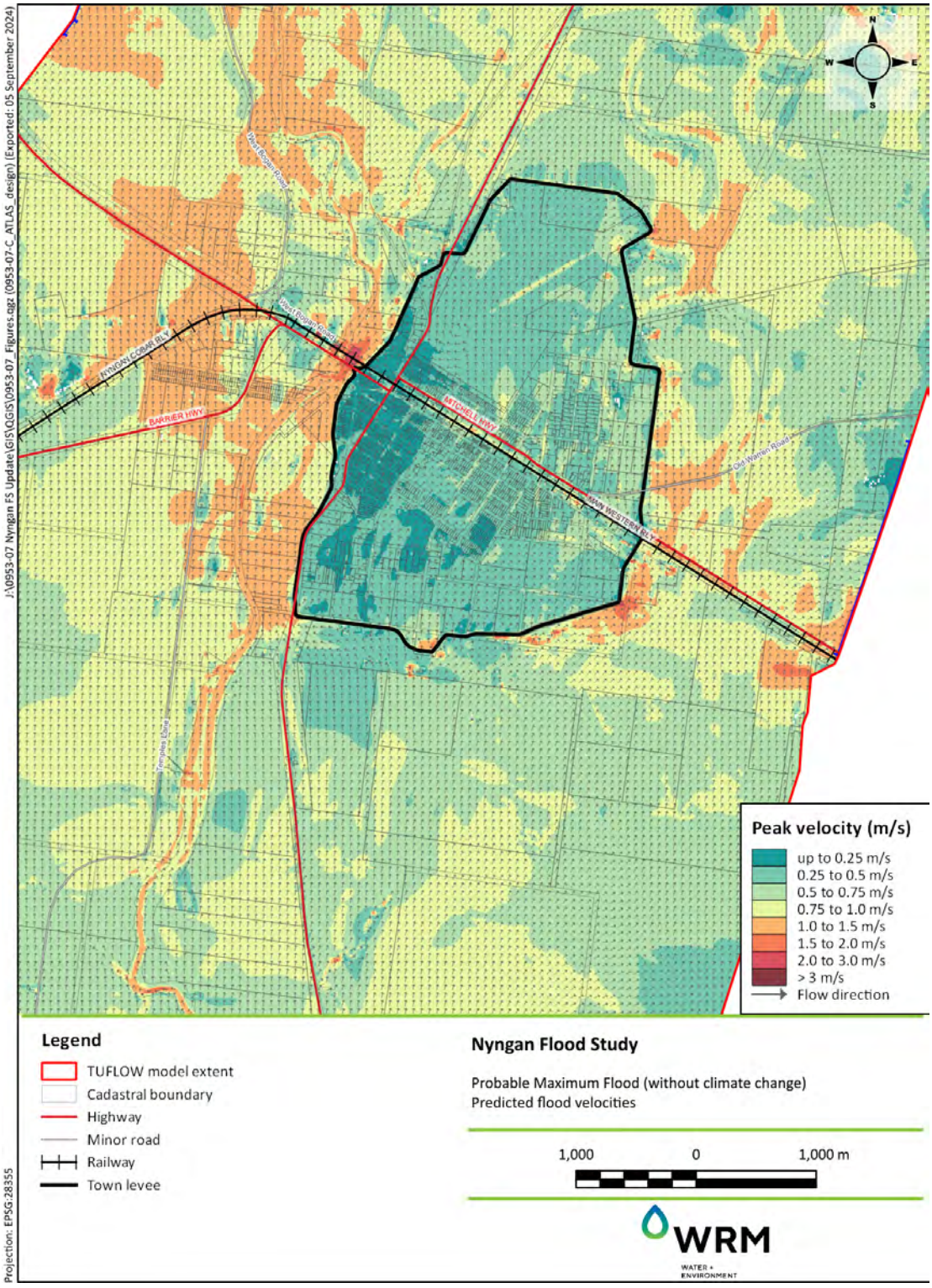


Figure G.8 PMF (without climate change) design event, peak flood velocities

G.3 FLOOD HAZARD

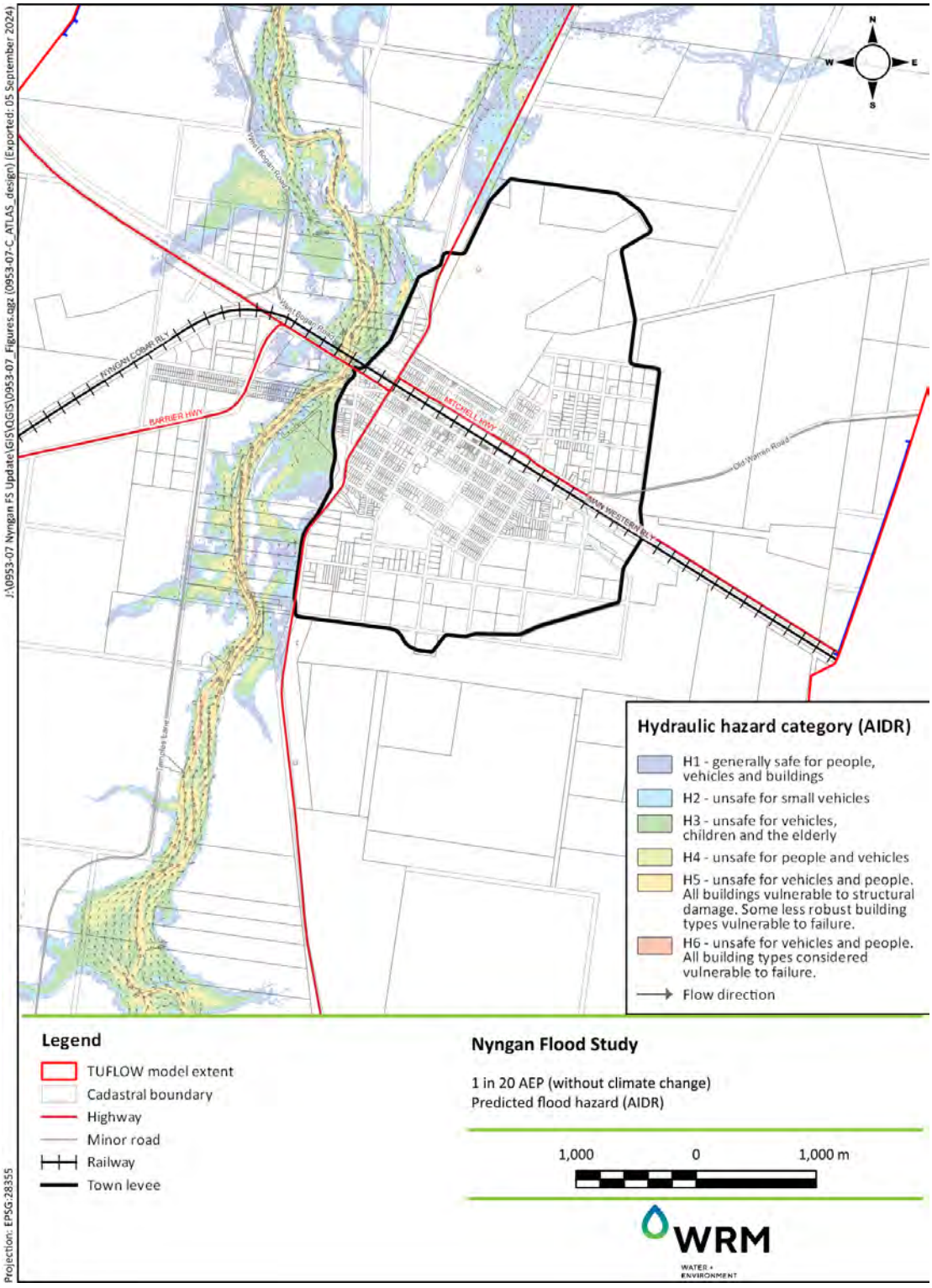


Figure G.9 1 in 20 AEP (without climate change) design event, AIDR flood hazard classification

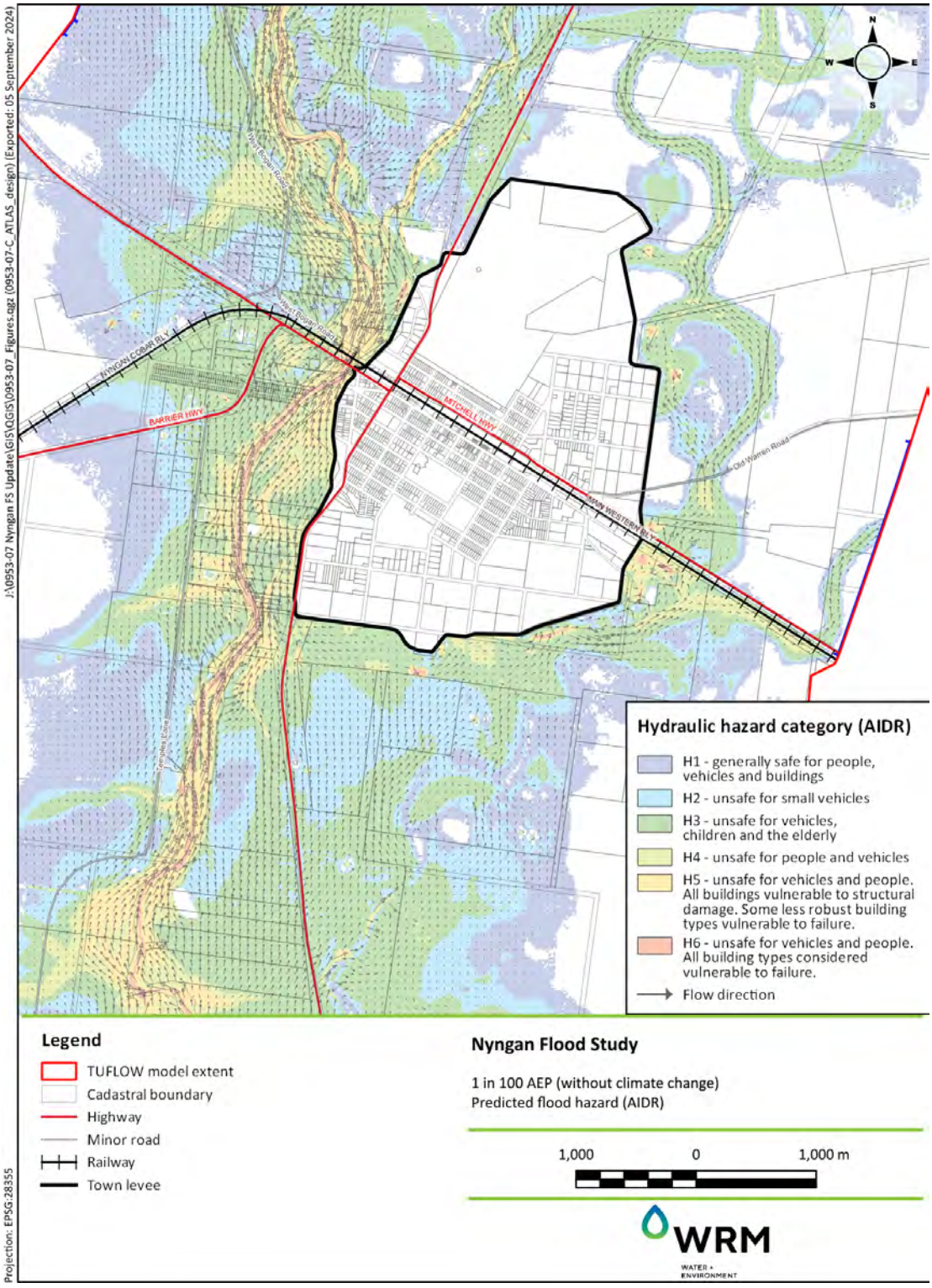


Figure G.10 1 in 100 AEP (without climate change) design event, AIDR flood hazard classification

