Assessment of Environmental Constraints

North Wagga Flood Mitigation Options

February 2023

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Revision	Date	Prepared by	Reviewed by	Approved by
Draft v1.0	24/02/2023	Amanda Conley	Martin Kim Gillian Young (Biodiversity Chapter)	Michial Sutherland Jared Graham-Higgs (Biodiversity Chapter)
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	[Enter the date]			

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NSW • ACT • QLD • VIC
ABN 31 124 444 622 ACN 124 444 622
W. www.nghconsulting.com.au
E. ngh@nghconsulting.com.au

BEGA - ACT & SOUTH EAST NSW
Suite 11, 89-91 Auckland Street
(PO Box 470) Bega NSW 2550
T. (02) 6492 8333

BRISBANE
T3, Level 7, 348 Edward Street
Brisbane QLD 4000
T. (07) 3129 7633

CANBERRA - NSW SE & ACT
Unit 8, 27 Yallourn Street
(PO Box 62) Fyshwick ACT 2609
T. (02) 6280 5053

GOLD COAST
2B 34 Tallebudgera Creek Road
Burleigh Heads QLD 4220
(PO Box 424 West Burleigh QLD 4219)
T. (07) 3129 7633

MELBOURNE
Level 14, 10-16 Queen Street
Melbourne VIC 3000

NEWCASTLE: HUNTER & NORTH COAST
Level 1, 31-33 Beaumont Street
Hamilton NSW 2303
T. (02) 4929 2301

SUNSHINE COAST
Suite 101, Level 2/30 Main Drive
Birtinya QLD 4575
T. 13 54 93

SYDNEY REGION
Unit 17, 21 Mary Street
Surry Hills NSW 2010
T. (02) 8202 8333

TOWNSVILLE
Level 4, 67-75 Denham Street
Townsville QLD 4810
T. (07) 4410 9000

WAGGA WAGGA: RIVERINA & WESTERN NSW
35 Kincaid Street (PO Box 5464)
Wagga Wagga NSW 2650
T. (02) 6971 9696

WODONGA
Unit 2, 83 Hume Street
(PO Box 506) Wodonga VIC 3690
T. (02) 6067 2533

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Acronyms and abbreviations

ACH Act	*Aboriginal Cultural Heritage Act 2003*
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ASL	Above sea level
BC Act	*Biodiversity Conservation Act 2016* (NSW)
Biosecurity Act	*Biosecurity Act 2015* (NSW)
CMA	Catchment management area
CWD	Coarse woody debris
Cth	Commonwealth
DAWE	Department of Agriculture, Water and the Environment (Cth) (formerly DoEE)
DCCEEW	Department of Climate Change, Energy, the Environment and Water (formerly DAWE)
DELWP	Department of Environment, Land, Water and Planning
DPE	Department of Planning and Environment (NSW)
DPIE	(Former) Department of Planning, Industry and Environment (NSW) (now DPE)
DSE	Department of Sustainability and Environment
E	Endangered
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIA	Environmental impact assessment
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ESD	Ecologically Sustainable Development
EVC	Ecological vegetation class
FM Act	*Fisheries Management Act 1994* (NSW)

GDA	Geographic Datum of Australia
GIS	Geographic information system
GPS	Geographical positioning system
ha	hectares
Heritage Act	*Heritage Act 1977* (NSW)
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021 (NSW)
KFH	Key Fish Habitat
km	kilometres
LALC	Local Aboriginal Land Council
LEP	Local Environment Plan
LGA	Local government area
m	metres
MNES	Matters of national environmental significance
NES	Matters of National Environmental Significance under the EPBC Act (*c.f.*)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NV Act	*Native Vegetation Act 2003* (NSW)
NVR	Native vegetation risk
OEH	(Former) Office of Environment and Heritage (NSW) (now EES)
P&E Act	*Planning and Environment Act 1987*
PMST	Protected matters search tool
Sp/spp	Species/multiple species
TEC	Threatened ecological community
The guidelines	Guidelines for the removal, destruction or lopping of native vegetation
V	Vulnerable

1. Introduction

Wagga Wagga City Council (WWCC) completed a review of the Murrumbidgee River Floodplain Risk Management Study and Plan (2018) focusing on the areas of Wagga Wagga impacted by riverine flooding. The majority of recent flood damage in urban parts of Wagga Wagga occur in the suburb of North Wagga and surrounds.

This Assessment of Environmental Constraints (AEC) is a snapshot of possible environmental constraints at the sites for proposed flood management works. The AEC highlights areas of high constraint for consideration during design. This information may inform any future Environmental Impact Assessment (EIA) and the location and design of proposed flood management works.

The following constraint levels are described below:

High Constraint: Avoid where feasible and specialist assessment at the EIA stage required.

Moderate Constraint: Avoid where possible and further assessment at EIA stage required to determine mitigations and safeguards.

Low Constraint: Standard safeguards would be adequate at the EIA stage.

The following definitions are used in this AEC:

Proposal: All works involved in the construction and operation of the proposed flood management works.

Development footprint: Area of land directly impacted by the construction of the proposal.

Study Area/ Locality: The development footprint with an approximate 10km buffer.

Survey Area: The proposed alignments for assessment plus a 50m buffer.

2. The proposal

2.1. Location and site description

The proposal is located in around the suburb of North Wagga, New South Wales (NSW). The proposal is located within the NSW South Western Slopes IBRA region.

Existing levee banks have been identified for raising, as well as the installation of a raised road and bridge connecting North Wagga to the Wagga Wagga town centre via Hampden bridge. Soil for the works is proposed to be excavated from EA1, EA2 and the Flood Runner (FR) – a small anabranch which only flows during periods of high flow in the stream or river it branches from. They have a relatively straight depression that occasionally conveys flood waters and tend to have a relatively uniform morphology.

Table 2-1 Proposed works locations and details.

ID	Location	Length (m)	Structure
L1	Existing Levee ring around North Wagga	4500 m	Earthen Bank
L2	Existing Levee surrounding limited number of houses East of North Wagga	1262 m	Earthen Bank
Flood Runner	Adjacent to Wilks Park	900 m X 70 m	Excavation of soil for proposed works 50m wide x 800m long x 2.5m deep
Excavation Points EA1 and EA2	Wilks Park and cleared area between Hampden Avenue and Parken Pragan lagoon - Wilks Park Off Leash Area (Wilks Park OLA)	1412 m*	Excavation points for proposed works to a depth between 2.5-5 m
Flood Management Structure	Hampden Avenue	700 m	Bridge/raised road/embankment

* Maximum extent

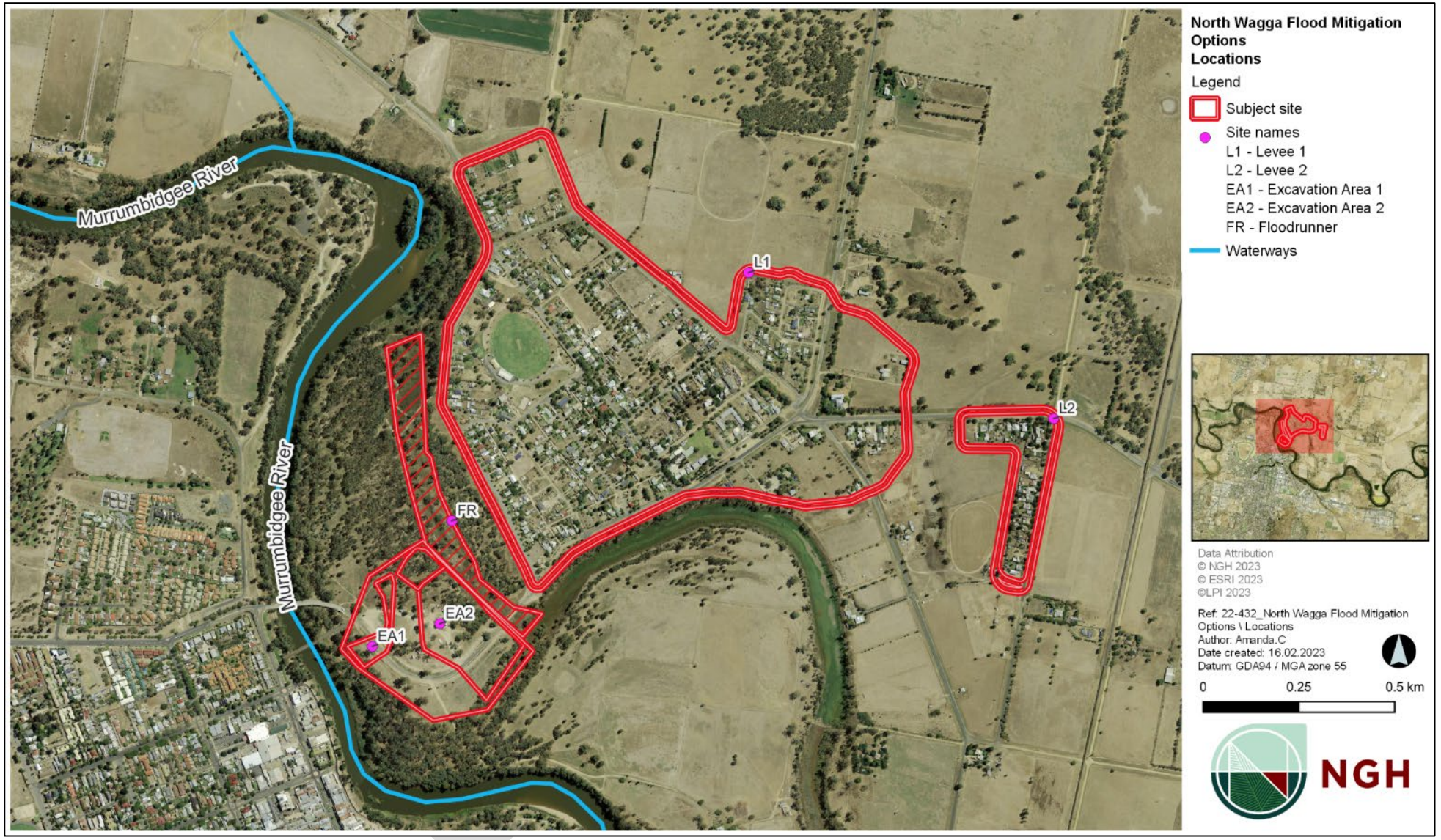


Figure 2-1 Location of proposed works

2.1.1. Description of the activity

Various options are being considered to assist with the impacts of flood mitigation for North Wagga. One of the options is to increase the height of the levee's currently supporting North Wagga to lessen the impact of a one in 20-year flood event. The soil for raising the levee and construction of flood infrastructure would be sourced locally. The soil would be sourced from areas within Wilks Park and Wilks Park Off leash area on the north eastern side of Hampden Avenue. This would include the following activities:

- Geotechnical investigation and survey of the preferred alignment
- Excavation of soil from EA1, EA2 and the Flood runner to provide the soil for the construction of the levees to a 1 in 20 year event.
- Construction of levee
- Establish laydown areas including amenities, temporary fencing and signage
- Establish environmental controls
- Vegetation trimming and removal where required

3. Legal and policy requirements

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
Commonwealth Law		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The objects of this Act are: a) *To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance,* b) *To promote ecologically sustainable development through the conservation and ecologically sustainable use of natural resources,* c) *To promote the conservation of biodiversity, and* d) *To provide for the protection and conservation of heritage,* e) *To promote a co–operative approach to the protection and management of the environment including governments, the community, landholders and indigenous peoples,* f) *To assist in the co–operative implementation of Australia's international environmental responsibilities,* g) *To recognise the role of indigenous people in the conservation and ecologically sustainable use of Australia's biodiversity, and* h) *To promote the use of indigenous peoples' knowledge of biodiversity with the involvement of, and in co–operation with, the owners of the knowledge.*	Approval by the Commonwealth environment minister is required if an action is likely to have a significant impact on a matter of national environmental significance or if it listed as a matter of national significance. There are listed Wetlands of International importance, Threatened Ecological Communities, Threatened Species, Listed Migratory Species and Listed Marine Species noted in the Protected Matters Search that would need consideration within the EIA.
State Law		

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
Environmental Planning and Assessment Act 1979 (EP&A Act)	The EP&A Act encourages proper management, development and conservation of natural and artificial resources, protection and conservation of the environment including native plants and animals, threatened species, populations, ecological communities and their habitats and ecologically sustainable development. Section 5A, lists a number of factors to be taken into account when deciding if there is the likelihood of a significant impact on threatened species, populations and their habitat or on ecological communities. If there is a chance of an impact, then an Assessment of Significance is required to determine the significance of the impact. If there is likelihood for a significant impact on threatened species, populations and their habitat or on ecological communities then further assessment through a SIS is required.	The proposed levee is likely to require assessment under Part 5 of the EP&A Act. Under the provisions of Section 5.5 of the EP&A Act, a determining authority in its consideration of an activity shall examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity. An EIA would need to be prepared by WWCC in order to carry out the proposal based on endorsed designs.
State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP)	TISEPP aims to facilitate the effective delivery of infrastructure across the state, including for roads and road infrastructure facilities.	Division 7 of TISEPP permits development for the purpose of flood mitigation work (including levees) to be carried out on by, or on behalf of, a public authority without consent on any land. Given the proposal involves the construction of a levee, being carried out by WWCC, the provisions of the TISEPP apply and the proposal is permissible without development consent under Part 5 of the EP&A Act. However, in section 5.5 and 5.7 of the EP&A Act and section 171 of the EP&A Regulation 2021 contains and obligation to consider the likely impact of an activity on the environment and to prepare an EIA demonstrating how the environmental factors were taken into consideration in an EIA. The proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* and does not require development consent or approval under the State

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
		Environmental Planning policy (Resilience and Hazards) 2021 and State Environmental Planning Policy (Planning Systems) 2021. Therefore, development consent would not be required if the proposal is assessed as an EIA.
Biodiversity Conservation Act 2016	The purpose of this Act is to maintain a healthy, productive and resilient environment for the greatest well–being of the community, now and into the future, consistent with the principles of ecologically sustainable development.	The *Biodiversity Conservation Act 2016* (BC Act) regulates the clearing of native vegetation in NSW. Under Part 7 of the Act, an assessment of the potential impacts of the proposed activity on threatened species, populations, ecological communities and critical habitat listed in the BC Act must be undertaken. This includes assessment of the potential for a significant impact under section 7.3 (5-part test) and whether an impact is likely on an area of Outstanding Biodiversity Value.
National Parks and Wildlife Act 1974 (NPW Act)	The *National Parks and Wildlife Act 1974* (NPW Act) promotes and regulates the management of national parks and historic sites or places of cultural value within the landscape and the conservation of certain fauna, native plants and Aboriginal objects and places. The NPW Act provides the basis for legal protection and management of Aboriginal sites in NSW. All Aboriginal objects within the state of New South Wales are protected under Part 6 of the NPW Act. The implementation of the Aboriginal heritage provisions in the NPW Act is the responsibility of the Office of Environment and Heritage (OEH).	The NPW Act provides the basis for legal protection and management of Aboriginal sites in NSW. All Aboriginal objects within the state of New South Wales are protected under Part 6 of the NPW Act. The implementation of the Aboriginal heritage provisions in the NPW Act is the responsibility of the Department of Planning and Environment – (DPE) – Biodiversity Conservation Department (BCD) formerly the Office of Environment and Heritage (OEH). Consent from the Director–General is required under Section 87, for the investigation of Aboriginal sites, or Section 90, for the destruction to an Aboriginal object or Aboriginal place.
Biosecurity Act 2015	The objects of this Act are the following: *a) To promote biosecurity as a shared responsibility between government, industry and communities,* *b) To provide a framework for the timely and effective*	Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented,

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
	management of the following: *i. Pests, disease, contaminants and other biosecurity matter that are economically significant for primary production industries.* *ii. threats* *iii. community activities and infrastructure,* *c) to provide a framework for risk–based decision–making in relation to biosecurity,* *d) to give effect to intergovernmental biosecurity agreements to which the State is a party,* e) *to provide the means by which biosecurity requirements in other jurisdictions can be met, so as to maintain market access for industry.*	eliminated or minimised.
Heritage Act 1977	The objects of this Act are as follows: *a) To promote an understanding of the State's heritage,* *b) To encourage the conservation of the State's heritage,* *c) To provide for the identification and registration of items of State Heritage Significance,* *d) To provide for the interim protection of items of State Heritage Significance,* *e) To encourage the adaptive reuse of items of State Heritage Significance,* *f) To constitute the Heritage Council of New South Wales and confer on it functions relating to the State's heritage, and* g) *To assist owners with the conservation of items of State Heritage Significance.*	Natural, cultural and built heritage is protected in NSW under this Act where it allows for heritage items or places to be listed on the State Heritage Register, or for interim heritage orders to be made to protect heritage items or places. Approval must be obtained from the NSW Heritage Council or local council before work can be done which might damage the item or place. A person who wishes to demolish, move, alter or in some way develop a place, building or land covered by an interim heritage order or a State Heritage Register listing (called "environmental heritage") must first obtain approval from the NSW Heritage Council. Any activity which might damage or destroy a tree or other vegetation on land or within a precinct relating to a heritage item also requires approval. A person must not disturb or excavate land if they know or have reasonable cause to suspect that they might discover, expose, move or damage a relic, unless they have an

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
		excavation permit. A "relic" means any deposit, artefact, object or material evidence that relates to the non–Aboriginal settlement of NSW and that is of State or local heritage significance. Excavation permits are issued by the Heritage Council. All discoveries of relics must be notified to the NSW Heritage Council, whether or not the person has been issued with a permit, and the location of the relic disclosed. A preliminary review of heritage databases found that the proposal would be unlikely to impact listed heritage items. Flood management works would afford further protection to the listed items located within the suburb of North Wagga.
Roads Act 1993 no 33	The objectives of this Act are: a) *to set out the rights of members of the public to pass along public roads, and* b) *to set out the rights of persons who own land adjoining a public road to have access to the public road, and* c) *to establish the procedures for the opening and closing of a public road, and* d) *to provide for the classification of roads, and* e) *to provide for the declaration of RMS and other public authorities as roads authorities for both classified and unclassified roads, and* f) *to confer certain functions (in particular, the function of carrying out road work) on RMS and on other roads authorities, and* g) *to provide for the distribution of the functions conferred by this Act between RMS and other roads authorities, and* h) *to regulate the carrying out of various activities on*	Section 138 of the Roads Act prohibits work on or over a public roadway without approval from the roads authority. The proposed work would occur near local roads. The relevant Road Authority for local roads is Wagga Wagga City Council.

Law, Policy or Regulation	*Objective*	*Requirement for the proposal*
	public roads.	
State Environmental Planning Policy (Biodiversity and Conservation) 2021	This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.	The KHP SEPP 2021 does not apply to these activities as they are not proposed to be within lands that are zoned RU1 primary production, RU2 rural landscape or RU3 Forestry
Local Law		
Wagga Wagga Local Environmental Plan 2010	This Plan aims to make local environmental planning provisions for land in Wagga Wagga in accordance with the relevant standard environmental planning instrument under section 3.2 of the Act. The particular aims of this Plan are as follows: *(a) To protect, enhance and conserve agricultural land through the proper management, development and conservation of natural and man-made resources,* *(b) To encourage a range of housing, employment, and recreational and community facilities to meet the needs of existing and future residents of Narrandera,* *(c) To promote the efficient and equitable provision of public services, infrastructure and amenities,* *(d) To conserve environmental heritage.*	The proposal area is zoned as RE1 Public Recreation, RU5 Village, C2 Environmental conservation and RU1 Primary Production under the Wagga Wagga LEP 2010. According to part 2 division 7 of the TISEPP, flood mitigation work is a development permitted without consent. Levees fall under the definition of flood mitigation works; therefore, the proposal is permitted without consent.

4. Preliminary Environmental assessment

Constraints have been tabulated (Table 4-2) to give a snapshot of the constraints for the project. Further details are explained in the relevant sections.

