Burley Griffin Way (MR84) Route Safety Review Improvements

Review of Environmental Factors

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Review of Environmental Factors

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Prepared by NGH Pty Ltd and Transport for NSW

Document controls

Approval and authorisation

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Signed:	J.Baaner
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Executive summary

The Proposal

The Burley Griffin Way (MR84) is a two-lane road with flexible pavement that provides an important link for the Northern and Western Riverina connecting Griffith to Yass and Sydney via the Hume Highway. The corridor is 258km long and extends from the Hume Highway (HW2) south of Bowning, via Binalong, Harden, Wallendbeen, Temora and Ariah Park to the Newell Highway near Mirrool, then from the Newell Highway near Ardlethan via Barellan and Yenda to Irrigation Way at Yoogali, east of Griffith in NSW.

Key features of the Proposal would include:

- Road edge repair and road widening at various locations (including required ancillary works),including culvert and drainage structure widening works
- Reinstatement of a hazard free roadside, where possible, by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of roadside safety barriers at various locations where a hazard free roadside cannot be achieved (nominally 10m from the existing carriageway edge line)
- Road signage upgrades
- Installation of new audio tactile line-marking in line with Transport for NSW policy
- Reinstatement of line marking and raised pavement markers on completion
- Beneficial re-use of surplus material.

For the purpose of this REF impacts are limited to the Construction footprint defined as: the area of land that is directly impacted by the Proposal, including access roads, plus areas used to store temporary construction facilities and infrastructure. The maximum impact footprint is based on the shapefile '220304_MR84_Vegetation_MGA55' provided by Transport for NSW.

Need for the Proposal

A Route Safety Review (RSR) of Burley Griffin Way was undertaken by Transport for NSW in 2019 **MR84 – Burley Griffin Way Route Safety Review A28334412.** The review identified key roadside infrastructure and line marking safety improvements required along the Burley Griffin Way between the Hume Highway and Griffith.

The Route Safety Review revealed that over 95% of fatal and serious injury crashes were head on or run off road type crashes along the route.

The program will improve road safety along routes through mass-action upgrades such as audio tactile line marking (ATLM), safety barrier installation, shoulder widening and median separation.

These road safety and traffic efficiency issues need to be addressed without unnecessary and/or negative environmental impact. For this reason, a range of features have been proposed as part of works to improve road user safety. The Proposal is also considered to be consistent with the objectives of the following Australian and State government strategic documents:

- Restart NSW (Infrastructure NSW 2019)
- Future Transport Strategy 2056 (Transport for NSW 2018)
- Building Momentum: State Infrastructure Strategy 2018 (Infrastructure NSW 2018)
- NSW Road Safety Strategy 2012 – 2021 (Transport for NSW 2012).

Proposal objectives

The Proposal forms part of a continuing process to improve road user safety on Burley Griffin Way by carrying out a range of safety improvement work between Bowning and Griffith.

The objectives of the Proposal include:

- Align with the NSW Road Safety Plan 2021
- Align with the NSW Towards Zero commitment to reduce road trauma
- Target identified primary crash types
- Reduce the likelihood and severity of fatal and serious injury type crashes
- Minimise environmental impacts.

The development criteria includes:

- Minimise impacts to infrastructure/services and private property
- Keep to existing road corridor where possible
- Meet road safety guidelines where possible.

Options considered

Transport for NSW developed and investigated four design options. The options are as follows:

- **Option 1** – Do nothing option
- **Option 2** – Road safety upgrades with clearing of the entire 10m corridor either side of the road to minimise collision risk
- **Option 3** – Road safety upgrades with clearing of areas of low constraint, reducing risk to road users and the environment
- **Option 4** – Road safety upgrades with clearing of areas of low constraint and avoiding all hollow bearing trees with >90cm diameter-at-breast-height, reducing risk to road users and the environment.

Options 3 – 4 reflect a responsiveness to environmental constraints, primarily aboriginal heritage and biodiversity. Option 4 maintains compliance with the Proposal objectives including not compromising environmental outcomes.

Statutory and planning framework

The Proposal is for a road and is to be carried out by Transport for NSW and can therefore be assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act). The Proposal does not require development consent under Part 4 of the EP&A Act due to permissibility in State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) and is not classified as State significant infrastructure under Division 5.2. Transport for NSW is classified as a proponent and a determining authority.

Community and stakeholder consultation

Transport for NSW has consulted with the NSW National Parks and Wildlife Service (NPWS) under the requirements of the TISEPP. NPWS confirmed that as the works are all proposed within the existing road reserve NPWS is happy for the works to proceed. This is documented in Appendix I, NPWS provided this response on 24 April 2023.

As part of the Aboriginal Archaeological Baseline Report (AABR) process consultation was carried out with five Local Aboriginal Lands Councils (LALCs). Feedback from the LALCs was used to complete the AABR and it is noted that the LALCs would continue to be consulted with throughout the works program.

All future consultation would be carried out by Transport for NSW in accordance with the Transport for NSW *Community Involvement Practice Notes and Resource Manual* as well as the 2019 Route Safety Review All Routes – Communication Plan, to be implemented on this Proposal.

Environmental impacts

The main environmental impacts of the Proposal are:

Biodiversity

During construction there would be impacts to biodiversity through the clearing of vegetation. The Proposal would result in the direct loss of 14.18ha of native roadside vegetation including about 13.07ha of Threatened Ecological Communities. The Proposal would also result in the removal of 64 habitat trees. Indirect impacts may only include spread of weeds, pests, and pathogens and exposure to disruptive conditions. A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* that will detail and track all measures that would ensure impacts to flora and fauna are not significant.

During operation impacts would be minor as Burley Griffin Way would sit within the same corridor as the existing road, with only minor edge effects anticipated.

The Proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* (NSW) or *Fisheries Management Act 1994* (NSW); a Species Impact Statement or Biodiversity Development Assessment Report is therefore not required.

The Proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth).

Aboriginal cultural heritage

The final Construction footprint responded to an extensive Aboriginal Archaeological Baseline Report (AABR) that identified areas of high, medium, and low sensitivity for Aboriginal heritage. The final works scope does not include any works covered by this REF in areas of high or moderate archaeological sensitivity. The modified scope (the Proposal) is mainly contained on disturbed land.

After modifying the scope Transport for NSW Aboriginal Cultural Heritage Officers conducted site visits of areas where Construction footprint works were proposed. Sections of the Burley Griffin Way that have proposed tree removal were also rapidly inspected by a Transport for NSW Aboriginal Cultural Heritage Officer. The assessment and site inspection by Transport for NSW align with Stage 1 of the Transport for NSW *Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (PACHCI) and satisfy the Due diligence Code of Practice for the Protection of Aboriginal Objects in NSW. The PACHCI assessment described the following:

- Based on Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI), the Proposal, as specified within the PACHCI and through a search of the Aboriginal Heritage Information Management System (AHIMS), was assessed as being unlikely to have an impact on Aboriginal Cultural Heritage.
- The assessment is based on the following due diligence considerations:
  - The Proposal is unlikely to harm known Aboriginal objects or places.
  - The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the Proposal area.
  - The Proposal area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's Due diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW procedure.
  - The cultural heritage potential of the Proposal area appears to be reduced due to past disturbance.

The Proposal may proceed in accordance with the environmental impact assessment process as no significant impact to Aboriginal cultural heritage is expected.

Justification and conclusion

The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. Environmental impacts can be effectively mitigated with the application of safeguards outlined within the REF.

The environmental impacts of the Proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act is not required for the Proposal.

The Proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of *the Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Climate Change, Energy, the Environment and Water (DCCEEW) is not required.

Overall, the Proposal is believed to be justified in meeting its objectives with few residual long-term impacts and is therefore justified and is in the interest of the public.

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1. Introduction

1.1 Proposal identification

The Burley Griffin Way (MR84) is a two-lane road with flexible pavement that provides an important link for the Northern and Western Riverina connecting Griffith to Yass and Sydney via the Hume Highway in the following Local Government Areas (LGA):

- Griffith City Council
- Carrathool Shire Council
- Narrandera Shire Council
- Coolamon Shire Council
- Temora Shire Council
- Cootamundra-Gundagai Regional Council
- Hilltops Council
- Yass Valley Council.

The corridor is 258km long and extends from the Hume Highway (HW2) south of Bowning, via Binalong, Harden, Wallendbeen, Temora and Ariah Park to the Newell Highway near Mirrool, then from the Newell Highway near Ardlethan via Barellan and Yenda to Irrigation Way at Yoogali, east of Griffith in NSW (refer Figure 1-1). The posted speed limit is 100 kilometres per hour (km/h) along open stretches and ranges between 50 km/h and 80 km/h as it passes through local town and villages. The road is sealed throughout the Proposal areas extent. The width of the carriageway (sealed road area) is variable depending on road treatments such as turning areas, but where the road is straight and consists of two lanes the carriageway width is approximately 7.5m. There are no footpaths or cycleways on the main route. The route includes some guardrails along turns such as the western approach to Stockingbingal township. More barrier installations are forecast for future works along the route. From the east the Main Southern Railway follows the route of Burley Griffin Way until Wallendbeen. East of Stockinbingal the Cootamundra Lake Cargelligo Railway follows the route until Temora where the railway becomes the Temora Roto Railway which follows the route until Yenda. There are four railway crossings along the Burley Griffin Way Proposal area (see Appendix H.1).

Key features of the Proposal would include:

- Road edge repair and road widening at various locations (including required ancillary works), including culvert and drainage structure widening works
- Reinstatement of a hazard free roadside, where possible, by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of roadside safety barriers at various locations where a hazard free roadside cannot be achieved (nominally 10m from the existing carriageway edge line)
- Road signage upgrades
- Installation of new audio tactile line-marking, in line with Transport for NSW policy
- Reinstatement of line marking and raised pavement markers on completion
- Beneficial re-use of surplus material.

A more detailed description of the Proposal is provided in section 3.

A route safety review of Burley Griffin Way (2019) by Transport for NSW which identified a number of opportunities to improve safety for road users. The route safety review identified road safety projects for road safety funding between 2018 and 2023 as part of the Saving Lives on Country Roads program. This program funds safety improvements to standardised road cross-section along routes. The program will improve road safety along routes through mass-action upgrades such as audio tactile line marking, safety barrier installation, shoulder widening and median separation.

The following definitions are used in this REF:

- **Proposal**: All works involved in the construction and operation of the works described in this REF.
- **Project area:** The total length (258km) of Burley Griffin Way considered in the Aboriginal Archaeological Baseline Report (AABR) in consideration of Aboriginal heritage constraints areas. The Project Area is taken as a 30m buffer of the Burley Griffin Way centreline.
- **Proposal area:** The total length (258km) of Burley Griffin Way where works (clearing and grubbing for safety purposes) would be conducted including all proposed stockpile, compound and laydown sites associated with the works. The Proposal area is taken as a 10m buffer from the Burley Griffin Way edgeline.
- **Construction footprint:** the area of land that is directly impacted by the Proposal, including access roads, plus areas used to store temporary construction facilities and infrastructure. The maximum impact footprint is based on the shapefile ‘220304_MR84_Vegetation_MGA55’ provided by Transport for NSW.
- **Locality:** The area within a 10 km radius of the Proposal area.

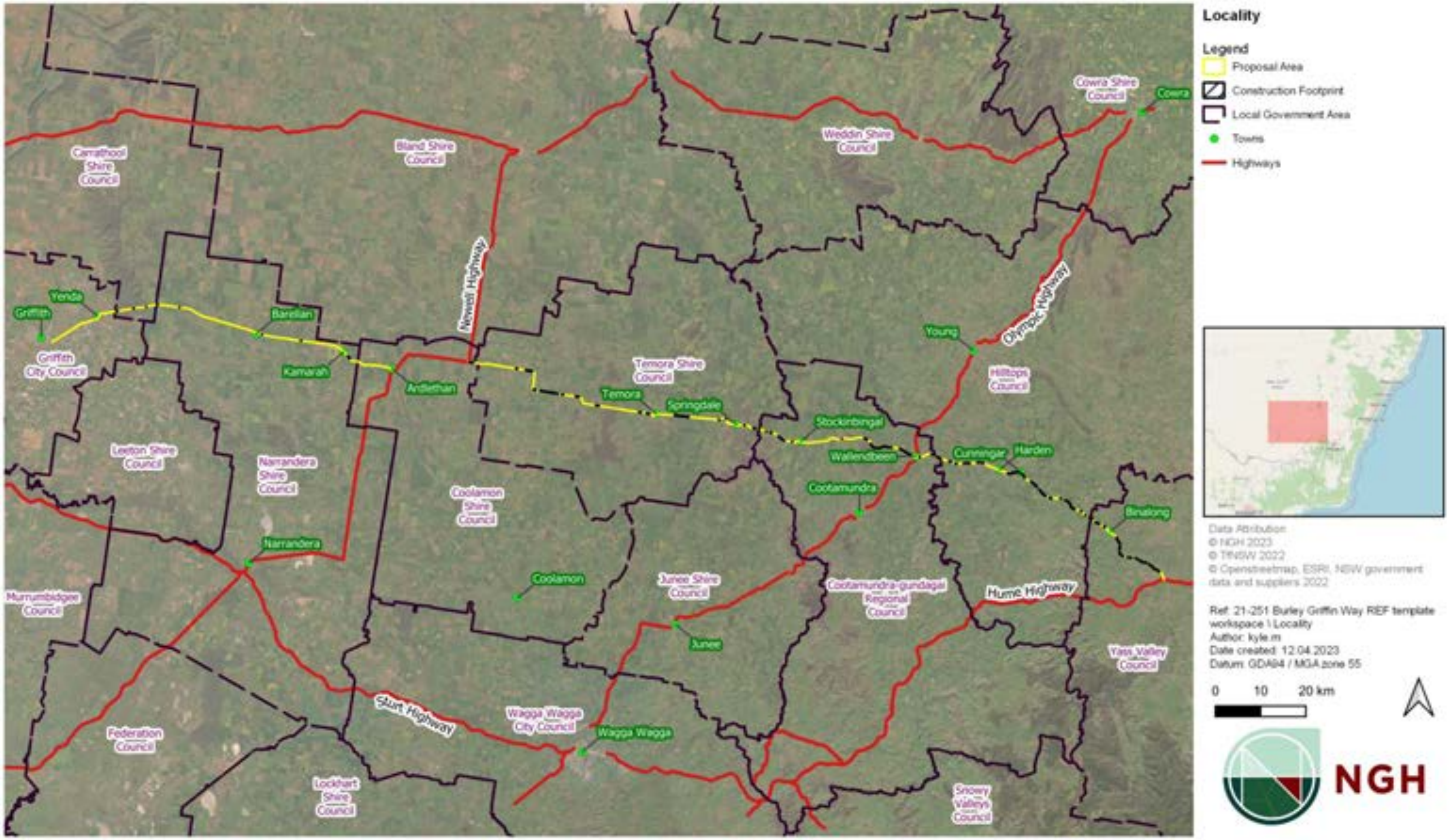

Figure 1-1 Location of the Proposal

1.2 Purpose of the report

This review of environmental factors (REF) has been prepared by NGH Pty Ltd (NGH) on behalf of Transport for NSW. For the purposes of these works, Transport for NSW is the proponent and the determining authority under Division 5.1 of the *Environmental Planning and Assessment Act 1979* (EP&A Act).

The purpose of the REF is to assess the environmental impacts of the Proposal, to fulfil the requirements of Division 5.1 of the EP&A Act, and to take into account all matters affecting or likely to affect the environment as a result of the Burley Griffin Way (MR84) Route Safety Review Safety Improvement Project along various chainages between Hume Highway and Yoogali.

The description of the proposed work and assessment of associated environmental impacts has been undertaken in the context of section 171 of the Environmental Planning and Assessment Regulation 2021 (NSW), the factors in *Guidelines for Division 5.1 assessments, (DPE 2022)*, *Roads and Related Facilities EIS Guideline* (DUAP 1996), the *Biodiversity Conservation Act 2016* (NSW) (BC Act), the *Fisheries Management Act 1994* (NSW) (FM Act), and the Australian Government's *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Proposal is subject to assessment and determination under Division 5.1 of the EP&A Act. Section 5.5 of the EP&A Act requires the proponent (Transport for NSW) "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity". The REF is prepared to document the assessment of environmental impacts.

The findings of the REF would be considered when assessing:

- Whether the Proposal is likely to have a significant impact on the environment and therefore the necessity for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning under Division 5.2 of the EP&A Act
- The significance of any impact on threatened species as defined by the BC Act and/or FM Act, in section 1.7 of the EP&A Act and therefore the requirement for a Species Impact Statement or a Biodiversity Development Assessment Report
- The significance of any impact on nationally listed biodiversity matters under the EPBC Act, including whether there is a real possibility that the activity may threaten long-term survival of these matters, and whether offsets are required and able to be secured.
- The potential for the Proposal to significantly impact any other matters of national environmental significance or Commonwealth land and the need, subject to the EPBC Act strategic assessment approval, to make a referral to the Australian Government Department of Agriculture, Water and the Environment for a decision by the Commonwealth Minister for the Environment on whether assessment and approval is required under the EPBC Act.

2. Need and options considered

2.1 Strategic need for the Proposal

A Route Safety Review (RSR) of Burley Griffin Way was undertaken by Transport for NSW in 2019 **MR84 – Burley Griffin Way Route Safety Review A28334412.** Between July 2013 and June 2018, 71 fatal and serious injury crashes occurred on the Burley Griffin Way.The review identified key roadside infrastructure and line marking safety improvements required along the Burley Griffin Way between the Hume Highway and Griffith.

A contemporary route safety review is founded on an understanding of the context of the route within the network and considers crash risk along the entire route. The aim is to bring the entire route up to a consistent, predetermined safety standard based on the infrastructure risk rather than the isolated crash locations.

Advantages of a route-based approach include investment based on proven crash risk (proactive approach, rather than waiting for trauma), economies of scale and location, consistency and predictability, which in turn leads to improved safety. The Route Safety Review revealed that over 95% of fatal and serious injury crashes were head on or run off road type crashes along the route.

The program will improve road safety along routes through mass-action upgrades such as audio tactile line marking (ATLM), safety barrier installation, shoulder widening and median separation.

These road safety and traffic efficiency issues need to be addressed without unnecessary and/or negative environmental impact. For this reason, a range of features have been proposed as part of works to improve road user safety. The Proposal is also considered to be consistent with the objectives of the following Australian and State government strategic documents:

- Restart NSW (Infrastructure NSW 2019)
- Future Transport Strategy 2056 (Transport for NSW 2018)
- Building Momentum: State Infrastructure Strategy 2018 (Infrastructure NSW 2018)
- NSW Road Safety Strategy 2012 – 2021 (Transport for NSW 2012).

2.2 Limitations of existing infrastructure

Burley Griffin Way is a two-way single-pavement state road, 258km in length. The road runs from the Hume Highway near Yass in the east to the intersection of Irrigation Way and Kurrajong Avenue, Yoogali in the west, refer Figure 1-1. The posted speed limit is 100 kilometres per hour (km/h) along open stretches and ranges between 50 km/h and 80 km/h as it passes through local towns and villages.

Two traffic monitoring points were used to characterise traffic volume along the length of the road. Traffic volume data is not currently available. The most recent data available is from 2012 and 2011 (TfNSW, 2021). An average of 1071 daily vehicle movements were recorded travelling in both directions in 2011 at the monitoring station located west of Barellan (95302). An average of 1955 daily vehicle movements were recorded travelling in both directions in 2012 at the monitoring station located east of Harden (94095). Heavy vehicle movements comprise approximately 20% of vehicles near Barellan and 17% near Harden in 2010 (TfNSW, 2021). Given a 2% annual increase, traffic numbers in 2021 would likely be around 1305 per day near Barellan and 2336 per day near Harden.

There is a break in Burley Griffin Way as it gives way to the Newell Highway from Ardlethan to the turnoff near Mirrool. There is one newly constructed set of traffic lights at the termination of Burley Griffin Way at the intersection of Irrigation Way, Yoogali. There are no other traffic lights along the road. Along the length of the road there are two roundabouts, in Temora and Wallendbeen, and four rail crossings.

2.3 Proposal objectives and development criteria

The Proposal forms part of a continuing process to improve road user safety on Burley Griffin Way by carrying out a range of safety improvement work between Bowning and Griffith.

The objectives of the Proposal include:

- Align with the NSW Road Safety Plan 2021
- Align with the NSW Towards Zero commitment to reduce road trauma
- Target identified primary crash types
- Reduce the likelihood and severity of fatal and serious injury type crashes
- Minimise environmental impacts.

The development criteria includes:

- Minimise impacts to infrastructure/services and private property
- Keep to existing road corridor where possible
- Meet road safety guidelines where possible.

2.4 Alternatives and options considered

The development of the Proposal has involved the analysis of multiple strategic design options and the selection of a preferred design option which best meets the Proposal objectives and minimises potential environmental and community impacts.

2.4.1 Methodology for selection of preferred option

Transport for NSW developed several strategic design options to tie into the works. These options were then assessed with proposed mitigation and offset measures to identify which performed best with the budget and timeframe, as well as which best met the Proposal objectives.

2.4.2 Identified options

A total of three different options were considered for the Proposal, including the "do nothing" option. The options are as follows:

- **Option 1** – Do nothing option
- **Option 2** – Road safety upgrades with clearing of the entire 10m corridor either side of the road to minimise collision risk

Option 3 – Road safety upgrades with clearing of areas of low constraint, reducing risk to road users and the environment

Initially the preferred option was identified as Option 3. This option was identified to best meet the Proposal objectives. However, as part of the design development during the preparation of the REF and biodiversity assessment, potential significant impacts were identified on the habitat of the Superb Parrot, requiring an EPBC referral for Option 3. To avoid these impacts, a further option was developed (Option 4); the design was amended, avoiding critical habitat of the Superb Parrot, and reducing the impact to an acceptable level.

- **Option 4** – Road safety upgrades with clearing of areas of low constraint and avoiding all hollow bearing trees with >90cm diameter at breast height, reducing risk to road users and the environment.
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2.4.3 Analysis of options

The selection of the preferred option was based on which option best met the Proposal objectives (refer to Section 2.3). Table 2-1 provides a description of each option and an analysis against the Proposal objectives.

Table 2-1 Option description and analysis

Option	Option description	Option analysis	Meets the Proposal objectives?
Option 1: **Do nothing**	This option involves no change to the roadside corridor, existing formation and infrastructure along any section of Burley Griffin Way.	Given that no work would be carried out, there would be no further traffic or safety benefits. Road user incidents would likely increase as road volumes gradually increase. No expenditure and resources would be used and no employment would be created. This option would not meet the Proposal objectives.	No
Option 2: **Road safety upgrades and Clear 10m corridor**	This option involves the implementation of road safety upgrades with clearing of a 10 m corridor either side of the road to accommodate safety improvements.	This option would likely produce the most safety measures that would be possible along the length of the road. This result would be the most likely to resolve as many road user risks as possible. This option would have a significantly detrimental impact on biodiversity, hydrology, geology, aboriginal heritage, heritage and many other components associated with the Proposal area. This option would require time and potentially costly biodiversity offsets.	No
Option 3: **Road safety upgrades and Clear low constraint areas**	This option involves the implementation of road safety upgrades with clearing of vegetation in low constraint areas only and avoiding high heritage sensitivity areas.	This option would be the most likely to improve road use safety . While the design was originally assumed to have no significant impact on the environment, the biodiversity assessment identified the removal of HBTs that would be considered critical habitat for Superb Parrot. This outcome is not considered acceptable under the EPBC Act and would require EPBC referral.	No
Option 4: **Road safety upgrades and Clear low constraint areas and avoid Hollow bearing trees with >90cm diameter-at-breast-height**	This option involves the implementation of road safety upgrades with clearing of vegetation in low constraint areas only and avoiding HBTs >90cm diameter.	This option would be the most likely to improve road use safety without causing significant harm to the natural and built environment. This option is not likely to require biodiversity offsetting or referral to the Commonwealth Environment Minister. This option avoids critical habitat of the Superb Parrot and results in an acceptable environmental impact outcome.	Yes

2.5 Preferred option

The updated design of Option 4 then involves the implementation of road safety upgrades with clearing of vegetation in low constraint areas only. It includes road safety upgrades with clearing of areas of low constraint and avoiding all hollow bearing trees (HBTs) with >90cm diameter-at-breast-height, reducing risk to road users and the environment.

Although this option would have some environmental and social impacts during both construction and operation (noise, visual, traffic and access), these have been and would be further minimised through the design process and would be managed in accordance with standard safeguards and mitigation measures during construction. The perceived road safety improvements and user benefits during operation are considered to outweigh the minor, negative impacts associated with the Proposal. As such, Option 4 is the preferred option.

As the concept and detailed design continues, further refinement of the design will be undertaken, guided by the Proposal objectives and development criteria.

3. Description of the Proposal

3.1 The Proposal

Transport for NSW proposes to undertake a range of road safety upgrades along sections of the Burley Griffin Way.

Key features of the Proposal would include:

- Road edge repair and road widening at various locations (including required ancillary works), including culvert and drainage structure widening works
- Reinstatement of a hazard free roadside, where possible, by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of roadside safety barriers at various locations where a hazard free roadside cannot be achieved (nominally 10m from the existing carriageway edge line)
- Road signage upgrades
- Installation of new audio tactile line-marking in line with Transport for NSW policy
- Reinstatement of line marking and raised pavement markers on completion.
- Beneficial re-use of surplus material.

The proposed work would be constructed at identified locations along Burley Griffin Way. These locations are identified in the GIS file provided by Transport for NSW (‘220304_MR84_Vegetation_MGA55’), as shown on Figure 1-1 and Appendix H-1. It is noted that this is the maximum impact footprint.

Areas outside these identified locations are excluded from this assessment; this includes all urban areas. A map set is provided that shows the Construction footprint and key landscape features over the Proposal area (refer to Appendix H.1). The proposed works have been categorised into Type 1 and Type 2 works in relation to their expected overall impact within the Construction footprint; Table 3-1 provides the breakdown of the proposed works into Type 1 and Type 2 works.

Table 3-1 General classification of Type 1 and Type 2 works

Type 1 Works	Type 2 Works
• **Road edge repair** • **Road signage upgrades** • **Installation of new audio tactile line-marking** • **Reinstatement of line marking and raised pavement markers** • **Installation of safety barrier where hazard free clear zones cannot be achieved** • **Relocation of utilities, if required** • **Provision of a 10 mm primer seal followed by a 7 mm final seal at the road widenings**	• Road widening, including culvert extensions • Reinstatement of a hazard free roadside where possible by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping • Tree removal and vegetation maintenance • Intersection upgrades.

3.2 Design

3.2.1 Design Criteria

The design criteria for the Proposal is to carry out safety improvement work based on detailed design through the Route Safety Review (RSR) of the Burley Griffin Way.

Hazard identification and remediation optioneering was undertaken by suitably experienced and qualified road safety engineering staff. Interventions have been designed to minimise the likelihood and severity of a fatal or serious injury crash occurring where hazards have been identified. These designs have been refined to avoid, minimise and mitigate the impacts of proposed development on biodiversity.

3.2.2 Engineering constraints

There are no known engineering constraints associated with this Proposal.

3.3 Construction activities

3.3.1 Work method

Detailed construction activities and work methodologies would be determined during detailed design and construction planning. Construction activities would follow a Construction Environmental Management Plan (CEMP) to ensure the work is carried out to Transport for NSW specifications within the specified work area. It is expected that the work would be staged into discrete sections to minimise impacts to road users.

The Proposal would involve the work method as outlined in Table 3-2.

Table 3-2 Proposed work method

Activity	Method

General site establishment	○ Survey set out
	○ Locate and protect existing utilities
	○ Set out, demark and fence the site to establish routes, and no-go zones
	• Implementation of environmental controls:
	  ○ Sediment protection of inlet pits
	  ○ Diversion of clean water from disturbed sites
	  ○ Suitable handling and storage of contaminated or hazardous materials.
	• Implementation of traffic control:
	  ○ Signage
	  ○ Temporary line marking.
	○ Establish construction compound sites and stockpiles.

Pavement widening	○ Clearing of vegetation including mature trees to reduce roadside hazards and to allow construction of any widening of road formation ○ Widening of the road formation, culvert structures and construction of table drains ○ Repair pavement edges.
Shoulder/ verge works	○ Removal of groundcover vegetation. ○ Mulching of trees for potential use of mulch during site works as ground cover for erosion and sediment control, as well as other beneficial reuses

Activity	Method
Safety barrier installation	○ Where possible, provide 6:1 batters or flatter. Locations where this is uneconomic, batters may be steepened, and safety barriers installed. ○ Potential property acquisition along the Proposal length to allow for widening of formation. ○ Reinstatement of road signage, line-marking, guideposts and other delineation
Line marking	○ Provision of audio tactile line marking along the highway within the Proposal length in line with the Audio Tactile Linemarking Technical Direction (TTD 2020/04).
Site clean-up and commissioning of upgraded facility	○ Site clean-up and removal of stockpiles and compound. ○ Removal of traffic controls and any erosion and sediment controls.

3.3.2 Construction workforce

Due to the varied nature of the Proposal, the number of workers on site at any given time is considered to be variable. Up to 50 persons are expected to work on site at any given time.