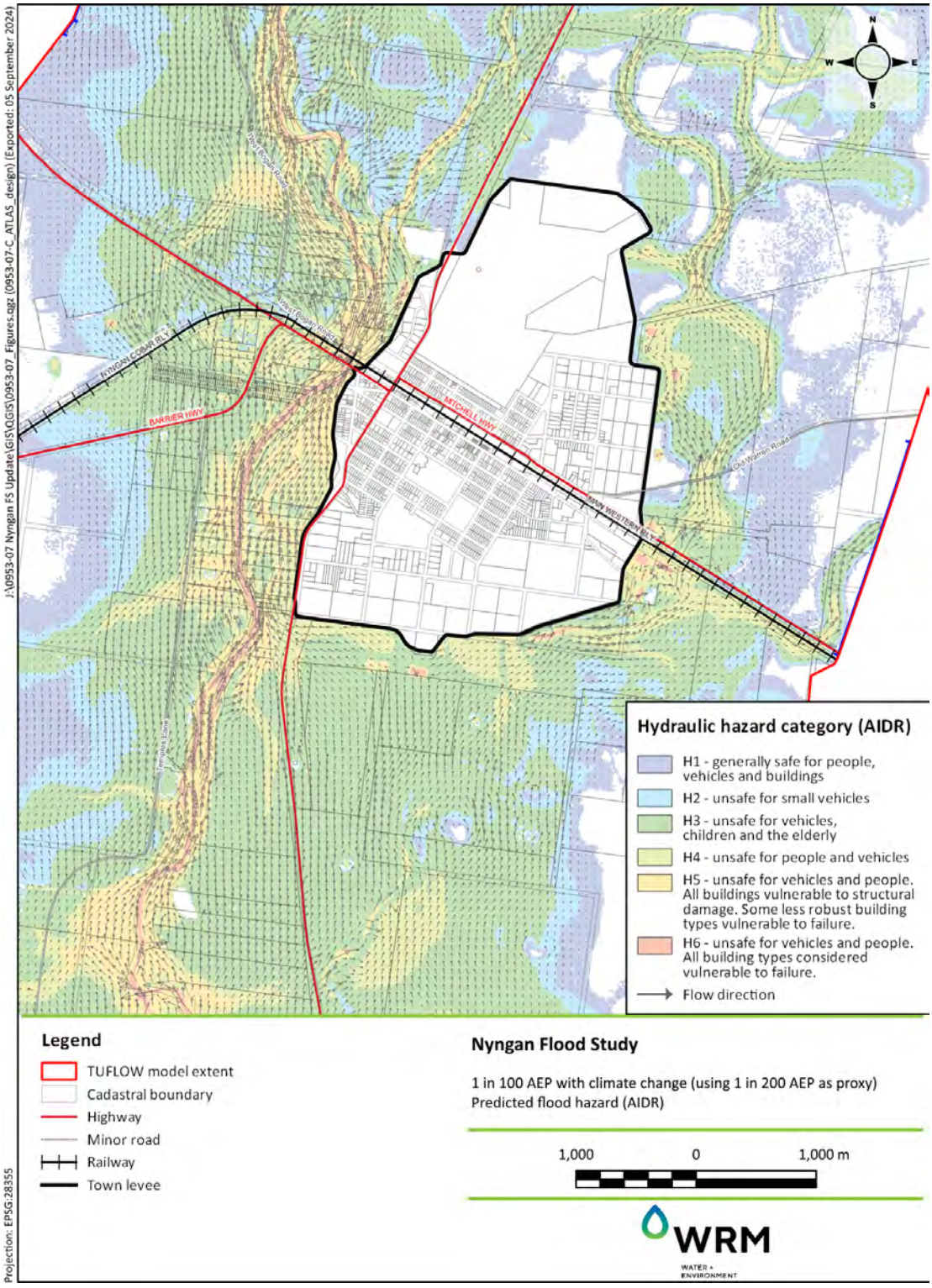


Figure G.11 **1 in 100 AEP with climate change design event, AIDR flood hazard classification**

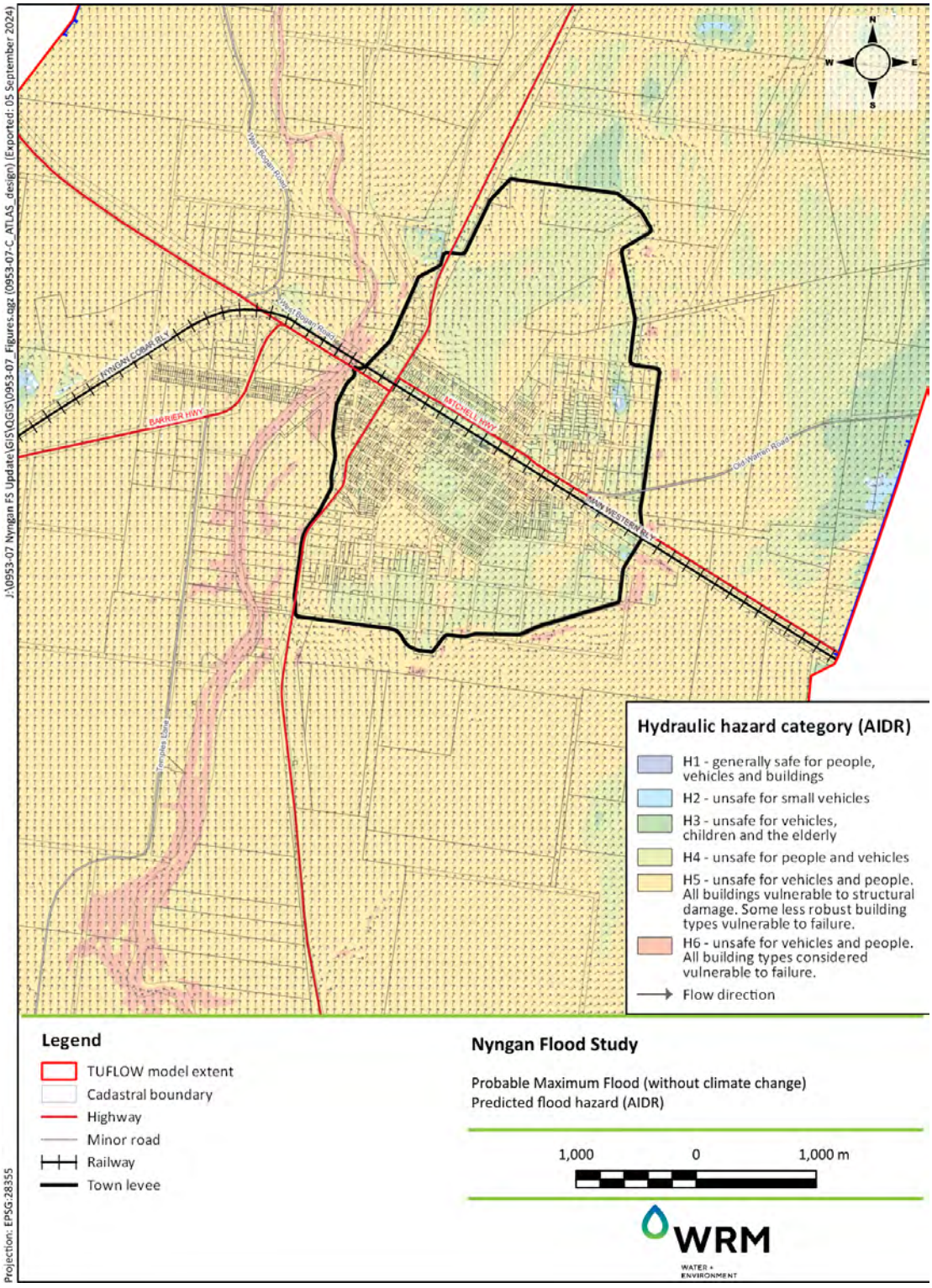


Figure G.12 **PMF (without climate change) design event, AIDR flood hazard classification**

Level 1, 369 Ann Street Brisbane
PO Box 10703 Brisbane Adelaide Street Qld 4000
07 3225 0200

Level 5, 93 Mitchell Street Darwin
GPO Box 43348 Casuarina NT 0811
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ATTACHMENT C - PRELIMINARY BIODIVERSITY ASSESSMENT

Preliminary Biodiversity Constraints Assessment

Bogan Housing Strategy

February 2025

Final

Prepared For
Bogan Shire Council

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Report History

Date	Revision	Comment
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Table of Contents

Schedule of Figures

Schedule of Tables

Abbreviations	
AHD	Australian Height Datum
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method Credit Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	*Biodiversity Conservation Regulation 2017* (NSW)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
EEC	Endangered Ecological Community
EPBC Act	*Environmental Protection and Biodiversity Conservation Act 1999* (Federal).
IBRA	Interim Biogeographically Regionalisation of Australia
MNES	Matters of National Environmental Significance
OEH	Office of Environment and Heritage
PCT	Plant Community Type
TECs	Threatened Ecological Communities
TSPD	Threatened Species Profile Database
VIS	Vegetation Integrity Score

1. INTRODUCTION

Accuplan has been commissioned by Bogan Shire Council to prepare a Preliminary Biodiversity Constraints Analysis (PBCA) to inform the Bogan Housing Strategy. This report has been prepared to investigate potential biodiversity constraints that may impede the development on land identified in the housing strategy as having residential development potential within the Nyngan township. Twelve investigation sites have been identified for assessment, all of which occur within the confines of the Nyngan flood levee.

The location of the investigation sites is shown in Figure 2.1.

Specifically, the report aims to:

- Describe the existing environment at each of the investigation sites;
- Identify the biodiversity constraints that may be relevant to future development of the investigation sites under the *NSW Biodiversity Conservation Act 2016* (BC Act);
- Consider the potential implications of the BC Act including likely assessment pathways, the potential to trigger entry into the Biodiversity Offsets Scheme (BOS), and provide comment on the likelihood for residential development over the land to generate a biodiversity offsets obligation.

The findings in this report are based on a desktop assessment and a site visit to confirm the existing condition of each site. It is noted that any advice provided in this report is indicative only and any findings would be subject to confirmation by detailed quantitative surveys.

2. METHODOLOGY

The analysis of the biodiversity values occurring within the study area included a combination of both desktop analysis as well as a brief site inspection to ascertain the existing condition of each site and identify the type of vegetation and habitats present.

A summary of the overall environmental context affecting all investigation sites (Nyngan township) is provided in Section 4. A detailed analysis of each site is provided in Section 5.

2.1 Desktop Assessment

A desktop analysis including review of existing vegetation mapping and threatened species records was undertaken to identify any known or potential biodiversity constraints that may occur within each site.

The following information sources were used for this assessment:

- Office of Environment and Heritage (OEH) licensed Bionet Atlas of NSW Wildlife database (local records within 50km of proposal area – last accessed February 2025)
- Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool (local records within 50km of proposal area – last accessed February 2025)
- Biodiversity Assessment Method Calculator (Version: 1.4.0.0) (BAM-C)
- *Biodiversity Assessment Method* (OEH, 2020)
- NSW Biodiversity Values Map – last accessed 15 April 2024
- *NSW Vegetation Information System* (VIS) classification database (OEH, 2024)
- Central West - Lachlan Regional Native Vegetation PCT Map Version 1.0 (OEH, 2015)

2.2 Site Inspection

An inspection of each site was conducted on 10 December 2024 to ascertain the existing condition and confirm the extent and type of vegetation and habitats present. All site observations are qualitative only. Consequently, any advice provided is indicative only and may be subject to change and/ or confirmation by a detailed quantitative survey.