Table 4-1 Constraints table explanation

No go – would not receive approval. Considered a fatal flaw.
High – may be difficult, expensive or preclude development.
High-moderate – key area of uncertainty. Further investigation required.
Moderate – may add time and cost to assessment, construction or operation however, considered readily manageable with standard or specific mitigation strategies.
Low – low likelihood of affecting approvability, time or cost of approval; standard pathway, least time and cost of assessment.

Table 4-2 Constraints table and location of details in this AEC

Constraint factor	Risk rating
Planning Low Section 3	• The planning pathway is highly transparent • Division 7 of TISEPP permits development for the purpose of flood mitigation work (including levees) to be carried out on by, or on behalf of, a public authority without consent on any land. However, in section 5.5 and 5.7 of the EP&A Act and section 171 of the EP&A Regulation 2021 contains and obligation to consider the likely impact of an activity on the environment and to prepare an EIA demonstrating how the environmental factors were taken into consideration in an EIA.
Soils Moderate Section 4.1	• Excavation of EA1 and EA2 would remove soil to a depth of 2.5m over a larger area which includes Wilks Park OLA and the area within Wilks Park.
Water High Section 4.2	• The Murrumbidgee River is within close proximity to the proposed works. Dredging and excavation are proposed in a constructed flood-runner and nearby water land. A buffer in accordance with the NRAR Guidelines for Controlled Activities on Waterfront Land is recommended **unless hydrology advice verifies this is suitable for construction of the proposed works.**
Biodiversity High Section 4.3	• High constraints for habitat especially hollow bearing trees. A number of trees were noted both in the floodway and throughout Wilks Park as being suitable habitat for endangered species.

Constraint factor	Risk rating
Biodiversity Low Section 4.3	• Exotic and low condition native grassland
Climate and air quality Low Section 4.4	• Soil disturbance for flood management works raising • Can be mitigated with standard strategies • Short term, temporary impacts
Heritage (Aboriginal and historic) High Section 4.7	• There are recorded Aboriginal sites present within the survey area, but none listed within the footprint of the proposed works. The location of the sites, are, however, within an important archaeological landscape area and within 200m of a water course. Surveys must occur to verify if any occur and what values the site has for Aboriginal people. This process is prescribed and can take time (minimum 6 months) but is unlikely to impact the layout or approvability of the proposal. • Additional Aboriginal and historic sites occur in the locality and should be investigated further in the EIA.
Community Moderate Section 4.9	• Many receivers occur within 250 m of the site and the proposal is likely to be of interest to nearby neighbours as well as the broader community. **A strategy to target consultation with affected stakeholders and also communicate more broadly with the community should be developed and presented in an EIA**. Key concerns identified by the community should be included in the EIA, particularly the visual and noise assessment.
Visual amenity High Section 4.10	• Loss of mature trees and regrowth to create a 70m wide 2.5 m deep flood runner through excavation activities in the existing flood runner would be considered a high constraint.
Amenity impacts (vibration, access, noise etc) Moderate to High Section 4.5 and 4.10	• Excavation of E1 and E2 (refer Table 2-1) and provision of Flood Management Structure would not greatly differ from the existing landscape features • The increase in the height of the Levee in some areas would block some views to neighbouring farm land • Changes in background noise amenity would be significant during construction • No change to operational noise
Waste	• Construction of flood structures and levee banks may lead to spoil or excess soil for redevelopment of new levee banks • Construction may lead to an increase of onsite solid waste • May lead to an increase in sewage

4.1. Topography, geology, and soils

4.1.1. Existing environment

The subject land occurs within the NSW South Western Slopes IBRA Bioregion. The associated soil landscapes of the subject land are Farnham and Kurrajong Plain. The landscape of the Farnham soil landscape which is associated with Wilks Park include:

- annually flooded areas of Murrumbidgee River. Gently undulating lower floodplains, low levees, river channels, billabongs, extensive backplains. Local relief 10 m; slope gradients up to 3%.
- Soils are moderately deep 80-120 cm Eutrophic Brown Dermosols in lower floodplains; Epipedal Grey Vertosols in back plains and billabongs, Siliceous Arenic Rudosols on Levees (DPIE, 2023).

Whereas soils associated with Kurrajong Plain include

- extensive level plain of higher Murrumbidgee River floodplain. Local relief mostly <2 m; slope gradients <1%.
- Almost completely cleared tall woodland.
- Soils are moderately deep (80-150 cm) Eutrophic Brown Dermosols and Eutrophic Brown Kandosols with occasional flooding, waterlogging (localised), streambank erosion (localised).

Topography

Farnham: Various alluvial landforms associated with the current Murrumbidgee Floodplain,

- include gently undulating lower floodplain with low (<1.5 m) levees, incised river channels, abandoned channels (billabongs) and extensive (>2 km wide) backplains.
- Slope gradients are generally <2%. Local relief is up to 10 m near streambank cliff and <1 m in backplain.
- The elevation ranges from 180 m in the east to 160 m in the west. This landscape is usually flooded annually (DPIE, 2023).

Kurrajong plain:

- Extensive level plain up to 10 m above the Murrumbidgee River normal water levels, rarely flooded.
- Slope gradients <1%. Local relief mostly <2 m within an elevation range of 165 – 190 m, higher towards east (DPIE, 2023).

Table 4-3 Topography Geology and Soils descriptions

Category	*Proposal Area*
Topography	Farnham: Undulating alluvial landforms. Kurrajong Plain: Low lying river plains.
Geology	Farnham: Thick (mostly >20 m) Cainozoic alluvial sediment sequences of clays, sands and gravels. Kurrajong Plain: Thick (mostly >20 m) Cainozoic alluvial sediment sequences, silty clay on top 5 – 8 m and sand, gravel and clay at depth (DPIE, 2023).
Soils	The eSpade (DPIE, 2023) website on 13 February 2023 indicates that it is low risk of Erosion Hazard with soils associated with the Kurrajong Plain soil landscape. Soils associated with the Farnham soil landscape have a slight risk of erosion with non-concentrated flows and a moderate to high risk of erosion in concentrated flow events. And a slight (brown silty clay and grey clay topsoil) to high level (Loamy Sand topsoil) of risk

Category	Proposal Area
	associated with wind erosion events.
Acid sulphate soils	The eSpade (DPIE, 2023) website indicates there is no known occurrence of acid sulphate soils to occur throughout the development site.

4.1.2. Potential impacts

Construction of the proposal would involve disturbance of existing road materials and local soils during levee construction. Disturbance would occur at a greater level where the stand-alone flood management structure would be constructed. Wherever possible, the area of disturbance should be kept to a minimum. The disturbed areas should be stabilised and rehabilitated as soon as possible post construction.

4.1.3. Summary and recommendations

The constraints for topography, geology and soils are moderate for all sites.

An EIA would be prepared for the proposal and should address appropriate mitigation measures for construction to ensure the proposal would minimise risks to landform, geology or soils.

4.2. Hydrology, catchment values and water quality

4.2.1. Existing Environment

Annual rainfall is 500 – 550 mm. Soils are moderately moist to moist during winter and spring but dry in summer and early autumn. Following flood events soils are saturated and banks are prown to slumping. Run-on is none to low for most parts (flooding excepted) and waterlogging may occur locally after flooding or heavy rains (DPIE, 2023).

Ground Water Dependent Ecosystems (GDE)

Groundwater plays an important role in sustaining aquatic and terrestrial ecosystems, such as springs, wetlands and vegetation. Ecosystems that rely on groundwater for some or all of their water requirements are classed as Groundwater Dependent Ecosystems (GDEs).

Surface Water (river) Quality

The Murrumbidgee River varies in flow and river heights, determined in the summer months by dam releases due to planned water delivery to the environment and irrigators. Water quality over the summer months tend to be high.

The main water quality issues, include turbidity, variable nutrient flushes from adjoining farming land and salt load. Turbidity is strongly related to rainfall and surface runoff from cultivated areas of the catchment.

4.2.2. Flooding

Flooding in Wagga is variable and is caused by both riverine flooding and major overland flow flooding paths which interact flood plain topography. Riverine Flooding occurs when rainfall of

sufficient intensity, duration and distribution over the catchment causes river flows to exceed its channel capacity.

Overland floods typically occurs when intense rainfall events and subsequent drainage from the landscape exceeds the capacity of the dams and river channel. Local drainage including unregulated creek systems in the Murrumbidgee River Catchment above Wagga Wagga also contribute to flooding at Wagga Wagga. The system has an estimated capacity of less than a 5-year ARI (0.2 exceedances per year (EY)). The system and the capacity of the overland flow routes has been tested with recent rainfall events such as 2022, this was a particularly challenging event as it coincided with a riverine flood event hindering drainage of these local systems.

While the CBD of Wagga Wagga has a levee built to 1% AEP, this is not the case for North Wagga and up to 174 residences are at risk from inundation from flood events with a 5% AEP.

4.2.3. Potential Impacts

Impacts to surface and ground water quality during construction can occur during excavation placement and compaction of soil for flood management works. The inner and outer faces of the levee bank should be protected with topsoil and ground cover to minimise dispersive action, prevent structural failures and protect against erosion.

Excavated areas should be revegetated as soon as possible to reduce the potential impact in the case of a significant rain event and possible subsequent erosion event.

Cumulative floodplain modifications also have the potential to relocate flooding in the river. The detention basin strategy would assist in the management of water. The proposed flood management works would direct flood flows past North Wagga and provide an escape route for residents during times when flood events cut road access to the Wagga CBD.

4.2.4. Summary and Recommendations

Constraints vary from low to high.

An EIA would be prepared for the proposal and should address appropriate mitigation measures to minimise risks to surface and ground water quality. Detailed design would be developed at this stage to reduce flood afflux.

4.3. Biodiversity

4.3.1. Approach

Database research

Database searches (10km buffer from the survey area) were undertaken in July–August 2022 and included the following:

- Commonwealth Protected Matters Search Tool (PMST)
- NSW BioNet Atlas
- DPE Biodiversity Values Map
- Hydrological features
- Flood Prone Land Mapping

- State Vegetation Mapping.

Threatened species evaluation.

An NGH ecologist reviewed the BioNet and PMST search results to evaluate species with a higher likelihood of impact and hence likely to require further assessment[1]. The results of this review are discussed below.

Field assessment

A preliminary site assessment was completed on 10 February 2023 by an NGH Ecologist to assess the biodiversity constraints within the study area.