3.3.3 Construction hours and duration

Standard working hours would be adopted to carry out the works as outlined below.

Days	Hours
Monday to Friday	7:00am to 6:00pm
Saturday	8:00am to 1:00pm
Sunday and Public Holiday	No works

Out of hours works including night work and work on Saturdays and Sundays may be adopted depending on Proposal staging, traffic impacts and impacts to any adjacent sensitive receivers. Any out-of-hours work would be carried out in accordance with the Noise Criteria Guideline (Roads and Maritime Services, 2015), Construction Noise and Vibration Guideline (Roads and Maritime Services, 2016) and Construction and Maintenance Noise Estimator Tool.

Work would be carried out in the 2022/2023 and 2023/24 financial years. It is anticipated that construction would commence in August 2023 and be completed by June 2024, with work to be undertaken in stages (to be determined as part of detailed design). Vegetation works would be undertaken in the 2022/2023 with subsequent civil works to take place in 2023/2024.

3.3.4 Plant and equipment

The following plant and equipment are expected to be used as part of the works:

- Excavators and loaders
- Rollers
- Trucks
- Water carts
- Graders
- Bitumen spray truck
- Aggregate spreaders
- Back-hoe

- Bobcat
- Light vehicles
- Concrete trucks
- Line-marker Truck
- Road profiler
- Vibrating compactors
- Road stabiliser
- Lime spreader
- Material transfer vehicle
- Elevated work platform
- Lighting tower
- Portable toilet/crib room/site office
- Mulcher
- Generator
- Guardrail Installation Equipment
- Cranes
- Hand Tools
- Temporary Traffic Lights.

3.3.5 Earthworks

Earthworks would be undertaken to carry out the Proposal. As the Proposal is still subject to detailed design, earthwork quantities (cut and fill) are unknown. Any excess material would be managed according to the Environment Technical Direction ETD 2015I 020 dependent on historical road or other construction work in the area.

3.3.6 Construction materials

Materials which would be brought to site for the work include the following:

- Road aggregates
- Reinforcing steel
- Watermain reticulation and backfill material
- Asphalt
- Concrete
- Drainage pits and pipes
- Roadside safety barriers
- Line marking paint
- Raised reflective pavement markers
- Signage and posts.

Where possible, the materials would be sourced from local Transport for NSW prequalified suppliers. The final quantity of materials would be determined during detailed design.

Surplus or unsuitable material that cannot be used on-site would be classified in accordance with the Waste Classification Guidelines (EPA, 2014) and reused or disposed of at an approved materials recycling or waste disposal facility.

3.3.7 Traffic management and access

The Proposal would generate additional light and heavy vehicle movements during the construction period, including:

- Heavy vehicle delivery and removal of construction materials/ equipment/ machinery including vegetation removal activities to both the Proposal area and compound sites.
- Light vehicles transporting personnel between the Proposal area and compound sites.

The typical number of heavy and light vehicle movements per day/period and during the various activities is as follows:

- General site establishment – two heavy vehicles, two light vehicles per shift
- Pavement widening, shoulder/ verge works, safety barrier reinstallation and line marking – six heavy vehicles, six light vehicles per shift
- Site clean- up and commissioning of upgraded facility – two heavy vehicles, two light vehicles per shift.

A Traffic Management Plan (TMP) would be prepared in accordance with the Transport for NSW's Traffic Control at Work Sites Manual (NSW, 2022) and Specification G10 – Traffic Management and approved by Transport for NSW before use. The TMP would provide details of the traffic management to be implemented during construction to ensure traffic flow on the surrounding network is maintained where possible.

Property accesses would be maintained as far as practicable throughout construction, with modified access through the construction zone under traffic control required at times. Residents would be consulted with regarding these alternate arrangements.

3.4 Ancillary facilities

Site compounds, stockpile sites and other ancillary facilities would be required during construction. Areas suitable for site compound/stockpile sites are identified in this REF with existing Transport registered stockpile sites to be used where possible (refer to Appendix H.1).

Site compound/stockpile sites would be used for the following activities:

- Temporary stockpiling
- Temporary material laydown
- Lunchroom and amenity facilities
- Car parking and machinery storage
- Temporary waste storage
- Chemical and fuel storage.

The stockpile sites would be subject to the criteria set out in Roads and Maritime's 'Stockpile Site Management Guideline' (Roads and Maritime 2015c) and QA Specification R44 – Earthworks. Stockpile sites would be managed in line with the following guidelines where practicable:

- Located in areas not prone to flash flooding and more than 50 metres from a watercourse
- Have ready access to the road network or direct access to the construction corridor
- Located in previously disturbed areas that do not require the clearing of native woodland vegetation
- Located in areas of low ecological and heritage conservation significance
- Located outside the drip line of trees
- Located on relatively level land.

No known public utility adjustments would be required for this Proposal.

No property acquisition is required for the use of compound sites. Local council would be consulted prior to the utilisation of any local council areas. Construction fencing would be established to appropriately separate the public and the compound site. Any temporary site compound/stockpile site on local council or private land would be subject to the Roads and Maritime's 'Management of Wastes on Roads and Maritime Services Land" (Roads and Maritime 2014) and Transport Environment and Sustainability Manager approval.

3.5 Property acquisition

No property acquisition would be required for this Proposal.

4. Statutory and planning framework

4.1 Environmental Planning and Assessment Act 1979

The *Environmental Planning and Assessment Act 1979* (NSW) (EP&A Act) and its associated regulations provide the framework for assessing environmental impacts and determining planning approvals for developments and activities in NSW.

The Proposal does not require development consent under Part 4 of the EP&A Act due to permissibility in State Environmental Planning Policy (Transport and Infrastructure) 2021 (TISEPP) (refer to Section 4.1.1 below) and is not classified as State significant infrastructure under Division 5.2. Therefore, the Proposal may be assessed under Division 5.1 of the EP&A Act. Under Part 5 of the EP&A Act, Transport for NSW is classified as a proponent and a determining authority.

4.1.1 State Environmental Planning Policies

State Environmental Planning Policy (Transport and Infrastructure) 2021

State Environmental Planning Policy (Transport and Infrastructure) 2021 (SEPP (Transport and Infrastructure)) aims to facilitate the effective delivery of infrastructure across the State.

Section 2.108 of SEPP (Transport and Infrastructure) permits development on any land for the purpose of a road or road infrastructure facilities to be carried out by or on behalf of a public authority without consent. As the Proposal is for a road and is to be carried out by Transport for NSW, it can be assessed under Division 5.1 of the EP&A Act. Development consent from council is not required.

The Proposal is not located on land reserved under the *National Parks and Wildlife Act 1974* (NSW) and does not require development consent or approval under:

- State Environmental Planning Policy (Resilience and Hazards) 2021
- State Environmental Planning Policy (Planning Systems) 2021
- State Environmental Planning Policy (Precincts – Central River City)
- State Environmental Planning Policy (Precincts – Eastern Harbour City)
- State Environmental Planning Policy (Precincts – Regional) 2021
- State Environmental Planning Policy (Precincts – Western Parkland City) 2021.

Section 2.10 to 2.15 of SEPP (Transport and Infrastructure) contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development. Consultation, including consultation as required by SEPP (Transport and Infrastructure) (where applicable), is discussed in section 5 of this REF.

4.1.2 Local Environmental Plans

The Proposal lies within eight different Local Government Areas (LGAs) including:

- Griffith City Council
- Carrathool Shire Council
- Narrandera Shire Council
- Coolamon Shire Council
- Temora Shire Council

- Cootamundra-Gundagai Regional Council
- Hilltops Council
- Yass Valley Council.

As identified in Section 4.1.1, the provisions of TISEPP override development consent requirements of the local government LEP's and development consent from local councils is not required. Consultation requirements with local governments pursuant to the TISEPP are outlined in Section 5.4. These local government areas in relation to the Proposal can be seen in Figure 1-1.

4.2 Other relevant NSW legislation

4.2.1 Roads Act 1993

Under Section 138 of the *Roads Act 1993* (NSW) (Roads Act) a person must not: erect a structure or carry out a work in, on or over a public road, or dig up or disturb the surface of a public road, otherwise than with the consent of the appropriate roads authority. Prior to undertaking any works, a Road Occupancy Licence (ROL) under Section 138 of the Roads Act would be obtained

4.2.2 Biodiversity Conservation Act 2016

Section 7.3 of the *Biodiversity Conservation Act 2016* (BC Act) establishes a test to determine whether a proposed development or activity is 'likely to significantly affect threatened species'. A Species Impact Statement (SIS) or a Biodiversity Development Assessment Report (BDAR) is required to be prepared where an activity under Division 5.1 of the EP&A Act is likely to significantly affect threatened species.

Relevant biodiversity searches were carried out in the Biodiversity Assessment Report as documented in Appendix D. There is unlikely to be a significant impact to any threatened species or ecological communities, or their habitats and a SIS or BDAR is not required for the Proposal.

4.2.3 Biosecurity Act

The *Biosecurity Act 2015* (Biosecurity Act) repealed the *Noxious Weeds Act 1993* and provides a framework for the prevention, elimination and minimisation of biosecurity risks. The Biosecurity Act and supporting Biosecurity Regulation 2017 provide for the establishment and functions of Local Control Authorities for weeds (LGA or County Councils) and weed control obligations on public and private land. Any land managers or authorities who deal with any plant has a duty to ensure the risk is prevented, eliminated or minimised, so far as is reasonably practicable.

Measures have been included in the REF to ensure adequate weed hygiene during the works (refer to Section 6.1.5).

4.2.4 Heritage Act 1977

The *Heritage Act 1977* (Heritage Act) provides protection for items of 'environmental heritage' in NSW. 'Environmental heritage' includes places, buildings, works, relics, movable objects or precincts considered significant based on historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic values. Under the Heritage Act, 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 excavation permit.

A search of all relevant heritage databases was undertaken for the Proposal area. Heritage impacts are considered in Section 6.7 of this REF.

4.2.5 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act) provides for the care, control and management of all national parks, historic sites, nature reserves, reserves, Aboriginal areas and state game reserves. The NPW Act outlines approval requirements for works in the vicinity of indigenous archaeological sites and provides for the protection of flora and fauna.

The NPW Act also provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW) under Section 90 of the act, and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community) under Section 84. Aboriginal objects are afforded automatic statutory protection in NSW. The Proposal is not expected to result in impacts to any Aboriginal objects or places.. Refer to Section 6.6 and Appendix E.

4.2.6 Fisheries Management Act 1994

The *Fisheries Management Act 1994* (Fisheries Act) provides for the protection of state waterways. Division 3 Dredging and reclamation is relevant to the Proposal where culverts may be extended. Section 198A of the Fisheries Act provides the definition of dredging and reclamation. Under Section 199 of the Fisheries Act, a public authority must, before it carries out or authorises the carrying out of dredging work or reclamation work:

a) give the Minister (or representative i.e. DPI Fisheries) written notice of the work
b) consider any matters concerning the proposed work that are raised by the Minister within 21 days after the giving of the notice (or such other period as is agreed between the Minister and the public authority).

The requirement for notification is included in Section 7.3.

4.2.7 Crown Land Management Act 2016

The *Crown Land Management Act 2016* (NSW) aims to provide for ownership, use and management of Crown land in NSW. Any require acquisition of Crown land would require consultation with the agency.

4.2.8 Environmental Planning and Assessment Regulation 2021 (EP&A Regulation)

The Environmental Planning and Assessment Regulation 2021 (EP&A Regulation) sets out the requirements and form for an REF and the consideration of matters to be addressed.

Section 170 refers to the REF Guidelines to be followed.

Section 171(2) refers to the environmental factors to be taken into account in the REF.

Section 171(4) requires publication of an REF for any activity with:

- A capital investment value of more than $5 million
- An approval or permit for activity that requires approval under:
  - *Fisheries Management Act 1994* (NSW) sections 144, 201, 205 or 219
  - *Heritage Act 1977* (NSW) section 57
  - *National Parks and Wildlife Act 1974* (NSW) section 90
  - *Protection of the Environment Operations act 1997* (NSW) sections 47-49 or 122
- If the determining authority considers it to be in the public interest.

This applies to the proposal unless, as noted under section 171(6), it:

a) Belongs to a class specified by the Planning Secretary in a notice published on the Department's website for the purposes of this section, or
b) An approved code under Division 6 applies.

Publishing of the REF must be undertaken either:

a) Before the activity commences, or
b) As soon as practicable, no later than one month after the activity commences.

Transport for NSW have an internal requirement to publish all project REF's on their website, regardless of whether they meet the requirements outlined above. As such this REF would be published on the Transport for NSW website.

4.3 Commonwealth legislation

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

Under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) a referral is required to the Australian Government for proposed actions that have the potential to significantly impact on matters of national environmental significance or the environment of Commonwealth land. These are considered in Appendix A and chapter 6 of the REF.

A referral is not required for proposed road activities that may affect nationally listed threatened species, endangered ecological communities and migratory species. This is because requirements for considering impacts to these biodiversity matters are the subject of a strategic assessment approval granted under the EPBC Act by the Australian Government in September 2015.

Potential impacts to these biodiversity matters are also considered as part of section 6.1 of the REF and Appendix D.

Findings – matters of national environmental significance

The assessment of the Proposal's impact on matters of national environmental significance and the environment of Commonwealth land found that there is unlikely to be a significant impact on relevant matters of national environmental significance or on Commonwealth land. Accordingly, the Proposal has not been referred to the Australian Government Department of Climate Change, Energy, the Environment and Water under the EPBC Act.

4.3.2 Native Title Act 1993

The *Native Title Act 1993* recognises and protects native title. The Act covers actions affecting native title and the processes for determining whether native title exists and compensation for actions affective native title. It establishes the Native Title Registrar, the National Native Title Tribunal, the Register of Native Title Claims and the Register of Indigenous Land Use Agreements, and the National Native Title Register. Under the Act a future act includes proposed public infrastructure on land or waters that affects native title rights or interest.

A search of the Native Title Tribunal Native Title Vision website was undertaken, with no Native Title holders/claimants identified (refer to Appendix C).

4.4 Confirmation of statutory position

The Proposal is categorised as development for the purpose of a road and/or road infrastructure facilities and is being carried out by or on behalf of a public authority. Under section 2.108 of TISEPP the Proposal is permissible without consent. The Proposal is not State significant infrastructure or State significant development. The Proposal can be assessed under Division 5.1 of the EP&A Act.

Transport for NSW is the determining authority for the Proposal. This REF fulfils Transport for NSW's obligation under section 5.5 of the EP&A Act including to examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the activity.

5. Consultation

This chapter discusses the consultation undertaken to date for the Proposal and the consultation proposed for the future.

5.1 Consultation strategy

All necessary community and stakeholder consultation would be carried out by Transport for NSW in accordance with the *Community Involvement Practice Notes and Resource Manual*. TfNSW has developed a Route Safety Review All Routes – Communication Plan to be implemented on this Proposal.

5.2 Community involvement

Community consultation that would be carried out as part of this Proposal includes the following activities:

- Notification of property owners to be affected by the Proposal such as the sensitive receivers adjacent to the Proposal and property owners affected by proposed property acquisition
- Notifications would be placed in local media prior to the commencement of work detailing the likely timing of the Proposal, potential changes to traffic conditions and project management contact details (to open communication channels to provide further details or address complaints)
- Temporary electronic Variable Message Signs (VMS) placed at both ends of the Proposal to advise of the Proposal and potential delays to motorists
- Meetings and briefings with stakeholders, businesses and residences (as required)
- Letters, phone calls, emails and targeted correspondence
- Project updates on the Transport website: ***www.transport.nsw.gov.au/projects*** live traffic website.

5.3 Aboriginal community involvement

Aboriginal community involvement and heritage impact was considered in accordance with the *Roads and Maritime Procedure for Aboriginal Cultural Heritage Consultation and Investigation (Resource 7)* (PACHCI).

Consultation was carried out with five Local Aboriginal Land Councils (LALCs) as part of the AABR prepared by NGH. Feedback from the LALCs was used to complete the AABR and it is noted that the LALCs would continue to be consulted with throughout the works program.

All future consultation would be carried out by Transport for NSW in accordance with the *Community Involvement Practice Notes and Resource Manual* as well as the 2019 Route Safety Review All Routes – Communication Plan, to be implemented on this Proposal.

Summaries of the various stages in the consultation process are provided within Appendix E.

5.4 TISEPP consultation and agency consultation

Division 1 of TISEPP contains provisions for public authorities to consult with local councils and other public authorities prior to the commencement of certain types of development.

Appendix B contains a TISEPP consultation checklist that documents how TISEPP consultation requirements will be considered.

NPWS

The Construction footprint would include the removal of 15 trees adjacent to Jindalee National Park. As such, consultation needs to occur with the National Parks and Wildlife Service (NPWS) as per the requirements of Section 2.15 of the TISEPP.

Transport for NSW has consulted with the NSW National Parks and Wildlife Service (NPWS) under the requirements of the TISEPP. NPWS confirmed that as the works are all proposed within the existing road reserve NPWS is happy for the works to proceed. This is documented in Appendix I, NPWS provided this response on 24 April 2023.

DPI Fisheries

The Proposal does not include any impacts on KFH areas, therefore no notification is required of DPI Fisheries. However, if any culvert works are to be undertaken within KFH area of Dunderalingo Creek then under s199 of the Fisheries Act when DPI Fisheries should be notified prior to undertaking dredging and reclamation work in water land.

5.5 Ongoing or future consultation

A communication strategy has been developed in consultation with Transport's Community and Customer Engagement team. The strategy includes standard measurers such as advising residents and road users of the potential delays to motorists. Temporary electronic Variable Message Signs (VMS) would be placed along the Burley Griffin Way during construction to advise of the Proposal and potential delays to motorists. The work would also be added to the Transport Live Traffic Website as 'scheduled road work' to provide advance notice to motorists to inform them of the potential for delays and to allow for travel time adjustment where possible. Notifications would also be placed in local print media advising the community of the proposed work and, where possible contact via email, letters and phone calls would be made. A stakeholder database and issues register would also be managed by Transport. Meetings and briefings would also be arranged for ongoing consultation as needed.

6. Environmental assessment

This section of the REF provides a detailed description of the potential environmental impacts associated with the construction and operation of the Proposal. All aspects of the environment, potentially impacted upon by the Proposal, are considered. This includes consideration of:

- Potential impacts on matters of national environmental significance under the EPBC Act
- The factors specified in the *Is an EIS required?* (DUAP 1995/1996)
- Section 171 of the Environmental Planning and Assessment Regulation 2021
- *The Roads and Related Facilities EIS Guideline* (DUAP 1996).

Site-specific safeguards and management measures are provided to mitigate the identified potential impacts.

6.1 Biodiversity

A Biodiversity Assessment Report (BAR) was prepared by NGH for the Proposal and the results are summarised in this section. Refer to Appendix D for the detailed BAR.

6.1.1 Methodology

Database searches were carried out to identify the potential for State (BC Act) listed and Commonwealth (EPBC Act) listed threatened species and ecological communities to occur within the Proposal area. Full search results are provided in Appendix D. A vegetation and threatened species assessment was undertaken for the BAR. This included surveys undertaken between 21 June to 14 July 2021 by five teams of two NGH Ecologists and led by an Accredited BAM Assessor. Site surveys informed the mapping of Plant Community Types (PCTs) and Threatened Ecological Communities (TECs) present on the site. The site surveys also included targeted surveys for threatened species. Tests of Significance (ToS) under the BC Act and Assessments of Significance (AoS) have been completed in the BAR for any species with a moderate to high likelihood of occurrence within the Construction footprint.

6.1.2 Existing environment

Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms and native vegetation. A total of 80% (468 394 ha) of the Proposal area occurs within the NSW South Western Slopes IBRA Region. This region has a sub-humid climate characterised by hot summers and no dry season (NPWS, 2003). Average annual rainfall varies from 400mm at Griffith in the west to 900mm at Burrinjuck Dam (near Yass) in the east (BOM, 2022). In the hilly higher rainfall (eastern) parts of the bioregion, the vegetation is dominated by box *(Eucalyptus spp.)* woodlands (NPWS, 2003). The semi-arid western portion of the bioregion also features box woodlands which grade to mallee and *Acacia* shrublands to the west (NPWS, 2003). The South Western Slopes bioregion has been intensively cleared and cultivated (NPWS, 2003). The Proposal mostly occurs within a heavily cleared landscape. Local remnant vegetation is generally associated with hilltops and ridgelines.

Twenty-seven Mitchell landscapes occur across the locality; 14 of these occur within the Proposal area. The Mitchell landscapes that occur in the Proposal area are detailed in Appendix D.

Plant community types and vegetation zones

Along the 285km long Proposal area, 19 plant community types (PCTs) were recorded and mapped. The native vegetation in the Proposal area was assigned to PCTs in accordance with the BioNet VIS (2021). Along with native vegetation, roadside vegetation includes exotic grassland and 'improved' pasture in adjacent farmland. PCT name, extent within the Proposal area and construction footprint, as well as whether the PCT is a threatened ecological community (TEC) is provided in the BAR. Detailed mapping of PCTs as well as detailed descriptions of PCTs are included in the BAR (Appendix D).

Threatened ecological communities

Two TECs listed under the BC Act are associated with PCTs present within the Proposal area, these TECs were confirmed during fieldwork on site by NGH Ecologists. These TECs and extent within both the Proposal area and Construction footprint is listed in Table 6-1.

Table 6-1 BC Act TECs in the Proposal area and extent within the Construction footprint

TEC	Status (BC Act)	Associated PCT present	Extent within the Proposal area (ha)	Extent within Construction footprint (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered	PCTs 76; 80; 82; 110	96.07	2.77
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	Critically Endangered	PCTs 74; 250; 266; 276; 277; 342; 796	90.97	10.30

Two TECs listed under the EPBC Act are associated with PCTs present within the Proposal area, these TECs were confirmed during fieldwork on site by NGH Ecologists. These TECs and extent within both the Proposal area and Construction footprint is listed in Table 6-2.

Table 6-2 EPBC Act TECs on site

TEC	Status (EPBC Act)	Associated PCT present	Extent within Construction footprint (ha)
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia	Endangered	PCTs 74, 250, 266, 276, 277, 342, 796	1.66

TEC	Status (EPBC Act)	Associated PCT present	Extent within Construction footprint (ha)
White box - Yellow box - Blakely's Red Gum grassy woodlands and derived native grasslands	Critically Endangered	PCTs 76,80, 82, 110	6.51

Threatened species and habitats

The habitat assessment undertaken in the BAR identified one threatened flora and 17 threatened fauna species (refer to Table 6-3) as having a high likelihood of depending upon resources within the Proposal area. This is based on nearby records, important habitat features and the presence of associated PCTs. Tests of Significance under the BC Act and Assessments of Significance under the EPBC Act have been competed for these species in the BAR (Appendix D).

Table 6-3 Threatened flora and fauna summary

Scientific Name	Common Name	Listing
Flora		
Ammobium craspedioides	Yass Daisy	Vulnerable – EPBC Act & BC Act
Fauna		
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable –BC Act
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable –BC Act
Certhionyx variegatus	Pied Honeyeater	Vulnerable –BC Act
Chthonicola sagittate	Speckled Warbler	Vulnerable –BC Act
Climacteris affinis	White-browed Treecreeper	Endangered –BC Act
Climacteris picumnus victoriae	Brown Treecreeper	Vulnerable –BC Act
Daphoenositta chrysoptera	Varied Sittella	Vulnerable –BC Act
Pachycephala inornata	Gilbert's Whistler	Vulnerable –BC Act
Grantiella picta	Painted Honeyeater	Vulnerable –BC Act Vulnerable – EPBC Act
Hylacola cautus	Shy Heathwren	Vulnerable –BC Act
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable –BC Act
Melanodryas cucullata	Hooded Robin	Vulnerable –BC Act
Petroica phoenicea	Flame Robin	Vulnerable –BC Act
Polytelis swainii	Superb Parrot	Vulnerable –BC Act Vulnerable – EPBC Act
Pomatostomus temporalis temporalis	Grey-crowned Babbler	Vulnerable –BC Act
Stagonopleura guttata	Diamond Firetail	Vulnerable –BC Act
Petaurus norfolcensis	Squirrel Glider	Vulnerable –BC Act

Habitat across the Construction footprint

The BAR describes habitat features across the Construction footprint. Details of the following are provided in Appendix D:

- Wildlife connectivity corridors
- Key biodiversity values
- Groundwater dependant ecosystems
- Aquatic habitats.

Habitat in the western portion of the Construction footprint includes woodland, shrubland and grassland. In the eastern portion of the Construction footprint, the habitat of the roadside corridor connects more freely with native vegetation which occurs in the surrounding landscape and consists mostly of woodland and scattered trees. The western portion is on dry plains, with naturally sparse vegetation (e.g. mallee) surrounded by heavily cleared, cropped paddocks. The eastern portion occurs in hilly terrain, vegetation features more understorey and ground cover and is surrounded by a grazing landuse which includes scattered trees and remnant vegetation. In parts, the Construction footprint passes through three large blocks of remnant vegetation in the Binya State Forest (PCT 103 Poplar Box shrubby woodland), Ingalba Nature Reserve and Jindalee National Park.

For the most part, the resources provided by the roadside vegetation in the Construction footprint is limited to occasional foraging habitat and breeding habitat where HBT are present. Roadside vegetation also provides connectivity between larger habitat patches.

The Proposal area contains a range of habitat and foraging resources where native vegetation is present. Additionally, over 644 hollow-bearing trees (HBTs) are present across the Proposal area which provide habitat for birds, microbats and mammals, with 64 HBTs within the Construction footprint.

Habitat mapping including HBT identification is included in the BAR (Appendix D).

Wildlife connectivity corridors

Native vegetation along Burley Griffin Way contributes a non-critical role in landscape connectivity in the eastern portion of the Proposal area. Meanwhile in parts of the western portion of the Proposal area, such as between Kamarah and Binya, roadside vegetation along Burley Griffin Way critically contributes to landscape connectivity. More detail is provided in Appendix D.

The following National Park and Wildlife areas and State forests provide habitat values adjacent to the Proposal area:

- Binya State Forest and adjoining Cocoparra National Park
- Ingalba Nature Reserve
- Jindalee National Park.

Key biodiversity values

Key Biodiversity Areas (KBAs) are places of global significance for the conservation of birds and other wildlife, identified around the by BirdLife and other conservation groups (BirdLife Australia, 2022). They supersede Important Bird Areas. Australia’s KBA National Co-ordination Group includes representatives from DCCEEW (BirdLife Australia, 2022). The Proposal area intersects the South-west Slopes of NSW KBA. The South-west Slopes KBA incorporates the core breeding area for Superb Parrot. More than half of the eastern portion of the Proposal area occurs within this KBA (more detail provided in Appendix D).

Groundwater dependent ecosystems

A search of the Bureau of Meteorology's National Atlas of Groundwater Dependent Ecosystems (GDEs) found that the majority of vegetation within the Proposal area has low potential for GDEs. A small area just west of Wallendbeen has a moderate potential for terrestrial GDEs, however, this area does not occur within the Construction footprint.

Aquatic habitats

Two river catchment areas occur within the Proposal area:

- Lachlan Catchment - briefly intersects this catchment between West Wyalong and Young, near Temora. The catchment features a number of significant wetlands systems; these are located well north of the Proposal area.
- Murrumbidgee & Lake George Catchment - the majority of the Proposal area falls within this catchment. The Murrumbidgee is a highly productive and diverse catchment, extending from the Snowy Mountains to the semi-arid inland NSW (MDBA, 2021). The Murrumbidgee River is an important water source for many wetlands, including Fivebough and Tuckerbill swamps near Leeton, and 16 wetlands listed as nationally significant in the directory of important wetlands (MDBA, 2021).

The DPI Fisheries Threatened Species database KFH mapping is included in Appendix H.2. KFH classified waterways intersect the Proposal area at 34 locations and the Construction footprint once at about 3.1km north of the intersection of Burley Griffin Way and the Hume Highway. The KFH crossing within the Construction footprint is Dunderalligo Creek (a Strahler 4th order stream).

Weeds

A search of the DPI Weed Wise database identified the priority weeds for the Riverina Region which have the potential to occur with the Proposal area. All priority weeds for the region are included in database searches of the BAR (Appendix D). In addition, high threat weeds were detected during BAM plots, mostly exotic grasses such as *Paspalum* spp and African Lovegrass *(Eragrostis curvula)*. Environmental weeds such as Blackberry (Rubus fruticosus spp.), Bridal Creeper (*Asparagus asparagoides)*, and African Boxthorn *(Lycium ferocissimum)* were recorded along with common pasture weeds such as St John's Wort *(Hypericum perforatum)* and Common Sowthistle (*Sonchus oleraceus)*.

6.1.3 Potential impacts

Construction

Native vegetation removal

The Proposal would result in the direct loss of 14.2ha of native roadside vegetation including about 13.1ha that is considered TEC. Vegetation removed would increase edge disturbance throughout the Construction footprint that are already present due to the disturbed nature of the active road corridor and adjacent land uses such as agriculture. About 229ha of native vegetation would remain in the Construction footprint and wider road reserve across the 285km road corridor.