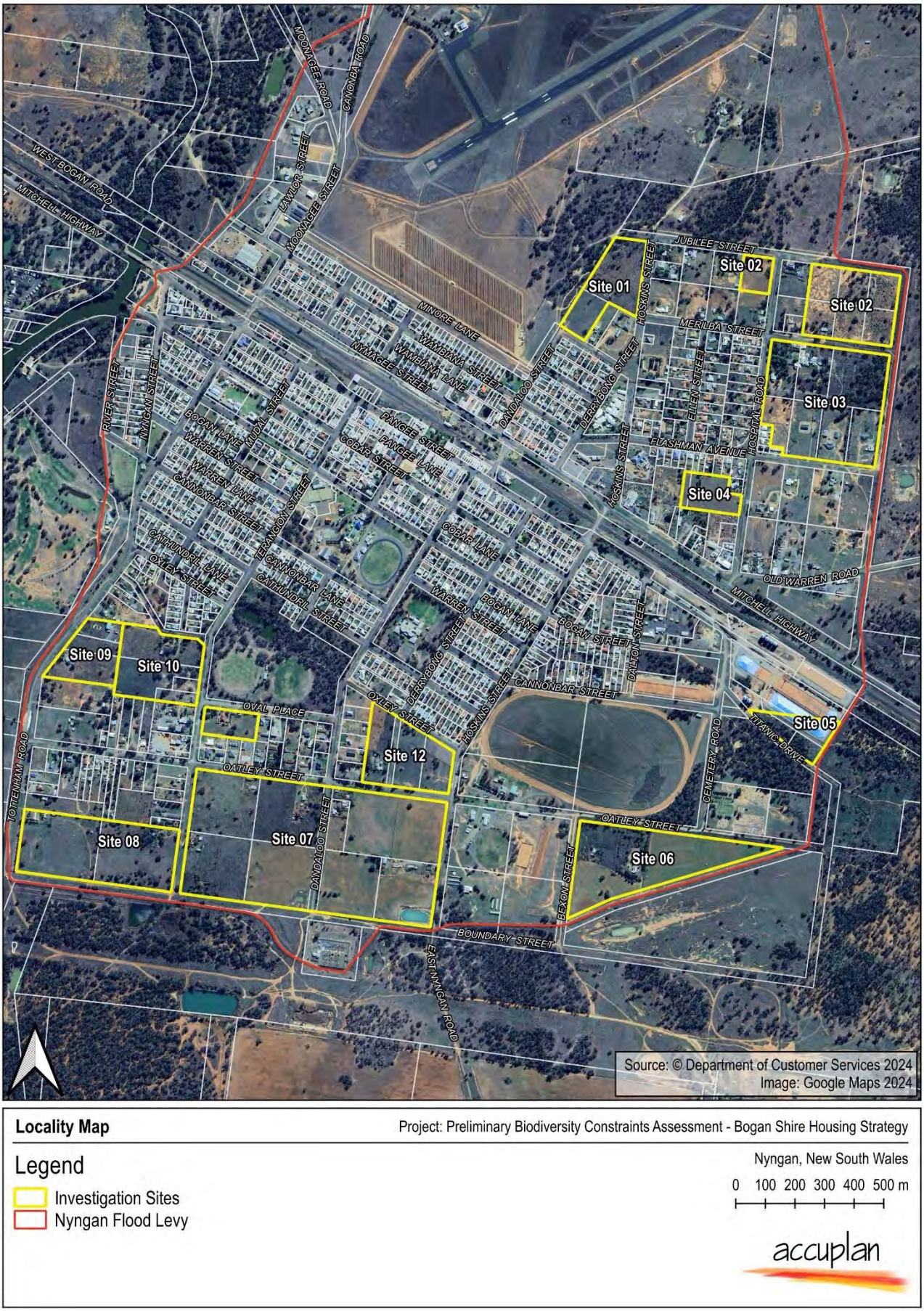

Figure 2.1: Site locality map showing investigation sites

2.3 Biodiversity Constraints Mapping

A biodiversity constraints map is provided for each investigation site in Section 5. The constraints mapping identifies areas of high ecological value and provides a basis to investigate suitable site and layout options that consider opportunities to avoid and minimise impacts to biodiversity. The categories used to identify levels of constraint are described in Table 2.1.

Table 2.1: Description of mapped biodiversity constraint categories

Constraint Category	Description
High	Includes the following areas: • Intact native vegetation. Any remnant native vegetation with most key structural elements present would likely have a relatively high condition score when assessed under the BAM. • Remnant patches / or TEC vegetation with a modified understorey. Previous surveys and site observations suggest that native species diversity and groundcover can be relatively high under the canopy of remnant trees and may result in a relatively high condition score when assessed under the BAM. If the BOS applies, development affecting the above areas will almost certainly result in an offset obligation and would have a relatively high offset requirement.
Moderate	Includes the following areas: • Mostly cleared TEC vegetation. Trees are mostly absent but any regrowth and groundcover may be derived from EEC vegetation. • Partially cleared and / or modified native vegetation (i.e., reduced / absent canopy and predominantly native lower stratum vegetation likely derived from non-TEC vegetation). • Scattered trees isolated by low condition groundcovers. • Unknown vegetation. This includes patches of vegetation that could not be inspected and the composition is unknown. These areas have been mapped as moderate as a precautionary measure. Whilst the above areas are in relatively poor condition, development affecting these areas may contribute to the BOS area clearing threshold and potentially result in an offset obligation should the BOS apply. Impacts to these areas are less likely to have a significant impact on threatened biodiversity and any offset requirement would likely be relatively low.
Low	Previously cleared and regularly managed and / or grazed land. These areas appear to be largely comprised of exotic species and in low condition, and development within these areas is not likely to require offsetting under the BAM. It is noted that this is indicative only. Whilst these areas appeared to be predominantly exotic during the site inspection, the composition and cover of native species is subject to change (e.g., seasonality, weather events, land use change) and would need to be confirmed by detailed surveys.

3. BIODIVERSITY ASSESSMENT REQUIREMENTS

The *Biodiversity Conservation Act 2016* (BC Act), together with the *Biodiversity Conservation Regulation 2017* (BC Regulation), outlines the framework for addressing impacts on biodiversity from development and clearing. It establishes a framework to avoid, minimise and offset impacts on biodiversity from development through the Biodiversity Offsets Scheme (BOS). Thresholds for entry into the scheme are:

1. Whether the impacts occur on an area mapped on the Biodiversity Values Map published by the Minister for the Environment; or
2. Whether the amount of native vegetation being cleared exceeds a threshold area. The threshold areas are based on the minimum lot size associated with the property as shown in Table 3.1. Where there is no minimum lot size, the actual lot size applies; or
3. Whether the proposal would have a significant impact on threatened communities or species – determined by the "5-part test".

Table 3.1: BOS Area clearing thresholds

Lot size or Minimum lot size associated with the property	Threshold for clearing, above which the BAM and offsets scheme apply
Less than 1 ha	0.25 ha or more
1 ha to less than 40 ha	0.5 ha or more
40 ha to less than 1000 ha	1 ha or more
1000 ha or more	2 ha or more

A development proposal that triggers any of the above thresholds would require an assessment to be undertaken by an accredited assessor to apply the Biodiversity Assessment Method (BAM). After applying the BAM, the accredited person would prepare a Biodiversity Development Assessment Report (BDAR) that sets out how the proponent has applied steps to avoid and minimise impacts on biodiversity, and identifies the number and type of ecosystem and species credits required to offset residual impacts of the proposal on biodiversity (credit obligation).

The analysis of each investigation site considers the potential implications of the BC Act including likely assessment pathways, the potential to trigger entry into the BOS and provides comment on the likelihood for residential development over the land to generate a biodiversity offsets obligation.

4. ENVIRONMENTAL CONTEXT

A summary of the local landscape context is provided in Table 4.1.

Table 4.1: Local landscape context summary

Attribute	Description
LGA	Bogan Shire Council
Zoning	The land zoning throughout the study area is shown in Figure 4.1. The investigation sites are zoned *R1 - General Residential* and *R5 - Large Lot Residential.*
Catchment	Bogan River
IBRA Bioregion	Darling Riverine Plains
IBRA Subregion	Bogan - Macquarie
Mitchell Landscape	A single Mitchell Landscape, Boggy Cowal Alluvial Plains (Bcp), is mapped over the entirety of the study area Description: Pleistocene fluvial sediments of backplain facies of the Carrabear Formation associated with the Boggy Cowal distributary stream system. Medium to heavy grey cracking clays with extensive gilgai. Carbonate nodules common in the subsoil and worked to gilgai crests, local relief to 2m. Associated vegetation includes extensive grasslands with scattered stands of myall (*Acacia pendula*), Bimble Box (*Eucalyptus populnea*), Black Box (*E. largiflorens*) and Belah (*Casuarina cristata*) (DECC, 2008).
Rivers and Streams	Mapped rivers streams and drainage lines occurring in the vicinity of the investigation area are shown in Figure 4.2. The only waterway that occurs within any of the investigation sites is a single first order stream occurring in the eastern part of Investigation Site 3.
Wetlands	No mapped wetlands occur within the vicinity of the proposal area.
Areas of Geological Significance and Soil Hazard Features	There are no areas of geological significance (karst, caves, crevices, cliffs, or other features) within the investigation area. Hydrogeological landscape classification mapping identifies the site occurs within Mullengudgery Landscape which has a high risk of localised dryland salinity (Wooldridge et al., 2012).
Existing Vegetation Mapping	An extract of the Central West - Lachlan Regional Native Vegetation PCT Map (OEH, 2015) is provided in Figure 4.3. The mapping provides a broad overview of remnant vegetation in the immediate vicinity of the investigation areas and has been used to inform the likely vegetation communities observed within each investigation site.
Mapped Biodiversity Values	No mapped biodiversity areas occur within any of the investigation sites (see Figure 4.4). The nearest mapped biodiversity areas are located to the west of the Nyngan township and associated with areas identified as 'Biodiverse Riparian Land' mapped along the Bogan River.