This site assessment aimed to:

- Identify any areas of suitable habitat for threated flora or fauna
- Record habitat features i.e., hollow-bearing trees, woody debris, watercourses etc
- Assess the percentage of native ground cover in grassland areas via the Local Land Services endorsed step point method (LLS, ND).
- Determine Plant Community Types (PCTs) according to the DPE BioNet Vegetation Classification (DPE, 2022).

Limitations

The following are factors that limited the field survey:

- Flood waters still present that restricted the access to assess some parts of the proposal area.
- Due to the timing of the survey, not all fauna and flora species would have been visible or present within the study area. Absence of any fauna or flora species, including threatened species, cannot ruled them out of requiring further survey effort.
- Two step point method assessments were completed, one at Wilkes Park and one in the Wilks Park Off Leash Area .

4.3.2. Results

Native vegetation

Three Plant Community Types (PCTs) were identified within the study area. Including:

- PCT 5 - *River Red Gum herbaceous-grassy very tall open forest wetland on inner floodplains in the lower slopes sub-region of the NSW South Western Slopes Bioregion and the eastern Riverina Bioregion.*
- PCT 74 - *Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion*
- PCT 796 - *Derived grassland of the NSW South Western Slopes.*

[1] This process was rapid and did not involve a comprehensive habitat evaluation table review. Hence, the results are likely to change under further investigation. However, the list generated in this process is a good preliminary estimate of threatened species that may require additional assessment and consideration.

Two step point method assessments were taken at Wilkes Park. The assessments confirmed the grassland and woodlands included native composition. Step point method results are displayed in Table 4-4 below.

Table 4-4 Step point method results

Exotic or Native ground cover counts	Woodland step point method	Grassland step point method
Exotic	23	51
Native	51	49
Bare soil	3	0
litter	23	0

Exotic vegetation.

Various compositions of exotic vegetation occurred within the study area. These areas are dominated by the species, Annual Meadow Grass (*Poa annua*), *Paspalum sp.*, and Wireweed (*Polygonum aviculare*). Areas of exotic grassland are estimated to contain roughly 15% native species[2] (*Couch sp.* and *Chloris truncate*).

[2] NOTE: Exotic areas were visually rapidly assessed by the NGH ecologist on site. No step point method assessments were taken in these zones. Step point method assessments will be required if exotic vegetation needs to be mapped at a fine scale.

Figure 4-1 Exotic dominated vegetation

Planted Native Vegetation

Planted native vegetation identified within the study area consisted of Couch Grass (*Cynodon dactylon*). This grass was evident on the on the pre-existing levee, likely used to stabilise the soil.

Threatened ecological community

Within the survey area the following Critically Endangered Ecological Community (CEEC) TECs have the potential to occur:

- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands, NSW South Western Slopes, South East Corner and Riverina Bioregions: **BC Act – CEEC**
- White Box – Yellow Box – Blakely's Red Gum Grassy Woodland and Derived Native Grassland: **EPBC Act – CEEC**
- Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains: **EPBC Act – CEEC**

BC Act Box Gum Woodland

PCT 74 and PCT 796 are both associated with this TEC.

BC Act Requirement	PCT 74	PCT 796
1. **Is, or was previously, at least one of the most common overstorey species White Box, Yellow Box or Blakely's Red Gum?**	No. River Red Gum is the most common overstorey species. Yellow box is present but in low numbers and not in high enough numbers to be dominant.	No. The dominant surrounding species are remnant and regenerating River Red Gum. The site is on the floodplain of the Murrumbidgee River which typically is characterised by River Red Gum and it is unlikely to have supported dominance of White Box, Yellow Box or Blakely's Red Gum
2. **The site is in the NSW North Coast, New England Tableland, Nandewar, Brigalow Belt South, Sydney Basin, South Eastern Highlands or NSW South Western Slopes Bioregions**	N/A	N/A
3. **The site has a mainly grassy ground layer.**	N/A	N/A
4. **The site contains the listed characteristic species (including as part of the seedbank)**	N/A	N/A
5. **Or, If the site has been degraded, is there potential for assisted natural regeneration of the tree layer or understory.**	N/A	N/A
Conclusion	**No – Does not meets the criteria for Box Gum woodland**	**No – Does not meets the criteria for Box Gum woodland**

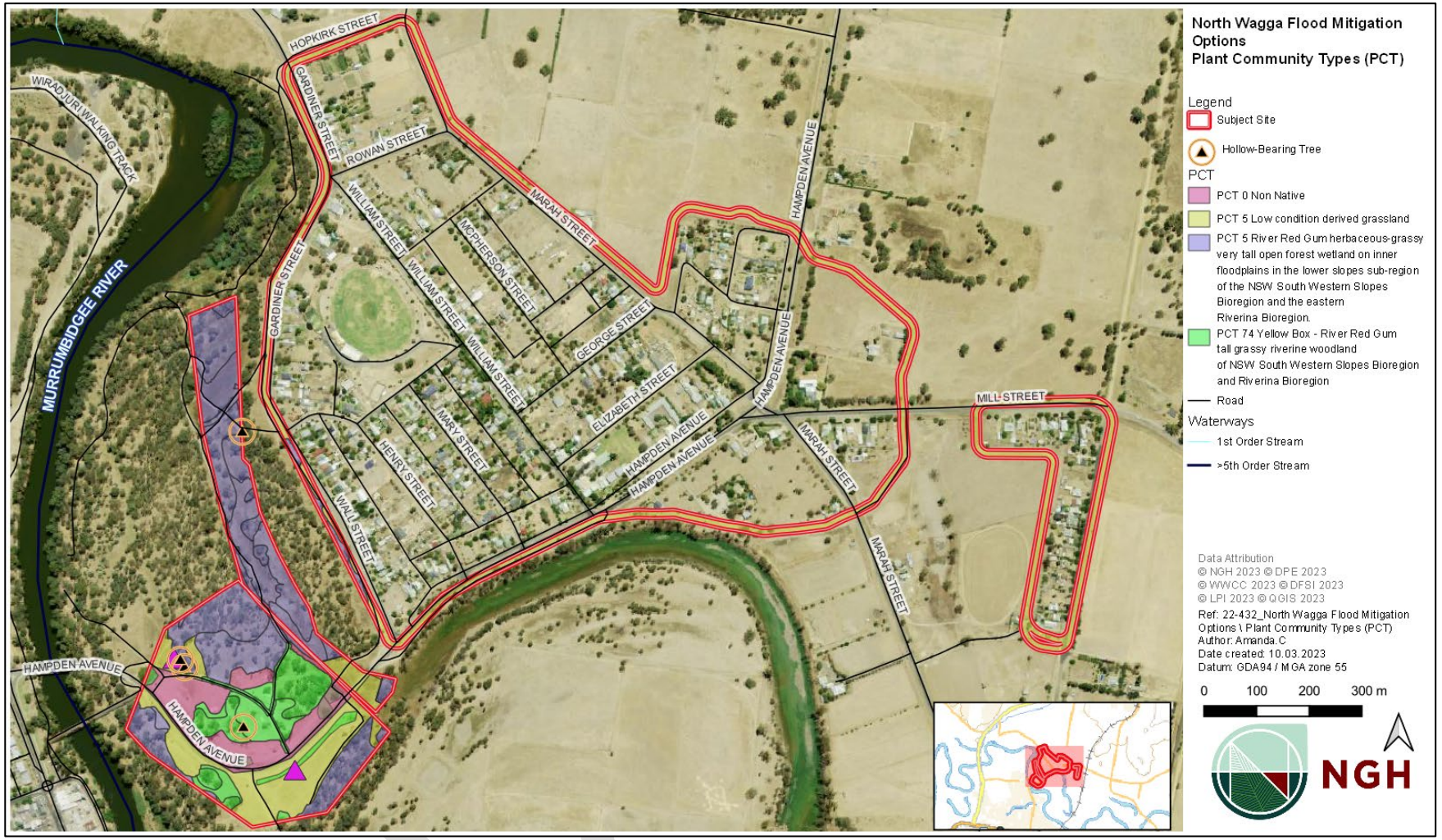


Figure 4-2 Plant Community Types within the Subject Land [3]

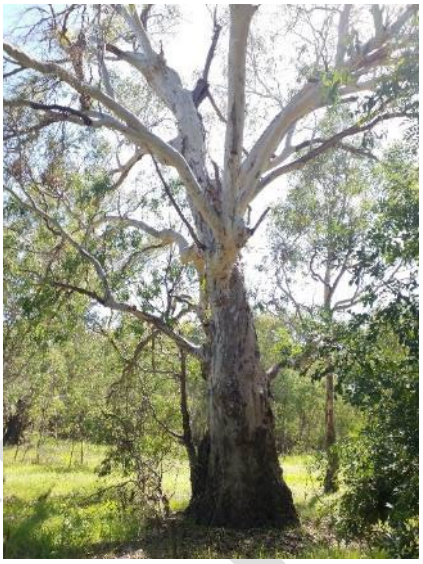
[3] The SVTM above has limitations. As per the step point method results, further ground truthing and fine scale mapping would be required to delineate native PCT areas.

Terrestrial habitat

Terrestrial habitat was identified within the survey area (refer Table 4-5).

Table 4-5 Terrestrial habitat identified within the survey area

Habitat feature	Description	Image
Woodland	Remnant woodland was identified in the study area. This woodland occurred in both large and small stands. Woodland provides valuable foraging and breeding habitat for native fauna. Remnant trees had numerous large hollows and are important habitat for threatened squirrel glider, superb parrot and other threatened species breeding in the area.	
Groundcover	Native grasses occurred in low to moderate densities. Native grasses provide foraging resources for native species. Most of the site was dominated by exotic perennial grasses, exotic grasses provide a low resource for foraging and refuge. Grasses within the proposal area at the time of the site assessment provided a very low foraging and refuge resource due to the recent mowing of the site.	
Woody debris	Fallen timber was observed in a few disturbed locations throughout the study area. One area contained timber piles from pushed up vegetation. Fallen timber provides shelter and foraging resources for several native fauna species including small reptiles and ground-foraging birds.	