The removal of native vegetation is part of the Key Threatening Process (KTP) - Clearing of native vegetation listed under Schedule 4 of the BC Act. The Proposal is not considered to significantly increase this KTP given the relatively small area of impact within the existing road corridor and mitigation measures proposed in section 6.1.4.

Hazardous tree removal

Many hazardous trees have been identified within the Proposal area. These trees are planned to be individually removed, with tree part mulched and stumps ground using machinery. The large machinery used to mulch and grid stumps will be generally restricted to the already existing road corridor to minimise impacts on surrounding vegetation.

A total of 64 HBTs are included in this hazardous tree removal scope of work. A full list of HBTs and their number/size of hollows is provided in the BAR (Appendix D). Removal of these habitat trees may impact on threatened species, hence assessments of significance have been provided in the BAR (Appendix D). Depending on the conservation status of each entity, either a Test of significance (ToS) (BC Act) and/or Assessment of Significance AoS (EPBC Act) was undertaken.

A soft fall felling method for the habitat trees under the supervision of a fauna spotter catcher ecologist is recommended to assist with minimising impacts as described in test tests of significance.

Removal of Threatened fauna habitat

Fauna habitat will be lost directly through the removal of 14.2 ha of native vegetation and removal of 64 HBTs. Microbat requirements such as hollows of particular dimensions or foraging habitat containing favoured flora species have been considered for each species. BAR discusses in detail the impacts of the Proposal according to the potential impact type identified during habitat evaluation and/or significance assessments. With the impacts of the Proposal spread over such an extensive area, impact assessment focussed on key habitat areas, based on literature and records.

For example, key Squirrel Glider habitat was identified at Jindalee NP; the Construction footprint borders the northern end of that park. It is assumed that the Construction footprint itself would not host the Jindalee Squirrel Glider population but would provide a function in supporting the population through connectivity and shelter resources. Therefore, connectivity between Jindalee NP and other sizeable woodland/forest remnants was considered along with HBT along the corresponding stretch of Burley Griffin Way.

Removal of Threatened Flora

The Proposal would not lead to the direct loss of any individuals of threatened flora as none were recorded within the Proposal area and the Construction footprint as a result. The only threatened flora species considered highly likely to occur based on microhabitat preferences and known extant populations is the Yass Daisy. The Yass Daisy is associated with Box/Gum Woodland comprising of PCT 277 and PCT 266. About 6.3ha of Box/Gum woodland would be cleared as a result of the Proposal.

Aquatic impacts

No threatened aquatic species, populations, or communities have been identified in the Proposal area or are considered likely to occur. No aquatic impacts are anticipated with the implementation of standard Transport for NSW mitigation measures refer to Section 6.1.4.

The Proposal does not include any work within KFH. If any culvert work is required in Dunderalligo Creek, notification to NSW DPI Fisheries would be required under section 199 of the *Fisheries Management Act 1994*, as noted in Section 5.4.

Injury and mortality

The potential for wildlife injury or death could occur during the construction phase. Clearing vegetation may result in injury or death to resident fauna. Species at risk include nocturnal species such as possums, gliders, and microbats which shelter during the day. Ground dwelling species such as snakes, lizards, and small mammals could also be directly impacted. There is also the risk of displaced fauna succumbing to predation or stress induced by competing with existing resident populations for resources, particularly shelter/refuge habitat.

Groundwater Dependent Ecosystems

The Proposal area contains native vegetation that has a low or moderate likelihood of being groundwater dependent. Due to the scope of works not requiring extensive excavation the Proposal is not considered to have an impact on groundwater or groundwater dependent ecosystems.

Invasion and spread of weeds, pests, pathogens and disease

The Proposal has the potential to spread weeds, pests, pathogens and diesease during vegetation removal and through the movement of vehicles and machinery into or out of the Proposal area. High Threat Weeds were detected during the BAR assessment, mostly exotic grasses such as *Paspalum spp.*, the spread of which threatened native grassy woodland communities. Vegetation disturbance and soil movements could exacerbate the risk of pest, pathogen and disease propagation. Weed pest, pathogen and disease propagation is considered manageable considering mitigation measures proposed.

Changes to hydrology

Only minor alterations are expected to occur to the existing hydrological conditions within the Proposal area. Proposed work includes widening or replacement of existing culverts and the reshaping of existing table drains as part of the road formation. Increased run off and nutrient load are likely to be minor due to the extent of works with the implementation of appropriated erosion and sediment controls.

Noise, light, dust and vibration

Temporary disturbance to wildlife from noise emissions and light spill during construction and night works are likely to be localised to within 50-100 m of the Construction footprint. Impacts are not likely to have a significant long-term impact on wildlife that may occur within the Construction footprint or surrounding environment as these impacts would be limited to construction times and there is sufficient habitat in the surrounding areas for animals move to if they are temporarily impacted.

Operation

Edge effects on adjacent native vegetation and habitat

Much of the vegetation in the Construction footprint consists of a narrow roadside strip of vegetation already subjected to edge effects, particularly in the western portion. Edge effects and habitat degradation may be exacerbated where the width of the vegetation corridor is reduced.

Mitigations measures such as weed hygiene controls during construction would minimise this effect.

Wildlife connectivity and habitat fragmentation

Vegetation in the Construction footprint contributes to overall landscape connectivity across 285 km. In stretches such as in the eastern portion, landscape connectivity is supported by the habitat matrix of woodland remnants, scattered trees, and vegetated corridors. While the Proposal would result in clearance of some habitat along the corridor, the BAR concludes that remaining tree cover that would not be cleared is sufficient to maintain wildlife connectivity. With the addition of appropriate mitigation measures such as native plantings in the road corridor, impacts to wildlife connectivity would be manageable.

Conclusion on significance of impacts

The Proposal is not likely to significantly impact threatened species or ecological communities or their habitats, within the meaning of the *Biodiversity Conservation Act 2016* (NSW) or *Fisheries Management Act 1994* (NSW) and therefore a Species Impact Statement or Biodiversity Development Assessment Report is not required.

The Proposal is not likely to significantly impact threatened species, ecological communities or migratory species, within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth).

6.1.4 Biodiversity offsets

Offset thresholds for REF projects assessed under Division 5.1 of the EP&A Act are outlined in Table 1 and Table 2 in Section 4.2 of Transport *Guideline for Biodiversity Offsets*. The residual impacts to biodiversity from the Proposal are considered to trigger the need for offsetting as:

- There would be clearing of a nationally listed and NSW listed CEEC in moderate to good condition.
  - BC Act listed: 10.30ha of White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Associated PCTs 74; 250; 266; 276; 277; 342; 796).
  - EPBC Act listed: 6.51ha White box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands (Associated PCTs 74; 250; 266; 276; 277; 342; 796).

The *National Recovery Plan* for Superb Parrot recommends offsets when clearing of habitat critical for survival cannot be avoided. The Superb Parrot habitat clearing is wholly Box-Gum Woodland TEC. Offsets for the TEC therefore encompass Superb Parrot also.

Biodiversity impacts would be mitigated or offset in accordance the current Transport for NSW *Biodiversity Policy 2022* and associated Guidelines. It would account for funded aspects of the work and would be staged in line with delivery phases.

6.1.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Biodiversity (management plans)	A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's (Transport) *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the *Landscape Guideline* (RMS, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013)	Transport and Contractor	Detailed design / pre-construction	Section 4.8 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Protocols to manage weeds and pathogens.			
Biodiversity (general)	Biodiversity impacts will be mitigated or offset in accordance the current *TfNSW Biodiversity Policy 2022* and relevant Transport guides such as the *Transport No net loss guidelines 2022*.	Transport	All stages	
Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Transport	Detailed design	
	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Transport	Pre-construction	
	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Post-Construction	
	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if **threatened ecological communities**, not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Construction	
Removal of threatened species habitat and habitat features	Habitat removal will be minimised through detailed design.	Transport	Detailed design	
	Habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction / Post-Construction	
	Nest boxes would be used to replace loss of HBTs in accordance with *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) or more current transport guides.	Contractor	Construction / Post-Construction	
Unexpected finds (fauna)	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) **if threatened fauna**, not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Construction	
Aquatic impacts	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	Contractor	Construction	
Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011).	Transport and Contractor	Detailed design, Construction / Post-Construction	
	Incorporate plantings of native, frangible vegetation at key locations along the Proposal area to secure and bolster connectivity.	Contractor	Construction / Post-Construction	
	Any connectivity measures implemented will be installed under the supervision of an experienced ecologist.	Contractor / Site ecologist	Construction / Post-Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
Invasion and spread of pests	Pest species will be managed within the Construction footprint. *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 7: Pathogen managment* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	

6.2 Hydrology and flooding

6.2.1 Existing environment

The Proposal area lies within the Murrumbidgee and Lachlan major catchments and are regulated under the *Water Sharing Plan for the Murrumbidgee Unregulated and Alluvial Water Sources 2012* and the *Water Sharing Plan for the Lachlan Unregulated and Alluvial Water Sources 2012*. Water sources across the site include:

- Murrumbidgee Western Water Source
- Murrumbidgee North Water Source
- Western Bland Creek Water Source
- Jugiong Water Source.

Numerous first, second and third order drainage lines traverse the extent of the site. The vast majority of drainage lines are un-named ephemeral drainages and only flow during significant rainfall events. There is one drainage line that is likely to be classed as a perennial stream known as Currawong Creek in Harden.

A number of intermittent streams occur across the site, concentrated more within the eastern half of the Proposal area due to higher rainfall and more fluctuant topography, these include:

- Rocky Ponds Creek, between Cunningar and Galong
- Illalong Creek near Poverty Hill
- Dunderalligo Creek, near Goondah
- Balgalal Creek, in Binalong
- Bobbara Creek, northwest of Binalong
- Demondrille Creek, near Demondrille
- Cunningham Creek, in Wallendbeen
- Bland Creek, in Stockinbingal
- Berri Jerri Creek, near Gundibindyal
- Gundibindyal Creek, in Springdale
- Dunderalligo Creek, near Bowning.

Stream water quality is varied from the site inspection with banks providing refuge for a number of exotic weeds and established eucalypt species. Streams eventually feed onto either the Lachlan River to the north or the Murrumbidgee River to the south. Both these rivers flow west as major tributaries within the Murray-Darling Basin System.

The western-most extent of the runs through part of the Murrumbidgee Irrigation Area (MIA). The site crosses both Main Canal and Northern Branch Canal and runs alongside Main Drain 1 from Yenda to Yoogali. The site also runs along and crosses smaller un-named canals and drainages. These man-made waterbodies have significantly altered the hydrology within the MIA.

6.2.2 Potential impacts

Construction

Impacts to surface and groundwater water quality during construction would mostly occur during road works. During this stage there is potential for construction material, chemicals (from construction work, refuelling activities, concrete curing or plant failure), and sediment-laden runoff from the work site to impact nearby waterways. Replacement or repairing existing culverts may also disturb creek banks which would aid erosion and sedimentation at the impact site.

The removal of vegetation within the construction footprint may destabilise soils and potentially result in exposure of soils to erosion hazards, causing sedimentation of nearby waterways. Erosion and sediment controls would be implemented for the works during construction. Works would be revegetated and stabilised progressively following the construction phase of the Proposal.

The Proposal may result in a number of potential contamination sources being identified on the site during construction. Fuel and oil for construction plant and equipment are potential sources of contamination. Due to the works occurring close to several watercourses there is potential for water contamination to occur as a result of accidental spills and leaks. Fuels and oils for refuelling would be stored in doubled bunded areas at site compounds, refuelling activities would occur at least 50m away from watercourses and within the designated compound sites. Plant and equipment would be routinely inspected and maintained for leaks during the works. Sewage levels from any toilets and ablutions would be monitored and removed from site regularly.

Flooding of the site during the work is possible after a high rainfall event. In the instance of a flood, a warning would be issued by the NSW State Emergency Service (SES) headquarters on current and expected impacts of flooding in the Murrumbidgee and Lachlan catchments (NSW SES, 2019). The Bureau of Meteorology would also issue a severe thunderstorm or severe weather warnings for flash flooding when conditions are expected to be dangerous (NSW SES, 2013). Flash flooding warnings are issued within 6 to

24 hours to provide time to move plant and equipment to be above the Probable Maximum Flood height (PMF) (NSW SES, 2019).

Rehabilitation of disturbed areas would be staged to occur during and post construction. Operational risks to water quality would remain unchanged from the current conditions once stabilisation has been achieved.

Operation

Operational risks to water quality would remain unchanged from the current conditions once construction has been completed.

6.2.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	A site-specific Erosion and Sediment Control Plan/s will be prepared and implemented The ESCP will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Transport Project Engineer	Detailed design / Pre-construction	Section 2.2 of QA *G38 Soil and Water Management*
Soil and water	Erosion and sediment control measures would be implemented to mitigate any impacts.	Transport Project Engineer	Detailed design/ pre-construction, Construction	Managing Urban Stormwater: Soils & Construction Guidelines (the Blue Book) (Landcom 2004), Section 3.1 of QA *G38 Soil and Water Management*
Soil and water	Establish erosion control and sediment capture measures, and maintain them regularly, to divert offsite stormwater, manage onsite stormwater runoff and stabilise stockpiles.	Transport Project Engineer	Construction	Section 3.5 of QA *G38 Soil and Water Management,* RMS Technical Guideline EMS-TG-010: Stockpile Site Management, the Blue Book.

Impact	Environmental safeguards	Responsibility	Timing	Reference
Soil and water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Transport Project Engineer	Construction	
Soil and water	All fuels, chemicals and lubricants are to be stored in an impervious bunded area either: • 50 m away from any aquatic habitat, flood prone areas, or on slopes steeper than 1:10 • Behind effective flood levy bank.	Transport Project Engineer	Construction	Section 4.3 of QA G36 *Environmental* Protection,
Soil and water	Refuelling of plant and equipment is to occur in impervious bunded areas	Transport Project Engineer	Construction	
Soil and water	Adequate incident management procedures will be incorporated into the Construction Environmental Management Plans, including requirement to notify EPA for incidents that cause material harm to the environment.	Transport Project Engineer	Construction	Section 147 – 153 POEO Act.
Water Quality	There is to be no release of dirty water into drainage lines and/or waterways.	Transport Project Engineer	During construction	
Water Quality	Measures to control pollutants from stormwater and spills would be investigated and incorporated in the pavement drainage system at locations where it discharges to the receiving drainage lines. Measures aimed at reducing flow rates during rain events and potential scour would also be incorporated in the design of the pavement drainage system.	Transport Project Engineer	Detailed design/ pre-construction During construction	
Water Quality	Minimise the extent of obstructions within flood prone areas as far as possible at all times during the works.	Transport Project Engineer	During construction	
Water Quality	Ensure compounds, stockpiles, waste containers, chemicals and dangerous goods are placed or stored above flood levels where practical.	Transport Project Engineer	During construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Water Quality	Monitor Bureau of Meteorology (BoM) forecast heavy rainfall events in order to allow sufficient time to vacate and prepare the site prior to the commencement of heavy rainfall and flood events.	Transport Project Engineer	During construction	
Water Quality	Remove materials and equipment from flood prone areas in the event of forecast rain that would lead to flooding to minimise the risk of damage to infrastructure, equipment and downstream impacts.	Transport Project Engineer	During construction	

6.3 Soils

6.3.1 Existing environment

Site elevation ranges from 120 m Australian Height Datum (mAHD) in the west to 610 mAHD in the east. Landforms vary across the extent of the site. The western extent consists of plains, colluvial plains, alluvial plains, waning lower slopes, terraces and floodplains with slopes down to less than 1% and widely spaced stream channels. The eastern verge of the site ranges up to undulating hills and steep hills, with slopes up to 60% and predominantly fixed stream channels.

Majority of the soils on site are classed under the Australian Soil Classification system as Chromosols – these are soils that display a strong texture contrast between A and B horizons and are not generally sodic. Other soils mapped across the site include Vertosols, Calcarosols, Sodosols, Kurosols, Rudosols, Ferrosols, Dermosols and Kandosols.

Majority of the soils on site are classed under the Great Soil Group system as Red-brown Earths. Other soils mapped across the site include:

- Grey, brown and red clays
- Calcareous red earths
- Non-calcic brown soils
- Solodic soils
- Red podzolic soils (less fertile)
- Brown podzolic soils
- Lithosols
- Euchrozems
- Red earths (more fertile)
- Yellow earths.

From the available soil profiles logged across the site, subsoils generally consist of light and medium to heavy clay. Topsoils on site are slightly more variable with loams and sandy loams across the majority of the site and some light clays and clay loams along the western extent.

There is also record of Naturally Occurring Asbestos (NOA) along the route near Wallendbeen (SEED portal , 2015). This 10km section has been mapped as having low to high Asbestos potential (refer to Figure 6-1).

There is no mapped risk for salinity under the Environmental Planning Instrument for Salinity (DPE, 2014).

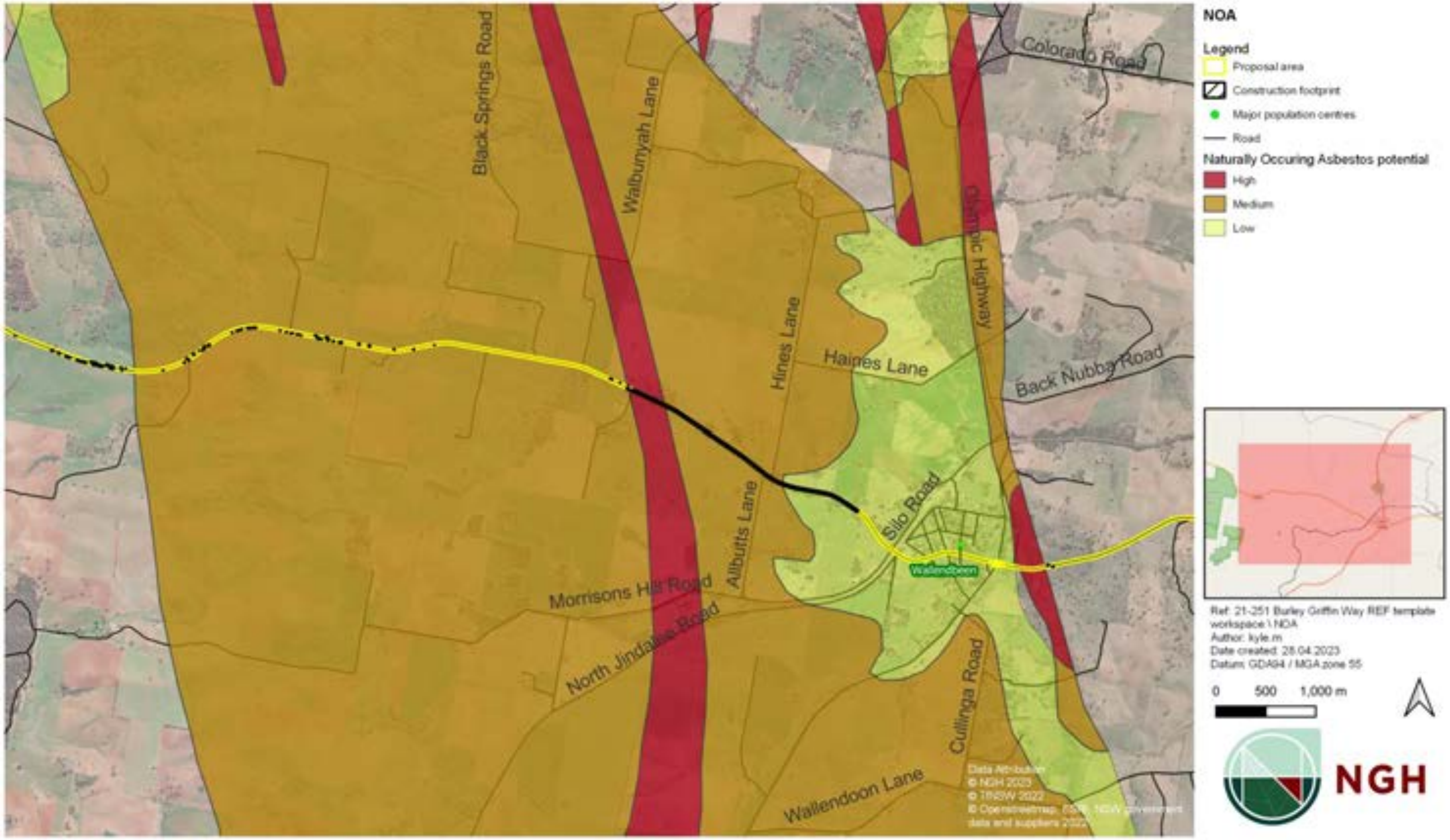

Figure 6-1 Naturally Occurring Asbestos

6.3.2 Potential impacts

Construction

Potential impacts to soils during construction include:

- Soil erosion during construction until landforms are restabilised
- Disturbance of soils in the road verge and around vehicle and plant access points
- Tracking of soils onto surrounding roads causing potential hazards for road users and potential spread of weeds and pathogens
- Potential for soil and sediment contamination.
- Potential to affect anyone close by asbestos fiber from NOA.

The Proposal would involve earthworks during construction. Excavation of soil and vegetation along the road verge would be required for road edge repairs and road widening. This would potentially result in soil erosion and sedimentation of the waterway. Installation of safety barriers and road signage would also disturb soils and have the potential to result in soil erosion.

Relocation of services is not expected as part of the proposed works. Any unforeseen service location would have similar impacts to other processes discussed in this section and may be mitigated accordingly.

Operation of construction machinery within the road reserve would also disturb vegetation and the soil surface. This may result in sedimentation of the waterway. Erosion and sediment controls would be implemented for the work during construction.

The Proposal may result in several potential contamination sources being introduced to the site and surrounds during construction. Fuel and oil for construction plant and equipment are potential sources of pollution. Fuels and oils for refueling would be stored in doubled bunded areas in the site compound and refueling activities would occur in doubled bunded areas within the designated compound site. Due to the presence of NOA around 10km section of the road near Wallendbeen, further testing is recommended in this area before any construction work involving excavation of natural ground can commence. If any Asbestos is deemed to be present an Asbestos Management plan should be drafted for health and safety of the workforce and the people in the area.

Rehabilitation of disturbed areas would be staged to occur during and post construction. Where required, locally sourced native seeding, and mulching may be used to facilitate revegetation and establishment of the site. If concentrated flow paths for stormwater are expected across the rehabilitated areas, jute matting or similar may be used to minimise scouring as warranted.

Extra care will be taken to manage landscape around potential NOA mapped areas. This area will be specified in detailed design and a management plan will be implemented as per WHS regulation.

Operation

Operational risks to soil would remain unchanged from the current conditions once construction has been completed.

6.3.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.	Transport Project Engineer	Construction	Section 4.2 of QA *G36 Environment Protection*
Accidental spill	An Emergency spill kit must be kept onsite at all times. All staff must be made aware of the location of the spill kit and trained in its use. If an incident (e.g. spill) occurs, the Transport Environmental Incident Classification and Management Procedure would be followed and the Transport Contract Manager notified as soon as practicable.	Transport Project Engineer	Construction	Section 4.3 of QA *G36 Environment Protection*
NOA management	A site specific Naturally Occurring Asbestos (NOA) management plan will be prepared to reduce risk on workers and anyone else getting close to the construction areas.	Contractor	Construction	Clause 431-434 of the WHS Regulation
Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Transport Project Engineer	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are completed and areas are stabilised.	Transport Project Engineer	Construction	
Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Transport Project Engineer	Construction	
Erosion and sedimentation	A progressive erosion and sediment control plan is to be prepared for the works.	Transport Project Engineer	Construction	
Erosion and sedimentation	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Stockpile Site Management Guideline (EMS-TG-10).	Transport Project Engineer	Construction	

Other safeguards and management measures that would address soil impacts are identified in section 6.2.3

6.4 Traffic and transport

6.4.1 Existing environment

Transport for NSW is the road authority for Burley Griffin Way, which is a classified State Road. Burley Griffin Way starts at the intersection of Mackay Avenue (B94), Irrigation Way and Kurrajong Avenue at the western extent. The road ends at the intersection of the Hume Highway (M31) near Yass. The road connects the major rural towns of Griffith and Yass providing a route for services and agricultural products. As such the road experiences a large proportion of trucks and agricultural machinery traffic. The posted speed limit is 100 kilometres per hour (km/h) along open stretches and ranges between 50 km/h and 80 km/h as it passes through local towns and villages.

The road is sealed with shoulders of various widths throughout its extent. The road is predominantly two lane, except where additional lanes allows for turning into adjacent roads. Line markings and road furniture such as signage and safety barriers are present.

6.4.2 Potential impacts

Construction

During construction, traffic is expected to experience short 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, businesses adjacent to Burley Griffin Way roads would be maintained during construction.

Additional heavy vehicle movements are expected for the movement of plant and materials. Some additional light vehicle movements would occur as a result of staff needs for the Proposal.

At any given time, traffic would still be able to travel across the entire length of Burley Griffin Way during the work with minor delays to be expected, from lane closures. This would be managed by suitable temporary traffic control arrangements, including variable message signs and notification to the community.

Access would be maintained as far as practicable to rural properties, with modified access through the construction zone under traffic control required at times. Residents would be consulted with regarding these alternate arrangements. Works may impact the physical condition of some property access points as well as council managed intersections. Mitigation measures will be in place to ensure long term impacts are negligible.

Operation

The safety for all road users would be improved upon completion of the proposed work with the installation of safety barriers and wider shoulders. Speed zones would remain unchanged from the current conditions and no additional lanes would be constructed.

6.4.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport for NSW	Transport Project Engineer	Detailed design / Pre-construction	Section 4.8 of QA *G36 Environment Protection*

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Traffic Control at Work Sites Manual (RTA, 2010) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic • monitoring, review and amendment mechanisms.			
Traffic and transport	Local and regional road users would be informed of any expected traffic or access changes and delays prior to construction commencing.	Transport Project Engineer	Pre-construction, construction	TMP
Traffic and transport	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Transport Project Engineer	Construction	TMP
Traffic and transport	All complaints are to be recorded on a Complaints Register and attended to promptly.	Transport Project Engineer	Construction	TMP

6.5 Noise and vibration

6.5.1 Methodology

The Proposal is only likely to generate noise impacts during construction. No additional operational noise is expected as a result of the proposed works as traffic volumes and speed would remain consistent. NGH has prepared this desktop qualitative construction noise and vibration assessment using the Transport for NSW noise calculator. The assessment is in accordance with the policies and guidance administered by the Environment Protection Authority (EPA), including:

- NSW Interim Construction Noise Guideline (ICNG) 2009
- NSW Noise Policy for Industry (NPfI) NSW EPA 2017.

The NSW Interim Construction Noise Guideline (ICNG) 2009 provides guidance on the measurement and management of construction noise impacts. The guideline requires, a quantitative assessment when works are likely to impact an individual or sensitive land use for more than three weeks in total. Works in one location are unlikely to take place for more than three weeks at a time, however, a conservative approach to noise has been adopted and a quantitative noise assessment has been conducted.

The ICNG describes the 'noise management levels' (NML's), for residences and other sensitive receivers. For work during standard working hours, residences are considered noise affected when construction noise is 10 dB(A) above the rating background level (RBL) and 'highly noise affected' when construction noise is above 75 dB(A). Work outside standard working hours affect sensitive receivers when construction noise is 5 dB(A) above the RBL (ICNG 2009).

Sleep Disturbance

Infrastructure projects often require certain works to be completed during the night-time. Where night works are located close to residential receivers there is potential for sleep disturbance impacts.

The ICNG lists five categories of works that might need to be undertaken outside of Standard Construction Hours:

- The delivery of oversized equipment or structures that require special arrangements to transport on public roads.
- Emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.
- Maintenance and repair of public infrastructure where disruption to essential services or considerations of worker safety do not allow work within standard hours.
- Public infrastructure works that shorten the length of the Proposal and are supported by the affected community.
- Works where a proponent demonstrates and justifies a need to operate outside the recommended standard hours.

Where construction works are planned to extend over more than two consecutive nights, the ICNG recommends that an assessment of sleep disturbance impacts should be completed. The ICNG refers to the NSW Environmental Criteria for Road Traffic Noise for assessing the potential impacts, which notes that to limit the level of sleep disturbance the L1 level (or LAmax) should not exceed the existing L90 background noise level by more than 15 dB. Works proposed are unlikely to require any night time works.

6.5.2 Existing environment

The Proposal covers an extensive area across a predominately rural environment. Existing noise sources include highway traffic such as light vehicles and heavy vehicles. Noise from farm activities including cultivation, sowing, spraying, grain harvest, haymaking and animal movement occur at peak times driven by seasonal conditions. Other noise sources include local traffic noise and general residential noises such as lawn mowers and dogs barking.

There are well over 100 sensitive receivers located within 1 km of the Proposal area (refer to noise mitigation maps included in Appendix H.3). These include residential dwellings, local businesses, industrial premises, schools, churches and recreational areas.

6.5.3 Criteria

Background noise level

Background noise monitoring has not been conducted for the Proposal. NGH has adopted the recommended background levels from the NSW Noise Policy for Industry 2017 (NPI). The NPI in Table 6-4 describes typical existing background noise levels for land within a rural residential area. These background noise levels were adopted as the RBL's for the purpose of this noise assessment.