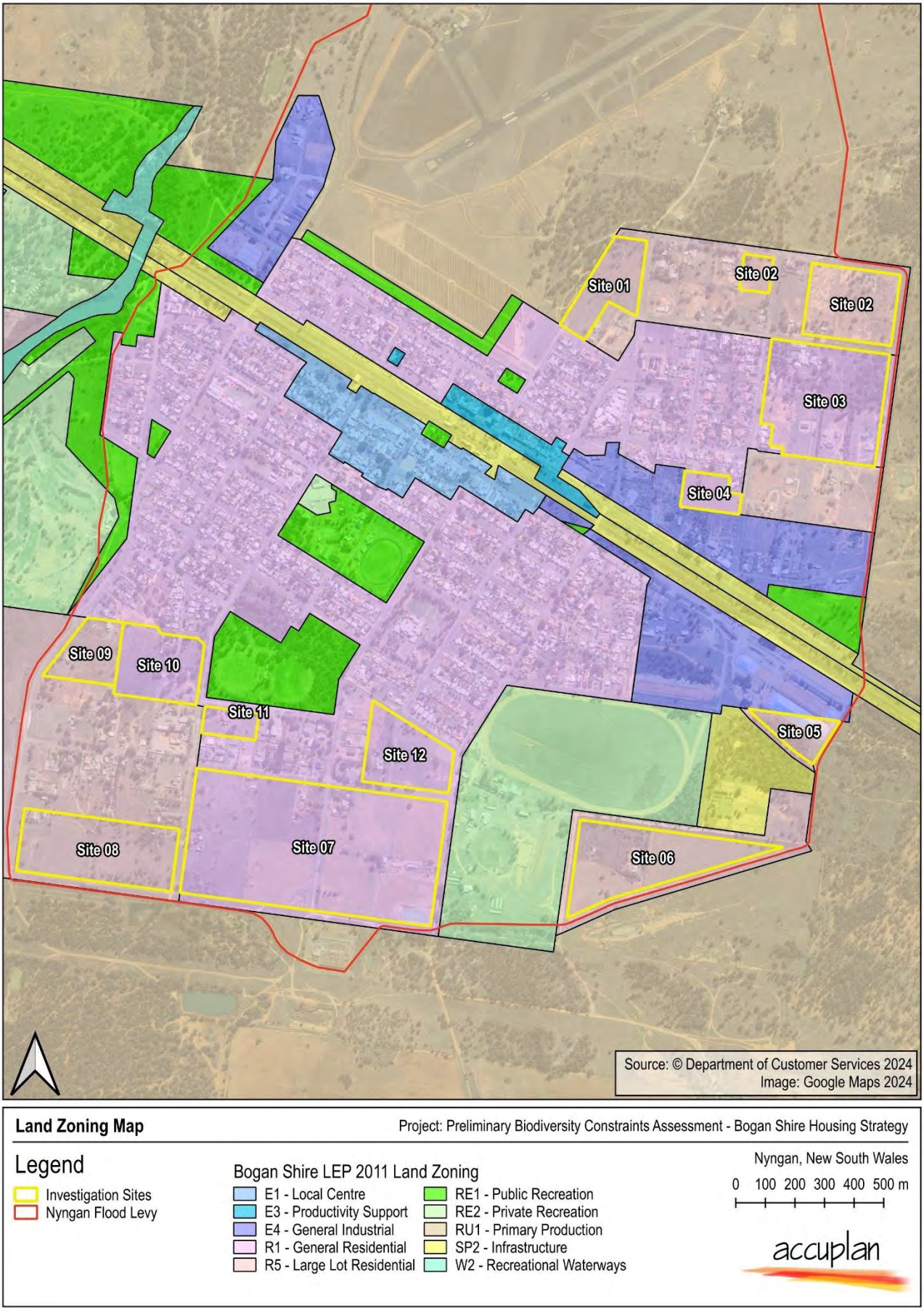

Figure 4.1: Land Zoning – *Bogan Local Environmental Plan 2011*

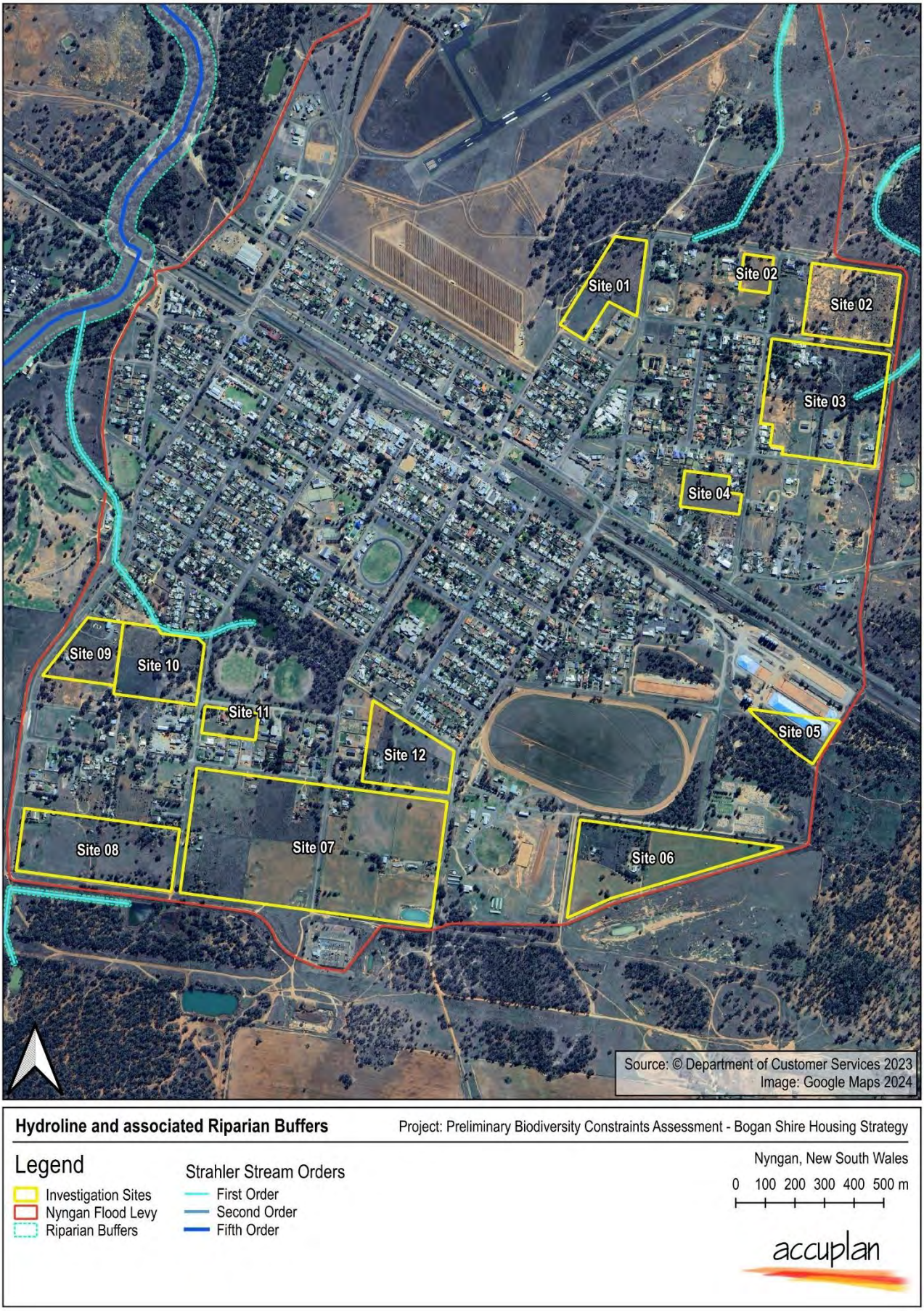

Figure 4.2: Rivers and streams

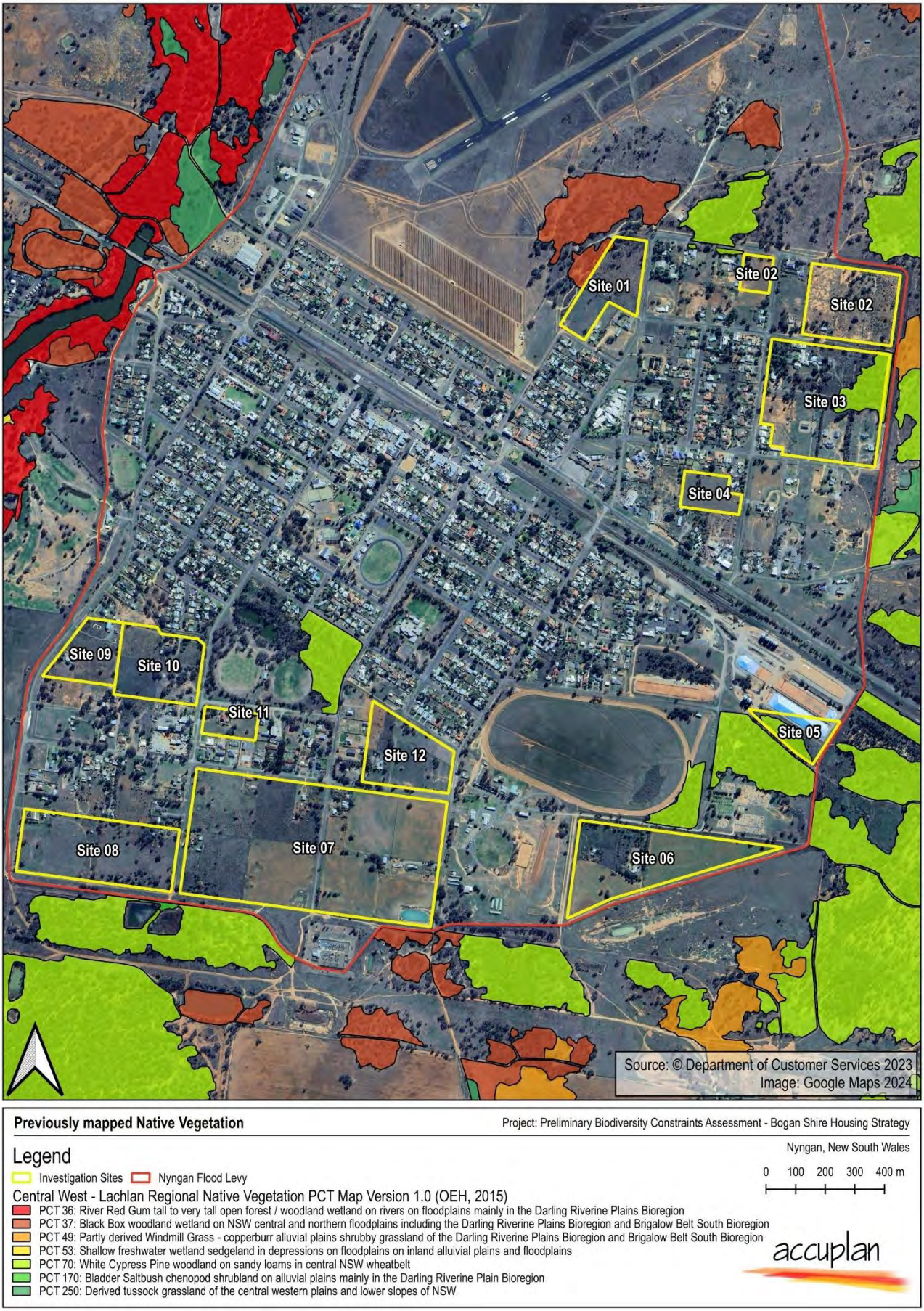

Figure 4.3: Existing vegetation mapping

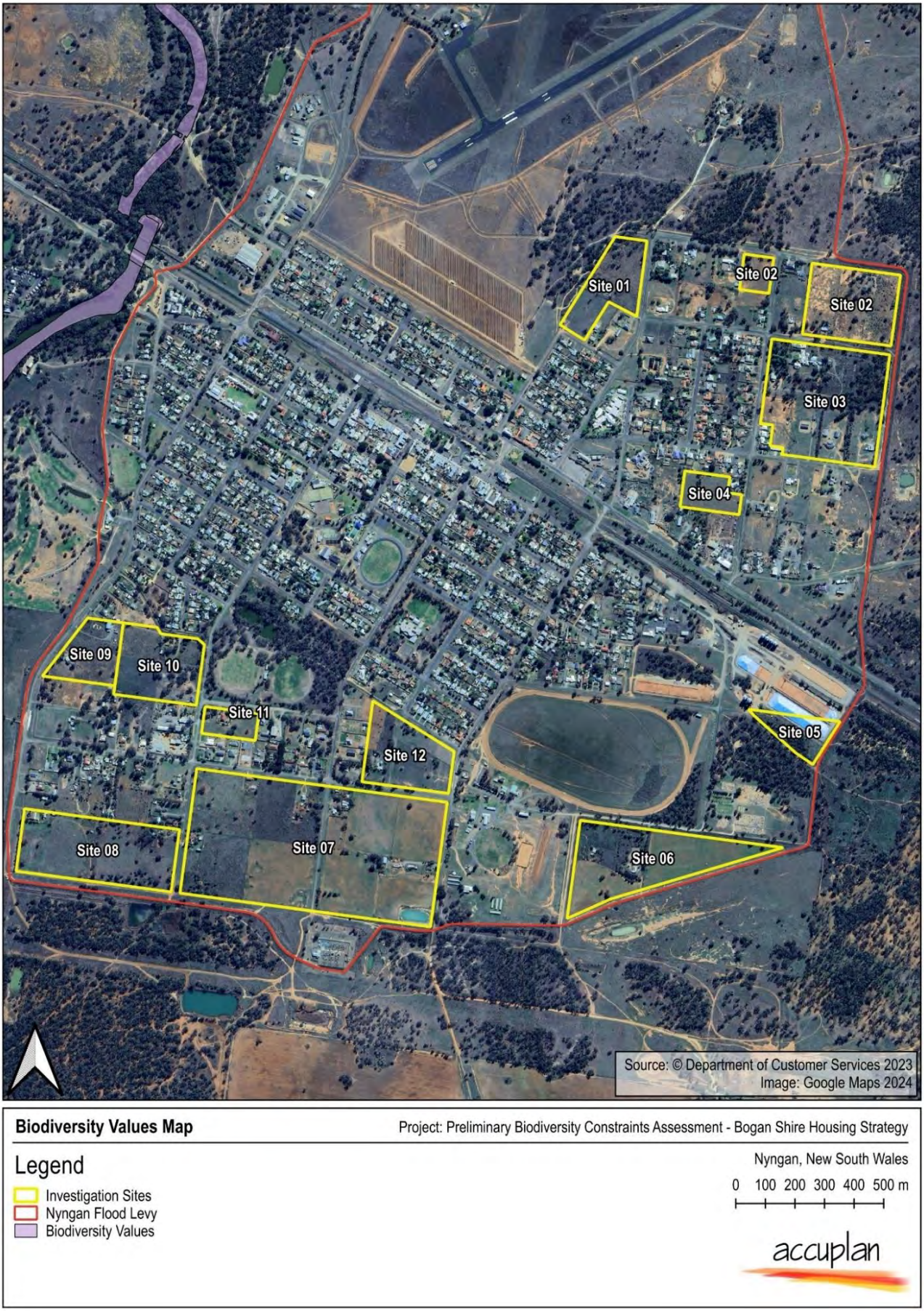

Figure 4.4: Mapped Biodiversity Values

5. SITE ANALYSIS

This section of the report provides an analysis of biodiversity issues affecting each investigation site.