Habitat feature	Description	Image
Hollow-bearing trees (HBTs)	HBTs occurred within the survey area. HBTs are an increasingly rare resource for fauna. HBTs take up to 100 years to start forming, many fauna species are dependent on hollow-bearing trees for breeding, nesting and roosting including a number of threatened species. HBTs within townships are generally low density and therefore provide a high-level of biodiversity value.	

Aquatic habitat

Ephemeral aquatic habitat occurred within the proposal area in the form of man-made floodways' as seen in Figure 4-1.

Figure 4-3 Ephemeral aquatic habitat

Threatened flora and fauna

No targeted threatened spices surveys have been completed within the study area and no threatened flora or fauna species were observed during the site assessment.

The following areas are likely to support threatened fauna species:

- The habitat features displayed in Table 4-5
- Areas of native vegetation

The following areas are likely to support threatened flora species:

- Areas of native vegetation

A list of threatened flora and fauna species that may occur within the study area are listed in Table 4-7.

Priority weeds

Plants restricted in trade and movement due to the potential to cause harm to the NSW environment, economy and community under the NSW Biosecurity Act are called 'Priority Weeds'. Weeds of National Significance are weeds that are considered *'the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.'* (DPI, 2022).

Several Priority Weeds for the Riverina were identified during the site assessment including; Caltrop (*Tribulus terrestris*), Khaki weed (*Alternanthera pungens*), Horehound (*Marrubium vulgare*), and Lippia (Phyla canescens). Further inspection will be required to confirm absence of other priority weeds throughout the proposal area, and map extent of the priority species identified during the site inspection.

4.3.3. Potential impacts

Vegetation and Threatened Ecological Communities

The proposal may result in loss of native vegetation, however, none of this vegetation loss would include BC Act and EPBC Act listed TECs. Detailed design determination would be required to calculate accurate vegetation impacts. Loss of remnant woodland and HBTs is considered a high constraint for the proposed works. The loss of planted native species is considered a moderate constraint and the loss of low condition grassland and exotic vegetation is considered a low constraint.

Table 4-6 Type of vegetation loss for each PCT

Location	Vegetation Loss Type (X = YES)				
	Remnant Woodland	TECs	HBTs	Planted Natives	Low Quality Grassland
PCT 5	X		X		
PCT 74	X		X		
PCT 796					X
Planted Native Trees				X	X
Exotic					X

Threatened species

The proposal has potential to impact state and federally listed threated species that may reside or frequent the study area. To preliminarily gauge these impacts against threated species NGH has

provided the results of the rapid threatened species evaluation in Table 4-7. Impacts to threated species would occur through:

- Removal of native trees and ground cover
- Removal of HBTs
- Removal of woody debris
- Removal of woodland areas
- Removal of grassland areas

Table 4-7 Threatened species likely to reside in or frequent the study area.

Scientific Name	**Common Name**	**LISTING Vulnerable (v), Endangered (E)**		**POTENTIAL IMPACT (X = YES)**
		BC ACT	**EPBC ACT**	
FLORA				
Brachyscome muelleroides	Claypan Daisy	V	V	**X**
Swainsona recta	Small Purple-pea	E	E	**X**
			Subtotal	**2**
FAUNA				
Apus pacificus	Fork-tailed Swift		Migratory	**X**
Artamus cyanopterus	Dusky Woodswallow	V		**X**
Callocephalon fimbriatum	Gang-gang Cockatoo	V	E	**X**
Chthonicola sagittata	Speckled Warbler	V		**X**
Circus assimilis	Spotted Harrier	V		**X**
Climacteris picumnus victoriae	Brown Treecreeper (eastern subspecies)	V		**X**
Daphoenositta chrysoptera	Varied Sittella	V		**X**

Scientific Name	Common Name	LISTING Vulnerable (v), Endangered (E)		POTENTIAL IMPACT (X = YES)
		BC ACT	EPBC ACT	
Epthianura albifrons	White-fronted Chat	V		**X**
Falco hypoleucos	Grey Falcon	E		**X**
Falco subniger	Black falcon	V		**X**
Glossopsitta pusilla	Little Lorikeet	V		**X**
Haliaeetus leucogaster	White-bellied Sea-Eagle	V		**X**
Hieraaetus morphnoides	Little Eagle	V		**X**
Hirundapus caudacutus	White-throated Needletail		V	**X**
Lophochroa leadbeateri	Major Mitchell's Cockatoo	V		**X**
Melanodryas cucullata cucullata	Hooded Robin (South-eastern form)	V		
Melithreptus gularis	Black-chinned Honeyeater (eastern subspecies)	V		**X**
Neophema pulchella	Turquoise Parrot	V		**X**
Ninox connivens	Barking Owl	V		**X**
Pachycephala inornata	Gilbert's Whistler	V		**X**
Petroica boodang	Scarlet Robing	V		**X**
Petroica phoenicea	Flame Robin	V		**X**

Scientific Name	Common Name	LISTING Vulnerable (v), Endangered (E)		POTENTIAL IMPACT (X = YES)
		BC ACT	EPBC ACT	
Polytelis swainsonii	Superb Parrot	V	V	**X**
Pomatostomus temporalis	Grey-crowned Babbler (eastern subspecies)	V		**X**
Stagonopleura guttata	Diamond Firetail	V		**X**
Stictonetta naevosa	Freckled Duck	V		**X**
Dasyurus maculatus	Spotted-Tailed Quoll	V	E	**X**
Miniopterus orianae oceanensis	Large Bent-winged Bat	V		**X**
Myotis macropus	Southern Myotis	V		**X**
Nyctophilus corbeni	Corben's Long-eared Bat	V	V	**X**
Petaurus norfolcensis	Squirrel Glider	V		**X**
Petaurus norfolcensis – Endangered Population	Squirrel Glider in the Wagga Wagga LGA	Endangered Population		**X**
Pteropus poliocephalus	Grey-headed Flying-fox	V	V	**X**
Saccolaimus flaviventris	Yellow-bellied Sheath-tail Bat	V		**X**
Vespadelus baverstocki	Inland Forest Bat	V		**X**
			Subtotal	**34**

4.3.4. Summary and recommendations

Constraints for biodiversity (refer Figure 4-4) vary across the site and include:

High Constraints:

Threatened species habitat including woodland areas

Low Constraints:

Exotic and low condition native grassland

It is recommended that further ecological surveys are completed in the study area. This will better inform the likelihood of threatened species being present, impacts that threatened species could incur, the condition of PCTs and presence of TECs, and biodiversity features presence such as HBT's. It is also recommended that detailed design avoid areas of high and moderate biodiversity constraint to reduce potential impacts to threatened species.

To assist the proposal gain approval, this could be completed as a Biodiversity Assessment (BA) report, to accompany an EIA. Any threatened entities with the potential to be impacted, would require Assessments or Tests of Significance under the BC Act and EPBC Act as part of the BA.

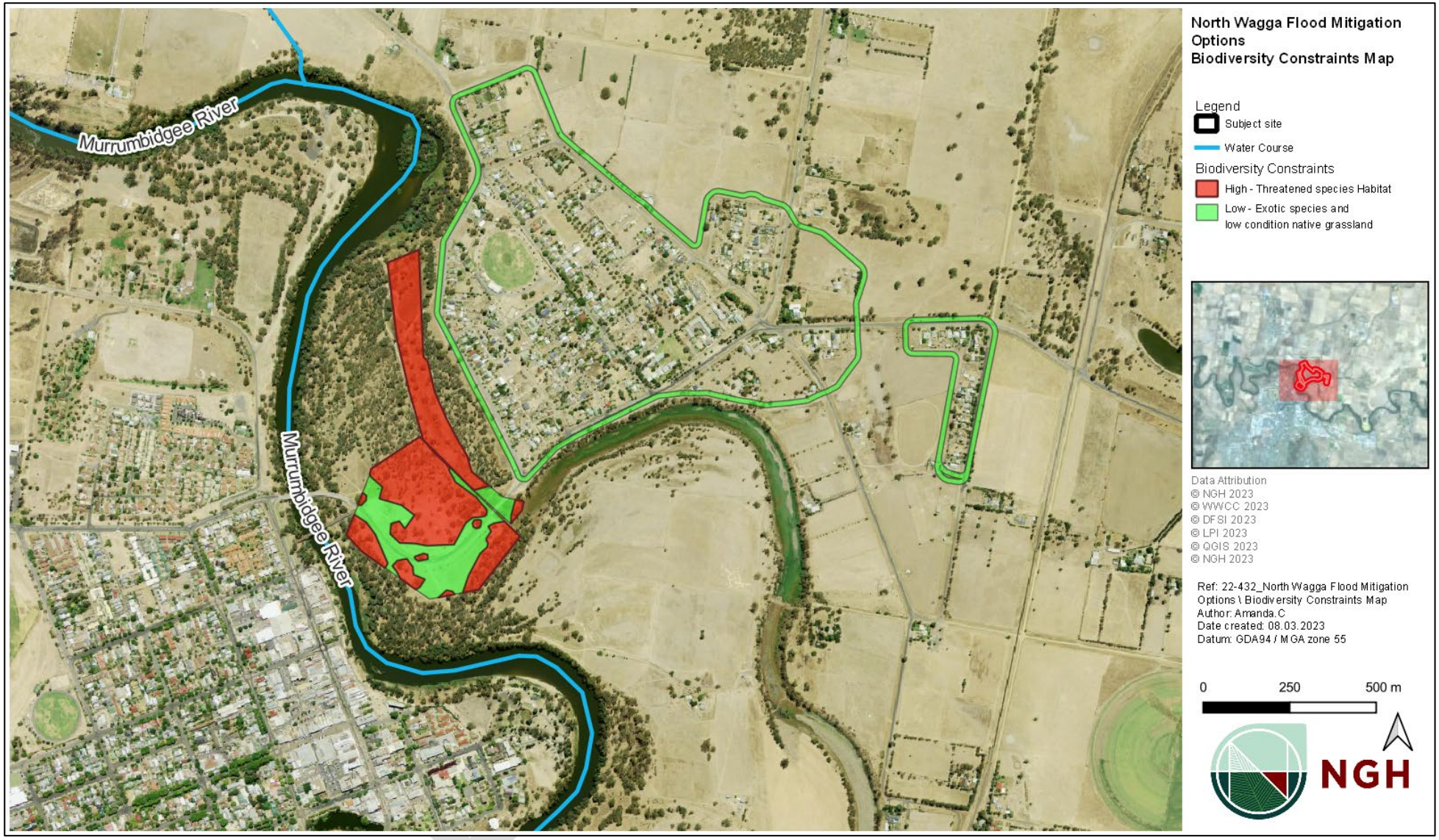


Figure 4-4 Biodiversity Constraints

4.4. Climate and air quality

4.4.1. Existing environment

The South West Slopes bioregion is dominated by a sub-humid climate characterised by hot summers and no dry season. A temperate climate, with warm summers, occurs at higher elevations along the eastern boundary of the bioregion adjacent to the South Eastern Highlands Bioregion.