Table 6-4 Average Background A-weighted sound pressure level (NSW NPI 2017)

	Daytime 0700 -1800	Evening (OOHW Period 1*) 1800 – 2200	Night-time (OOHW Period 2*) 2200- 07000
Rural Residential	40	35	30

*note: OOHW = Out Of Hours Work.

Noise management levels for the proposed activity have been determined in accordance with the NSW ICNG described below and summarised in Table 6-5.

- Standard working hours - 10 dB(A) above background levels
- Outside standard working hours - 5 dB(A) above background levels
- Residences receiving noise levels over 75 dB(A) during standard working hours are considered highly noise affected irrespective of the RBL.

Table 6-5 Noise Management Levels for the proposed activity.

Daytime NML (dB(A)) (RBL +10 dB(A))	OOHW Period 1 NML (dB(A)) (RBL +5 dB(A))	OOHW Period 2 NML (dB(A)) (RBL +5 dB(A))	Highly Noise Affected Level (dB(A))
50	40	35	75

6.5.4 Potential impacts

Construction – Noise

The predicted noise level for the proposed work was calculated using the Transport for NSW Construction Noise Estimator. Two construction scenarios were modelled. These are considered 'worst case scenarios' where all plant and machinery are operating continuously and concurrently (Table 6-6). This is unlikely to be the case and as such, actual noise levels would be lower than predicted.

Table 6-6 Construction scenarios

Construction Equipment	Sound Pressure level @ 7m (dB(A))	No. of units
Scenario 1 – Earthworks for shoulder widening		
Grader	88	1
Dump truck	85	1
Light vehicle	78	1
Water truck	82	1
Scenario 2 – Vegetation removal		
Excavator	85	1
Chainsaw	89	2
Tub grinder/ mulcher 40-50hp	91	1
Dump truck	85	1

Distance based attenuation was used for each scenario to determine noise levels at receivers located within 360 m of the proposed work. The predicted noise levels for sensitive receivers within this distance for each scenario is provided in Table 6-7.

Table 6-7 Predicted construction noise levels

Distance from construction footprint (m)	Predicted Noise Level dB(A)	Daytime NML Exceedance (dB(A))	Recommended Additional Mitigation Measures*
Scenario 1 Earthworks for shoulder widening			
20	75	25	N, V, PC, RO
130	60	10	N, V
140	59	9	-
250	50	0	-
Scenario 2 Vegetation removal			
44	75	25	N, V, PC, RO
180	60	10	N, V
190	59	9	-
360	50	0	-

*Note:
N =Notification, V = Verification, PC = Phone call, RO = Respite offer.
Green = no exceedance, Yellow = Minor exceedance, Orange = Substantial exceedance, Red = highly noise affected.

It is predicted that during earthworks for shoulder widening receivers located within 20 m of the proposed works will be highly noise affected (Table 6-7). Receivers located within 130 m of the earthworks will experience an exceedance of 10 dB(A) or higher, above the daytime NML. Additional mitigation measures are recommended for these receivers.

It is predicted that during the removal of vegetation receivers located within 44 m of the proposed works will be highly noise affected (Table 6-7). Receivers located within 180 m of the vegetation removal will experience an exceedance of 10 dB(A) or higher, above the daytime NML. Additional mitigation measures are also recommended for these receivers (refer to section 6.5.5). Noise receiving distances are mapped in Appendix H.3. Mitigation measures in accordance with Table 6-7 must be applied when works are planned to occur in an area of the Construction footprint. The area that would require mitigation would be re-assessed prior to construction with reference to mapping in Appendix H.3.

The Proposal excludes low speed environments, which are typically located in more populated areas (eg. towns and villages), however some rural residences are within a close proximity to the road. Noise impacts are conservatively expressed above and are only expected over a short period of time.

Construction – Vibration

Plant and equipment used for construction activities such as roadside earthworks and compacting for road formation may have vibration impacts on nearby buildings. Table 6-8 details minimum working distances recommended for vibration-intensive plant that may be used for the Proposal.

Table 6-8 Recommended minimum working distances for vibration-intensive plant from sensitive receivers (Roads and Maritime Services , 2016)

Plant item	Rating / Description	Minimum working distance	
		Cosmetic damage (BS 7385)	Human response (OH&E Vibration guideline)
Vibratory Roller	< 50 kN (Typically 1-2 tonnes)	5 m	15 m to 20 m
	< 100 kN (Typically 2-4 tonnes)	6 m	20 m
	< 200 kN (Typically 4-6 tonnes)	12 m	40 m
	< 300 kN (Typically 7-13 tonnes)	15 m	100 m
	> 300 kN (Typically 13-18 tonnes)	20 m	100 m
	> 300 kN (> 18 tonnes)	25 m	100 m
Small Hydraulic Hammer	(300 kg - 5 to 12t excavator)	2 m	7 m
Medium Hydraulic Hammer	(900 kg – 12 to 18t excavator)	7 m	23 m
Large Hydraulic Hammer	(1600 kg – 18 to 34t excavator)	22 m	73 m
Vibratory Pile Driver	Sheet piles	2 m to 20 m	20 m
Pile Boring	≤ 800 mm	2 m (nominal)	4 m
Jackhammer	Hand held	1 m (nominal)	2 m

Note: More stringent conditions may apply to heritage or other sensitive structures

Based on the table above and the location of the proposed works, vibration is unlikely to impact nearby residents. Further assessment will be undertaken when detailed construction method are developed.

Operation

The Proposal would involve the road widening of up to 10m from existing carriageway edge lines, but this is not forecasted to occur within townships or nearby residences. In areas along the Construction footprint where no road widening would take place then as according to the Roads and Maritime *Noise Criteria Guideline* these areas would only classify as minor works where it's unlikely that the work would contribute more than 2 dB(A) above the existing noise levels ($L_{Aeq(15h)}$ and $L_{Aeq(9h)}$) at any receiver. Therefore, it is expected that noise would not exceed NCG criteria; thus, the Proposal is not expected to generate more than negligibly additional noise during operation.

Audio-tactile line markings (ATLM) have the potential to result in additional road noise. ATLM would be installed in line with Transport for NSW's Technical Direction for the installation of audio tactile line marking TTD 2020/04 | Version No. 1 – 25 August 2020. This includes avoiding installing ATLM within 200m of a residence and in urban areas.

6.5.5 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Noise and vibration	All sensitive receivers (eg schools, local residents) likely to be affected will be notified at least 5 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The Proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting • How to obtain further information.	Transport Project Engineer	Pre-construction	
Noise and vibration	For receivers located with 180 m of construction work during standard working hours, should: • Notification (letterbox drop or equivalent) a minimum of 7 days prior to the commencement of works.	Transport Project Engineer	Pre-construction	Transport for NSW Construction Noise and Vibration Guideline (2016). NVMP

Impact	Environmental safeguards	Responsibility	Timing	Reference
	• Receive verification of noise and vibration levels (as detailed above).			
Noise and vibration	For receivers located with 44m of construction work during standard working hours, should: • Notification (letterbox drop or equivalent) a minimum of 7 days prior to the commencement of works. • Phone calls detailing relevant information made to identified/affected stakeholders within 7 days of proposed work. • Respite offer to receivers within 44m would be provided should there be any noise complaints received.	Transport Project Engineer	Pre-construction	Transport for NSW Construction Noise and Vibration Guideline (2016).
Noise and vibration	Works are to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public holidays must be re-assessed and have measures in place to minimise noise impacts and be in accordance with the Roads and Maritime Construction Noise and Vibration Guideline (2016).	Transport Project Engineer	Pre-construction, Construction	
Noise and vibration	Noise impacts are to be minimised in accordance with Roads and Maritime Construction Noise Estimator.	Transport Project Engineer	Construction	
Noise and vibration	Measures, including allowing adequate distance that rollers	Transport Project Engineer	Construction	

Impact	Environmental safeguards	Responsibility	Timing	Reference
	and other vibration producing equipment can come to adjacent buildings and/or using non-vibration producing equipment, to minimise or prevent vibration impacts.			
Noise and vibration	ATML will be installed in line with the Technical Direction TTD 2020/04 | Version No. 1 – 25 August 2020.	Transport Project Engineer	Pre-construction, Construction	

6.6 Aboriginal cultural heritage

6.6.1 Methodology

NGH undertook an Aboriginal Archaeological baseline assessment as part of Stage 1 of the TfNSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI). The Aboriginal Archaeological Baseline Report (AABR) is included as Appendix E of this REF.

Onerwal, Young, Narrandera, Leeton and District, and Griffith Local Aboriginal Land Councils (LALCS) were contacted for consultation as part of the AABR. Onerwal, Young, Leeton and District, and Griffith were consulted during development of the AABR.

After the initial background research and sensitivity mapping was completed, NGH provided LALCS with copies of the sensitivity mapping within their areas for their review. Online meetings were organised between Transport for New South Wales, NGH, and LALCs to discuss:

- Proposed works
- Sensitivity mapping
- Unidentified areas containing Aboriginal cultural heritage values or sites
- Any further concerns

Four meetings were held on either 6 or 7 October 2021.

Heritage register searches were undertaken to identify any items or places in proximity to the Proposal area that contain Aboriginal heritage or archaeological potential. The following resources were used as part of this assessment:

- The NSW State Heritage Inventory (SHI), this includes items on the State Heritage Register and items listed by state agencies and local Government, to identify any items currently listed within or adjacent to the Proposal area.
- The Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the Proposal area.

None of the searches above listed any aboriginal heritage items or places. The AABR included maps that identified landscape features or areas considered likely to contain Aboriginal items or places.

After the AABR was developed, Transport for NSW modified the scope of work to avoid landscape features more likely to contain Aboriginal items or places. A Transport for NSW Aboriginal Cultural Heritage Officer

(ACHO) and Project Engineer conducted site visits to identify if vegetation proposed for removal had the potential to be culturally modified or in any way culturally sensitive. Site visits were also conducted at locations proposed for Type 2 works. Transport for NSW ACHO prepared an assessment in line with Stage 1 of the PACHCI based on the modified, final, scope.

6.6.2 Existing environment

Land disturbances near the Proposal area are largely associated with the construction and continued operation of Burley Griffin Way and the roads that preceded it. Burley Griffin Way was commissioned as State Route 94 in 1974 and as B94 in 2013. Historical imagery from the 1960s at various points along the route show that roads were present along the corridor prior to 1974. Most of these roads would have served as country roads for locals and are unlikely to have seen the same heavy traffic that occurred after 1974. The road was commissioned to act as a route between the Hume Highway near Yass and the agricultural regions surrounding Griffith. Establishment and ongoing operation of the road has caused significant ground disturbance within the road corridor. Activities such as removal of topsoils, cutting into rock, vegetation clearance, construction of bridges and culverts, laying road base, and sealing with bitumen are likely to have destroyed a significant portion of archaeological sites such as subsurface deposits or scarred trees within the roadway itself. As a result the sealed roads within the Proposal area have a negligible potential for archaeological sites.

Very little specific information is available for the historical land use of the Proposal area prior to the establishment of the road, however, it can be assumed that it was subjected to a similar style of agriculturalism and pastoralism that is characteristic in the private land owned adjacent to the road. This style of land use, while destructive to vegetation, often causes only superficial disturbances to the upper layers of soil deposits. The result of this is that subsurface archaeological deposits are often found in areas that had been farmed for over 100 years.

The Proposal area is currently used for the Burley Griffin Way roadway and involves associated infrastructure such as rest areas, culverts, bridges, road reserves, etc. Other infrastructure such as low-density housing and electrical easements are also located within or adjacent to the Proposal area as well as farmland and nature reserves/state forests.

AHIMS search

The Aboriginal Heritage Information Management System (AHIMS) is a database of previously recorded Aboriginal heritage sites in NSW. A search provides basic information about any sites previously identified within a search area. An AHIMS register search is not conclusive evidence of the presence or absence of Aboriginal heritage sites, as it requires that an area has been inspected and details of any sites located have been added to the register. As a starting point, the search will indicate whether any sites are known within or adjacent to the investigation area.

A search of the AHIMS database was conducted on 28 June 2022 over the entire 258 km corridor of the Burley Griffin Way with a 1 km buffer from the centreline of the road. The AHIMS Client Service ID was 696179. There were 54 Aboriginal sites and no declared Aboriginal Places recorded in the search area.

The results of the AHIMS search can be seen in Table 6-9 and figures are provided in Appendix E.

Table 6-9 Summary of AHIMS search results

Site Type	Number
Modified Tree	30

Site Type	Number
Artefact (1 or more)	21
Potential Archaeological Deposit (PAD)	2
Aboriginal Resource and Gathering	1
TOTAL	**54**

The AHIMS search identified that there are four previously recorded valid sites – AHIMS# 50-2-0006, AHIMS# 50-2-0004, AHIMS# 50-3-0046, AHIMS#50-3-0010 – within the Proposal area. A further 28 previously recorded valid sites are located within 300 m of Burley Griffin Way at various points along the corridor. These sites are described in Table 6-10 below. A detailed series of 26 maps showing the AHIMS sites within 1 km of the Proposal area is available in Appendix E.

The four registered AHIMS sites within the Proposal area are described in Section 6.6.3 below.

Table 6-10 AHIMS search results details

Site ID	Site Name	Site Type	Status on AHIMS	Location to Proposal area (m)
50-2-0006	WT/OC2	Artefact	Valid	Within the Proposal area
50-2-0004	WT/H?1	Artefact	Valid	Within the Proposal area
50-3-0046	Burley Griffin Way Scar Tree 1	Modified Tree (Carved or Scarred)	Valid	Within the Proposal area
50-3-0010	WT/ST1	Modified Tree (Carved or Scarred)	Valid	Within the Proposal area
51-1-0040	Site 1 in Nowra District	Artefact	Valid	Approximately 24 m from the Proposal area
50-2-0005	W/0C3	Artefact	Valid	Approximately 25 m from the Proposal area
50-5-0026	Spring Creek	Artefact	Valid	Approximately 28 m from the Proposal area
50-1-0031	Ingalba NR Scar Tree 7	Modified Tree (Carved or Scarred)	Valid	Approximately 29 m from the Proposal area
51-4-0056	C-0S-1/Chris P	Artefact	Valid	Approximately 33 m from the Proposal area
50-6-0107	Jindalee NP Tree 10	Modified Tree (Carved or Scarred)	Valid	Approximately 35 m from the Proposal area
50-6-0062	WT/OC1	Artefact	Valid	Approximately 38 m from the Proposal area

Site ID	Site Name	Site Type	Status on AHIMS	Location to Proposal area (m)
50-5-0291	8 Mile TSR Young	Modified Tree (Carved or Scarred)	Valid	Approximately 50 m from the Proposal area
50-6-0102	Jindalee NP Tree 5	Modified Tree (Carved or Scarred)	Valid	Approximately 59 m from the Proposal area
50-6-0103	Jindalee Np Tree 6	Modified Tree (Carved or Scarred)	Valid	Approximately 63 m from the Proposal area
51-1-0041	Isolated Artefact - Pebble Axe	Artefact	Valid	Approximately 65 m from the Proposal area
50-6-0101	Jindalee NP Tree 4	Modified Tree (Carved or Scarred)	Valid	Approximately 66 m from the Proposal area
50-5-0020	Beechwood 1	Artefact	Valid	Approximately 66 m from the Proposal area
50-6-0108	Jindalee NP Tree 11	Modified Tree (Carved or Scarred)	Valid	Approximately 66 m from the Proposal area
50-6-0168	Harden Cumbamurra 1	Modified Tree (Carved or Scarred)	Valid	Approximately 74 m from the Proposal area
50-6-0098	Jindalee NP Tree 1	Modified Tree (Carved or Scarred)	Valid	Approximately 75 m from the Proposal area
50-6-0099	Jindalee NP Tree 2	Modified Tree (Carved or Scarred)	Valid	Approximately 78 m from the Proposal area
50-6-0100	Jindalee NP Tree 3	Modified Tree (Carved or Scarred)	Valid	Approximately 79 m from the Proposal area
50-6-0109	Jindalee NP Tree 10	Modified Tree (Carved or Scarred)	Valid	Approximately 80 m from the Proposal area
50-6-0106	Jindalee NP Tree 9	Modified Tree (Carved or Scarred)	Valid	Approximately 87 m from the Proposal area
51-4-0055	Yass	Modified Tree (Carved or Scarred)	Valid	Approximately 96 m from the Proposal area
51-4-0039	Queenbyan Site 2	Artefact	Valid	Approximately 116 m from the Proposal area
50-6-0104	Jindalee NP Tree 7	Modified Tree (Carved or Scarred)	Valid	Approximately 117 m from the Proposal area
50-6-0110	Jindalee NP Tree 11	Modified Tree (Carved or Scarred)	Valid	Approximately 119 m from the Proposal area
50-3-0067	Tubul Tank	Aboriginal Resource and Gathering	Valid	Approximately 128 m from the Proposal area

Site ID	Site Name	Site Type	Status on AHIMS	Location to Proposal area (m)
50-6-0105	Jindalee NP Tree 8	Modified Tree (Carved or Scarred)	Valid	Approximately 153 m from the Proposal area
50-6-0112	Jindalee NP Tree 13	Modified Tree (Carved or Scarred)	Valid	Approximately 268 m from the Proposal area
50-6-0111	Jindalee NP Tree 12	Modified Tree (Carved or Scarred)	Valid	Approximately 289 m from the Proposal area

Archaeological sensitivity and constraints

Constraints mapping was undertaken that used a combination of the above site prediction model for the South-Western Slopes and GIS techniques such Digital Elevation modelling. A total of 25 maps were produced covering 10 km sections of the Burley Griffin Way. This was done to ensure that the areas of sensitivity and their surrounding landscape context would be visible within an appropriate number of maps.

The mapping has the following limitations:

- The areas of high, medium, and low archaeological sensitivity along with disturbed areas were determined based on the desktop information available to NGH. This includes ESRI and NSW LPI satellite imagery as well a Digital Elevation Model (DEM) data from NSW Spatial Services. As a result, the current status of certain landforms within the Proposal area may be different from that which is visible within this data.
- The likelihood of encountering scarred trees is difficult to anticipate, as they may occur wherever old-growth native vegetation is present. As a result, it is difficult to identify these areas using purely desktop methods as satellite imagery is often one or two years old.

The areas of archaeological sensitivity were based on a variety of criteria, including:

- The sensitive landforms outlined in Step 2b of the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales
- General archaeological modelling based on the previous archaeological research that has been performed within the region
- Previous experience in producing heritage constraints maps within NSW.

The criteria of high, medium, and low sensitivity correlate with the following:

- **High** – an area that is highly likely to contain archaeological sensitivity due to the landforms present within the area, its position within the landscape, and proximity to resource areas such as waterways.
- **Medium** – an area that has a moderate potential to contain archaeological sensitivity for similar reasons to above. The difference is that these areas are located close to areas of high potential, which reduces their overall sensitivity in comparison due to their presence to areas of 'higher' sensitivity.
- **Low** – an area that has a low potential to contain archaeological sensitivity. These areas are usually comprised of vast flats and floodplains, or areas with significant slopes. While they are less likely to contain archaeological material, it is still possible for archaeological material to be encountered in these areas, albeit in reduced densities.
- **Disturbed** – a separate category was added to reflect the nature of areas where disturbance has taken place. While the activities that caused this disturbance may have reduced the archaeological

sensitivity of the area, it is still possible to find durable archaeological materials, such as stone artefacts, in these areas. Archaeological material found in disturbed areas is highly likely to be within a highly disturbed context and is unlikely to represent a significant scientific value.

6.6.3 Potential impacts

Construction

The results of the AABR and associated predictive modelling show that the proposed safety upgrades, including ground disturbing works and vegetation removal, has the potential to impact both recorded and unrecorded Aboriginal heritage. The mapping for Aboriginal heritage constraints has identified the sensitivity of all areas along Burley Griffin Way. In general, the entire road corridor, 10 m each side from the centreline of the road, along with the towns are considered to be disturbed and therefore present a negligible potential for Aboriginal heritage. There are more towns in the eastern sections of the Construction footprint, east of Temora. The approaches to Griffith are completely disturbed due to the irrigated farming system present. The Construction footprint east of Temora has a higher sensitivity than those to the west due to the presence of multiple landforms such as waterways, spurs and elevated flats within relatively small areas in comparison to the expansive plains in the west. This suggests that the eastern sections of the Construction footprint have a higher potential for the presence of PADs and artefact scatters. It is easier to predict their presence within these landforms in comparison to larger open plains which, while still occupied, have far fewer topographical features that allow for the identification of sensitive areas. It should be noted that the western sections of the Proposal area are also considered to have fairly high sensitivity, especially in relation to the presence of modified trees on the native vegetation that hugs the road corridor.

The AABR determined that works that align with Type 1 construction would not require further assessment and would be able to proceed with caution in consideration of mitigation measures in Section 6.6.4.

Transport for NSW modified the scope of work after the AABR predictive model maps were produced. The modified scope does not include any Type 2 works in areas of high or moderate archaeological sensitivity. The modified scope is mainly contained on disturbed land. After modifying the scope Transport for NSW Aboriginal Cultural Heritage Officers did site visits of areas where Type 2 works are proposed. Sections of the Burley Griffin Way that have proposed tree removal were also rapidly inspected by a Transport for NSW ACHO. The assessment and site inspection by Transport for NSW align with Stage 1 of the PACHCI and satisfy the Due diligence Code of Practice for the Protection of Aboriginal Objects in NSW. The PACHCI assessment described the following:

- Based on Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI), the Proposal, as specified within the PACHCI and through a search of the Aboriginal Heritage Information Management System (AHIMS), was assessed as being unlikely to have an impact on Aboriginal Cultural Heritage.
- The assessment is based on the following due diligence considerations:
  - The Proposal is unlikely to harm known Aboriginal objects or places.
  - The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the Proposal area.
  - The Proposal area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's Due diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW procedure.
  - The cultural heritage potential of the Proposal area appears to be reduced due to past disturbance.
- The Proposal may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals.

Operation

There would be no impact on Aboriginal cultural heritage during the operation stage of this Proposal.

6.6.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the *Procedure for Aboriginal cultural heritage consultation and investigation* (Transport for NSW, 2012) and *Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Contactor	Detailed design / pre-construction	Section 4.9 of QA *G36 Environment Protection*
Aboriginal heritage	• *The Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. • Work will only re-commence once the requirements of that Procedure have been satisfied.	Contactor	Detailed design / pre-construction	Section 4.9 of QA *G36 Environment Protection*
Aboriginal heritage	The removal of any mature native trees requires a pre-clearing survey. The survey includes inspection for modifications or impacts to the trees that could be cultural markings. Transports unexpected finds procedure would be followed if trees with potential cultural modifications are identified. Where a culturally modified tree is identified the tree would be avoided or further assessment and consultation would be undertaken in line with the PACHCI.	Transport for NSW	Pre-construction	AHMP
Aboriginal heritage	Members of the Aboriginal community must continue to be engaged and consulted about the project and the potential for Aboriginal heritage impacts. They shall also be provided an opportunity to assist in any	Transport for NSW	Pre-construction	AHMP

Impact	Environmental safeguards	Responsibility	Timing	Reference
	formal survey of the Proposal area or part of any Stage 2 assessment.			

6.7 Non-Aboriginal heritage

6.7.1 Methodology

A desktop assessment was undertaken to determine the heritage values of any objects or places within the Proposal area. Heritage database searches were conducted on 8 September 2022 and 28 October 2022 and included:

- The NSW State Heritage Inventory (SHI) (for items listed on the State Heritage Register, Heritage and Conservation Registers of State Government agencies and local heritage items on the Cootamundra LEP, Harden LEP, Narrandera LEP, Temora LEP and Yass Valley LEP).
- Australian Heritage Database

Search results are included in Appendix C.

6.7.2 Existing environment

There are 39 local heritage items in the Proposal area. They are listed in Table 6-11. None of the items below would be impacted as they are not within the Construction footprint at any extent. The heritage items listed below are of local significance. There are no items of NSW state heritage significance or Australian heritage significance in the Proposal area. A map that identifies state and local heritage items in the Proposal area is attached in Appendix H.5).

No items were listed along Burley Griffin Way on the Australian Heritage Database.

Table 6-11 Non-Aboriginal heritage within the Proposal area

LEP	Item name	Address	Property description	Significance	Item no	Located within a town?
Cootamundra LEP	Mackay Park, Barry Grace Oval, trees (not buildings)	Hoskins Street	Lot 1, DP 759041	Local	I88	Yes, Wallendbeen
Cootamundra LEP	Public school	Burley Griffin Way	Lot 1, DP 1091263	Local	I122	**No**
Cootamundra LEP	Kurrajong trees	Hibernia Street	Road reserve	Local	I77	Yes, Stockinbingal
Cootamundra LEP	Stockinbingal Heritage Conservation Area	N/A	N/A	Local	C3	Yes, Stockinbingal
Cootamundra LEP	Stock and Station (former Powderhorn Museum)	44 Hibernia Street	Lot 2, DP 1096788	Local	I76	Yes, Stockinbingal
Harden LEP	Former schoolmasters residence	Albury Street	Lot 4, DP 727527	Local	I72	Yes, Harden

LEP	Item name	Address	Property description	Significance	Item no	Located within a town?
Harden LEP	Murrumburrah Pulic School	Albury Street	Lots 5–7, DP 727527; Lot 1, Section 14, DP 758737; Lot 2, Section 27, DP 758737; Lot 740, DP 820592	Local	I74	Yes, Harden
Harden LEP	Pise cottage duplex	128 and 130 Albury Street	Lots 1 and 2, DP 625188	Local	I28	Yes, Harden
Harden LEP	St Anthonys Catholic Church	Albury Street	Lot 1, DP 1011158	Local	I25	Yes, Harden
Harden LEP	Pise Victorian Cottage	Albury Street	Lot 1, DP 1093722	Local	I26	Yes, Harden
Harden LEP	Gleehaven homestead	383 Albury Street	Lot 351, DP 753624	Local	I82	Yes, Harden
Harden LEP	Whichcraft and Coffee cottage	19 Vernon Street	Lot 5, Section 21, DP 758737	Local	I98	Yes, Harden
Harden LEP	Harden Murrumburrah Cemetery	Burley Griffin Way	Lot 1, DP 668458; Lot 1, DP 668462; Lots 723 and 724, DP 753624; Lot 7008, DP 1021572; Lot 7013, DP 1021574; Lot 7022, DP 1021570; Lots 7325–7328, DP 1162286	Local	I86	**No**
Harden LEP	Demondrille Creek Bridge	Burley Griffin Way	Road corridor	Local	I4	**No**
Harden LEP	Courthouse	Albury Street	Lot 1, Section 22, DP 758737	Local	I71	Yes, Harden
Harden LEP	Commercial Hotel	337–341 Albury Street	Lot 1, DP 228407	Local	I79	Yes, Harden
Harden LEP	Former bank building	319 Albury Street	Lot 1, DP 724127	Local	I78	Yes, Harden
Harden LEP	Victorian residence	Neill Street	Lot 2, DP 1080535	Local	I92	Yes, Harden
Harden LEP	Federation residence	299 Albury Street	Lot 741, DP 821793	Local	I76	Yes, Harden

LEP	Item name	Address	Property description	Significance	Item no	Located within a town?
Harden LEP	Liliansfel homestead	259 Albury Street	Lot 4, Section 25, DP 758737	Local	I75	Yes, Harden
Narrandera LEP	Former Billiards Shop	90 Yapunyah Street	Lot C, DP 316798	Local	I005	Yes, Barellan
Narrandera LEP	Barellan Post Office	108 Yapunyah Street	Lot 2, DP 616364	Local	I001	Yes, Barellan
Narrandera LEP	General Store & Newsagency	100 Yapunyah Street	Lot 3, Section 3, DP 758052	Local	I008	Yes, Barellan
Narrandera LEP	Former Refreshment Rooms	60 Yapunyah Street	Lot 4, DP 1096888	Local	I007	Yes, Barellan
Temora LEP	Central Conservation Area	N/A	N/A	Local	A	Yes, Temora
Temora LEP	Baptist Manse	3 Victoria Street	Lots 3 and 4, DP 129701	Local	I116	Yes, Temora
Temora LEP	House - Carr - Victoria St	Victoria Street	Lots 1 and 2, DP 129701	Local	I83	Yes, Temora
Temora LEP	Site of former Temora Footbridge	Victoria Street	Railway reserve	Local	I107	Yes, Temora
Temora LEP	Baptist Church	Baker Street	Lot 11, Section 18, DP 758957	Local	I73	Yes, Temora
Temora LEP	Temora Silos North & South	Railway Precinct	Lot 1, DP 819863	Local	I152	Yes, Temora
Temora LEP	United Evangelical Lutheran Church	Vesper Street	Lot 63, DP 750587	Local	I74	Yes, Temora
Temora LEP	Civic Conservation Area	N/A	N/A	Local	B	Yes, Temora
Temora LEP	Masonic Hall & Temple	Vesper Street	Lot 63, DP 750587	Local	I9	Yes, Temora
Temora LEP	War Memorial - Springdale	Burley Griffin Way	Lot 90, DP 750603	Local	I57	Yes, Springdale

LEP	Item name	Address	Property description	Significance	Item no	Located within a town?
Yass Valley LEP	Illalong Quarry	Burley Griffin Way	Lot 51, DP 870124	Local	A290	**No**
Yass Valley LEP	Golden Fleece Inn (former)	49 Queen Street	Lot 4, Section 27, DP 758109	Local	I027	Yes, Binalong
Yass Valley LEP	Binalong	N/A	N/A	Local	C1	Yes, Binalong
Yass Valley LEP	The Elms	30 Grampian Street	Lot 7, DP 759136	Local	I023	Yes, Binalong
Yass Valley LEP	St Thomas Anglican Church	20 Stephens Street	Lot 1, DP 538441	Local	I028	Yes, Binalong

6.7.3 Potential impacts

Construction

Desktop level assessment of the proposed works along the 258km Burley Griffin Way shows that there are areas of non-Aboriginal heritage present adjacent to the Road. If they are not properly identified in the field, there is a risk to these valuable assets being damaged/destroyed during construction.