5.1 Investigation Site 1 – Gregory Street

Attribute	Description
Lot No. / Address	Lot 1 - DP1102360 (1.46 ha) Lot 4 - DP1102360 (3.51 ha) Gregory Street, Nyngan
Total Area	4.97 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	The entirety of Lot 1 and the southern part of Lot 4 is comprised of grazed and / or regularly managed groundcovers with some scattered trees. The groundcover appears to be highly modified and is comprised of a mixture of native and exotic groundcovers. Whilst some scattered trees, mostly *Eucalyptus populnea ssp. bimbil* (Poplar Box) occur throughout this area, tree regeneration appears to be suppressed by grazing and regular management. Relatively good condition woodland with a canopy comprised of *Eucalyptus largiflorens* (Black Box) and Poplar Box occurs in the northern part of Lot 4. Tree regeneration was present in this area and a higher cover of native species including shrubs and groundcovers persists within the understorey. This vegetation forms part of a larger patch of woodland vegetation that extends to the west and north of Site 1.
Potential PCTs occurring within site	Native vegetation within the site is most likely derived from *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box. Existing vegetation mapping identifies a relatively large patch of PCT 37 adjoining to the west and north of the site.
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. This community is also associated with TEC *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* listed under the EPBC Act.
Habitat Features	Large trees containing hollows occur sporadically and may provide roosting and/or foraging and/or breeding habitat for a range of birds, mammals, reptiles and frogs. A small dam in the north-western corner provides a freshwater resource and seasonal habitat for a range of frogs, reptiles and birds.
Assessment Pathways	Given the variable composition of groundcovers across the site, the below advice assumes the development of either Lot would exceed the 0.25-hectare BOS clearing threshold and would require a BDAR. Impacts to higher quality vegetation in the northern part of Lot 4 would almost certainly have an offset requirement. Impacts to small patches of trees or areas with tree regeneration also have a high potential to generate an offset obligation (areas mapped as moderate or high constraint). Predominantly cleared areas comprised of grazed or regularly managed groundcovers, and where tree regeneration is absent, have potential to qualify as low condition when assessed under the BAM and development of these areas is unlikely to generate an offset obligation. This includes most, if not all, of Lot 1 and the southern part of Lot 4. A preliminary constraints map for Investigation Site 1 is provided in Figure 5.1.

Photo 5.1: Taken from western boundary of Lot 1 looking NE showing probable low condition grassland and scattered Poplar Box

Photo 5.2: Black Box / Poplar Box woodland occurring in the north-eastern corner of Lot 4

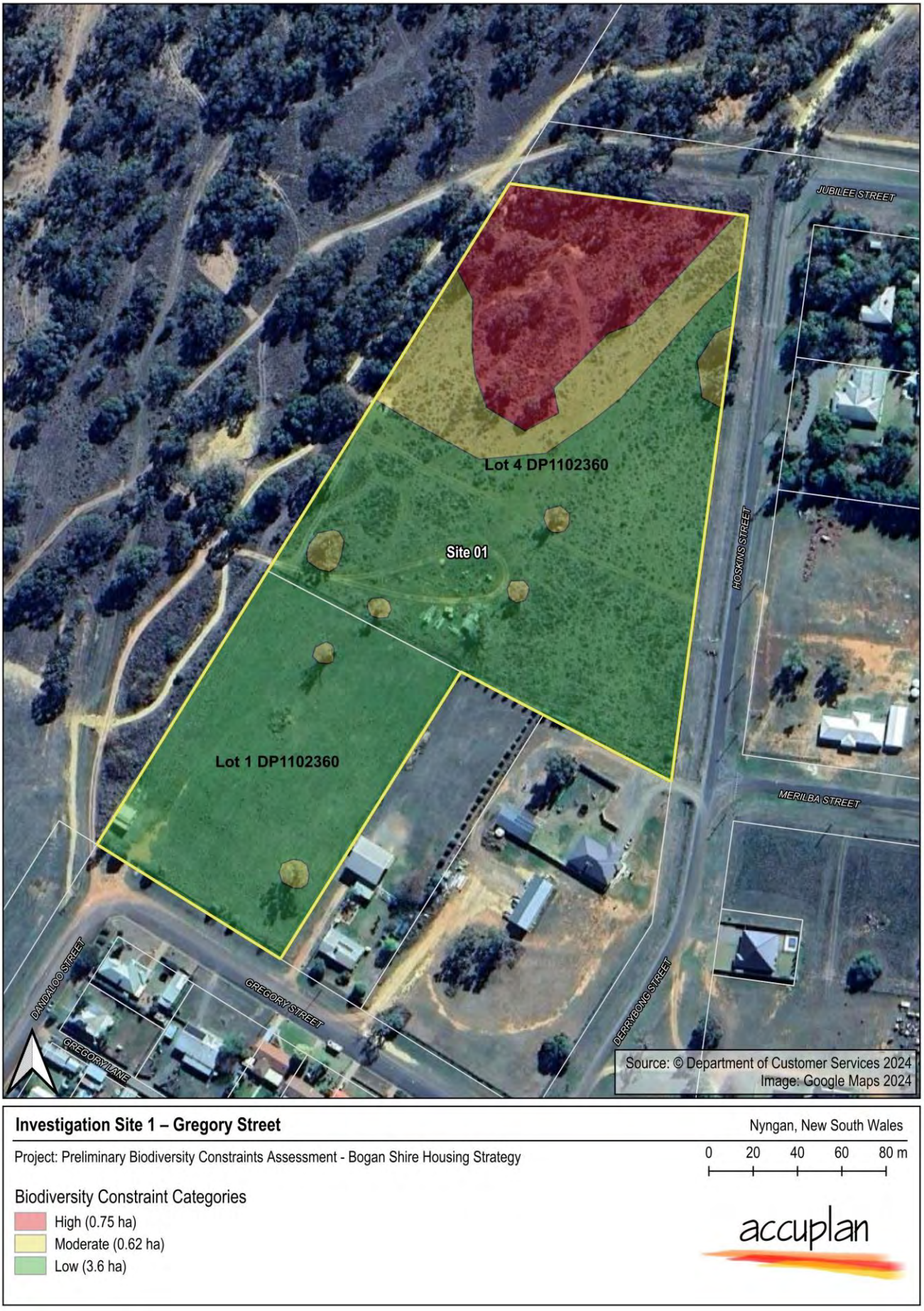

Figure 5.1: Preliminary biodiversity constraints map – Investigation Site 1

5.2 Investigation Site 2 – Jubilee and Merilba Street

Attribute	Description
Address / Associated Lots	Jubilee Street, Nyngan Lot 4 Section 1 – DP758803 (1.22 ha) 58 Merilba Street, Nyngan Lot 2 Section 2 – DP758803 (1.22 ha) Lot 3 Section 2 – DP758803 (1.22 ha) Lot 4 Section 2 – DP758803 (1.22 ha) Lot 6 Section 2 – DP758803 (1.22 ha) Lot 7 Section 2 – DP758803 (1.22 ha) Lot 8 Section 2 – DP758803 (1.22 ha)
Total Area	8.54 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	Lot 4 - Jubilee Street, Nyngan Vegetation occurring in Lot 4 is comprised of grazed and / or regularly managed groundcovers with trees limited to a clump of three mature trees (Poplar Box and Black Box) present in the north-western corner (Photo 5.3) and two mature Poplar Box trees located on the eastern boundary (Photo 5.4). The groundcover throughout most of the site is highly modified and appears to be dominated by exotic species. Predominantly native vegetation appears to be restricted to the base of trees. 58 Merilba Street, Nyngan The vegetation occurring throughout 58 Merilba Street consists of scattered trees and a shrub layer dominated by *Lycium ferocissimum* (African Boxthorn), a high threat weed. The site was heavily grazed by sheep resulting in very low coverage of groundcovers throughout. Scattered trees were largely comprised of Poplar Box with *Callitris glaucophylla* (White Cypress) also present (see Photos 5.5 and 5.6).
Potential PCTs occurring within site	Native vegetation within the site is highly modified with diagnostic features largely limited to canopy species. Based on the presence of diagnostic tree species, the vegetation may be derived from a number of PCTs that occur in the local area, including but not limited to: - *PCT 37 Black Box Woodland on NSW central and northern floodplains* - *PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt* - *PCT 244 - Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)*
Associated TECs	PCT 37 is associated with the EEC Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions listed under the BC Act. Highly modified areas occurring within the investigation area, particularly with remnant Black Box may be representative of a highly disturbed example of this EEC. Vegetation occurring within Investigation Site 2 is not likely to meet the minimum condition thresholds to be protected under any EPBC Act listed TECs (e.g., Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions or Poplar Box Grassy Woodland on Alluvial Plains).
Habitat Features	Trees containing hollows occur sporadically and may provide roosting and/or foraging and/or breeding habitat for a range of birds, reptiles and frogs. A dam in the northern part of 58 Merilba Street provides a freshwater resource and seasonal habitat for a range of frogs, reptiles and birds.
Assessment Pathways	Preliminary investigations suggest there is potential to develop most lots individually without triggering entry into the BOS given the low coverage of native vegetation present (all but Lot 3 Section 2 DP758803). Should future development proposals involve multiple lots, there is potential to exceed the 0.25 ha clearing threshold and a BDAR and offsets may apply. Predominantly cleared areas with no tree cover and limited groundcover, or areas dominated by African Boxthorn, are likely to qualify as low condition when assessed under the BAM and development of these areas is unlikely to generate an offset obligation.

Attribute	Description
	There is potential for vegetation zones comprising clumps of scattered trees with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the poor condition of vegetation present throughout the investigation area. A preliminary constraints map for Investigation Site 2 is provided in Figure 5.2.

Photo 5.3: Clump of mature trees occurring in north-western corner of Lot 4 – Jubilee Street

Photo 5.4: Taken from north-eastern corner of Lot 4 – Jubilee Street looking SSE showing predominantly exotic groundcover and Poplar Box occurring along eastern boundary

Photo 5.5: Taken from south-eastern boundary of 58 Merilba Street looking west showing extensive coverage of African Boxthorn and scattered Bimble Box

Photo 5.6: Taken from northern boundary of 58 Merilba Street looking SE towards dam showing scattered Bimble Box and low condition groundcover

Figure 5.2: Preliminary biodiversity constraints map – Investigation Site 2

5.3 Investigation Site 3 – Hospital Road and Flashman Avenue

Attribute	Description
Address / Associated Lots	2 Hospital Road, Nyngan (former Hospital site) Lot 1 Section 3 – DP758803 (1.92 ha) Lot 2 Section 3 – DP758803 (2.13 ha) Lot 89 – DP755305 (3.65 ha) Flashman Avenue, Nyngan Lot 6 – DP1112770 (1.42 ha) Lot 6 Section 3 – DP758803 (1.92 ha) Lot 7 Section 3 – DP758803 (1.92 ha) Lot 8 Section 3 – DP758803 (1.92 ha)
Total Area	14.9 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	5000m^2 - The actual lot size applies when determining application of the BOS clearing thresholds. All lots are within the 1 ha to less than 40 ha category.
Vegetation Description	2 Hospital Road, Nyngan (former Hospital site) Extensive areas of native vegetation occur throughout the former hospital grounds. Native vegetation covers the entirety of Lot 89 which is largely comprised of remnant Poplar Box woodland and derived chenopod shrubland occurs over previously cleared areas (Photos 5.7 and 5.8). The areas of Poplar Box woodland in the eastern part of the site are in relatively good condition with minimal disturbance. Vegetation surrounding the former hospital includes some small remnant patches and trees, and a mixture of planted native and exotic trees over managed grass (Photos 5.9 and 5.10). Some of the planted native trees form a mosaic with remnant vegetation and would potentially be subject to offsetting when assessed under the BAM. Flashman Avenue, Nyngan Most of the lots along Flashman Avenue have residential dwellings and vegetation across all the lots is highly modified and regularly managed. Remnant native vegetation is limited to a narrow patch of Poplar Box woodland number of remnant scattered trees. Planted rows of native trees also extend along the boundaries of Lot 7 (Photo 5.11).
Potential PCTs occurring within site	Based on the presence of diagnostic species, the native vegetation occurring within Investigation Site 3 may be associated with a number of PCTs that occur in the local area, including but not limited to: - *PCT 70 - White Cypress Pine woodland on sandy loams in central NSW wheatbelt* - *PCT 168 - Derived Copperburr shrubland of the NSW northern inland alluvial floodplains* - *PCT 244 - Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)*
Associated TECs	PCT 244 is associated with the EEC *Poplar Box Grassy Woodland on Alluvial Plains* listed under the EPBC Act. The intact Poplar Box woodland occurring in the eastern part of Lot 89 has potential to meet key diagnostic characteristics and condition thresholds to be protected under the national listing. Whilst no Black Box trees were observed during the site inspection, there is potential for vegetation consistent with the EEC *Coolibah-Black Box Woodland* listed under the BC Act to occur within the investigation area.
Habitat Features	Trees containing hollows occur sporadically throughout the former hospital lands and may provide roosting and/or foraging and/or breeding habitat for a range of birds, reptiles and frogs. A mapped first order stream occurs in the eastern part of Lot 89 and low-lying areas of Poplar Box woodland in this area were inundated during the site inspection. Periodically inundated areas would provide seasonal habitat for a range of frogs, reptiles and birds.