4.4.2. Potential impacts

The proposed work has the potential to generate dust and smoke emissions through construction activities. The construction of stand-alone levies/detention basins could cause dust impacts. However, these are likely to be short term and minimal.

Exhaust fumes from construction plant equipment could similarly cause some minimal impact to air quality. Overall, any reduction in air quality would be highly localised and short in duration and would not cause undue impact on the public or on the surrounding environment so long as standard mitigation measures are in place.

4.4.3. Summary and recommendations

Constraints are low for all sites.

Given the low level of dust likely to be generated from the works which are expected to be staged, no significant impact on potential sensitive receivers is expected. Potential air quality impacts can be readily managed with the implementation of appropriate safeguards and mitigation measures in the EIA for the proposal.

4.5. Noise and vibration

4.5.1. Approach

During construction, noise is likely to be generated from the construction activities. Road traffic noise from truck deliveries and other construction-related vehicle movements will occur. These impacts would vary for receivers depending on their proximity to the proposed work. Receivers located along Wall Street both existing may be subject to both levee construction and floodway upgrades.

A preliminary construction noise assessment was conducted in accordance with the EPA's *Interim Construction Noise Guidelines*. According to the guidelines, an assessment of construction noise impacts is warranted when works are likely to impact an individual or sensitive land use for more than three weeks in total (interpreted as a total of 15 days over the duration of the works).

The guideline specifies Noise Management Levels (NMLs) for residences and other noise sensitive receivers. The proposal occurs within environmental conservation zoned land (C2) and directly adjacent to general residential zoning (R1). The NMLs have been determined using assumed RBL (Rating Background Level) value of 45 dB(A) for urban residential areas. Acceptable EPA daytime NMLs are 10 dB(A) above background. As such, acceptable daytime NMLs for residences affected by the development are 55 dB(A). Residences are highly noise affected when construction noise is above 75 dB(A).

The predicted noise level for the proposed work at sensitive receivers was calculated using the Transport for NSW Construction Noise Estimator. The scenario selected to be modelled was the construction of a levee. This scenario predicts the 'worst case scenario' and assumes that all plant and machinery are operating continuously and concurrently.

East Street south of Oura Road was selected because it best represents a scenario where there are residences located adjacent to flood management works.

4.5.2. Existing environment

The dominant sources of noise experienced in the study area include:

- Traffic noise from local roads with 60km/h speeds
- General residential noise including power tools and vehicles.

The development footprint spans a number of different sites and sensitive receivers. Receivers have not been individually mapped at this stage. Wilks Park public use and camping would may also be subject to construction noise.

Buffer zones have been used to display predicted noise levels (Figure 4-5). These buffer zones have been determined based on the equipment used and distance to the works.

Background noise levels for North Wagga were assumed in accordance with the Noise Policy for Industry (NPI) (2017). The guidelines describe an suburban area *R2 – low density residential* with an acoustic environment dominated by natural sounds, local transportation, rail, residential development, and agricultural activities. R2 was selected with an daytime RBL value of 45 dB(A) for urban residential areas.

Table 4-8 Average Background A-weighted sound pressure level

	Daytime 0700–1800	Evening 1800–2200	Night-time 2200–0700
Noise area category R2	45 dB(A)	40 dB(A)	35 dB(A)

Noise management levels for the proposed activity have been determined in accordance with the NPI, described below and summarised in Table 4-9.

- Standard working hours Monday to Friday between the hours of 7am–6pm, and Saturday 8am–1pm.- 10dB(A) above background levels
- Outside standard working hours - 5dB(A) above background levels
- Residences receiving noise levels over 75dB(A) during standard working hours are considered highly noise affected irrespective of the RBL.

Table 4-9 Noise Management Levels for construction activity

Daytime NML dB(A) (RBL +10 dB(A))	Evening NML dB(A) (RBL +5 dB(A))	Night NML dB(A) (RBL +5 dB(A))	Highly Noise Affected Level dB(A)
55 dB(A)	45 dB(A)	40 dB(A)	75 dB(A)

4.5.3. Potential construction noise impacts

Construction works for the proposal would likely be standard working hours. Construction noise predictions assume all plant items would be operating simultaneously for each construction activity. Simultaneous operation is unlikely and as a result any predictions are conservative. The representative noise from the construction equipment is detailed in Table 4-10.

Table 4-10 Construction equipment - placing and compacting road material

Construction equipment	Sound power level (dB(A))	No. of units
Dump truck	110	1
Grader	113	1
Water cart	107	1
Smooth drum roller	107	1
Scraper	110	1

A preliminary distance-based assessment was used to determine noise levels for receivers located within buffer zones from the preferred levee alignment. The predicted noise level for nearby receivers is detailed in Table 4-11.

Table 4-11 Predicted noise levels for receivers based on levee construction

Distance (m) from the development	Predicted Noise Level dB(A) Red = highly noise effected Orange = noise affected Yellow = minor exceedance Green = no exceedance	Description Noise affected = RBL + 10 dB Highly noise affected = 75 dB (A)	Recommended additional mitigation measures**
Levee construction			
35* - 40	76	Highly noise affected	N, PC, RO
115*	65	Moderately Intrusive	N

Distance (m) from the development	Predicted Noise Level dB(A) Red = highly noise effected Orange = noise affected Yellow = minor exceedance Green = no exceedance	Description Noise affected = RBL + 10 dB Highly noise affected = 75 dB (A)	Recommended additional mitigation measures**
130	62	Moderately Intrusive	N
305	53	Not affected	N/A

* Non-residential local School receivers and active recreation

** N – Notification, PC – Phone Calls, RO – Respite offer

Receivers within 30–70m of the proposed works are likely to be highly noise affected (Figure 4-5), and would be subject to further assessment in the EIA for the proposal. Additional mitigation measures may be required and consultation with the community is recommended.

4.5.4. Summary and recommendations

Constraints are considered **moderate to high** for noise impacts during construction.

Normal school hours are considered to be 8:30am to 4:30pm Monday to Friday, wholly within normal construction hours. Consideration and consultation with appropriate representatives of the Department of Education for timing of works near the Primary School should be further investigated in an EIA prior to construction.

The proposal is likely to generate noise impacts during construction that would further be investigated in an EIA. No additional operational noise is expected as a result of the proposed works.

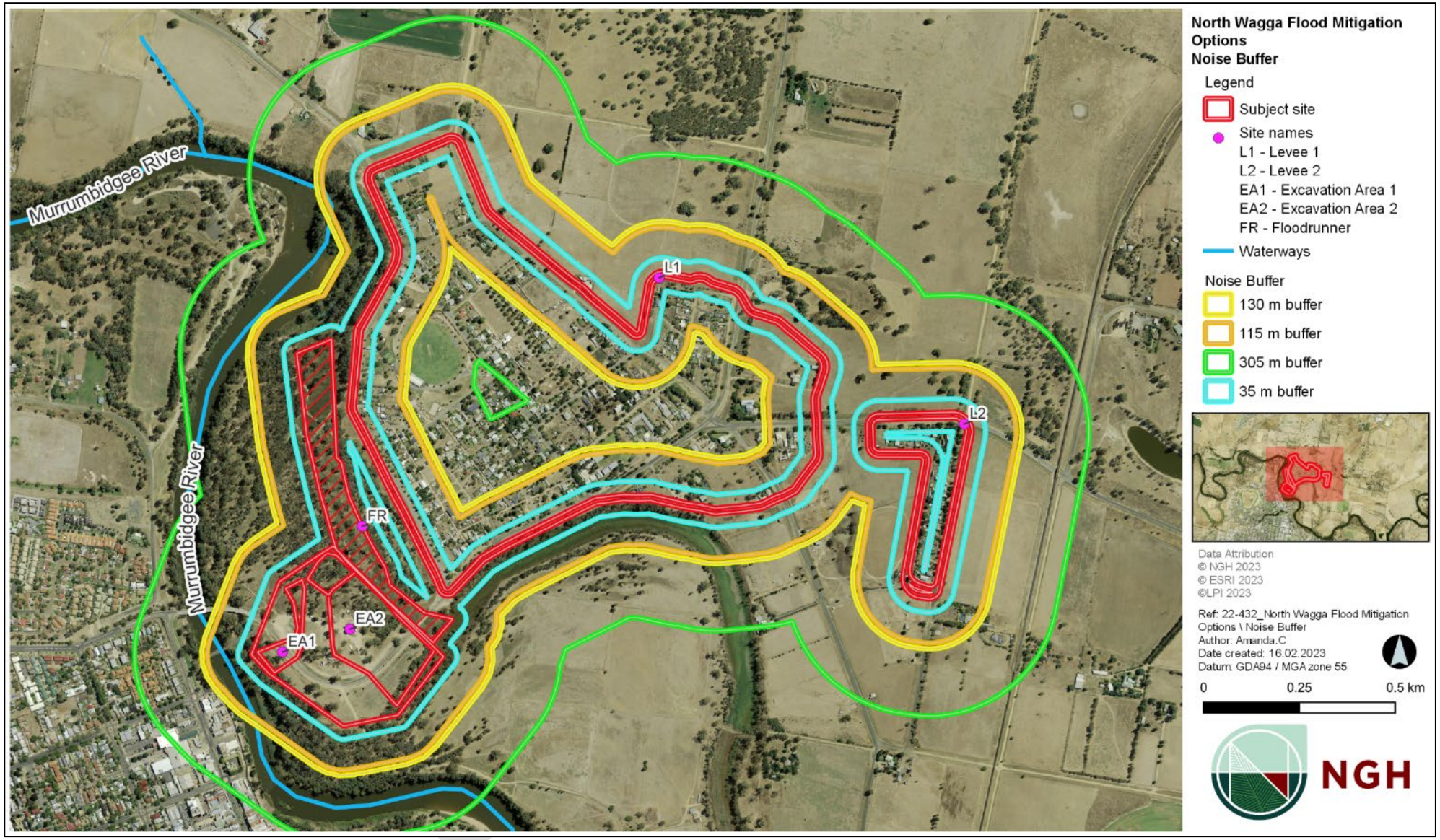


Figure 4-5 Noise Buffer

4.6. Traffic and access

4.6.1. Existing Environment

Access to the proposal would be local sealed roads. The Olympic Highway northwest of the works provides regional access via Gardiner Street and Hampden Avenue. Other arterial roads that facilitate access include Oura Road, Byrnes Road and Eunony Bridge Road.