Most of the heritage structures are located in built up areas which are going to be avoided by the Proposal. For all others within the Construction footprint, a detailed site survey needs to be conducted prior to construction activities being commenced and it should identify the heritage sites and the design should be modified in a way that would avoid impact on these heritage items. The REF has determined that there are no Non-Aboriginal heritage items that intersect the Construction footprint outside of townships.

It is assumed as stated in the project description that there would be no likely impact to any Non-Aboriginal heritage item that is located within a township. This is the case for 35 of the Non-Aboriginal heritage items identified in Table 6-11 that have curtilages that fall inside the Proposal area. This would also extend to any additional heritage items identified following consistency reviews undertaken for each detailed design. With consideration of the Construction footprint there are no Non-Aboriginal heritage items in proximity (refer to Appendix H.4).

Operation

There would be no impact to the non-Aboriginal heritage during operation stage of this Proposal.

6.7.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Non-Aboriginal heritage	The Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) will be followed if any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Transport Project Engineer	Construction	Section 4.10 of QA *G36 Environment Protection*
Non-Aboriginal heritage	If an existing heritage item or item identified on the Roads and Maritime s.170 register is on site or in the near vicinity of the works, the item is to be protected to prevent any damage or disturbance.	Transport Project Engineer	Pre-construction/Construction	

6.8 Landscape Character and Visual Impacts

6.8.1 Existing environment

Visual amenity is subjective to the extent that landscape features can be perceived differently by different people. What some people may deem to be visually attractive, others may perceive as visually intrusive. The Proposal aims to not significantly alter the existing landscape and landscape features with new infrastructure to complement existing features rather than contrast.

The Proposal is located across the Southwestern Slopes and Cobar Peneplain Bioregions, both of which are a landscapes in which the seasons vary from cold winters to warm summers. As a result, the Proposal area should be considered as a varying landscape depending on the temporal factors of climate, geology, topography, and hydrology in each area. Several dozen waterways, ranging from 1st order ephemeral tributaries to >5th order major waterways, flow through the Proposal area at various points. In general, the dominant visual characteristics are typical of a regional area and include agricultural land used for cropping and grazing, residential dwellings, trainlines, electricity transmission lines and waterways.

The existing landscape within the Burley Griffin Way corridor is of a typical regional NSW arterial road. Throughout its extent the road is sealed, includes line marking and other road furniture such as guardrails. The road corridor includes shoulders both gravel and vegetated depending on the area of reference. The corridor also includes cut and fill batters. The broader corridor in many extents is vegetated with trees and mid story vegetation and in other extents the vegetation consists of grasses and low shrubs.

6.8.2 Potential impacts

Construction

Minor changes to the immediate visual amenity of the construction footprint would occur during construction. Construction of the Proposal would disturb groundcover, remove vegetation and involve road safety improvement works

The work is unlikely to lead to any long-term change in the broader scale visual amenity as the Burley Griffin Way already exists within the Proposal area. The proposed activity involves repairing and occasional widening of the existing Burley Griffin Way.

Operation

The works are unlikely to lead to any long-term change in the visual amenity as Burley Griffin Way and road infrastructure already exist within the construction footprint. The character of the Proposal is the same as the existing environment.

6.8.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Landscape character and visual impact	Landscaping is to be managed in accordance with Roads and Maritime Landscape guideline, 2013	Transport Project Engineers	During construction	

6.9 Socio-economic and land use

6.9.1 Existing environment

Social characteristics

The Proposal is located across the Riverina and Southeast and Tablelands region and occurs across eight LGA's. These are:

- Carrathool Shire Council — Total population: 2,866
- Griffith City Council — Total population: 27,086,
- Narrandera Shire Council — Total population: 5,698
- Coolamon Shire Council — Total population: 4,385
- Temora Shire Council — Total population: 6,034
- Cootamundra-Gundagai Regional Council — Total population: 11,403
- Hilltops Council — Total population: 19,254
- Yass Valley Council — Total population: 17,281.

Census data taken from ABS (Australian Bureau of Statstics, 2016).

The predominant land use of the surrounding areas is grazing agriculture. With the exception of Griffith and Yass Valley councils the primary industry of employment in all LGAs above is farming. With the top industry of employment in Griffith being healthcare and in Yass the top responses were Government Administration and Defence, however farming in both LGAs is still well above NSW averages.

Property, and social value

The Proposal area occurs across several different land zonings including:

- RU1 Primary Production
- RU5 Village
- R1 General Residential
- R5 Large Lot Residential
- RE1 Public Recreation

- E1 National Parks and Nature Reserves
- E2 Environmental Conservation
- SP1 Cemetery
- SP2 Infrastructure
- B2 Local Centre
- B4 Mixed Use
- IN1 General Industrial.

Background searches identified that this road passes along multiple sections of Crown Land on the Minview database (NSW Government , 2022) (refer to Appendix C). Considering the Construction footprint would be contained within the existing Burley Griffin Way road corridor no acquisition of Crown Land is required. While some Crown Land does intersect the road, the road corridor is considered under the management of Transport for NSW.

Local businesses, pedestrian areas, and street parking areas along the route are largely restricted to the main townships along the Construction footprint. Along Burley Griffin Way itself shoulders do not include pedestrian pathways, bike lanes or formal parking opportunities. Several rural property accesses join Burley Griffin Way along the Construction footprint (e.g. Figure 6-2). Most of these accesses are unsealed.

Figure 6-2 Typical private property access along Burley Griffin Way (Source: Google Earth)

While not noted during site inspections, there is likely to be informal roadside memorials along the Construction footprint. These memorials if present would represent social value to members of local communities.

6.9.2 Potential impacts

Construction

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

- Noise (refer to section 6.5 for assessment)
- Traffic and transport (refer to section 6.4 for assessment)
- Landscape and Visual (refer to section 6.8 for assessment)
- Air quality (refer to section 6.11 for assessment).

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. There would be no property acquisition or permanent change to the existing land uses as a result of the Proposal.

Roadside memorials could be encountered during construction. These items would be managed in accordance with the Transport for NSW *Roadside Tributes Policy* (PN 148).

Operation

The Proposal would have an overall positive socio-economic impact when in operation with improved road safety for road users.

6.9.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Socio-economic	All complaints are to be recorded on a complaints register and attended to promptly.	Transport Project Engineer	Construction	
Socio-economic	Potential impact to any roadside memorials must be in accordance with the Transport for NSW 'Roadside Tributes Policy' (PN 148).	Transport Project Engineer	Construction	
Socio-economic	Local council will be consulted prior to removal of any native tree plantings	Transport Project Engineer	Construction	
Socio-economic	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Transport Project Engineer	Construction	

6.10 Air quality

6.10.1 Existing Environment

Climate and Meteorology

Nearest weather station to Yass end of the Proposal is Burrinjuck Dam station 073007. It is located approximately 30km south of the Proposal area. The mean Maximum temperature recorded in this station is 29.8^{0}C in January and the mean minimum temperature is 3^{0}C in July. Mean annual rainfall is 926.5mm with the highest fall recorded in the month of July.

Nearest weather station to Griffith end of the Proposal is at Griffith Airport. It is located approximately 5km north of the Proposal area. This site is numbered as site number 075041 by Bureau of Meteorology (BOM). Comparing the data between 1970 and 2022, we can see that the highest mean temperature is 33.2^{0}C in the month of January. Lowest mean temperature is 3.5^{0}C for the month of July. It also indicates annual mean rainfall of 398.6mm spread out almost evenly throughout the year (BOM, 2022).

Background air quality

Data from the Wagga Wagga North air quality monitoring station was selected as a representative station for the rural south western slopes region. Air quality exceedances for key pollutants such as NO2, Ozone and particulate matter was revised for the past five years (refer to Figure 6-3) (Department of Energy and Climate Change , 2023). The results show air quality exceedances occurred only for particulate matter. Notably these spikes trend towards the summer months which are generally bushfire effected. This is most clearly shown in the 2019/2020 spike which would correlate to the historic Black Summer bushfires. Outside of bushfire season it is expected that rural areas such as those adjacent to Burley Griffin Way would experience good air quality conditions.

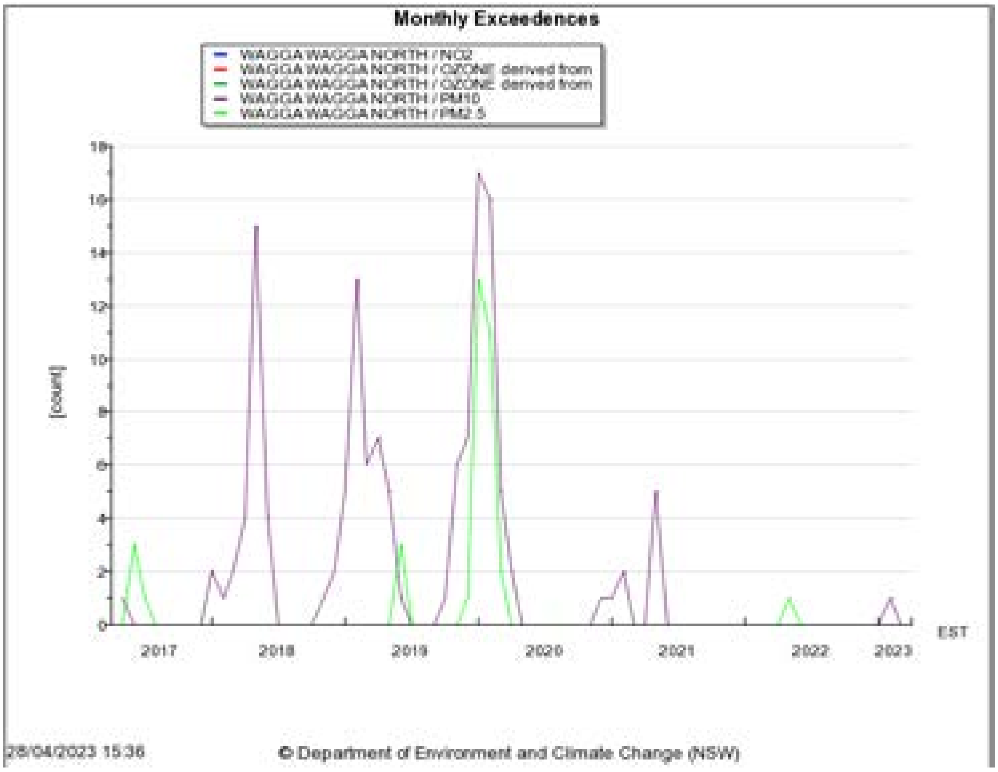

Figure 6-3 Monthly air quality exceedances (Wagga Wagga North)

6.10.2 Potential impacts

Construction

Construction activities like clearing vegetation and using heavy machinery during earthworks have the potential to increase airborne particulate matter and impact nearby sensitive receivers. However, any impacts would be minor and localised. Potential impacts could be:

- Small quantities of dust could occur from cutting and filling activities. Stockpiled material may also generate dust. There is the potential that a lime spreader would be utilised where needed for the Proposal. Levels of dust are unlikely to impact any private residences. Emissions from plant and equipment during construction may result in a minor temporary and short-term reduction of local air quality. However, the potential impacts are unlikely to result in adverse human health impacts.
- Odour may be generated from diesel fuel operated plant. This short-term and temporary impact is not likely to be significant.

Operation

Potential impact to air quality during the operation stage of the Proposal is unlikely to change. This is considered true as traffic volumes are not projected to increase because of the Proposal.

Increased pavement width and installation of audio tactile linemarking in some locations would likely reduce vehicles entering into the unpaved area, hence reducing dust emissions.

Potential impact to air quality arising from the proposed works during operation is expected to be negligible.

6.10.3 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Air quality	Construction activities will be managed to minimise the emission of dust, smoke, and other substances.	Transport Project Engineer	Construction	Section 4.4 of QA G36 Environment Protection
Air quality	Clearing of natural vegetation will be minimised where possible.	Transport Project Engineer	Construction	Section 4.4 of QA G36 Environment Protection
Air quality	All delivery vehicles would be covered during transportation.	Transport Project Engineer	Construction	N/A
Air quality	Vegetation or other materials would not be burnt on site.	Transport Project Engineer	Construction	N/A
Air quality	Dust suppression techniques would be utilised in response to visible dust, such as watering dusty work areas and stockpile sites (using non-potable water where available).	Transport Project Engineer	Construction	N/A
Air quality	Stabilisation of disturbed surfaces will take place as soon as practicable.	Transport Project Engineer	Construction	N/A
Air quality	Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with Roads and Maritime	Transport Project Engineer	Construction	Roads and Maritime Stockpile Site Management

Impact	Environmental safeguards	Responsibility	Timing	Reference
	Stockpile Site Management Guideline (RTA 2011a).			Guideline (RMS, 2011)
Air quality	Plant and machinery will be turned off when not in use as much as possible and will be fitted with emission control devices complying with Australian Design Standards where practicable.	Transport Project Engineer	Construction	N/A
Air quality	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality.	Transport Project Engineer	Construction	N/A

6.11 Other impacts

6.11.1 Existing environment and potential impacts

Environmental factor	Existing environment	Potential impacts
Waste and Resources	Waste management would occur in accordance with the NSW *Waste Avoidance and Resource Recovery Act 2001*. The objectives of this Act are: a) To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development. b) To ensure that resource management options are considered against a hierarchy of the following order: i. Avoidance of unnecessary resource consumption. ii. Resource recovery (including reuse, reprocessing, recycling, and energy recovery). iii. Disposal. c) To provide for the continual reduction in waste generation. d) To minimise the consumption of natural resources and the final disposal of waste by encouraging the avoidance of waste and the reuse and recycling of waste. e) To ensure that industry shares with the community the responsibility for reducing and dealing with waste. f) To ensure the efficient funding of waste and resource management planning, programs, and service delivery. g) To achieve integrated waste and resource management planning, programs, and service delivery on a State–wide basis. To assist in the achievement of the objectives of the NSW *Protection of the Environment Operations Act 1997*.	Generation of small quantities of waste including: • General construction waste • Domestic rubbish • Spoil • Concrete • Metal • Vegetation • Bitumen • Sewerage • Fuels, oils and lubricants. Potential impacts include: • Run-off from materials/waste storage if mismanaged, resulting in sedimentation and erosion, waste transfer and spillages • Ground contamination from spillages, leaching from excavated material • Incorrect disposal of waste • Excessive waste diverted to landfill • Amenity impacts from litter/waste.

6.11.2 Safeguards and management measures

Table 6-12 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the Proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. The WMP will be prepared taking into account the *Environmental Procedure - Management of Wastes on Transport for NSW Land* (Transport for NSW, 2014) and relevant Transport for NSW Waste Fact Sheets.	Transport Project Engineer	Detailed design / pre-construction	Section 4.2 of QA *G36 Environment Protection*
Waste	All waste generated by the proposed work to be classified in accordance with the NSW Waste Classification Guidelines Part 1: Classifying Wastes (DECCW 2008).	Transport Project Engineer	Construction	NSW Waste Classification Guidelines Part 1: Classifying Wastes (DECCW 2008)
Waste	Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority. • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). • Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).	Transport Project Engineer	Construction	Waste Avoidance & Resource Recovery Act (2001)
Waste	All waste generated on site is to be transported off site and disposed of at landfill site approved to accept General Solid Waste (non–putrescible). When transporting or depositing the waste the contractor is to comply with section 143 of the POEO Act.	Transport Project Engineer	Construction	Section 4.11.4 of QA G36 Environment Protection

Impact	Environmental safeguards	Responsibility	Timing	Reference
Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Transport Project Engineer	Construction	N/A

6.12 Cumulative impacts

6.12.1 Methodology

Cumulative impacts are incremental environmental impacts caused by the combination of past, present, and reasonably foreseeable future actions. Cumulative impacts accumulate over time, from one or more sources. While impacts may be insignificant in isolation, significant impacts may occur when individual effects are considered in combination.

The assessment of cumulative impacts focused on the interaction of the proposed activity with other projects in the vicinity of the proposed activity within the eight Local Government Authorities (LGA's) including other proposals along the Burley Griffin Way, and where construction and/or operational timeframes are likely to be concurrent.

6.12.2 Existing Environment

A review of the NSW Department of Planning and Environment (DPE) Major Project Register conducted on 28 April 2023 identified 82 major development applications (includes modifications and determined applications) across the eight LGA's. None of these projects occur within or adjacent to the Proposal area. Additional local council development applications were not considered relevant as the Construction footprint works would take place within state owned land.

6.12.3 Potential impacts

The Proposal is part of a broader program of work to carry out safety improvement work along the Burley Griffin Way. This would result in safety improvements for road users. During construction, impacts to biodiversity for other proposals along the Burley Griffin Way are likely to occur as a result of ongoing safety improvement works. This would be both permanent and temporary impacts. It is unlikely that cumulative impact from operations would occur..

6.12.4 Safeguards and management measures

Impact	Environmental safeguards	Responsibility	Timing	Reference
Cumulative Biodiversity impact	Biodiversity impacts would be mitigated or offset in accordance with the Transport for NSW *Biodiversity Policy* (2022) and *Tree and Hollow Replacement Guidelines* (2022)	Transport Project Engineer	During the course of safety improvements along the Burley Griffin Way	

7. Environmental management

This chapter describes how the Proposal would be managed to reduce potential environmental impacts throughout detailed design, construction and operation. A framework for managing the potential impacts is provided. A summary of site-specific environmental safeguards is provided and the licence and/or approval requirements required prior to construction are also listed.

7.1 Environmental management plans (or system)

A number of safeguards and management measures have been identified in the REF in order to minimise adverse environmental impacts, including social impacts, which could potentially arise as a result of the Proposal. Should the Proposal proceed, these safeguards and management measures would be incorporated into the detailed design and applied during the construction and operation of the Proposal.

A Construction Environmental Management Plan (CEMP) will be prepared to describe the safeguards and management measures identified. The CEMP will provide a framework for establishing how these measures will be implemented and who would be responsible for their implementation.

The CEMP will be prepared prior to construction of the Proposal and must be reviewed and certified by the Transport Environment and Sustainability Manager, South West region, prior to the commencement of any on-site works. The CEMP will be a working document, subject to ongoing change and updated as necessary to respond to specific requirements. The CEMP would be developed in accordance with relevant sections of the specifications set out in the QA Specification *G36 – Environmental Protection (Management System)*, QA Specification *G38 – Soil and Water Management (Soil and Water Plan)*, QA Specification *G40 – Clearing and Grubbing*, QA Specification *G10 – Traffic Management.*

7.2 Summary of safeguards and management measures

Environmental safeguards and management measures outlined in this REF will be incorporated into the detailed design phase of the Proposal and during construction and operation of the Proposal, should it proceed. These safeguards and management measures will minimise any potential adverse impacts arising from the proposed works on the surrounding environment. The safeguards and management measures are summarised in Table 7-1.

Table 7-1 Summary of safeguards and management measures

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
GEN1	Assessment of detailed concept designs	A consistency assessment will need to be prepared when detailed civil engineering designs are received to confirm that the environmental impacts would not differ significantly from those identified in this REF. If additional impacts are identified, an Addendum REF would be required.	Transport for NSW project manager	Pre-construction / detailed design	
GEN1	General - minimise environmental impacts during construction	A CEMP will be prepared and submitted for review and endorsement of the Transport for NSW Environment Manager prior to commencement of the activity. As a minimum, the CEMP will address the following: • any requirements associated with statutory approvals • details of how the project will implement the identified safeguards outlined in the REF • issue-specific environmental management plans • roles and responsibilities • communication requirements • induction and training requirements • procedures for monitoring and evaluating environmental performance, and for corrective action • reporting requirements and record-keeping • procedures for emergency and incident management • procedures for audit and review.	Contractor / Transport for NSW project manager	Pre-construction / detailed design	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		The endorsed CEMP will be implemented during the undertaking of the activity.			
GEN2	General - notification	All businesses, residential properties and other key stakeholders (e.g. schools, local councils) affected by the activity will be notified at least five days prior to commencement of the activity.	Contractor / Transport for NSW project manager	Pre-construction	
GEN3	General – environmental awareness	All personnel working on site will receive training to ensure awareness of environment protection requirements to be implemented during the project. This will include up-front site induction and regular "toolbox" style briefings. Site-specific training will be provided to personnel engaged in activities or areas of higher risk. These include • areas of Aboriginal heritage sensitivity • threatened species habitat • adjoining residential areas requiring particular noise management measures]	Contractor / Transport for NSW project manager	Pre-construction / detailed design	
B1	Biodiversity (management plans)	A Flora and Fauna Management Plan will be prepared in accordance with Transport for NSW's (Transport) *Biodiversity Guidelines: Protecting and Managing Biodiversity on Projects* (RMS, 2011) and implemented as part of the CEMP. It will include, but not be limited to: • plans showing areas to be cleared and areas to be protected, including exclusion zones, protected habitat features and revegetation areas • requirements set out in the *Landscape Guideline* (RMS, 2008) • pre-clearing survey requirements • procedures for unexpected threatened species finds and fauna handling • procedures addressing relevant matters specified in the *Policy and guidelines for fish habitat conservation and management* (DPI Fisheries, 2013) Protocols to manage weeds and pathogens.	Transport and Contractor	Detailed design / pre-construction	Section 4.8 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B2	Biodiversity (general)	Biodiversity impacts will be mitigated or offset in accordance the current *TfNSW Biodiversity Policy 2022* and relevant Transport guides such as the *Transport No net loss guidelines 2022*.	Transport	All stages	
B3	Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Transport	Detailed design	
B4		Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Transport	Pre-construction	
B5		Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
B6		Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Post-Construction	
B7		The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if **threatened ecological communities**, not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Construction	
B8	Removal of threatened species habitat and habitat features	Habitat removal will be minimised through detailed design.	Transport	Detailed design	
B9		Habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B10		Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction / Post-Construction	
B11		Nest boxes would be used to replace loss of HBTs in accordance with *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) or more current transport guides.	Contractor	Construction / Post-Construction	
B12	Unexpected finds (fauna)	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) **if threatened fauna**, not assessed in the biodiversity assessment, are identified in the construction footprint.	Contractor	Construction	
B13	Aquatic impacts	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	Contractor	Construction	
B14	Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011).	Transport and Contractor	Detailed design, Construction / Post-Construction	
B15		Incorporate plantings of native, frangible vegetation at key locations along the Proposal area to secure and bolster connectivity.	Contractor	Construction / Post-Construction	
B16		Any connectivity measures implemented will be installed under the supervision of an experienced ecologist.	Contractor / Site ecologist	Construction / Post-Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
B17	Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
B18	Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
B19	Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
B20	Invasion and spread of pests	Pest species will be managed within the Construction footprint. *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
B21	Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 7: Pathogen management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Contractor	Construction	
SW1	Soil and water	A site-specific Erosion and Sediment Control Plan/s will be prepared and implemented The ESCP will include arrangements for managing wet weather events, including monitoring of potential high-risk events (such as storms) and specific controls and follow-up measures to be applied in the event of wet weather.	Transport Project Engineer	Detailed design / Pre-construction	Section 2.2 of QA *G38 Soil and Water Management*
SW2	Soil and water	Erosion and sediment control measures would be implemented to mitigate any impacts.	Transport Project Engineer	Detailed design/ pre-construction, Construction	Managing Urban Stormwater: Soils & Construction Guidelines

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
					(the Blue Book) (Landcom 2004), Section 3.1 of QA *G38 Soil and Water Management*
SW3	Soil and water	Establish erosion control and sediment capture measures, and maintain them regularly, to divert offsite stormwater, manage onsite stormwater runoff and stabilise stockpiles.	Transport Project Engineer	Construction	Section 3.5 of QA *G38 Soil and Water Management,* RMS Technical Guideline EMS-TG-010: Stockpile Site Management, the Blue Book.
SW4	Soil and water	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Transport Project Engineer	Construction	
SW5					
SW6	Soil and water	All fuels, chemicals and lubricants are to be stored in an impervious bunded area either: • 50 m away from any aquatic habitat, flood prone areas, or on slopes steeper than 1:10 Behind effective flood levy bank.	Transport Project Engineer	Construction	Section 4.3 of QA G36 *Environmental* Protection,

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SW7	Soil and water	Refuelling of plant and equipment is to occur in impervious bunded areas	Transport Project Engineer	Construction	
SW8	Soil and water	Adequate incident management procedures will be incorporated into the Construction Environmental Management Plans, including requirement to notify EPA for incidents that cause material harm to the environment.	Transport Project Engineer	Construction	Section 147 – 153 POEO Act.
WQ1	Water Quality	There is to be no release of dirty water into drainage lines and/or waterways.	Transport Project Engineer	During construction	
WQ2	Water Quality	Measures to control pollutants from stormwater and spills would be investigated and incorporated in the pavement drainage system at locations where it discharges to the receiving drainage lines. Measures aimed at reducing flow rates during rain events and potential scour would also be incorporated in the design of the pavement drainage system.	Transport Project Engineer	Detailed design/ pre-construction During construction	
WQ3	Water Quality	Minimise the extent of obstructions within flood prone areas as far as possible at all times during the works.	Transport Project Engineer	During construction	
WQ4	Water Quality	Ensure compounds, stockpiles, waste containers, chemicals and dangerous goods are placed or stored above flood levels where practical.	Transport Project Engineer	During construction	
WQ5	Water Quality	Monitor Bureau of Meteorology (BoM) forecast heavy rainfall events in order to allow sufficient time to vacate and prepare the site prior to the commencement of heavy rainfall and flood events.	Transport Project Engineer	During construction	
WQ6	Water Quality	Remove materials and equipment from flood prone areas in the event of forecast rain that would lead to flooding to minimise the risk of damage to infrastructure, equipment and downstream impacts.	Transport Project Engineer	During construction	
S1	Contaminated land	If contaminated areas are encountered during construction, appropriate control measures will be implemented to manage the	Transport Project Engineer	Construction	Section 4.2 of QA *G36*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		immediate risks of contamination. All other works that may impact on the contaminated area will cease until the nature and extent of the contamination has been confirmed and any necessary site-specific controls or further actions identified in consultation with the Transport for NSW Environment Manager and/or EPA.			*Environment Protection*
S2	Accidental spill	An Emergency spill kit must be kept onsite at all times. All staff must be made aware of the location of the spill kit and trained in its use. If an incident (e.g. spill) occurs, the Transport Environmental Incident Classification and Management Procedure would be followed and the Transport Contract Manager notified as soon as practicable.	Transport Project Engineer	Construction	Section 4.3 of QA *G36 Environment Protection*
S3	NOA management	A site specific Naturally Occurring Asbestos (NOA) management plan will be prepared to reduce risk on workers and anyone else getting close to the construction areas.	Contractor	Construction	Clause 431-434 of the WHS Regulation
S4	Erosion and sedimentation	Erosion and sedimentation controls are to be checked and maintained on a regular basis (including clearing of sediment from behind barriers) and records kept and provided on request.	Transport Project Engineer	Construction	
S5	Erosion and sedimentation	Erosion and sediment control measures are not to be removed until the works are completed and areas are stabilised.	Transport Project Engineer	Construction	
S6	Erosion and sedimentation	Work areas are to be stabilised progressively during the works.	Transport Project Engineer	Construction	
S7	Erosion and sedimentation	A progressive erosion and sediment control plan is to be prepared for the works.	Transport Project Engineer	Construction	
S8	Erosion and sedimentation	The maintenance of established stockpile sites is to be in accordance with the Roads and Maritime Stockpile Site Management Guideline (EMS-TG-10).	Transport Project Engineer	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
T1	Traffic and transport	A Traffic Management Plan (TMP) will be prepared and implemented as part of the CEMP. The TMP will be prepared in accordance with the Transport for NSW *Traffic Control at Work Sites Manual* (RTA, 2010) and *QA Specification G10 Control of Traffic* (Transport for NSW, 2008). The TMP will include: • confirmation of haulage routes • measures to maintain access to local roads and properties • site specific traffic control measures (including signage) to manage and regulate traffic movement • measures to maintain pedestrian and cyclist access • requirements and methods to consult and inform the local community of impacts on the local road network • access to construction sites including entry and exit locations and measures to prevent construction vehicles queuing on public roads. • a response plan for any construction traffic incident • consideration of other developments that may be under construction to minimise traffic conflict and congestion that may occur due to the cumulative increase in construction vehicle traffic monitoring, review and amendment mechanisms.	Transport Project Engineer	Detailed design / Pre-construction	Section 4.8 of QA *G36 Environment Protection*
T2	Traffic and transport	Local and regional road users would be informed of any expected traffic or access changes and delays prior to construction commencing.	Transport Project Engineer	Pre-construction, construction	TMP
T3	Traffic and transport	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Transport Project Engineer	Construction	TMP
T4	Traffic and transport	All complaints are to be recorded on a Complaints Register and attended to promptly.	Transport Project Engineer	Construction	TMP