Attribute	Description
Assessment Pathways	Any residential development over the former hospital land (any of the three lots comprising 2 Hospital Road) would almost certainly exceed the 0.5 ha BOS clearing threshold and a BDAR and offsets would apply. Any development within Lot 89 would likely result in a relatively high credit obligation given the extent and condition of vegetation present. The lots along Flashman Avenue have a low coverage of native vegetation and it is possible that residential development over individual lots, or a combination of lots, could be achieved without triggering the BOS. Should future development proposals involve multiple lots, there is potential to exceed the 0.5 ha clearing threshold and a BDAR and offsets may apply. Predominantly cleared areas with no or very limited tree cover would likely qualify as low condition when assessed under the BAM and development of these areas is unlikely to generate an offset obligation. The planted rows of native trees would also likely qualify as planted native vegetation under the BAM and offsets would not likely apply to these areas. There is potential for offsets to apply should the relatively small patch of remnant Poplar Box woodland that extends into the northern part of Lot 7 be impacted by future proposals where the BOS applies. A preliminary constraints map for Investigation Site 3 is provided in Figure 5.3.

Photo 5.7: Partially inundated Poplar Box Woodland present in the eastern part of Lot 89

Photo 5.8: Derived chenopod shrubland occurring to the east of the former hospital buildings

Photo 5.9: Remnant vegetation and mixture of planted native and exotic trees over managed grass surrounding former hospital

Photo 5.10: Mixture of remnant and/or planted native and exotic trees over managed grass in western part of former hospital site

Photo 5.11: Planted vegetation along boundaries of Lot 7 comprised of native and exotic trees

Figure 5.3: Preliminary biodiversity constraints map – Investigation Site 3

5.4 Investigation Site 4 – 37 & 45 Flashman Avenue

Attribute	Description
Lot No. / Address	Part Lot 4151 DP712894 – 37 Flashman Avenue (0.28 ha) Lot 2 DP1073422 – 45 Flashman Avenue (1.92 ha)
Total Area	2.2 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	0.25 ha or 0.5 ha - The actual lot size applies when determining application of the BOS clearing thresholds. The applicable threshold would be dependent on which parcels of land form part of any future development proposal. The 0.25 ha threshold would apply if Part Lot 4151 forms part of any development proposal as the parcel of land is less than 1 ha.
Vegetation Description	The entirety of Investigation Site 4 is comprised of grazed and / or regularly managed groundcovers with a small number of scattered trees. The site was heavily grazed by goats and a native understorey appeared to be largely absent. The scattered trees appeared to be mostly comprised of Poplar Box and / or Black Box although this was not able to be confirmed as access was restricted to roadside observations (Photo 12).
Potential PCTs occurring within site	Appears largely non-native. A small number of scattered trees are likely remnants potentially associated with several PCTs known to occur in the local area.
Associated TECs	Not likely to be associated with any TECs.
Habitat Features	There is potential for remnant trees to contain hollows which may provide roosting and/or foraging and/or breeding habitat for a range of highly-mobile species.
Assessment Pathways	Preliminary investigations suggest that Investigation Site 4 has potential to be developed without triggering entry into the BOS given the low coverage of native vegetation present. The composition of groundcover can be temporally variable. In the event that future development exceeds the clearing threshold (i.e., groundcover has a relatively high cover of native species) and triggers entry into the BOS, it is likely that the vegetation observed within the site would qualify as low condition when assessed under the BAM and development of these areas is unlikely to generate an offset obligation. A preliminary constraints map for Investigation Site 4 is provided in Figure 5.4.

Photo 5.12: Taken from eastern boundary of Lot 2 looking NW showing predominantly exotic groundcovers

Photo 5.13: Scattered trees occurring in the western part of Lot 2

Figure 5.4: Preliminary biodiversity constraints map – Investigation Site 4

5.5 Investigation Site 5 – Titanic Drive

Attribute	Description
Address / Associated Lots	Titanic Drive, Nyngan Lot 115 DP721258 (0.69 ha) Part Lot 102 – DP733171 (0.7 ha) Note: The adjoining GrainCorp site occurring over R5 zoned land was excluded from the investigation area
Total Area	1.4 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	Native vegetation covers most of the investigation area which was largely comprised of White Cypress and Poplar Box woodland and derived grassland occurring over previously cleared areas (Photos 5.14 and 5.15). The woodland areas appear to be in relatively good condition with all strata and trees of multiple age-classes including regrowth present.
Potential PCTs occurring within site	The native vegetation occurring within the investigation area is characterised by a canopy of Poplar Box and White Cypress Pine and appears to be consistent with the existing vegetation mapping which is identified as *PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt.*
Associated TECs	The woodland vegetation within the investigation area (tentatively identified as PCT 70) is not associated with any listed TECs.
Habitat Features	Trees containing hollows occur sporadically throughout the woodland areas and may provide roosting and/or foraging and/or breeding habitat for a range of birds, mammals, reptiles and frogs. Some ponding was observed in low-lying swales during the site inspection. Periodically inundated areas would provide seasonal habitat for a range of frogs, reptiles and birds.
Assessment Pathways	Any residential development over the investigation area would likely exceed the 0.25 ha BOS clearing threshold and a BDAR and offsets would apply. Development within the investigation area would likely result in a relatively high credit obligation given the extent and condition of vegetation present. A preliminary constraints map for Investigation Site 4 is provided in Figure 5.4.

Photo 5.14: Relatively good condition White Cypress and Poplar Box Woodland occurring within the investigation area

Photo 5.15: Derived grassland transitioning to woodland in the western part of Lot 115

Figure 5.5: Preliminary biodiversity constraints map – Investigation Site 5

5.6 Investigation Site 6 – Bexton Street

Attribute	Description
Address / Associated Lots	1 Bexton Street, Nyngan - Lot 1 DP814303
Total Area	10.96 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	The investigation area is largely comprised of non-native cropping land with a small number of isolated Black Box trees (Photo 5.16). An existing dwelling and some small grazing paddocks occur in the north-western part of the site. The vegetation surrounding the existing dwelling includes a mixture of planted native and exotic trees. Much of the vegetation in the north-western corner appeared to have been unmanaged for a period of time and a relatively high cover of native species, mostly grasses and saltbushes, was observed (Photo 5.17 and 5.18). There is potential for some areas, particularly areas with native tree cover and a relatively native understorey, to be subject to offsetting when assessed under the BAM.
Potential PCTs occurring within site	Native vegetation within the site is highly modified with diagnostic features largely limited to scattered trees and derived groundcovers. The vegetation may be derived from a number PCTs that occur in the local area, including but not limited to: - *PCT 37 Black Box Woodland on NSW central and northern floodplains* - *PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt* - *PCT 244 - Poplar Box grassy woodland on alluvial clay-loam soils mainly in the temperate (hot summer) climate zone of central NSW (wheatbelt)*
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. Highly modified areas occurring within the investigation area, particularly with remnant Black Box, may be representative of a highly disturbed example of this EEC. Vegetation occurring within Investigation Site 6 is not likely to meet the minimum condition thresholds to be protected under any EPBC Act listed TECs (e.g., *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* or *Poplar Box Grassy Woodland on Alluvial Plains*).
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows.
Assessment Pathways	Residential development that includes the north-western part of the investigation area would likely exceed the 0.25 ha BOS clearing threshold and a BDAR and offsets may apply. There is potential for the derived vegetation comprising clumps of scattered trees with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the relatively poor condition of vegetation present. The cropping land within the investigation area is largely non-native and has potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. A preliminary constraints map for Investigation Site 6 is provided in Figure 5.6.

Photo 5.16: Example of non-native cropping land occurring within Lot 1 DP814303

Photo 5.17: Vegetation occurring around the existing dwelling comprised of planted native and exotic trees occurring over derived groundcovers with relatively high cover of native species

Photo 5.18: Groundcover occurring in the north-western corner has relatively high cover of native species, mostly grasses and saltbushes

Figure 5.6: Preliminary biodiversity constraints map – Investigation Site 6

5.7 Investigation Site 7 – Land encompassed by Terangion, Oatley and Hoskins Streets

Attribute	Description
Associated Lots	East of Dandaloo Street Lot 11 DP595770 (1.08 ha) — Lot 12 DP595770 (7.19 ha) Lot 3 Section 16 DP758803 (4.14 ha) — Lot 4 Section 16 DP758803 (4.14 ha) West of Dandaloo Street Lot 1 Section 15 DP758803 (4.63 ha) — Lot 2 Section 15 DP758803 (4.63 ha) Lot 3 Section 15 DP758803 (4.63 ha) — Lot 4 Section 15 DP758803 (4.63 ha)
Total Area	35.07 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	5000m² - The actual lot size applies when determining application of the BOS clearing thresholds. All lots are within the 1 ha to less than 40 ha category.
Vegetation Description	East of Dandaloo Street The lots occurring to the east of Dandaloo Street are primarily used for cropping and grazing and are mostly comprised of low condition or predominantly exotic groundcovers. Native vegetation cover is largely limited to scattered trees (mostly Black Box and a small number of planted trees in the south-westernmost lot, a small remnant patch of trees located near the centre of the lots and a horse paddock where selective grazing has resulted in a high cover of saltbushes (see Photos 5.19 to 5.22). West of Dandaloo Street The lots occurring to the west of Dandaloo Street are primarily used for grazing. Grazing pressure appeared to be low at the time of the site inspection resulting in relatively high amounts of groundcover comprised of both native and exotic species (Photo 5.23). Tree cover was limited to scattered trees and a remnant patch present in the south-westernmost lot comprised of Black Box and Poplar Box (Photo 5.24). Areas with native groundcovers may contribute towards the BOS clearing threshold and there is potential for some areas, particularly areas with native tree cover and / or regrowth, to be subject to offsetting when assessed under the BAM.
Potential PCTs occurring within site	Native vegetation within the site is highly modified with diagnostic features largely limited to scattered trees and derived groundcovers with Black Box the most common tree. The vegetation occurring within the investigation may be derived from a number of PCTs that occur in the local area, including but not limited to: - *PCT 37 Black Box Woodland on NSW central and northern floodplains* - *PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt* - *PCT 195 Bladder Saltbush chenopod shrubland on alluvial plains mainly in the Darling Riverine Plain Bioregion*
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. Remnant patches and highly modified areas with trees and/or derived vegetation, particularly with remnant Black Box, may be representative of this EEC.
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows. Dams may provide a freshwater resource and seasonal habitat for a range of frogs, reptiles and birds. A large number of tadpoles (appeared to be *Litoria caerulea*) were recorded in ponding water present in the roadside drainage at the time of the survey.
Assessment Pathways	A large proportion of the investigation area (mapped as Low Biodiversity Constraint Category) is largely non-native and has potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. Development that includes areas with native groundcover (areas mapped moderate or high) would likely contribute to the 0.5 ha BOS clearing threshold. If the BOS threshold is exceeded, a BDAR and offsets may apply. There is potential for the remnant patches and derived vegetation comprising clumps of scattered trees