The posted speed limits adjacent the proposal range between 50-60 km/hr. Traffic volumes are typical of residential and peri-urban vehicular movements.

4.6.2. Potential Impacts

During construction, local traffic is expected to experience minor delays. The scope of works, construction equipment and materials movement required would rely on traffic control and single lane access at various times. The proposal would require a reduced speed zone and one-way traffic lights or stop/slow signs to control traffic during construction. Access to properties from local roads adjacent to the proposal areas would be maintained.

4.6.3. Summary and recommendations

Constraints for traffic are assessed as **low** for the proposal sites with the exception of the construction of the proposed bridges if the access road to North Wagga is to be raised and a floodway installed to move water from Wilks Park OLA to the flood runner. This work would be staged assessed as moderate and the current access road would be utilised until the new access road is commissioned.

4.7. Aboriginal Heritage

4.7.1. Existing environment

A desktop search of AHIMS (7 February 2023) indicates 9 Aboriginal sites are recorded and 3 Aboriginal places have been declared in or near the proposal site. One named Aboriginal Place (Wiradjuri Reserve and Gobba Beach) on the Wagga Wagga LEP 2010 is approximately 100m north of the proposed flood runner along Murrumbidgee River.

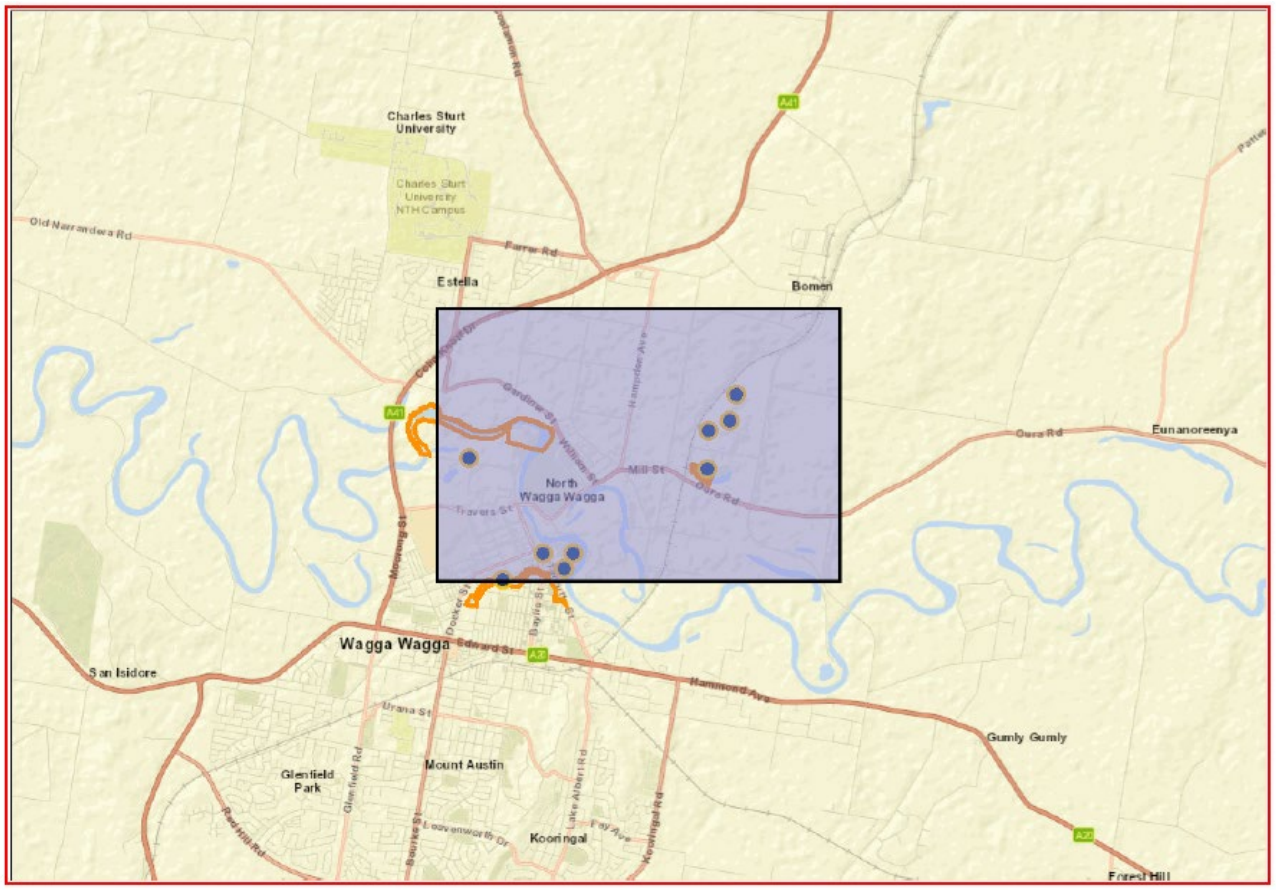


Figure 4-6 Previously recorded AHIMS sites

4.7.2. Potential impacts

The proposed work would involve earth works and ground disturbance. Due to the proximity of the site to an existing Aboriginal place (e.g. Wiradjuri Reserve and Gobba Beach) and sensitive landforms, the Murrumbidgee River, (within 200m of a body of water), there is potential for Aboriginal objects to occur within the proposal area.

Due to the location of the proposed work and the need to ground disturbance, an Aboriginal Due Diligence Assessment in accordance with the OEH Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (2010) is recommended as part of an EIA as a minimum. If it is found that Aboriginal objects would be impacted, it would be necessary to obtain an Aboriginal Heritage Impact Permit (AHIP) from DPE .

4.7.3. Summary and recommendations

Constraints for Aboriginal Heritage are assessed as high due to the rich history of Aboriginal presence in the locality.

An Aboriginal Heritage assessment should be completed for the works and form part of any future EIA.

4.8. Historic Heritage

4.8.1. Approach

Searches of the following heritage databases were undertaken on 7 February 2023:

- State Heritage Inventory (which includes LEP, State Heritage Register and s170 listed items)
- Australian Heritage Database

4.8.2. Existing Environment

A search of the State Heritage Inventory found 287 listed items. 278 were listed on the Wagga Wagga LEP 2010. Seven of which would be encompassed by the limits of the works, but not within the worksites themselves. These items are:

- The Mill House (70 m from existing Levee 1)
- North Wagg Wagga Hall (230 m west of the Eastern side of Levee 1)
- North Wagga Wagga Public School (85 m west of the Eastern side of Levee 1)
- Police Station (former) (50 m west of the Eastern side of Levee 1)
- Two listed residences (48 m and 49 m from existing Levee (1))
- St Mary's Anglican Church and Hall (277 m from closest Levee (1) embankment).

Nearby Listed Heritage items outside the existing levee banks include the residence of Springfield which is located within 130 m east of levee 2.

One named Aboriginal Place (Wiradjuri Reserve and Gobba Beach) on the Wagga Wagga LEP 2010 is approximately 100m north of the proposed flood runner along Murrumbidgee River.

A search of the Australian Heritage database listed 20 items in Wagga Wagga, however, none are within the proposal area.

4.8.3. Potential impacts

The purpose of the proposed works aim to minimise flood impacts on North Wagga. The LEP listed items (all of which are located in North Wagga within the area protected by Levee number 1 (refer Figure 4-7). The transport, placement and compaction of materials for flood management works has the potential to impact built structures through vibration. The management of vibration adjacent to built structures should be considered during any further detailed design and environmental assessment.

4.8.4. Summary and recommendations

Due to the number of listed heritage items that have lines of are within 100m of the proposal, constraints are considered to be moderate in terms of historic heritage. A Statement of Heritage Impact (SOHI) may also be required as part of the EIA to address the potential impacts of the proposal and lines of sight.