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
N1	Noise and vibration	All sensitive receivers (eg. schools, local residents) likely to be affected will be notified at least 5 days prior to commencement of any works associated with the activity that may have an adverse noise or vibration impact. The notification will provide details of: • The Proposal • The construction period and construction hours • Contact information for project management staff • Complaint and incident reporting How to obtain further information.	Transport Project Engineer	Pre-construction	
N2	Noise and vibration	For receivers located with 180 m of construction work during standard working hours, should: • Notification (letterbox drop or equivalent) a minimum of 7 days prior to the commencement of works. Receive verification of noise and vibration levels (as detailed above).	Transport Project Engineer	Pre-construction	Transport for NSW Construction Noise and Vibration Guideline (2016). NVMP
N3	Noise and vibration	For receivers located with 44m of construction work during standard working hours, should: • Notification (letterbox drop or equivalent) a minimum of 7 days prior to the commencement of works. • Phone calls detailing relevant information made to identified/affected stakeholders within 7 days of proposed work. Respite offer to receivers within 44m would be provided should there be any noise complaints received.	Transport Project Engineer	Pre-construction	Transport for NSW Construction Noise and Vibration Guideline (2016).
N4	Noise and vibration	Works are to be carried out during normal work hours (i.e. 7am to 6pm Monday to Friday; 8am to 1pm Saturdays). Any work that is performed outside normal work hours or on Sundays or public	Transport Project Engineer	Pre-construction, Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
		holidays must be re-assessed and have measures in place to minimise noise impacts and be in accordance with the Roads and Maritime Construction Noise and Vibration Guideline (2016).			
N5	Noise and vibration	Noise impacts are to be minimised in accordance with Roads and Maritime Construction Noise Estimator.	Transport Project Engineer	Construction	
N6	Noise and vibration	Measures, including allowing adequate distance that rollers and other vibration producing equipment can come to adjacent buildings and/or using non-vibration producing equipment, to minimise or prevent vibration impacts.	Transport Project Engineer	Construction	
N7	Noise and vibration	ATML will be installed in line with the Technical Direction TTD 2020/04 | Version No. 1 – 25 August 2020.	Transport Project Engineer	Pre-construction, Construction	
AH1	Aboriginal heritage	An Aboriginal Heritage Management Plan (AHMP) will be prepared in accordance with the *Procedure for Aboriginal cultural heritage consultation and investigation* (Transport for NSW, 2012) and *Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) and implemented as part of the CEMP. It will provide specific guidance on measures and controls to be implemented for managing impacts on Aboriginal heritage. The AHMP will be prepared in consultation with all relevant Aboriginal groups.	Contactor	Detailed design / pre-construction	Section 4.9 of QA *G36 Environment Protection*
AH2	Aboriginal heritage	• *The Standard Management Procedure - Unexpected Heritage Items* (Transport for NSW, 2015) will be followed in the event that an unknown or potential Aboriginal object/s, including skeletal remains, is found during construction. This applies where Transport for NSW does not have approval to disturb the object/s or where a specific safeguard for managing the disturbance (apart from the Procedure) is not in place. Work will only re-commence once the requirements of that Procedure have been satisfied.	Contactor	Detailed design / pre-construction	Section 4.9 of QA *G36 Environment Protection*

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
AH3	Aboriginal heritage	The removal of any mature native trees requires a pre-clearing survey. The survey includes inspection for modifications or impacts to the trees that could be cultural markings. Transports unexpected finds procedure would be followed if trees with potential cultural modifications are identified. Where a culturally modified tree is identified the tree would be avoided or further assessment and consultation would be undertaken in line with the PACHCI.	Transport for NSW	Pre-construction	AHMP
AH4	Aboriginal heritage	Members of the Aboriginal community must continue to be engaged and consulted about the project and the potential for Aboriginal heritage impacts. They shall also be provided an opportunity to assist in any formal survey of the Proposal area or part of any Stage 2 assessment.	Transport for NSW	Pre-construction	AHMP
NAH1	Non-Aboriginal heritage	The Standard Management Procedure - Unexpected Heritage Items (Roads and Maritime, 2015) will be followed if any unexpected heritage items, archaeological remains or potential relics of non-Aboriginal origin are encountered. Work will only re-commence once the requirements of that Procedure have been satisfied.	Transport Project Engineer	Construction	Section 4.10 of QA *G36 Environment Protection*
NAH2	Non-Aboriginal heritage	If an existing heritage item or item identified on the Roads and Maritime s.170 register is on site or in the near vicinity of the works, the item is to be protected to prevent any damage or disturbance.	Transport Project Engineer	Pre-construction/Construction	
L1	Landscape character and visual impact	Landscaping is to be managed in accordance with Roads and Maritime Landscape guideline, 2013	Transport Project Engineers	During construction	
SE1	Socio-economic	All complaints are to be recorded on a complaints register and attended to promptly.	Transport Project Engineer	Construction	

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
SE2	Socio-economic	Potential impact to any roadside memorials must be in accordance with the Transport for NSW 'Roadside Tributes Policy' (PN 148).	Transport Project Engineer	Construction	
SE3	Socio-economic	Local council will be consulted prior to removal of any native tree plantings	Transport Project Engineer	Construction	
SE4	Socio-economic	Existing access for nearby and adjoining properties is to be maintained at all times during the works unless otherwise agreed to by the affected property owner.	Transport Project Engineer	Construction	
AQ1	Air quality	Construction activities will be managed to minimise the emission of dust, smoke, and other substances.	Transport Project Engineer	Construction	Section 4.4 of QA G36 Environment Protection
AQ2	Air quality	Clearing of natural vegetation will be minimised where possible.	Transport Project Engineer	Construction	Section 4.4 of QA G36 Environment Protection
AQ3	Air quality	All delivery vehicles would be covered during transportation.	Transport Project Engineer	Construction	N/A
AQ4	Air quality	Vegetation or other materials would not be burnt on site.	Transport Project Engineer	Construction	N/A
AQ5	Air quality	Dust suppression techniques would be utilised in response to visible dust, such as watering dusty work areas and stockpile sites (using non-potable water where available).	Transport Project Engineer	Construction	N/A
AQ6	Air quality	Stabilisation of disturbed surfaces will take place as soon as practicable.	Transport Project Engineer	Construction	N/A
AQ7	Air quality	Stockpiles or areas that may generate dust will be managed to suppress dust emissions in accordance with Roads and Maritime Stockpile Site Management Guideline (RTA 2011a).	Transport Project Engineer	Construction	Roads and Maritime

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
					Stockpile Site Management Guideline (RMS, 2011)
AQ8	Air quality	Plant and machinery will be turned off when not in use as much as possible and will be fitted with emission control devices complying with Australian Design Standards where practicable.	Transport Project Engineer	Construction	N/A
AQ9	Air quality	Construction plant and equipment will be maintained in a good working condition in order to limit impacts on air quality.	Transport Project Engineer	Construction	N/A
W1	Waste	A Waste Management Plan (WMP) will be prepared and implemented as part of the CEMP. The WMP will include but not be limited to: • measures to avoid and minimise waste associated with the Proposal • classification of wastes and management options (re-use, recycle, stockpile, disposal) • statutory approvals required for managing both on and off-site waste, or application of any relevant resource recovery exemptions • procedures for storage, transport and disposal • monitoring, record keeping and reporting. The WMP will be prepared taking into account the *Environmental Procedure - Management of Wastes on Transport for NSW Land* (Transport for NSW, 2014) and relevant Transport for NSW Waste Fact Sheets.	Transport Project Engineer	Detailed design / pre-construction	Section 4.2 of QA *G36 Environment Protection*
W2	Waste	All waste generated by the proposed work to be classified in accordance with the NSW Waste Classification Guidelines Part 1: Classifying Wastes (DECCW 2008).	Transport Project Engineer	Construction	NSW Waste Classification Guidelines Part 1: Classifying

No.	Impact	Environmental safeguards	Responsibility	Timing	Reference
					W3Wastes (DECCW 2008)
W3	Waste	Resource management hierarchy principles are to be followed: • Avoid unnecessary resource consumption as a priority. • Avoidance is followed by resource recovery (including reuse of materials, reprocessing, and recycling and energy recovery). Disposal is undertaken as a last resort (in accordance with the *Waste Avoidance & Resource Recovery Act 2001*).	Transport Project Engineer	Construction	Waste Avoidance & Resource Recovery Act (2001)
W4	Waste	All waste generated on site is to be transported off site and disposed of at landfill site approved to accept General Solid Waste (non–putrescible). When transporting or depositing the waste the contractor is to comply with section 143 of the POEO Act.	Transport Project Engineer	Construction	Section 4.11.4 of QA G36 Environment Protection
W5	Waste	Working areas are to be maintained, kept free of rubbish and cleaned up at the end of each working day.	Transport Project Engineer	Construction	N/A
C1	Cumulative Biodiversity impact	Biodiversity impacts would be mitigated or offset in accordance with the Transport for NSW *Biodiversity Policy* (2022) and *Tree and Hollow Replacement Guidelines* (2022)	Transport Project Engineer	During the course of safety improvements along the Burley Griffin Way	

7.3 Licensing, approvals and notifications

A road occupancy licence (ROL) would be required prior to any work commencing.

Water extraction license (s) may be required from the Natural Resources Access Regulator (NRAR) and would be obtained where necessary in consultation with the Transport Environment and Sustainability Manager.

If any culvert works are to be undertaken within KFH area of Dunderalingo Creek then under s199 of the Fisheries Act DPI Fisheries is required to be notified prior to undertaking dredging and reclamation work in water land. Any matters raised by DPI Fisheries within 21 days of the notice being given would be considered by TfNSW.

8. Conclusion

This chapter provides the justification for the Proposal considering its biophysical, social and economic impacts, the suitability of the site and whether or not the Proposal is in the public interest. The Proposal is also considered in the context of the objectives of the EP&A Act, including the principles of ecologically sustainable development as defined in section 193 of the Environmental Planning and Assessment Regulation 2021.

8.1 Justification

The REF has examined and taken into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of the proposed activity. Environmental impacts can be effectively mitigated with the application of safeguards outlined within the REF.

The environmental impacts of the Proposal are not likely to be significant and therefore the preparation of an environmental impact statement and approval under Division 5.2 of the EP&A Act is not required for the Proposal.

The Proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

Overall, the Proposal is believed to be justified in meeting its objectives with few residual long-term impacts and is therefore justified and is in the interest of the public.

8.2 Objects of the EP&A Act

Object	Comment
1.3(a) To promote the social and economic welfare of the community and a better environment by the proper management, development and conservation of the State's natural and other resources.	The Proposal would improve the safety on the Burely Griffin Way while minimizing impacts on the natural and built environment. It is therefore consistent with the objective of promoting the social and economic welfare of the community and for a better environment.
1.3(b) To facilitate ecologically sustainable development by integrating relevant economic, environmental and social considerations in decision-making about environmental planning and assessment.	Ecologically sustainable development is considered in Section 8.2.1.
1.3(c) To promote the orderly and economic use and development of land.	Not relevant to the Proposal.
1.3(d) To promote the delivery and maintenance of affordable housing.	Not relevant to the Proposal.
1.3(e) To protect the environment, including the conservation of threatened and other species of native animals and plants, ecological communities and their habitats.	This REF lists safeguards and management measures to mitigate and minimise the potential impact on the environment including native animals and plants including threatened species.
1.3(f) To promote the sustainable management of built and cultural heritage (including Aboriginal cultural heritage).	Not relevant to the Proposal.
1.3(g) To promote good design and amenity of the built environment.	Not relevant to the Proposal.
1.3(h) To promote the proper construction and maintenance of buildings, including the protection of the health and safety of their occupants.	Not relevant to the Proposal.
1.3(i) To promote the sharing of the responsibility for environmental planning and assessment between the different levels of government in the State.	Not relevant to the Proposal.
1.3(j) To provide increased opportunity for community participation in environmental planning and assessment.	Transport would carry out community consultation with adjoining residents and other key stakeholders. This REF will be published on the Transport website.

8.2.1 Ecologically sustainable development

Ecologically sustainable development (ESD) is development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles of ESD have been an integral consideration throughout the development of the Proposal .

ESD requires the effective integration of economic and environmental considerations in decision-making processes. The four main principles supporting the achievement of ESD are discussed below.

The precautionary principle

The precautionary principle relates to reconciling scientific uncertainty about environmental impacts with certainty in decision-making. It provides that where there is a threat of serious or irreversible environmental damage, the absence of full scientific certainty should not be used as a reason to postpone measures to prevent environmental degradation.

This principle has been applied in the design of the Construction footprint and the mitigation measures made as commitments in Section 7.2. The design of the Construction footprint avoids impacts to environmental factors such as biodiversity and Aboriginal heritage as much as practicable. Where impacts could not be completely avoided appropriate mitigation measures have been applied.

Intergenerational equity

Social equity is concerned with the distribution of economic, social and environmental costs and benefits. Inter-generational equity introduces a temporal element with a focus on minimising the distribution of costs to future generations. The preferred Construction footprint minimises vegetation clearance within sensitive ecological areas to ensure preservation for the benefit of future generations. An Aboriginal cultural heritage assessment was carried out as part of the assessment to avoid or minimise the potential for irreparable damage to occur to Aboriginal cultural heritage during the construction phase of the Proposal.

Conservation of biological diversity and ecological integrity

The preferred Construction footprint has been refined along with the scope of works and subsequent construction methodology to minimise vegetation clearance and ensure the conservation of biological diversity and ecological integrity wherever possible. The impact of road works as assessed in this REF would not significantly impact the conservation of biological diversity or ecological integrity.

Improved valuation, pricing and incentive mechanisms

The principle of internalising environmental costs into decision making requires consideration of all environmental resources which may be affected by the carrying out of a Proposal, including air, water, land and living things. TfNSW corporate environment policy and procedure ensure projects and programs align with this principle.

8.3 Conclusion

The proposed safety improvements along the Burley Griffin Way are subject to assessment under Division 5.1 of the EP&A Act. The REF has examined and taken into account matters affecting or likely to affect the environment by reason of the proposed activity.

This REF has included consideration (where relevant) of conservation agreements and plans of management under the NPW Act, biodiversity stewardship sites under the BC Act, wilderness areas, areas of outstanding value, impacts on threatened species and ecological communities and their habitats and other protected fauna and native plants. It has also considered potential impacts to matters of national environmental significance listed under the Federal EPBC Act.

A number of potential environmental impacts from the Proposal have been avoided or reduced during the concept design development and options assessment. The Proposal as described in the REF best meets the Proposal objectives but would still result in some impacts on biodiversity, including vegetation and habitat clearing. Safeguards and management measures as detailed in this REF would ameliorate or minimise these impacts. The Proposal would improve overall road user safety. On balance the Proposal is considered justified.

Significance of impact under NSW legislation

The Proposal would be unlikely to cause a significant impact on the environment. Therefore, it is not necessary for an environmental impact statement to be prepared and approval to be sought from the Minister for Planning and Public Spaces under Division 5.2 of the EP&A Act. A Biodiversity Development Assessment Report or Species Impact Statement is not required. The Proposal is subject to assessment under Division 5.1 of the EP&A Act. Consent from Councils along the route is not required.

Significance of impact under Australian legislation

The Proposal is not likely to have a significant impact on matters of national environmental significance or the environment of Commonwealth land within the meaning of the *Environment Protection and Biodiversity Conservation Act 1999*. A referral to the Australian Department of Climate Change, Energy, the Environment and Water is not required.

9. Certification

This review of environmental factors provides a true and fair review of the Proposal in relation to its potential effects on the environment. It addresses to the fullest extent possible all matters affecting or likely to affect the environment as a result of the Proposal.

Kyle Mercer

Senior Consultant – Environmental Assessment and Approvals

NGH Pty Ltd

Date: 10/05/2023

I have examined this review of environmental factors and accept it on behalf of Transport for NSW.

Jesse Baaner

Project Manager

Project Services, South Date:

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Terms and acronyms used in this REF

Term / Acronym	Description
AHIMS	Aboriginal Heritage Information Management System`
AoS	Assessments of Significance
ATLM	Audio-tactile line marking
BC Act	*Biodiversity Conservation Act 2016* (NSW).
Construction footprint	the area of land that is directly impacted by the Proposal, including access roads, plus areas used to store temporary construction facilities and infrastructure. The final impact footprint was provided by TfNSW as a shapefile ('220304_MR84_Vegetation_MGA55').
CO	Carbon monoxide
CEMP	Construction environmental management plan
DPE	Department of Planning and Environment
EPA	Environment Protection Authority
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW). Provides the legislative framework for land use planning and development assessment in NSW
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth). Provides for the protection of the environment, especially matters of national environmental significance, and provides a national assessment and approvals process.
ESD	Ecologically sustainable development. Development which uses, conserves and enhances the resources of the community so that ecological processes on which life depends, are maintained and the total quality of life, now and in the future, can be increased
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater Dependent Ecosystems
HBT	Hollow Bearing Tree
Heritage Act	*Heritage Act 1977* (NSW)
IBRA	Interim Biogeographic Regionalisation for Australia
ICNG	NSW Interim Construction Noise Guideline
KBA	Key Biodiversity Area
KTP	Key Threatening Process
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan. A type of planning instrument made under Part 3 of the EP&A Act.
LGA	Local Government Area
Locality	The area within a 10 km radius of the Proposal area

Term / Acronym	Description
MIA	Murrumbidgee Irrigation Area
NAHMP	Non-Aboriginal Heritage Management Plan
NO_2	nitrogen dioxide
NML	Noise Management Level
NPfI	NSW Noise Policy for Industry
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
PACHCI	Transport for NSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PCT	Plant Community Types
Project area	The total length (258km) of Burley Griffin Way considered in the AABR in consideration of Aboriginal heritage constraints areas. The Project Area is taken as a 30m buffer of the Burley Griffin Way centreline.
Proposal	All works involved in the implementation and operation of the works described in this REF.
Proposal area	The total length (258km) of Burley Griffin Way where works (clearing and grubbing for safety purposes) will be conducted including all proposed stockpile, compound and laydown sites associated with the works. The Proposal area is taken as a 10m buffer from the Burley Griffin Way edgeline.
Roads and Maritime	NSW Roads and Maritime Services, now known as Transport for NSW
SEPP	State Environmental Planning Policy. A type of planning instrument made under Part 3 of the EP&A Act.
SHI	State Heritage Inventory
TEC	Threatened Ecological Community
TISEPP	State Environmental Planning Policy (Transport and Infrastructure) 2021
ToS	Test of Significance
TMP	Traffic Management Plan
QA Specifications	Specifications developed by Transport for NSW for use with road work and bridge work contracts let by Transport for NSW.
REF	Review of Environmental Factors
RBL	rating background level
VMS	Variable Message Signs

Appendix A

Consideration of section 171(2) factors and matters of national environmental significance and Commonwealth land

Section 171(2) Checklist

In addition to the requirements of the Guideline for Division 5.1 assessments (DPE 2022) and the *Roads and Related Facilities EIS Guideline* (DUAP 1996) as detailed in the REF, the following factors, listed in section 171(2) of the Environmental Planning and Assessment Regulation 2021, have also been considered to assess the likely impacts of the Proposal on the natural and built environment.

Factor	Impact
a) Any environmental impact on a community?	Short term, minor, negative
Short term traffic, noise and vibration during construction. These impacts have been addressed in chapter 6 and would be mitigated with the implementation of safeguards as discussed in section 7.2.	
During Operation, the Proposal would result in increased visibility, traffic efficiency and improved road safety.	Long term, moderate, positive
b) Any transformation of a locality?	Short-term, minor, negative
Temporary work sites and temporary stockpile sites would be established in multiple places within the road corridor during construction which would not transform the locality The proposed work would not transform the locality during operation, as works would generally be contained within the existing road formation and be carried out on existing TfNSW assets.	
c) Any environmental impact on the ecosystems of the locality?	Short-term, moderate, negative
The Proposal would remove, or impact vegetation, with about 14.2 ha of native vegetation and 64 hollow-bearing trees impacted by the Proposal. The Proposal would have potential minor negative environmental impacts on the ecosystems of a locality, however, the potential impacts would be minimised with the implementation of the safeguards detailed in Section 7.2 of this REF.	
d) Any reduction of the aesthetic, recreational, scientific or other environmental quality or value of a locality?	Short-term, minor, negative
There would be temporary minimal negative impacts in relation to reduction of the aesthetic, recreational, scientific or other environmental quality or value of locality during construction. Any impacts would be reduced by mitigation measures proposed in chapter 6. During operation the Proposal would not reduce the aesthetic, recreational, scientific or other environmental quality or value of the locality, as works would be contained with the existing road corridor with no new elevated installations beyond low level road barriers.	
e) Any effect on a locality, place or building having aesthetic, anthropological, archaeological, architectural, cultural, historical, scientific or social significance or other special value for present or future generations?	Nil

Factor	Impact
The Proposal is not likely to have an impact on a locality, place or building of significance or other special value for present or future generations.	
f) Any impact on the habitat of protected fauna (within the meaning of the *National Parks and Wildlife Act 1974)?* Fauna habitat would be lost through the removal of 14.18 ha of native vegetation within the Proposal area. An estimated 64 of the 644 HBTs recorded within the Proposal area would be removed. These impacts have been assessed in Section 6.1 and concluded to not be significant with the inclusion of mitigation measures in Section 7.2. The impact to protected fauna was specifically assessed in the AOS and TOS's in the BAR. No significant impacts are considered likely with the included of mitigation measures.	Short-term, moderate, negative
g) Any endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air? During construction short term minor impacts would occur on animals and plants. However, the biodiversity assessment has concluded that the Proposal would not lead to the endangering of any species of animal, plant or other form of life, whether living on land, in water or in the air with the implementation of the safeguards given in Section 7.2 of this REF.	Nil
h) Any long-term effects on the environment? Over the longer term, the Proposal would result in improved safety for road users. Due to the location of the works within the vicinity of an existing state road corridor, long term affects on the natural environment are considered to be similar to the impacts already associated with the existing roadway.	Minor long-term positive (social impacts) Negligible long term natural environment impact
i) Any degradation of the quality of the environment? The Proposal may potentially degrade the quality of the environment in the short-term (air quality, visual and noise impacts), however, any potential impacts would be minimised with the implementation of the safeguards given in Section 7.2 of this REF.	Minor short-term negative
j) Any risk to the safety of the environment? The proposed works (construction and operation) are unlikely to pose a risk to the safety of the environment with the implementation of the proposed mitigation measures outlined in Section 7.2.	Nil
k) Any reduction in the range of beneficial uses of the environment? The Proposal would result in a minor reduction in the use of the road due to construction work and temporary traffic control during construction, which may potentially increase travelling time for road users in the short-term. The potential impacts would be minimised	Short-term, minor, negative

Factor	Impact
with the implementation of the safeguards given in Section 7.2 in this REF. There would be no long-term reduction in the range of beneficial uses of the environment as a result of the Proposal.	
l) Any pollution of the environment? The proposed works may potentially cause pollution of the environment during construction. However, the potential impacts would be minimal with the implementation of the safeguards given in Section 7.2 of this REF. Improved drainage construction would contribute to reduced erosion and better flood mitigation over the life of the upgraded sections of Burley Griffin Way. This is considered a long-term positive impact of the Proposal.	Minor short-term negative Long-term positive
m) Any environmental problems associated with the disposal of waste? The Proposal would involve the removal and disposal of waste generated by construction works and vegetation removal, as discussed in Section 6.11. These risks would be confined to construction and would be mitigated with the safeguards discussed in Section 7.2.	Nil
n) Any increased demands on resources (natural or otherwise) that are, or are likely to become, in short supply? The Proposal would not significantly increase demands on resources, which are, or are likely to become, in short supply. Relatively small amounts of materials would be required for the proposed work none of which are in short supply. The safeguards listed in Section 7.2 of this REF would be implemented to minimise any impacts.	Nil
o) Any cumulative environmental effect with other existing or likely future activities? The cumulative impacts of this Proposal are discussed in Section 6.12. No significant nearby projects are known or expected to occur simultaneously. Any cumulative impact is considered to be minor with the implementation of mitigation measures in Section 7.2 of this REF.	Nil
p) Any impact on coastal processes and coastal hazards, including those under projected climate change conditions? The Proposal is not located in a coastal area.	Nil
q) Applicable local strategic planning statements, regional strategic plans or district strategic plans made under the Act, Division 3.1. The importance of roads such as Burley Griffin Way is formalised in Objective 18 of the draft Riverina Murray Regional Plan 2041.The draft Riverina Murray Regional Plan 2041 notes the importance of	Long-term positive.

Factor	Impact
maintaining already ‘failing’ regional road infrastructure to support likely increases in freight movements in the region. The interconnectedness maintained by road and rail passages is highlighted throughout all eight LGA local strategic planning statements. The upgrades proposed in this REF would directly improve the road condition of Burley Griffin Way, which is an important regional Road for multiple LGAs. https://www.planning.nsw.gov.au/Plans-for-your-area/Regional-Plans https://pp.planningportal.nsw.gov.au/exhibitions-publications/local-strategic-planning-statements.	
r) Other relevant environmental factors No additional environmental factors have been considered relevant to this Proposal.	Nil

Matters of National Environmental Significance and Commonwealth land

Under the environmental assessment provisions of the EPBC Act 1999, the following matters of national environmental significance and impacts on Commonwealth land are required to be considered to assist in determining whether the Proposal should be referred to the Australian Government Department of Agriculture, Water and the Environment.

A referral is not required for proposed actions that may affect nationally listed threatened species, endangered ecological communities and migratory species. Impacts on these matters are still assessed as part of the REF in accordance with Australian Government significant impact criteria and taking into account relevant guidelines and policies.

Factor	Impact
a) Any impact on a World Heritage property? There are no World Heritage listed items located near the Proposal area.	Nil
b) Any impact on a National Heritage place? There are no National Heritage listed places located near the Proposal area.	Nil
c) Any impact on a wetland of international importance? There would no impacts on wetland of international importance.	Nil
d) Any impact on a listed threatened species or communities? Two threatened ecological communities and 3 listed threatened species were assessed in the BAR for significant impacts. The Assessment of significant impacts concluded that impacts within the Construction footprint and mitigation measures in Section 7.2 would not result in a significant impact to listed threated species or communities.	Short term minor impact no referral triggered.
e) Any impacts on listed migratory species? No migratory species likely to depend upon habitat resources in the Proposal area, although may occur within the Construction footprint (e.g. White-bellied Sea-eagle, White-throated Needletail).	Nil
f) Any impact on a Commonwealth marine area? The Proposal would not impact on a Commonwealth marine area	Nil
g) Does the Proposal involve a nuclear action (including uranium mining)? The Proposal would not involve a nuclear action.	Nil
h) Additionally, any impact (direct or indirect) on the environment of Commonwealth land? No direct or indirect impacts to Commonwealth land are expected	Nil

Appendix B

Statutory consultation checklists

SEPP (Transport and Infrastructure)

Certain development types

Development type	Description	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Car Park	Does the project include a car park intended for the use by commuters using regular bus services?	No		Section 2.110
Bus Depots	Does the project propose a bus depot?	No		Section 2.110
Permanent road maintenance depot and associated infrastructure	Does the project propose a permanent road maintenance depot or associated infrastructure such as garages, sheds, tool houses, storage yards, training facilities and workers' amenities?	No		Section 2.110

Development within the Coastal Zone

Issue	Description	Yes / No / NA	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Development with impacts on certain land within the coastal zone	Is the proposal within a coastal vulnerability area and is inconsistent with a certified coastal management program applying to that land?	No		Section 2.14

Council related infrastructure or services

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Stormwater	Are the works likely to have a *substantial* impact on the stormwater management services which are provided by council?	No	No stormwater works are proposed within lands management by a council.	Section 2.10
Traffic	Are the works likely to generate traffic to an extent that will *strain* the capacity of the existing road system in a local government area?	No	Works would be staged and constructed as details designs are completed. As such traffic impacts during construction is expected to be minimal.	Section 2.10
Sewerage system	Will the works involve connection to a council owned sewerage system? If so, will this connection have a *substantial* impact on the	No		Section 2.10

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
	capacity of any part of the system?			
Water usage	Will the works involve connection to a council owned water supply system? If so, will this require the use of a *substantial* volume of water?	No		Section 2.10
Temporary structures	Will the works involve the installation of a temporary structure on, or the enclosing of, a public place which is under local council management or control? If so, will this cause more than a *minor* or *inconsequential* disruption to pedestrian or vehicular flow?	No		Section 2.10
Road & footpath excavation	Will the works involve more than *minor* or *inconsequential* excavation of a road or adjacent footpath for which council is the roads authority and responsible for maintenance?	No		Section 2.10

Local heritage items

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Local heritage	Is there is a local heritage item (that is not also a State heritage item) or a heritage conservation area in the study area for the works? If yes, does a heritage assessment indicate that the potential impacts to the heritage significance of the item/area are more than *minor* or *inconsequential?*	No		Section 2.11

Flood liable land

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
Flood liable land	Are the works located on flood liable land? If so, will the works change flood patterns to more than a *minor* extent?	No	Works are located on land that may be subject to flooding, where the road crosses waterways. The works will not however, change flood patterns to more than a *minor* extent	Section 2.12
Flood liable land	Are the works located on flood liable land? (to any extent). If so, do the works comprise more than minor alterations or additions to, or the demolition of, a building, emergency works or routine maintenance?	No		Section 2.13

Note: Flood liable land means land that is susceptible to flooding by the probable maximum flood event, identified in accordance with the principles set out in the manual entitled *Floodplain Development Manual: the management of flood liable* land published by the New South Wales Government.