Attribute	Description
	with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. For the most part, it is likely that credit requirements would be relatively low given the poor condition of vegetation present. A preliminary constraints map for Investigation Site 7 is provided in Figure 5.7

Photo 5.19: Typical vegetation occurring on lots to the east of Dandaloo Street mostly consisting of low condition or predominantly exotic groundcovers with scattered trees (mostly Black Box)

Photo 5.20: Small remnant patch surrounded by low condition / exotic groundcover located near the centre of Lots occurring east of Dandaloo Street

Photo 5.21: Goat paddock with low condition ground cover and a small number of planted native trees (Lot 3 Section 16 DP758803)

Photo 5.22: Horse paddock with relatively high cover of saltbushes and reduced ground cover (Lot 11 DP595770 – 48 Dandaloo Street)

Photo 5.23: Paddock with relatively high native species cover and scattered trees in north-westernmost lot of Investigation Area 7 (Lot 1 Section 15 DP758803 – 55 Oatley Street)

Photo 5.24: Remnant patch of Polar Box and Black Box woodland present in the south-westernmost lot of Investigation Area 7 (Lot 3 Section 15 DP758803 – 118 Terangion Street)

Figure 5.7: Preliminary biodiversity constraints map – Investigation Site 7

5.8 Investigation Site 8 – Tottenham Road and Terangion Street

Attribute	Description
Associated Lots	117 Terangion Street, Nyngan Lot 4 DP304355 (5.63 ha) Tottenham Road, Nyngan Lot 3 Section 14 DP758803 (5.62 ha)
Total Area	11.25 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	Vegetation occurring throughout the investigation area largely consists of grassland with patches of remnant woodland present in the eastern lot (Lot 4). The remnant patches of woodland and isolated trees are largely comprised of *Eucalyptus largiflorens* (Black Box) and *Eucalyptus populnea ssp. bimbil* (Poplar Box). Much of the grassland vegetation throughout the investigation area appeared to have a relatively high cover of native species, mostly grasses and saltbushes (Photo 5.25 to 5.29). Some planted vegetation was present around the existing dwellings, although many of the trees around the dwelling in the eastern lot appeared to be native. The vegetation in the western part of the investigation area (Lot 3) is more disturbed and has potential to be low condition when assessed under the BAM as trees and tree regeneration is generally absent. Most of the area has been mapped as moderate constraint as the high amount of native groundcover would likely contribute to BOS thresholds.
Potential PCTs occurring within site	The remnant woodland is most likely derived from *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box. Native vegetation throughout the remainder of the site is highly modified with diagnostic features largely limited to scattered trees and derived groundcovers.
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. Highly modified areas occurring within the investigation area, particularly with remnant Black Box, may be representative of a highly disturbed example of this EEC.
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows.
Assessment Pathways	Development over land that includes areas with native groundcover (areas mapped moderate or high constraint) would likely contribute to the 0.25 ha BOS clearing threshold and a BDAR and offsets may apply if the BOS threshold is exceeded. The remnant patches in the eastern part of the investigation area (areas mapped as high) appeared to be in relatively good condition and development impacting these areas would likely result in a relatively high credit obligation (estimate ranging between 25 to 40 credits per hectare) given the extent and condition of vegetation present. There is also potential for any derived vegetation (potentially occurring within the area mapped as moderate constraint) to generate an offset obligation when assessed under the BAM. It is likely that any credit obligation for development affecting these areas would be relatively low, if any, given the absence of trees and or/ tree regrowth. A preliminary constraints map for Investigation Site 8 is provided in Figure 5.8.

Photo 5.25: Example of relatively high condition remnant Black Box woodland and derived groundcovers occurring in Lot 4 DP304355

Photo 5.26: Remnant Black Box woodland surrounding existing dwelling in Lot 4 DP304355

Photo 5.27: Mostly cleared paddock with scattered trees and derived groundcover in Lot 3/16/DP758803

Photo 5.28: Mostly cleared paddock with scattered trees and derived groundcover in Lot 3/16/DP758803

Figure 5.8: Preliminary biodiversity constraints map – Investigation Site 8

5.9 Investigation Site 9 – 28 and 30 Tottenham Road

Attribute	Description
Associated Lots	28 Tottenham Road, Nyngan Lot 1 DP34584 (0.88 ha) Lot 1 DP34585 (0.88 ha) 30 Tottenham Road, Nyngan Lot 5 Section 13 DP758803 (2.2 ha)
Total Area	3.96 ha
Zoning	R5 Large Lot Residential
Minimum Lot Size	4000m^2
BOS Clearing Threshold	2500m^2
Vegetation Description	Investigation Site 9 is mostly comprised of grazed and / or regularly managed grassland. For the most part, the grassland areas appear to be highly modified and largely comprised of exotic groundcovers, although some areas in the south- and north-western corners appeared to have a higher proportion of native cover (Photo 5.29). Native tree cover was limited to scattered trees and a small patch of *Eucalyptus largiflorens* (Black Box) located in the south-western corner (Photo 5.30). The vegetation surrounding the existing dwelling includes a mixture of planted native and exotic trees and shrubs (Photo 5.31). Areas with native trees and/or groundcovers may contribute towards the BOS clearing threshold.
Potential PCTs occurring within site	Native vegetation within the site is highly modified with diagnostic features largely limited to scattered trees and derived groundcovers. The native vegetation within the site is most likely derived from *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box.
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. Highly modified areas occurring within the investigation area, particularly with remnant Black Box, may be representative of a highly disturbed example of this EEC. Vegetation occurring within Investigation Site 9 is not likely to meet the minimum condition thresholds to be protected under any EPBC Act listed TECs (e.g., *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* or *Poplar Box Grassy Woodland on Alluvial Plains*).
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows.
Assessment Pathways	Most of the investigation area (mapped as Low Biodiversity Constraint Category) appears to be non-native and has potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. Development that includes areas with native groundcover (areas mapped moderate or high) has potential to contribute to the 0.25 ha BOS clearing threshold. If the BOS threshold is exceeded, a BDAR and offsets may apply. There is potential for development that impacts the remnant patch and derived vegetation to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the small area and poor condition of vegetation present. A preliminary constraints map for Investigation Site 9 is provided in Figure 5.9.

Photo 5.29: Example of low condition and/or predominantly exotic groundcovers throughout Investigation Area 9

Photo 5.30: Small patch of Black Box in south-western corner of Investigation Area 9

Photo 5.31: Planted vegetation surrounding existing dwelling (30 Tottenham Road)

Figure 5.9: Preliminary biodiversity constraints map – Investigation Site 9

5.10 Investigation Site 10 – Terangion Street

Attribute	Description
Associated Lots	Lot 163 DP593183 – Terangion Street (2.88 ha) Lot 92 DP1293018 – 71 Terangion Street (2.66 ha) Lot 91 DP1293018 – 73 Terangion Street (0.4 ha) Lot 90 DP1293018 – 75 Terangion Street (0.59 ha)
Total Area	6.53 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	0.25 ha or 0.5 ha - The actual lot size applies when determining application of the BOS clearing thresholds. The applicable threshold would be dependent on which parcels of land form part of any future development proposal. The 0.25 ha threshold would apply if Lots 90 or 91 form part of any development proposal as both parcels of land are less than 1 ha.
Vegetation Description	Investigation Area 10 is largely comprised of grassland used for grazing and managed land associated with the existing dwellings. The condition of groundcover was variable with areas of largely exotic groundcovers observed in the eastern part of Lot 163 and areas that appeared to have a higher native cover, potentially due to reduced grazing pressure at the time of the site inspection (Photo 5.32 and Photo 5.34). A patch of relatively good condition remnant woodland occurs in the eastern part of Lot 92 with most of the trees comprised of *Eucalyptus largiflorens* (Black Box) (Photo 5.33).
Potential PCTs occurring within site	The remnant woodland is most likely derived from *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box. Native vegetation throughout the remainder of the site is highly modified with diagnostic features largely limited to scattered trees and derived groundcovers.
Associated TECs	PCT 37 is associated with the EEC Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions listed under the BC Act. The remnant woodland and highly modified areas occurring within the investigation area, particularly with remnant Black Box, may be representative of this EEC. Vegetation occurring within Investigation Site 10 is not likely to meet the minimum condition thresholds to be protected under any EPBC Act listed TECs (e.g., *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* or *Poplar Box Grassy Woodland on Alluvial Plains*).
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows.
Assessment Pathways	A development proposal that includes areas with native groundcover has potential to contribute to the BOS clearing threshold. Much of the paddock areas have been mapped as a moderate constraint as the composition of groundcover could not be confirmed during the site inspection and native cover appeared to be relatively high. If the BOS threshold is exceeded, a BDAR and offsets may apply. Development that impacts the remnant patch in the eastern part of Lot 92 (mapped as high constraint) has potential to result in a relatively high credit obligation (estimate ranging between 10 to 20 credits for 0.6 hectares) given the condition and size of the patch. Whilst there is potential for any derived vegetation (potentially occurring within the area mapped as moderate constraint) to generate an offset obligation when assessed under the BAM, it is likely that credit requirements would be relatively low, if any, given the poor condition of vegetation present and apparent absence of tree regrowth. A preliminary constraints map for Investigation Site 10 is provided in Figure 5.10.

Photo 5.32: Example of low condition and/or predominantly exotic groundcovers in eastern part of Lot 163

Photo 5.33: Patch of Black Box woodland in the eastern part of Lot 92

Photo 5.34: Paddock (on opposite side of drainage line) with potentially high cover of native species in western part of Lot 163 and Lot 92

Figure 5.10: Preliminary biodiversity constraints map – Investigation Site 10

5.11 Investigation Site 11 – 1-31 Oval Place

Attribute	Description
Associated Lots	Lot 7 DP1269782– 1 -31 Oval Place
Total Area	1.67 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	0.5 ha - The actual lot size of 1.67 ha applies when determining application of the BOS clearing thresholds.
Vegetation Description	The vegetation within Site 11 is highly modified with native vegetation limited to a strip of mature *Eucalyptus largiflorens* (Black Box) surrounding the dam in the north-western corner of the site (Photo 5.35) and a small number of scattered Black Box surrounded by managed / low condition grassland (Photo 5.36). The groundcover is highly modified and appears to be dominated by exotic species.
Potential PCTs occurring within site	The remnant woodland is most likely derived from *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box. Native vegetation throughout the remainder of the site is highly modified and not consistent with any described PCTs.
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. The remnant trees occurring within the investigation area may be representative of this EEC. Vegetation occurring within Investigation Site 11 is not likely to meet the minimum condition thresholds to be protected under any EPBC Act listed TECs (e.g., *Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions* or *Poplar Box Grassy Woodland on Alluvial Plains*).
Habitat Features	No significant habitat features were observed although there is potential for remnant trees to contain hollows. A dam in the north-western corner of the site provides a freshwater resource and seasonal habitat for a range of frogs, reptiles and birds.
Assessment Pathways	Preliminary investigations suggest that the native vegetation coverage within Investigation Site 11 is well below the 0.5 ha BOS clearing threshold and future residential development over the land is likely to be achieved without triggering entry into the BOS. A preliminary constraints map for Investigation Site 11 is provided in Figure 5.11.