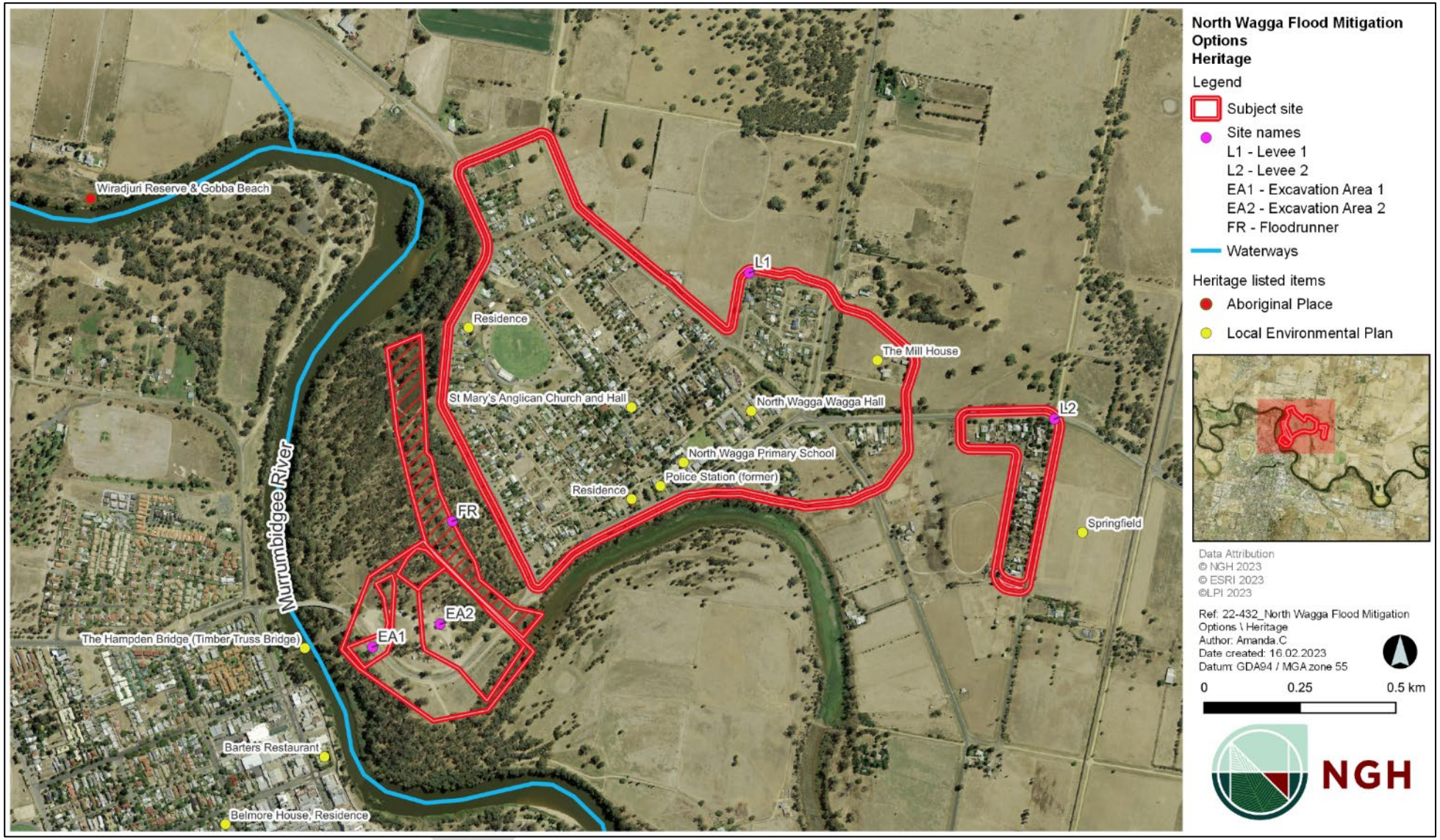


Figure 4-7 Listed Heritage Items

4.9. Visual amenity

4.9.1. Approach

Building up of the existing levees would change the visual perspective as the levee would be raised 1-1.5 m in some areas. In addition, there would be locations where the width may be 4 m wider either side of the levee. Altered heights and widths may alter the visual amenity of the area.

The approach to North Wagga includes Wilks Park and Wilks Park OLA. These areas are disturbed and mowed for public recreation.

Areas that are currently highly disturbed such as recreational areas have low constraints. Areas that are currently relatively not disturbed and have significant levels of vegetation have higher constraints.

4.9.2. Existing environment

The dominant visual characteristics include; the Murrumbidgee River, North Wagga, local roads and existing levee banks.

Wilks Park and Wilks Park OLA is surrounded by a disturbed/mown free camp area, amenities servicing this area, scattered mature river red gum trees, dilapidated fencing, established service tracks, rubbish and general debris from long term campers.

The dominant visual characteristics of the flood runner area (adjacent to Wilks Park) include large hollowed River Redgum trees, saplings, and mature trees 20 years old or older. This area is was formerly excavated for levee construction and provides relief that is visually appealing.

The main (Levee 1) forms a ring around the main part of north Wagga. The dominant visual characteristics associated with Levee 1 includes; dwellings, wooded floodplain and farmland. The built levee was established in 1993. The structure was improved after the 2012 flood event. Repairs and improvements to the structure created a uniform trapezoidal shape. The surface is dominated by couch grass, windmill grass and opportunistic weeds.

The second Levee (Levee 2) surrounds a smaller number of assets and homes. Levee 2 is smaller in length and the dominant visual characteristics are large lot rural holdings, grazing livestock the Great Southern Railway Viaduct and small patches of established native vegetation.

4.9.3. Potential impacts

There would be a noticeable change in visual amenity due to the height and width of the levee works. Views of areas beyond the levee would be reduced. While views of the levee structure increased. While the dimensions would change the structure may be similar in overall appearance.

Works through Wilks park would change the visual amenity through the addition of a built earthen structure, new bridge and the loss of native vegetation. Excavation of the floodway similarly would result in the loss of some vegetation. Excavation works within the flood runner (refer Figure 2-1) may result in the loss of large established trees and native fauna. This would be a major change to the visual character and is a high constraint.

Excavation and changes within Parken Pragan (EA2), would not be too dissimilar to the cleared area which already exists and would be considered a low constraint.

4.9.4. Summary and recommendations

Alterations to the existing levee are deemed low to moderate constraints, Wilks Park OLA is considered a moderate to low constraint, and the flood runner is considered a high constraint. Due to the potential extent of proposed works, this is considered a high constraint.

A detailed visual impact assessment is recommended as a minimum to accompany the EIA to assess the magnitude of construction impacts as well as the visual impacts upon operation for an increased levee height of such extent.

4.10. Socio-economic impacts

The proposal is located within Wagga Wagga City Local Government Area and specifically within the suburb of North Wagga. Wagga Wagga is known for its agricultural, Aboriginal, Armed services and University history. Wagga contains several historical buildings including Hampden Bridge, Railway Station, Wagga Court house, Wagga Post office (former), a range of churches and former homesteads. North Wagga is a long standing residential area of the City of Wagga Wagga. Flooding has direct and costly impacts on the socio-economic activity of North Wagga. The reduction of flood impacts on North Wagga improves the socio-economic condition and health and safety of the community.

4.10.1. Existing environment

The suburb of North Wagga is known to flood regularly with recent flood event in March 2012 (2.85% AEP), 2016 and 2022 (10% AEP). In 2021 there were 679 residents and 291 dwellings in North Wagga (ABS, 2021). Due to historic flooding events, restrictions on the development of additional houses was introduced in 1985 and reinforced in 2010 (see Wagga Wagga LEP 1985 and 2010). As such, the population of North Wagga and the number of dwellings are limited with a no growth strategy employed in this suburb.

There are several businesses and a primary school located within North Wagga and in proximity <200m to the levee bank that is proposed to be upgraded.

4.10.2. Potential impacts

The construction of flood management works would create temporary noise, air quality, traffic and access, and waste impacts. However, the construction of the flood management works would reduce the frequency of levee bank overtopping and subsequent inundation. This would reduce the cost and inconvenience of flooding on the historic, social and cultural infrastructure of North Wagga . The flood management works would aim protect the suburb from a 1:20 event and enhance egress during flooding.

The proposal has the potential to impact local residents during construction as a result of the following:

- Air quality – section 4.4
- Noise – section 4.5
- Traffic and access – section 4.6
- Visual amenity – section 4.9.

These impacts would be temporary and minor during the construction period. It is unlikely that the proposal would have a negative impact on surrounding business operations.

In the longer term, the proposal would provide flood safety within the township and contribute to a stronger local economy. It would reduce the risk to life from flood as well as the costs of flooding on the community.

4.10.3. Summary and recommendations

Constraints area assessed as moderate due to magnitude of potential socio-economic impacts as well as the overall benefit to the residents of North Wagga from reduced flood impacts.

4.11. Waste minimisation and management

During construction small quantities of waste are likely to be generated which includes general construction waste, vegetation, spoil, bitumen and fill materials. These wastes would be reused in the work or disposed of as building and demolition waste at a local approved waste facility.

Domestic rubbish and raw sewage will be generated by the construction personnel. This waste has the potential to attract wildlife which may increase predation pressures on local native wildlife populations. These wastes may also create a loss in visual amenity impacting those passing the site. These wastes would be directed to the municipal reticulated sewage system.

Inappropriate disposal of construction wastes can impact on the visual amenity and environment including pollution of waterways and soil contamination. The proposed works are likely to result in the generation of construction waste including fuels, oils and lubricants. Inappropriate storage and disposal of these wastes may contaminate the land and affect its productivity.

4.11.1. Summary and recommendations

Constraints are assessed as low and mitigation measures would be further explored in the EIA.

5. Conclusion

5.1. Planning Pathway

State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) Division 7 Flood mitigation work, permits development for the purpose of flood mitigation work (including levees) to be carried out on or behalf of a public authority without consent on any land. The proposal is characterised as flood mitigation work and would be undertaken by a public authority, being WWCC. Therefore, the provisions of the TISEPP apply and the proposal is permissible without development consent under Part 5 of the EP&A Act.

Councils and State authorities may assess and approve their own activities in accordance with EP&A Act. An EIA prepared and assessed under Section 5.2 of the EP&A Act would be required for the construction of the proposal.

A site assessment of biodiversity values to be impacted by the proposed works would be required. Tests of Significant Impacts for threatened species, ecological communities and endangered populations would be required under the BC Act and EPBC Act. Projects assessed and determined under Part 5 of the EP&A Act (EIA) could also require assessment under the BC Act Biodiversity Offset Scheme (BOS) if a significant impact is found on any threatened entities. Under the EPBC Act, significance of impacts is determined in accordance with the Significance impact guidelines 1.1 – Matters of National Environmental Significance (DoE 2013).

The NPW Act promotes and regulates the management of national parks and historic sites or places of cultural value within the landscape and the conservation of certain fauna, and native plants. The NPW Act provides the basis for legal protection and management of Aboriginal sites in NSW, under Part 6 of the NPW Act. Due to the nature of the proposal, comprising significant earthworks, and the potential Aboriginal heritage, a Due Diligence assessment conducted by a qualified archaeologist would be required as part of an EIA. Site assessment to determine presence/absence of the impact area would be required.

Areas considered high constraints include:

- Water
- Biodiversity
- Aboriginal Heritage
- Visual

Areas considered to be moderate-high constraints include:

- Soils
- Visual
- Noise
- Biodiversity

Areas considered to be moderate constraints include:

- Biodiversity
- Community

Areas considered to be low constraints include:

- Waste

- Climate and Air quality
- Community

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Appendix A Background searches

Appendix B Biodiversity