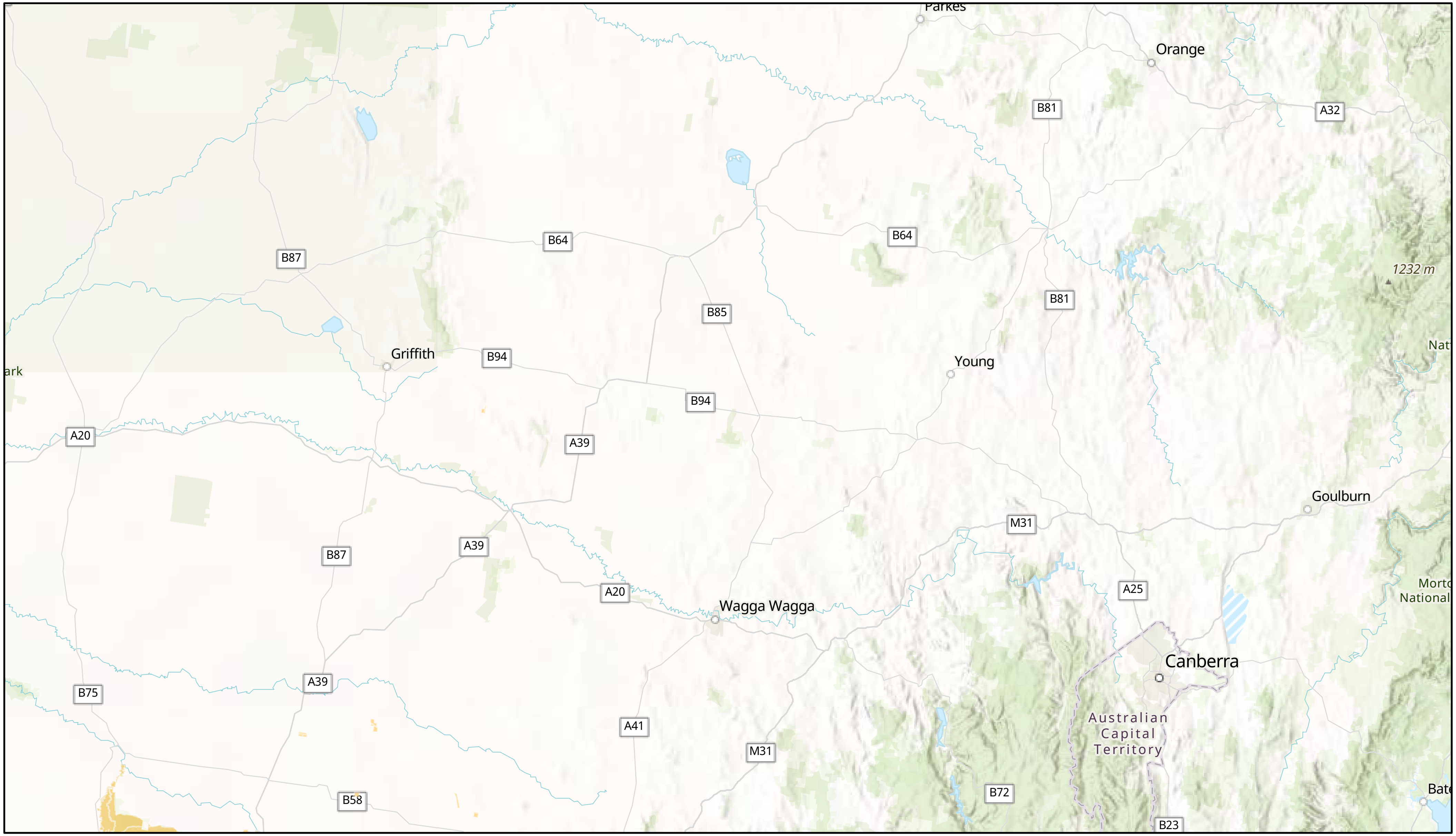
Public authorities other than councils

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
National parks and reserves	Are the works adjacent to a national park or nature reserve, or other area reserved under the *National Parks and Wildlife Act 1974*, or on land acquired under that Act*?*	Yes, Tree removal within the Construction footprint overlaps with the curtilage of Jindalee National Park (refer to Appendix H.1)	Environment, Energy and Science, DPE	Section 2.15
National parks and reserves	Are the works on land in Zone E1 National Parks and Nature Reserves or in a land use zone equivalent to that zone?	Yes, E1 zoning is associated with the curtilage of Jindalee National Park and also overlaps the Construction footprint.	Environment, Energy and Science, DPE	Section 2.15
Aquatic reserves	Are the works adjacent to an aquatic reserve or a marine park declared under the	No		Section 2.15

Issue	Potential impact	Yes / No	If 'yes' consult with	SEPP (Transport and Infrastructure) section
	Marine Estate Management Act 2014?			
Sydney Harbour foreshore	Are the works in the Sydney Harbour Foreshore Area as defined by the *Sydney Harbour Foreshore Authority Act 1998?*	No		Section 2.15
Bush fire prone land	Are the works for the purpose of residential development, an educational establishment, a health services facility, a correctional centre or group home in bush fire prone land?	No		Section 2.15
Artificial light	Would the works increase the amount of artificial light in the night sky and that is on land within the dark sky region as identified on the dark sky region map? (Note: the dark sky region is within 200 kilometres of the Siding Spring Observatory)	No		Section 2.15
Defence communications buffer land	Are the works on buffer land around the defence communications facility near Morundah? (Note: refer to Defence Communications Facility Buffer Map referred to in section 5.15 of Lockhart LEP 2012, Narrandera LEP 2013 and Urana LEP 2011.	No		Section 2.15
Mine subsidence land	Are the works on land in a mine subsidence district within the meaning of the *Mine Subsidence Compensation Act 1961*?	No		Section 2.15

Appendix C Database searches

Native TitleVision Web Map



01/06/2022, 13:42:42

Determinations

In effect - Finalised

1:2,311,162

0 15 30 60 mi

0 25 50 100 km

Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland, FEMA, Intermap and the GIS user community, Sources: Esri, HERE, Garmin, FAO, NOAA, USGS, © OpenStreetMap contributors, and the GIS User Community

Native TitleVision

Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS | Esri, USGS | © State of New South Wales | National Native Title Tribunal, © Commonwealth of Australia |

Search Results

No results found.

Enter at least one search criterion.

[Search Hints](#)

Search | Reset form

Place name

Street name
Burley Griffin Way

Town or suburb | State
New South Wales

Country

Advanced search options

List
All Lists
Different lists will provide different status and class options

Local Government Area | Place ID number

Legal status
--All--

Class
--All--

Keyword Search

☑ Description ☑ Statement of Significance ☑ Place history

Latitude/Longitude

N

Latitude 1

Longitude 1 S Longitude 2

W E Latitude 2 E E

S

S

○ Wholly within region
◉ Wholly or partially within region

Longitude coordinates should be entered as ddd.mm.ss
Latitude coordinates should be entered as dd.mm.ss

Map Ref No

1:100,000 eg 2357
1:250,000 eg SF-50-01

Search Hints

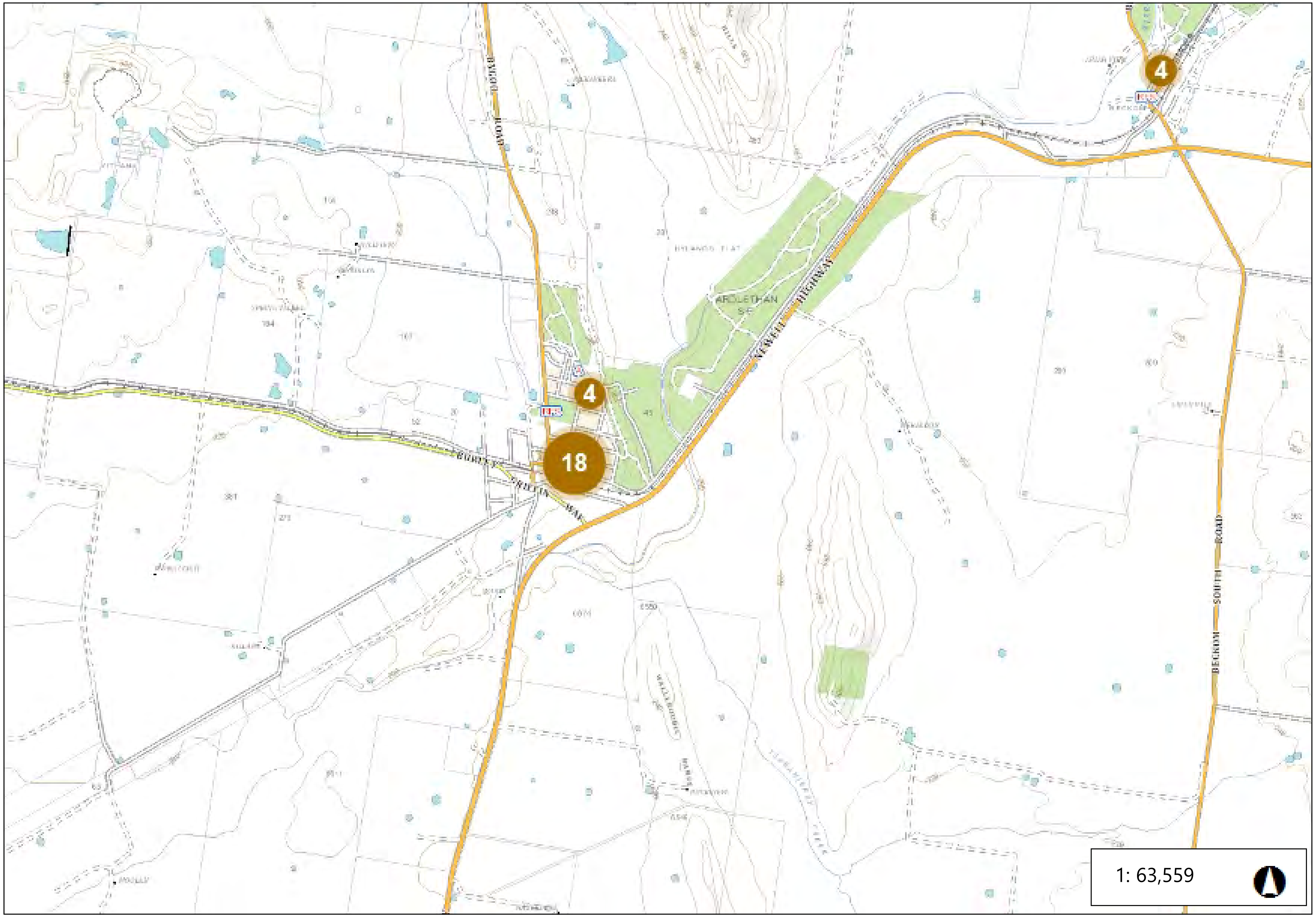
- Not all fields need to be filled in. The fewer you fill in the more results you will get.
- If you cannot find a place, check spelling and try alternative names. Reduce the number of words that you include and use fewer fields.

- The Local Government field used on its own will provide a comprehensive list of places in an area.

Report Produced: Fri Oct 28 16:21:53 2022

Coolamon LGA SHR items extent

Heritage NSW



Legend

- World Heritage Areas NSW
- SEPP
- SEPP
- World Heritage Site
- Local Environmental Plan
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

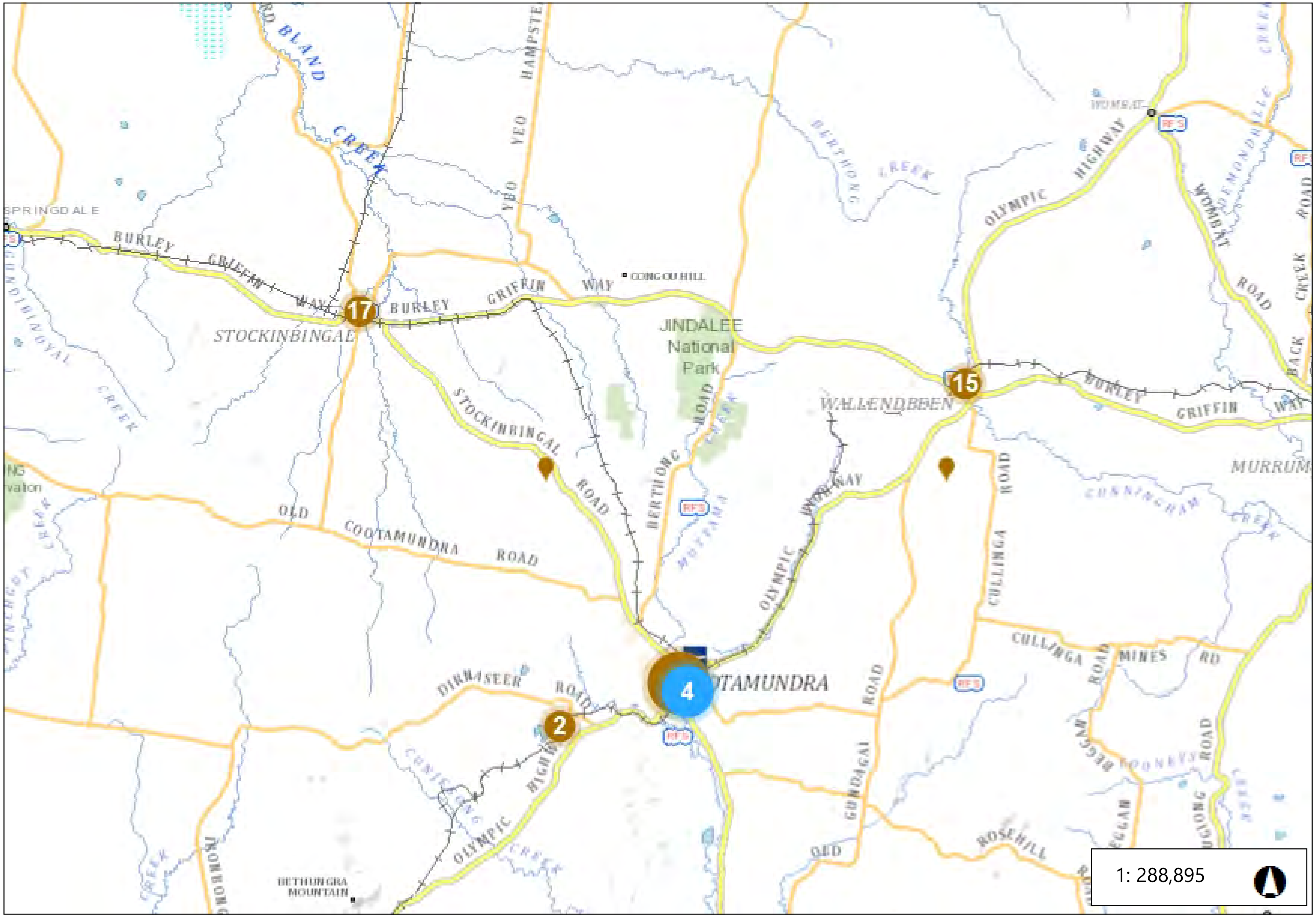
Notes

All items of note within township

3,228.8 0 1,614.39 3,228.8 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

Cootamundra-Gundagai LGA SHR items extent



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- SEPP
- World Heritage Site
- Local Environmental Plan
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- State Heritage Register
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

1: 288,895

Notes

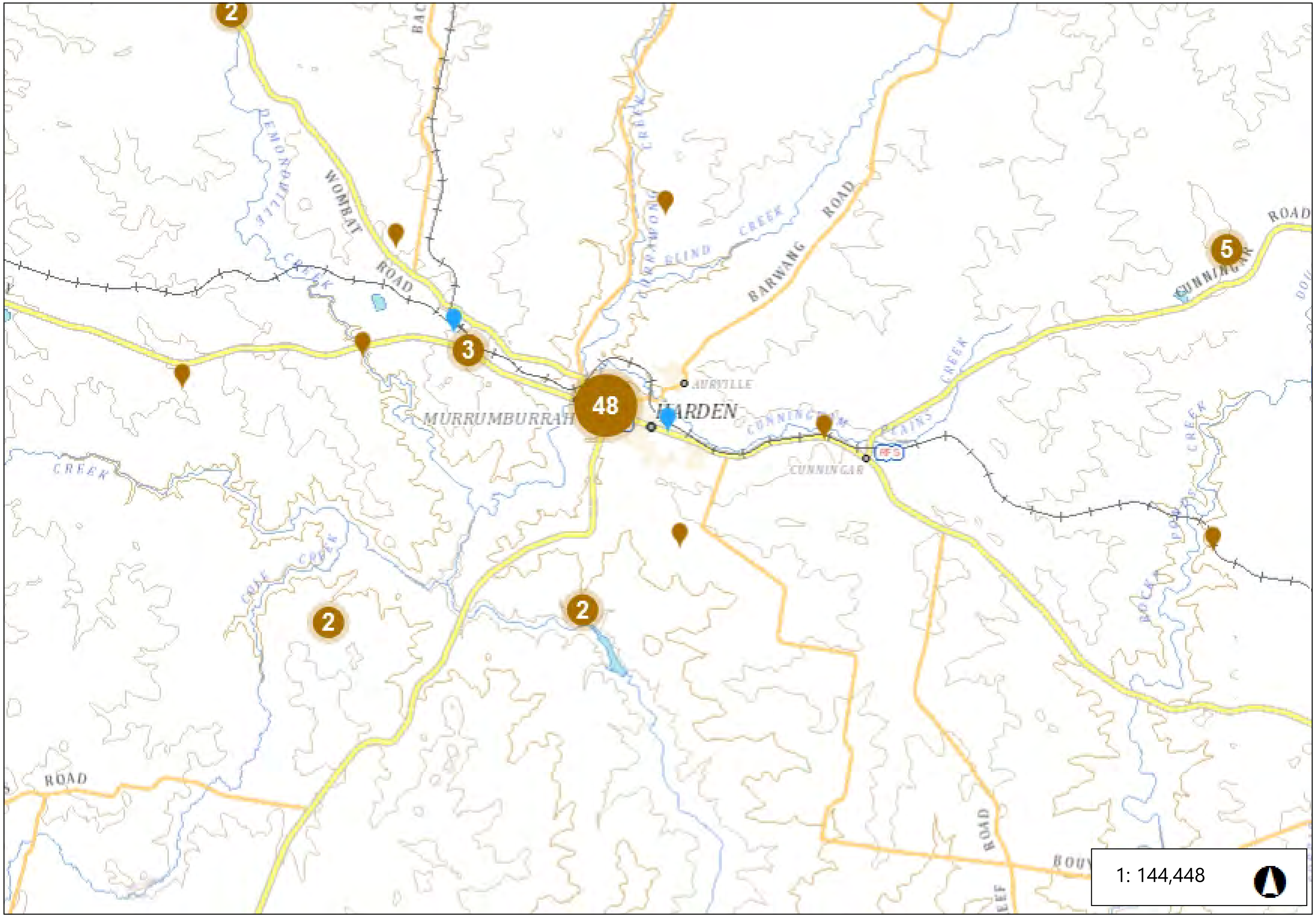
14,675.9 0 7,337.94 14,675.9 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Heritage NSW

Hilltops LGA SHR items extent



Legend

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- SEPP
- SEPP
- World Heritage Site
- Local Environmental Plan
  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

Notes

7,337.9 0 3,668.97 7,337.9 Meters

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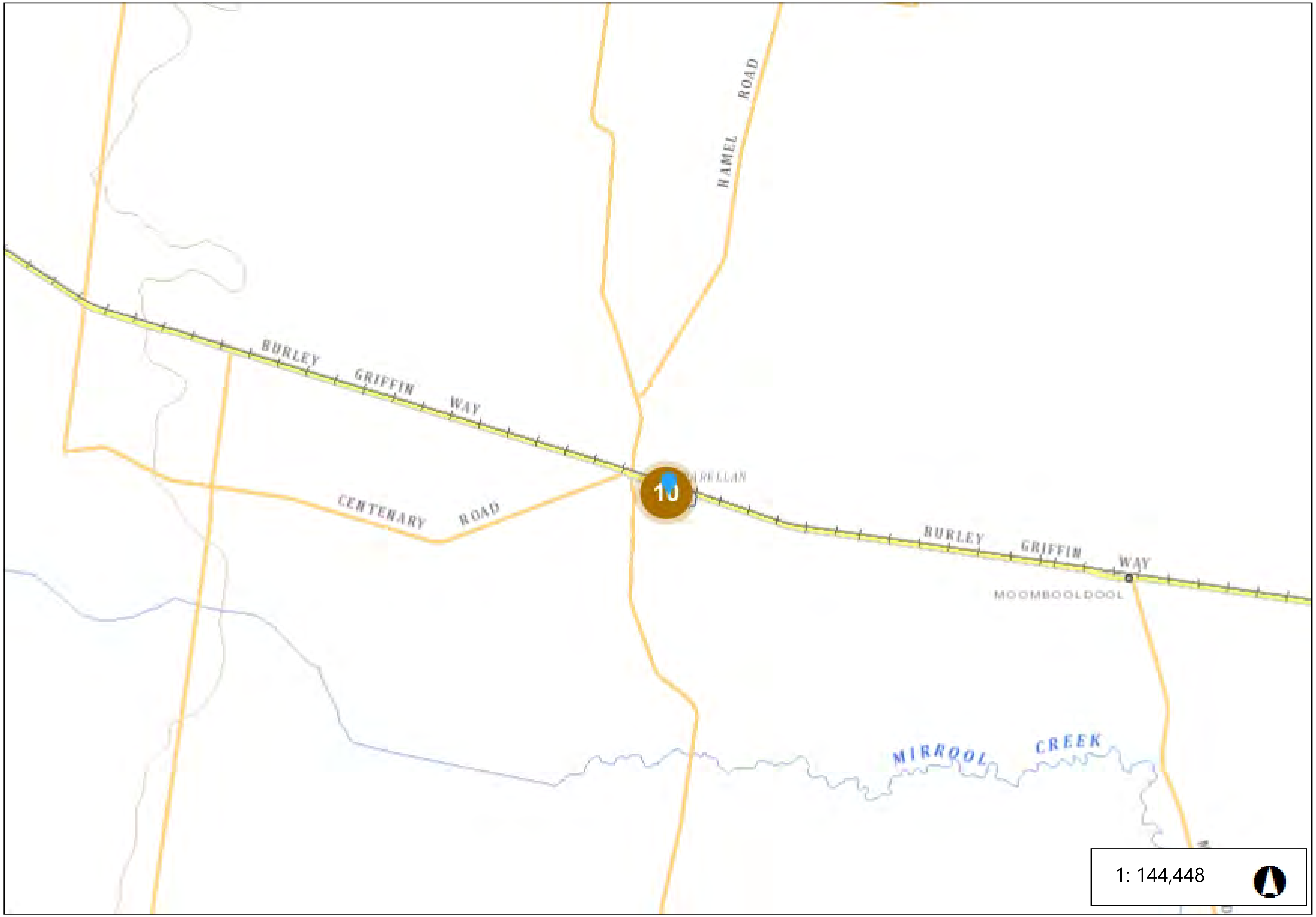
This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Narrandera LGA SHR items extent

Heritage NSW



1: 144,448

Legend

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- SEPP
- SEPP
- World Heritage Site
- Local Environmental Plan
  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

7,337.9 0 3,668.97 7,337.9 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

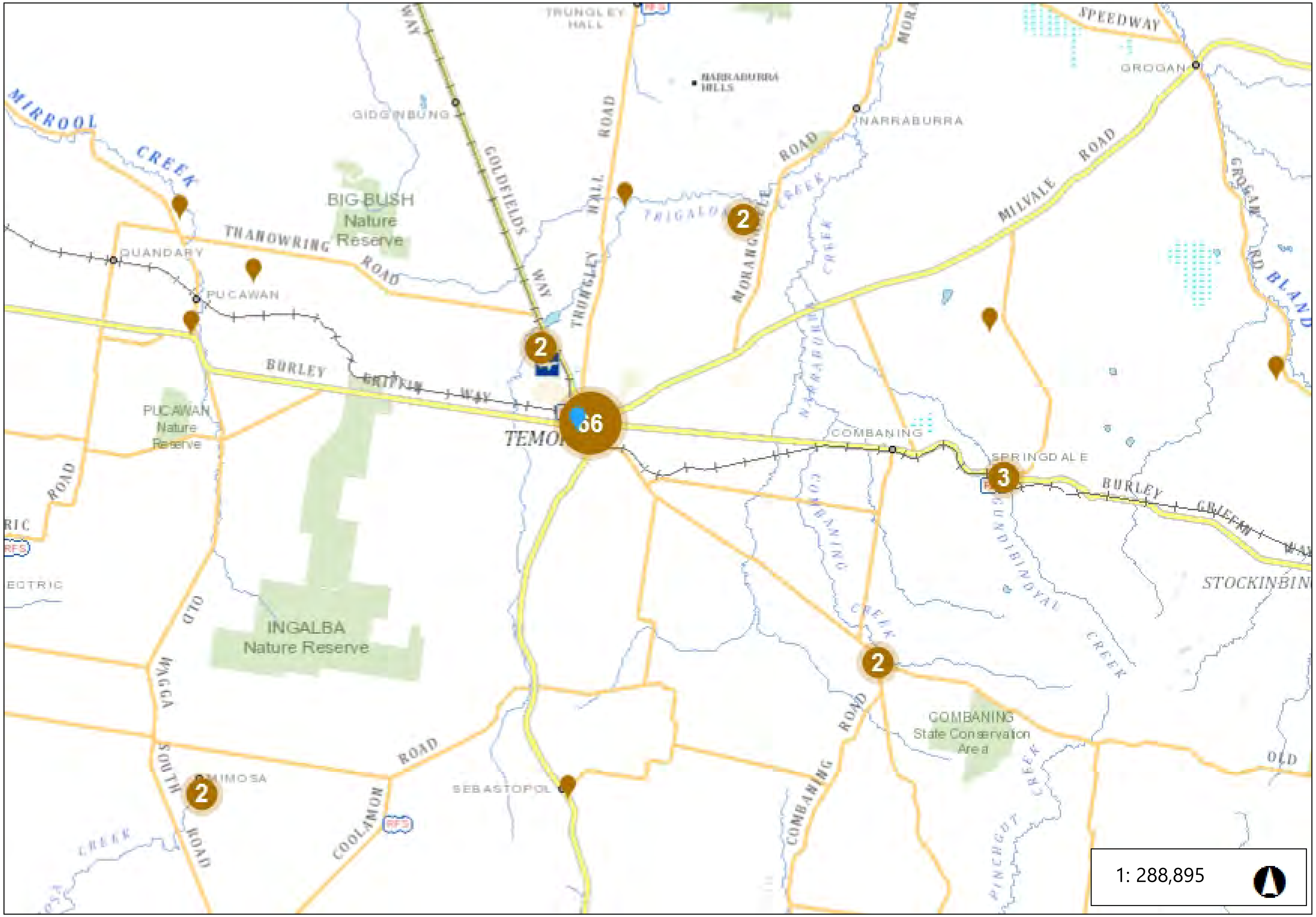
This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

All heritage items within township of Barrellan

Heritage NSW

Temora LGA SHR items extent



Legend

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- SEPP
- World Heritage Site
- Local Environmental Plan
  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