Photo 5.35: Mature Black Box trees surrounding existing dam in north-western corner of Lot

Photo 5.36: Isolated Black Box trees surrounded by managed / low condition grassland

Figure 5.11: Preliminary biodiversity constraints map – Investigation Site 11

5.12 Investigation Site 12 – Oatley and Oxley Street

Attribute	Description
Address / Associated Lots	Lot 3 Section 11 DP758803 – 84 Oatley Street (2.13 ha) Lot 4 Section 11 DP758803 – Oxley Street (1.92 ha) Lot 5 Section 11 DP758803 – Oxley Street (1.67 ha) Road Reserve (Derybong Street) (0.47 ha)
Total Area	6.19 ha
Zoning	R1 General Residential
Minimum Lot Size	No minimum lot size applies.
BOS Clearing Threshold	5000m^2 - The actual lot size applies when determining application of the BOS clearing thresholds. All lots are within the 1 ha to less than 40 ha category.
Vegetation Description	Lots 4 & 5 and the road reserve were the subject of a BDAR (Accuplan, 2024) addressing impacts for a proposed residential subdivision over the land. The vegetation is largely comprised of modified grazing land and small discontinuous patches of remnant vegetation. The canopy of the remnant vegetation within the site is mostly comprised of *Eucalyptus largiflorens* (Black Box). The BDAR identified two separate vegetation zones: • Zone 1: PCT 37 (Moderate) – This zone comprised the small remnant patches of Black Box woodland present within the site. The limits of this zone were determined by the canopy extent of remnant trees. Whilst the understorey was similarly affected by grazing and/or regular maintenance as the surrounding grassland, a higher number of native species persisted within the understorey relative to the surrounding pasture (Zone 2). • Zone 2: PCT 37 (Low Condition) – This zone covered the predominantly cleared areas comprised of grazed or regularly managed groundcovers. Trees and tree regeneration was generally absent, although some isolated shrubs occurred throughout the zone. Similar vegetation occurs on the adjoining land to the west (84 Oatley Street) which is largely comprised of derived grassland and small discontinuous patches of remnant vegetation. Most of the remnant trees occur near the existing dwelling in the south of the site.
Potential PCTs occurring within site	The BDAR identified the areas of remnant and derived vegetation as *PCT 37 Black Box Woodland on NSW central and northern floodplains* which is characterised by a canopy dominated by Black Box, often with Poplar Box. The vegetation occurring in the western part of the investigation area is also likely to be associated with this PCT.
Associated TECs	PCT 37 is associated with the EEC *Coolibah-Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* listed under the BC Act. PCT 37 is also associated with the EEC Coolibah-Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions listed under the EPBC Act. When assessed against the key diagnostic and condition threshold criteria outlined in the Conservation Advice (Threatened Species Scientific Committee (TSSC), 2011), the vegetation within the site is not likely to meet the minimum thresholds to be protected under the EPBC Act.
Habitat Features	Trees containing hollows occur sporadically throughout the site and may provide roosting and/or foraging and/or breeding habitat for a range of birds, reptiles and frogs. The BDAR recorded a single threatened species, *Pomatostomus temporalis temporalis* (Grey-crowned Babbler), within the investigation area. A family group of at least five (5) birds was observed foraging at the base of trees and shrubs near the western boundary. No nests indicative of breeding were recorded within the site and none were observed within the adjoining land.
Assessment Pathways	The residential subdivision proposal over Lots 4 & 5 was subject to a BDAR as native vegetation cover (including the grassland areas) exceeded the BOS clearing threshold (0.5 ha). When assessed using the BAM, Vegetation Zone 1 (Photo 5.37) returned a relatively high Vegetation Integrity Score (VIS) of 62.6

Attribute	Description
	and impacts to 0.33 ha resulted in a credit obligation of 10 ecosystem credits. The largely cleared grassland areas (Zone 2 - Photo 5.38) were in "low condition" when assessed under the BAM and were therefore not subject to offsetting. The derived groundcover within Lot 3 also had a relatively high cover of native species which may contribute to the BOS clearing threshold if subject to a future residential subdivision proposal. These largely cleared areas are in a similar condition to the adjoining areas assessed as low condition in Lots 4 and 5 and have therefore been mapped as low constraint with a low potential to generate an offset obligation. The isolated patches of woodland vegetation present within Lot 3 would likely generate a similar offset requirement to the remnant woodland recorded in Lots 4 and 5 should the BOS apply. A preliminary constraints map for Investigation Site 3 is provided in Figure 5.3.

Photo 5.37: Example of remnant woodland in moderate to good condition which was subject to offsetting when assessed under the BAM

Photo 5.38: Example of derived grassland which was assessed as low condition when assessed under the BAM

Photo 5.39: Remnant woodland and groundcover with potentially high cover of native species in Lot 3

Investigation Site 12 – Oatley and Oxley Street

Nyngan, New South Wales

Project: Preliminary Biodiversity Constraints Assessment - Bogan Shire Housing Strategy

0 20 40 60 m

Biodiversity Constraint Categories

- High (0.48 ha)
- Moderate (0.14 ha)
- Low (5.62 ha)

accuplan

Figure 5.12: Preliminary biodiversity constraints map – Investigation Site 12

6. SUMMARY

A summary of the identified biodiversity constraint areas and considerations of the future development and offset potential for each investigation site is provided Table 6.1.

Table 6.1: Summary of biodiversity constraint areas and offset potential considerations

Site #	Biodiversity Constraint Areas			Development and offset potential summary
	Low	Moderate	High	
1	3.6 ha	0.62 ha	0.75 ha	There is a high likelihood that residential development over the entirety of Lot 1 and the southern part of Lot 4 could be achieved without requiring offsets given the low condition of vegetation present. Impacts to native vegetation identified in the northern part of the investigation area has potential to result in a relatively high offset requirement.
2	7.99 ha	0.51 ha	--	Preliminary investigations suggest there is potential to develop most lots individually without triggering entry into the BOS given the low coverage of native vegetation present (all but Lot 3 Section 2 DP758803). Should future development proposals involve multiple lots, there is potential to exceed the 0.25 ha clearing threshold and a BDAR and offsets may apply. Predominantly cleared areas with no tree cover and limited groundcover, or areas dominated by African Boxthorn, are likely to qualify as low condition when assessed under the BAM and development of these areas is unlikely to generate an offset obligation. There is potential for vegetation zones comprising clumps of scattered trees with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the poor condition of vegetation present throughout the investigation area.
3	9.29 ha	3.43 ha	2.18 ha	Any residential development over the former hospital land (any of the three lots comprising 2 Hospital Road) would almost certainly exceed the 0.5 ha BOS clearing threshold and a BDAR and offsets would apply. Any development within Lot 89 would likely result in a relatively high credit obligation given the extent and condition of vegetation present. The existing residential lots along Flashman Avenue have a low coverage of native vegetation and it is possible that residential development over individual lots, or a combination of lots, could be achieved without triggering the BOS. Should future development proposals involve multiple lots, there is potential to exceed the 0.5 ha clearing threshold and a BDAR and offsets may apply.
4	2.15 ha	0.05 ha	--	Preliminary investigations suggest that the land has potential to be developed without triggering entry into the BOS given the low coverage of native vegetation present. In the event that future development does exceed the clearing threshold (i.e., groundcover has a relatively high cover of native species) and triggers entry into the BOS, it is likely that the vegetation observed within the site would qualify as low condition when assessed under the BAM and development of these areas has a low potential to generate an offset obligation.

Site #	Biodiversity Constraint Areas			Development and offset potential summary
	Low	Moderate	High	
5	0.28 ha	--	1.16 ha	Any residential development over the land would likely exceed the 0.25 ha BOS clearing threshold and a BDAR and offsets would apply. Development would likely result in a relatively high credit obligation given the extent and condition of vegetation present.
6	7.06 ha	3.91 ha	--	The cropping land within the investigation area is largely non-native and has potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. Residential development that includes the north-western part of the investigation area would likely exceed the 0.25 ha BOS clearing threshold and a BDAR and offsets may apply. There is potential for the derived vegetation comprising clumps of scattered trees with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the relatively poor condition of vegetation present.
7	21.06 ha	12.79 ha	0.68 ha	The identified low constraint areas are largely non-native and have potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. Development that includes areas identified as moderate and high constraint areas would likely contribute to the 0.5 ha BOS clearing threshold. If the BOS threshold is exceeded, a BDAR and offsets may apply. There is potential for the remnant patches and derived vegetation comprising clumps of scattered trees with some native understorey and / or tree regeneration to generate an offset obligation when assessed under the BAM. For the most part, it is likely that credit requirements would be relatively low given the poor condition of vegetation present.
8	1.37 ha	8.52 ha	1.36 ha	Development that includes areas the identified moderate and high constraint areas would likely contribute to the 0.25 ha BOS clearing threshold and a BDAR and offsets may apply. The identified high constraint areas in the eastern part of the investigation area appeared to be in relatively good condition and development impacting these areas would likely result in a relatively high credit obligation (estimate ranging between 25 to 40 credits per hectare) given the extent and condition of vegetation present. There is also potential for any derived vegetation (potentially occurring within the area mapped as moderate constraint) to generate an offset obligation when assessed under the BAM. It is likely that any credit obligation for development affecting these areas would be relatively low, if any, given the absence of trees and or/ tree regrowth.
9	3.55 ha	0.32 ha	0.09 ha	The identified low constraint areas are largely non-native and have potential to be developed either separately without triggering entry into the BOS or, if the BOS does apply, development of these areas is unlikely to generate an offset obligation. Development that includes areas identified as moderate and high constraint areas would likely contribute to the 0.25 ha BOS clearing threshold. If the BOS threshold is exceeded, a BDAR and offsets may apply. There is potential for development that impacts the remnant patch and derived vegetation to generate an offset obligation when assessed under the BAM. It is likely that credit requirements would be relatively low given the small area and poor condition of vegetation present.

Site #	Biodiversity Constraint Areas			Development and offset potential summary
	Low	Moderate	High	
10	1.65 ha	4.29 ha	0.59 ha	A development proposal that includes areas with native groundcover has potential to contribute to the BOS clearing threshold. Much of the paddock areas have been mapped as a moderate constraint as the composition of groundcover could not be confirmed during the site inspection and native cover appeared to be relatively high. If the BOS threshold is exceeded, a BDAR and offsets may apply. Development that impacts the high constraint areas in the eastern part of Lot 92 has potential to result in a relatively high credit obligation (estimate ranging between 10 to 20 credits for 0.6 hectares) given the condition and size of the patch. Whilst there is potential for any derived vegetation (potentially occurring within the area mapped as moderate constraint) to generate an offset obligation when assessed under the BAM, it is likely that credit requirements would be relatively low, if any, given the poor condition of vegetation present and apparent absence of tree regrowth.
11	1.46 ha	0.22 ha	--	Preliminary investigations suggest that the native vegetation coverage is well below the 0.5 ha BOS clearing threshold and future residential development over the land could be achieved without triggering entry into the BOS.
12	5.62 ha	0.14 ha	0.48 ha	The BDAR undertaken for the residential subdivision proposal over Lots 4 & 5 resulted in an offset obligation of 10 ecosystem credits for impacts to 0.33 ha of remnant Black Box woodland. The grassland areas with no tree cover were in “low condition” when assessed under the BAM and were therefore not subject to offsetting. The derived groundcover within Lot 3 had a relatively high cover of native species which may contribute to the BOS clearing threshold if subject to a future residential subdivision proposal. These largely cleared areas are in a similar condition to the adjoining areas assessed as low condition in Lots 4 and 5 and have a a low potential to generate an offset obligation. The isolated patches of woodland vegetation present within Lot 3 would likely generate a similar offset requirement to the remnant woodland recorded in Lots 4 and 5 should the BOS apply.

7. REFERENCES

Accuplan (2024), Biodiversity Development Assessment Report - Proposed residential subdivision over Lots 4 and 5 DP 758803, Oxley Street, Nyngan

Department of Planning, Industry and Environment (DPIE) (2020a), *Biodiversity Assessment Method*, Office of Environment and Heritage for the NSW Government, Sydney

DPIE (2020b), *Biodiversity Assessment Method Operation Manual – Stage 1*, Office of Environment and Heritage for the NSW Government, Sydney

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Wooldridge, A., Nicholson, A., Muller, R., Cook, W., Winkler, M., Jenkins, B., Grant, S., Agar, B and Brennan, N. (2012*), Hydrogeological Landscapes for the Western Central West Catchment – Final Report*, NSW Office of Environment and Heritage, Department of Premier and Cabinet, Wagga Wagga.