Notes

All heritage items within township of Temora and Springdale

14,675.9 0 7,337.94 14,675.9 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
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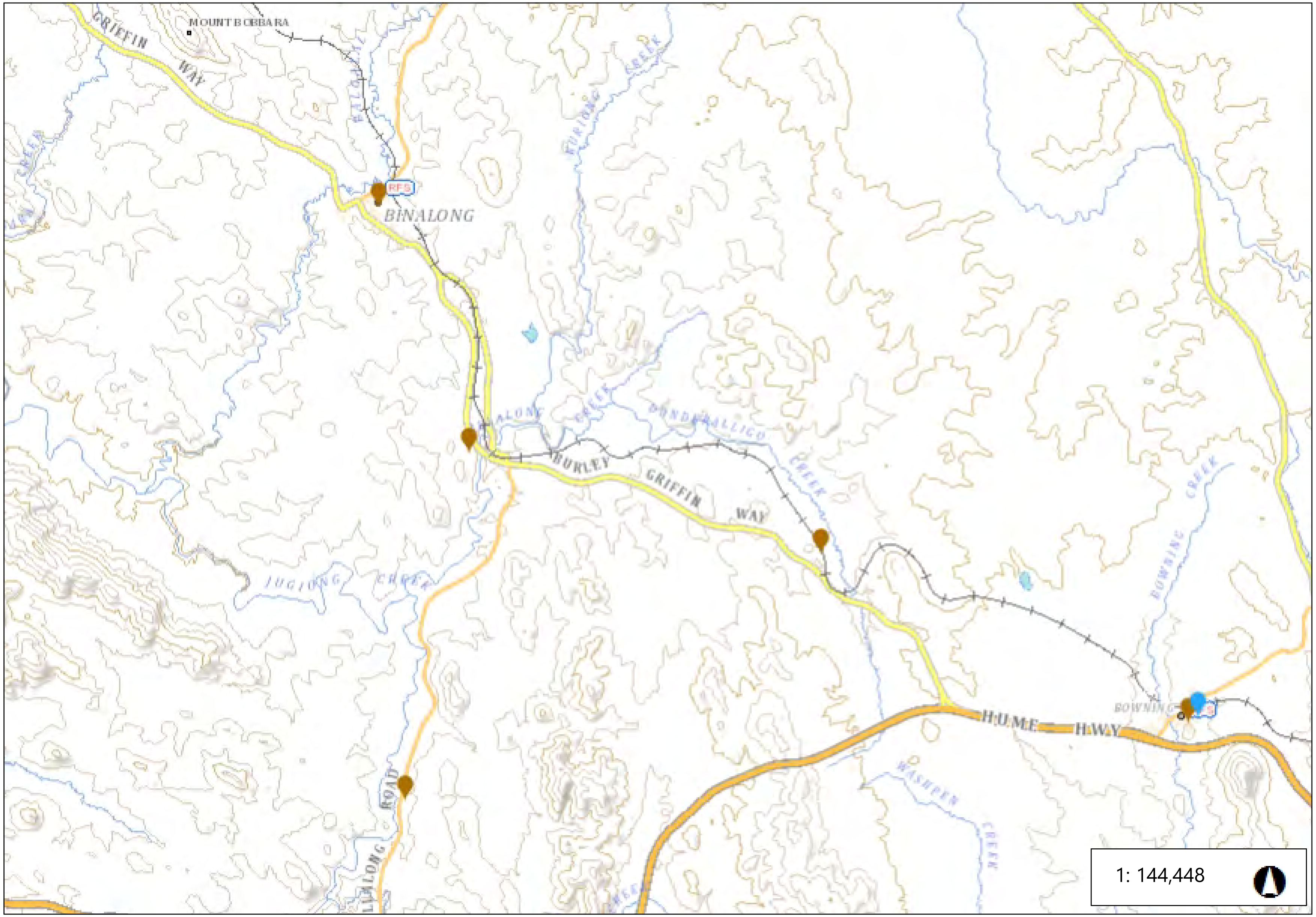
Yass Valley LGA SHR items extent



Legend

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- Local Environmental Plan
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  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

1: 144,448

7,337.9 0 3,668.97 7,337.9 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

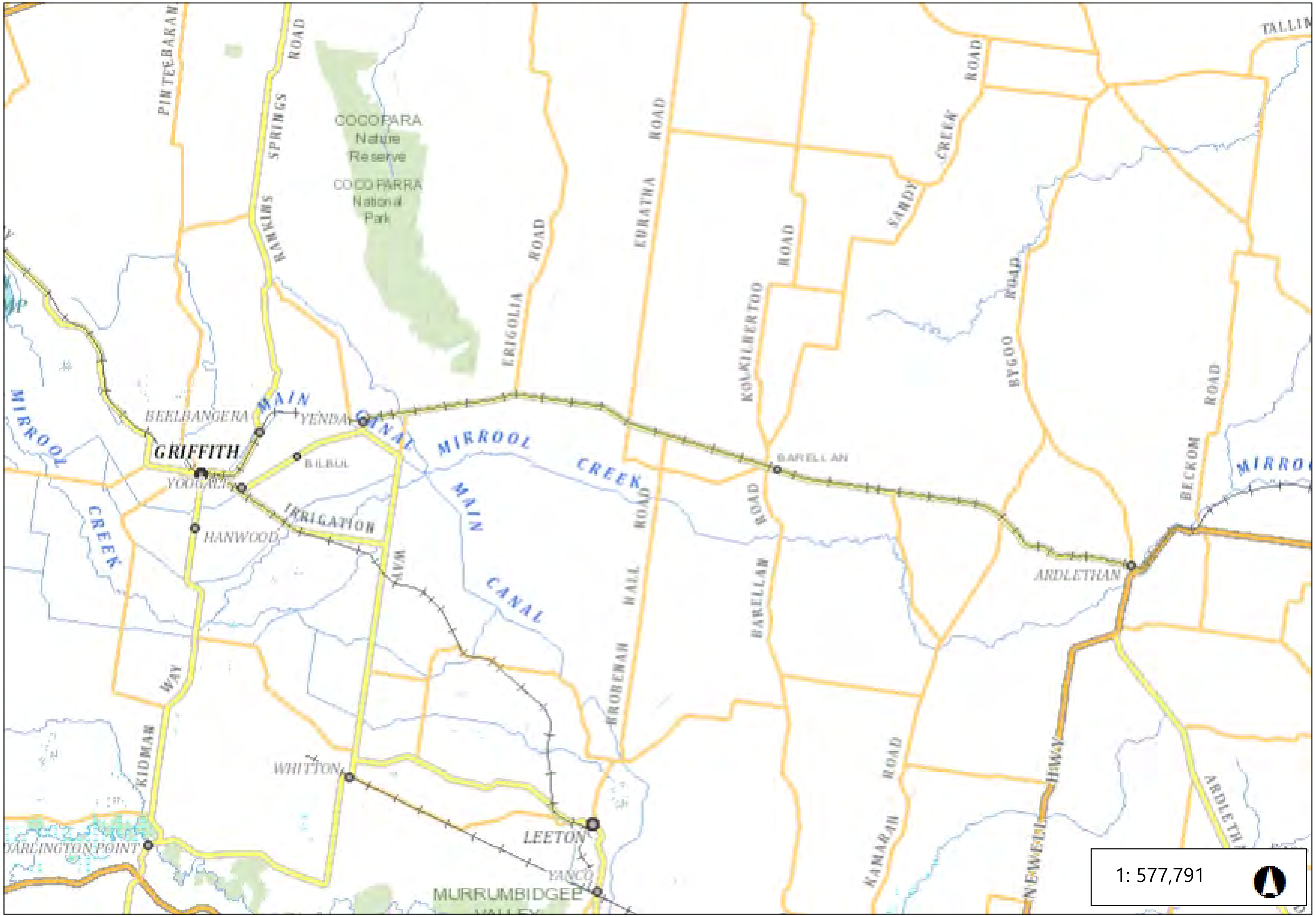
This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

Illalong quarry inside Development footprint

Heritage NSW

Carrathool LGA SHR



Legend

- World Heritage Areas NSW
- SEPP
- Local Environmental Plan
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- Aboriginal Place
  - Cluster (label denotes number)
- State Heritage Register
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

1: 577,791

29,351.8 | 0 | 14,675.88 | 29,351.8 | Meters

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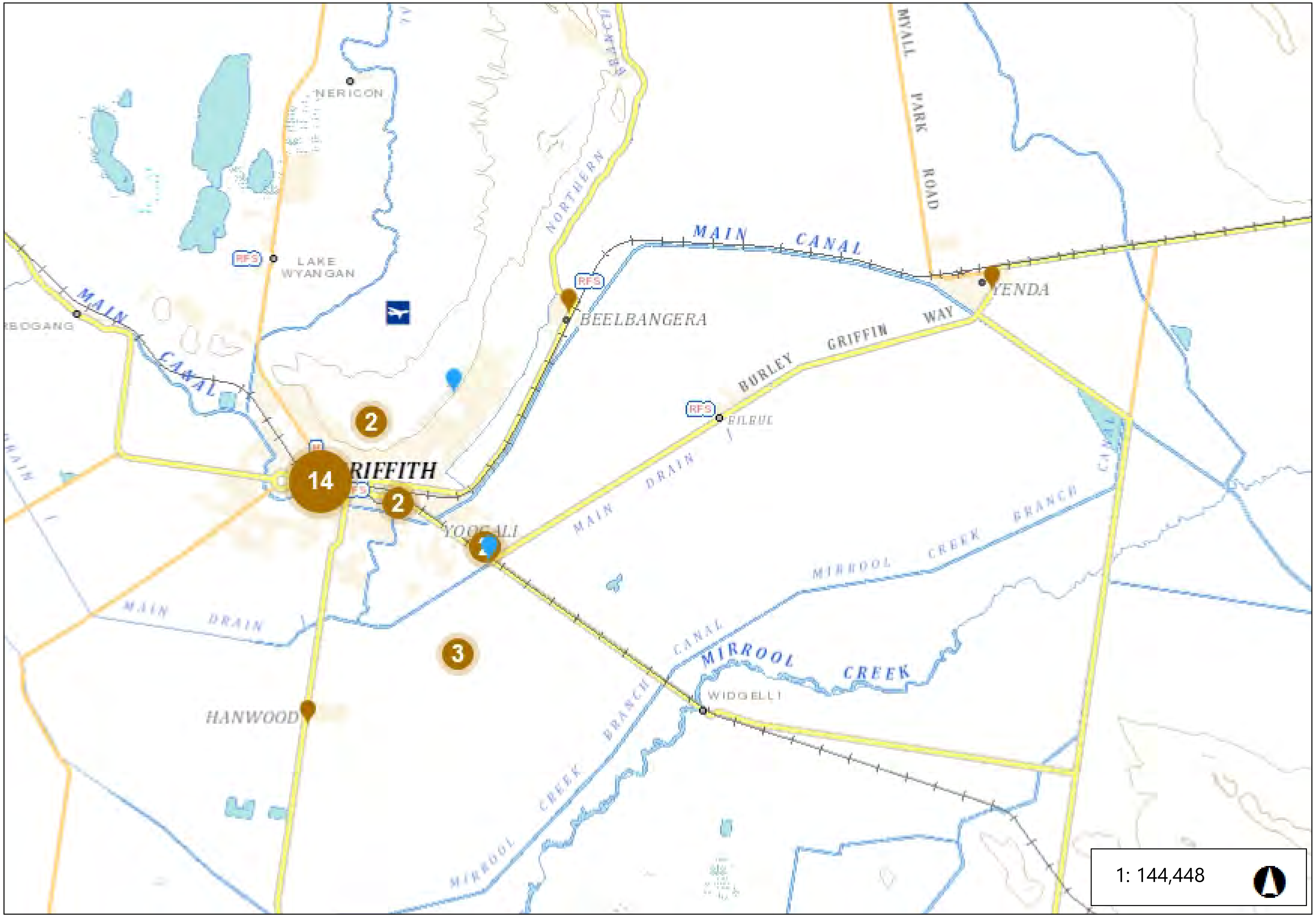
This map is a user generated static output from the Heritage Management System and is for reference only. Information that appears on this map may or may not be accurate, current, or otherwise reliable.
THIS MAP IS NOT TO BE USED FOR NAVIGATION

Notes

Notes

Heritage NSW

Griffith LGA SHR



Legend

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- Local Environmental Plan
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- State Heritage Register
  - Cluster (label denotes number)
- Aboriginal Place
  - Cluster (label denotes number)
- Interim Heritage Order
  - Cluster (label denotes number)

Notes

Notes

7,337.9 0 3,668.97 7,337.9 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere

Crown lands

N

59km

Contact: geoscience.products@planning.nsw.gov.au
Date Saved: 01/06/2022 03:18

NSW Crownland
NSW Crownland
Locations

Legend

Contact: geoscience.products@planning.nsw.gov.au
Date Saved: 01/06/2022 03:18

Appendix D Biodiversity Assessment Report

Burley Griffin Way (MR84) Route Safety Review Safety Improvements

Biodiversity Assessment Report (BAR)

Transport for NSW | Final v.1 April 2023

Contents

TABLES

FIGURES

Executive Summary

Transport for NSW (TfNSW) proposes to carry out a range of safety improvements along Burley Griffin Way (MR84) between Griffith and the town of Yass, over approximately 285 km. Key features of the proposal include:

- Road edge repair and road widening at various locations (including required ancillary works), including culvert and drainage structure widening works.
- Reinstate a hazard free roadside where possible by: removing trees, maintaining vegetation regrowth, flattening batters and reshaping table drains.
- Install roadside safety barriers at various locations where a hazard free roadside cannot be achieved; nominally 10 m from the existing carriageway edge line.
- Upgrade intersections at various locations.
- Upgrades road signs.
- Install new audio tactile line-marking in line with TfNSW policy.
- Reinstate line marking and raised pavement markers on completion.
- Beneficial re-use of surplus material from the project.

To assess the potential impacts upon biodiversity, background searches and field validation of Plant Community Types (PCTs) and habitat values were undertaken. The site survey included plant community identification and condition zoning, opportunistic flora and fauna surveys, and recording of habitat features. Collection of plot data in accordance with the Biodiversity Assessment Methodology (BAM) was completed for all areas of the proposal area. Preliminary ecological constraints information was provided to TfNSW. Based on these constraints, the construction footprint was designed to minimise impacts to high value areas including Threatened Ecological Communities (TECs). The construction footprint now includes two components: impacted vegetation areas and impacted isolated trees. The majority of the footprint consists of impacted isolated trees. Impacted vegetation areas occur in places where key safety improvements require total clearing and occur in the eastern most portion of the proposal area.

Nineteen PCTs were recorded and mapped along the proposal area, 14 of which intersect with the construction footprint. Two TECs occur in the proposal area which are listed under both NSW and Commonwealth legislation:

- Inland Grey Box Woodland Endangered Ecological Community (EEC).
- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland Critically Endangered Ecological Community (CEEC).

Vegetation in and around the proposal area provides habitat for threatened species. The proposal area provides of a vegetated corridor between substantial areas of habitat and protected areas such as Binya State Forest, Jindalee National Park, and Ingalba Nature Reserve. The proposal area also intersects two Key Biodiversity Areas (KBAs): South-west Slopes of NSW and Binya & Cocoparra National Park. A number of threatened species (mostly birds) utilise these habitat areas and are likely to occur within the proposal area. The proposal area provides habitat connectivity which is supported by the adjacent landscape matrix in most areas. Crucial habitat corridors were identified within the proposal area, none of which will be directly impacted by the construction footprint.

The construction footprint will result in the removal of approximately 14.7 ha of vegetation in total, of which around 14.2 ha is native vegetation (the remainder exotic), and 64 hollow-bearing trees (HBT). Potential impacts arising for threatened fauna including habitat fragmentation, loss of connectivity, loss of hollow-bearing trees (potential den and breeding sites), and loss of specific foraging habitat (e.g. mistletoe for Painted Honeyeater). Approximately 6.3 ha of potential habitat for the threatened Yass Daisy would be cleared. Approximately 10.3 ha of Box Gum Woodland EEC (NSW listed) and 6.5 ha of Box Gum Woodland CEEC (Commonwealth listed) would be removed in six separate impacted vegetation areas and one impacted tree area (seven trees). Approximately 2.7 ha would be modified (canopy trees removed) from Grey Box Woodland EEC (NSW listed) in three locations. Approximately 1.6 ha of Grey Box Woodland CEEC (Commonwealth listed) would be modified across three locations, with a total of approximately 68 trees removed.

Tests of Significance under NSW legislation and Assessments of Significance under Commonwealth legislation were undertaken for species and communities known to be impacted or with high potential to be impacted by clearing in the construction footprint. Although impacts are anticipated upon NSW and Commonwealth listed threatened species and communities, on balance a significant impact is not considered likely given clearing is dispersed over a large area, the roadside is already subject to edge effects such as weeds, and the proposal would not affect the connectivity between remnants.

Mitigation measures to minimise impacts from the proposal include but are not limited to:

- Pre-clearance surveys for Yass Daisy between Harden and Hume Hwy intersection.
- Installation of nest boxes to replace hollows (some HBT bear multiple hollows) at a ratio of 1:1 on a like-for-like basis.
- Planting of frangible native vegetation at key connectivity corridor locations as detailed in this report.

Biodiversity impacts would be mitigated or offset in accordance the TfNSW Biodiversity Policy (2022) and Tree and Hollow Replacement Guideline (2022). A Biodiversity Offset Strategy will be developed and implemented. It will account for funded aspects of the work and will be staged in line with delivery phases. In summary, the project has been developed iteratively with the aim of avoiding impacts to biodiversity in the first instance. The final construction footprint impacts only 4% of the original construction footprint in areas of high constraint native vegetation. Impacts to areas that cannot be avoided will be minimised through mitigation measures such as those listed above. Impacts to areas of high conservation value, such as Box Gum Woodland EEC or Superb Parrot core breeding area, will be mitigated or offset. As such, overall the project is unlikely to cause a significant impact to any threatened species or ecological community.

Glossary

Definitions	
Accredited person or assessor	Means as person accredited under section 6.10 (of the BC Act) to prepare reports in accordance with the BAM.
Biodiversity Assessment Method	The Biodiversity Assessment Method is established under section 6.7 of the BC Act. The BAM is established for the purpose of assessing certain impacts on threatened species and threatened ecological communities (TECs), and their habitats, and the impact on biodiversity values.
Biodiversity offsets	The gain in biodiversity values achieved from the implementation of management actions on areas of land, to compensate for losses to biodiversity values from the impacts of development (DPIE 2020a).
Biodiversity Assessment Method Calculator	Biodiversity Assessment Method Calculator (BAM-C) – the online computer program that provides decision support to assessors and proponents by applying the BAM and referred to as the BAM-C. The BAM-C contains biodiversity data from the BioNet Vegetation Classification and the Threatened Biodiversity Data Collection that the assessor is required to use in a BAM assessment. The BAM-C applies the equations used in the BAM, including those to determine the number and class of biodiversity credits required to offset the impacts of a development, or created at a biodiversity stewardship site. It is published by the Department (DPIE 2020a).
Biodiversity credit report	The report produced by the BAM-C that sets out the number and class of biodiversity credits required to offset the remaining adverse impacts on biodiversity values at a development site, or on land to be biodiversity certified, or that sets out the number and class of biodiversity credits that are created at a biodiversity stewardship site (DPIE 2020a).
Biodiversity Offsets and Agreement Management System	The online system used to administer the Biodiversity Offsets Scheme. The BOAMS is used by accredited assessors (to carry out specific BAM-related tasks involving access to the BAM-C to perform assessments, submit data, generate credits and calculate a credit price), by landholders (to apply for a Biodiversity Stewardship Agreement and manage ongoing reporting obligations for their agreement) and by proponents of developments (to view their credit obligation or the payment required to the Biodiversity Conservation Fund).
Biodiversity Stewardship site	Refers to land which is the subject to a Biodiversity Stewardship Agreement under the BC Act.
BioNet Atlas	The DPIE database of flora and fauna records (formerly known as the NSW Wildlife Atlas). The Atlas contains records of plants, mammals, birds, reptiles, amphibians, some fungi, some invertebrates (such as insects and snails listed under the BC Act) and some fish (DPIE 2020a).
BioNet Vegetation classification	Refers to the vegetation community-level classification for use in vegetation mapping programs and regulatory biodiversity impact assessment frameworks in NSW. The BioNet Vegetation Classification is published by the Department and available at ***www.environment.nsw.gov.au/research/Visclassification.htm*** (DPIE 2020a).

Definitions	
Construction footprint	The areas including the proposal area that would be directly impacted by construction activities. The construction footprint also includes temporary access roads, temporary construction facilities and infrastructure along with stockpiles sites. The construction footprint is also known as the subject land. The final impact footprint was provided by TfNSW as a shapefile ('220304_MR84_Vegetation_MGA55').
Cumulative impact	The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. Refer to Clause 228(2) of the EP&A Regulation 2000 for cumulative impact assessment requirements.
Direct impact	Direct impacts on biodiversity values include those related to clearing native vegetation and threatened species habitat, and impacts on biodiversity values prescribed by the Biodiversity Conservation Regulation 2017 (the BC Regulation) (DPIE 2020a).
Ecosystem credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for ecosystem credits. This is analogous with the definition of 'predicted species'.
Ecosystem credits	A measurement of the value of threatened ecological communities, threatened species habitat for species that can be reliably predicted to occur with a PCT, and PCTs generally. Ecosystem credits measure the loss in biodiversity values at a development, activity, clearing or biodiversity certification site and the gain in biodiversity values at a biodiversity stewardship site (DPIE 2020a).
Habitat	An area or areas occupied, or periodically or occasionally occupied, by a species, population or ecological community, including any biotic or abiotic component (DPIE 2020a).
Indirect impact	Impacts that occur when the proposal affects native vegetation and threatened species habitat beyond the construction footprint or within retained areas (e.g. transporting weeds or pathogens, dumping rubbish). This includes impacts from activities related to the construction or operational phase of the proposal and prescribed impacts (DPIE 2020a).

Definitions	
Local population	The population that occurs in the study area. The assessment of the local population may be extended to include individuals beyond the study area if it can be clearly demonstrated that contiguous or interconnecting parts of the population continue beyond the study area, according to the following definitions: • The local population of a threatened plant species comprises those individuals occurring in the study area or the cluster of individuals that extend into habitat adjoining and contiguous with the study area that could reasonably be expected to be cross-pollinating with those in the study area. • The local population of resident fauna species comprises those individuals known or likely to occur in the study area, as well as any individuals occurring in adjoining areas (contiguous or otherwise) that are known or likely to utilise habitats in the study area. • The local population of migratory or nomadic fauna species comprises those individuals that are likely to occur in the study area from time to time or return year to year (OEH 2018).
Locality	Land within the proposal area and a 10 km buffer from the proposal area, unless specified.
Matter of national environmental significance	A matter of national environmental significance (MNES) is any of the nine defined components protected by a provision of Part 3 of the EPBC Act (Commonwealth).
NSW (Mitchell) landscape	Landscapes with relatively homogeneous geomorphology, soils and broad vegetation types, mapped at a scale of 1:250,000 (DPIE 2020a).
Mitigation	Action to reduce the severity of an impact.
Native vegetation	Has the same meaning as in section 1.6 of the BC Act and section 60B of the LLS Act. In summary, (a) trees (including any sapling or shrub or any scrub), (b) understorey plants, (c) groundcover (being any type of herbaceous vegetation), (d) plants occurring in a wetland. A plant is native to New South Wales if it was established in New South Wales before European settlement (BC Act). Native vegetation does not extend to marine vegetation (being mangroves, seagrasses or any other species of plant that at any time in its life cycle must inhabit water other than fresh water). Marine vegetation is covered by the provisions of the FM Act.
Patch size	An area of native vegetation that: • occurs on the development site or biodiversity stewardship site • includes native vegetation that has a gap of less than 100 m from the next area of native vegetation (or ≤30 m for non-woody ecosystems). Patch size may extend onto adjoining land that is not part of the development site or biodiversity stewardship site (DPIE 2020a).

Definitions	
PlantNET	An online database of the flora of New South Wales which contains currently accepted taxonomy for plants found in the State, both native and exotic.
Population	A group of organisms, all of the same species, occupying a particular area (DPIE 2020a).
Proposal area	The existing road corridor and a 10 m buffer from the existing road edge line.
Spatial datasets	Spatial databases required to prepare a BDAR • BioNet NSW (Mitchell) Landscapes – Version 3.1 • NSW Interim Biogeographic Regions of Australia (IBRA region and sub-regions) – Version 7 • NSW soil profiles • hydrogeological landscapes • acid sulfate soils risk • digital cadastral database • Vegetation Information Systems maps • Geological sites of NSW.
Species credit species	Threatened species or components of species habitat that are identified in the Threatened Species Data Collection as requiring assessment for species credits (DPIE 2020a). This is analogous with the definition of 'candidate species'.
Species credits	The class of biodiversity credits created or required for the impact on threatened species that cannot be reliably predicted to use an area of land based on habitat surrogates. Species that require species credits are listed in the Threatened Biodiversity Data Collection (DPIE 2020a).
Species polygon	An area of land identified in Chapter 5 (of the BAM) that contains habitat or is occupied by a threatened species (DPIE 2020a).
Subject land	Land subject to a development, activity, clearing, biodiversity certification or a biodiversity stewardship proposal. It excludes the landscape assessment area which surrounds the subject land (ie the area of land in the 1500 m buffer zone around the subject land or 500m buffer zone for linear proposals). In the case of a biodiversity certification proposal, subject land includes the biodiversity certification assessment area (DPIE 2020a). See also definition for construction footprint.
Study area	The area subject to field survey, for this assessment effectively the proposal area.
Threatened Biodiversity Data Collection	A publicly assessable online database (registration required) which contains information for listed threatened species, populations and ecological communities (DPIE 2020a). Part of the BioNet database, published by EESG and accessible from the BioNet website at www.bionet.nsw.gov.au.
Vegetation integrity (score)	The condition of native vegetation assessed for each vegetation zone against the benchmark for the PCT. The vegetation integrity score is the quantitative measure of vegetation condition calculated by the BAM-C (DPIE 2020a).

Definitions	
Vegetation zone	A relatively homogeneous area of native vegetation on a development site, clearing site, land to be biodiversity certified or biodiversity stewardship site that is the same PCT and has the same broad condition state (DPIE 2020a).

Abbreviations	
AOBV	Area of Outstanding Biodiversity Value
BAM	Biodiversity Assessment Method
BAM-C	Biodiversity Assessment Method calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BC Regulation	Biodiversity Conservation Regulation 2017 (NSW)
BDAR	Biodiversity Development Assessment Report
BOAMS	Biodiversity Offsets and Agreement Management System
BOS	Biodiversity Offset Scheme
CEEC	Critically Endangered Ecological Community
CEMP	Construction Environmental Management Plan
DAWE	Department of Agriculture, Water and the Environment
DIWA	Directory of Important Wetlands in Australia
DPI	Department of Primary Industries
DPIE	Department of Planning, Industry and Environment
EEC	Endangered ecological community
EESG	NSW Environment Energy and Science Group within the Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EP&A Act	*Environment Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
Fisheries NSW Policy and Guidelines	Fisheries NSW Policy and guidelines for fish habitat conservation and management (Update 2013)
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater dependent ecosystems
IBRA	Interim Biogeographically Regionalisation of Australia

Abbreviations	
MNES	Matters of national environmental significance
PCT	Plant community type
PMST	Protected Matters Search Tool
REF	Review of Environmental Factors
SAII	Serious and Irreversible Impacts
SEARs	Secretary’s Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
SSI	State Significant Infrastructure
TBDC	Threatened Biodiversity Data Collection
TECs	Threatened ecological communities (VECs, EECs and CEECs)
TfNSW	Transport for NSW
VEC	Vulnerable Ecological Community

1. Introduction

1.1 Proposal Background

Transport for NSW (TfNSW) and the NSW State government is committed to the ‘Towards Zero’ initiative to reduce the number of human fatalities on NSW roads. To achieve this outcome, the Safe System approach has been adopted. The Safe System approach has four main pillars: Safe People, Safe Vehicles, Safe Speeds, and Safe Roads. This project is focusing on the Safe Roads pillar of the Safe System approach.

The Safe Systems approach recognises that drivers are human and will make mistakes. A Safe Roads project aims to address the likelihood of a crash occurring through preventative safety measures such as wide centre line and audio tactile line marking. It aims to reduce the severity of a crash, should it occur, through the removal of roadside hazards and implementation of safety barrier.

Burley Griffin Way (MR84) is a two-lane flexible pavement of mostly single carriageway that forms a state road between the city of Griffith and the Hume Highway near Yass, NSW. TfNSW have carried out a Route Safety Review (RSR) which has identified key roadside infrastructure and line marking safety improvements are required. Burley Griffin Way is about 285 km in length. Improvements are needed in certain discreet areas along the road.

TfNSW have engaged NGH Pty Ltd to complete a Biodiversity Assessment Report (BAR) that would form part of a Project Review of Environmental Factors (REF) to be assessed under Division 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

1.2 The Proposal

TfNSW proposes to carry out a range of safety improvements along Burley Griffin Way between Griffith and Yass (See Figure 1-1). Improvements include:

- Road edge repair and road widening at various locations (including required ancillary works) including culvert and drainage structure widening works
- Reinstate a hazard free roadside where possible by; removing trees, maintaining vegetation regrowth, flattening batters and reshaping table drains
- Install roadside safety barriers at various locations where a hazard free roadside cannot be achieved; nominally 10 m from the existing carriageway edge line.
- Upgrade intersection at various locations
- Upgrades road signs
- Install new audio tactile line-marking in line with TfNSW policy
- Reinstate line marking and raised pavement markers on completion
- Beneficial re-use of surplus material from the project..

The improvements outlined above involve the following activities:

- Establish compounds, stockpile sites, lay down areas and exclusion zone fencing.
- Implement temporary traffic control.
- Install erosion and sediment controls.
- Clear and mulch vegetation identified for removal.
- Widen the road formation and culvert structures.
- Construct table drains.
- Repair pavement edges.
- Install roadside safety barriers.
- Where possible, provide 6:1 or flatter batters.
- Install audio tactile line marking in line with current Transport guidelines.
- Reinstate road signs, line marking, guideposts and other delineation.
- Clean-up, stabilise and rehabilitate disturbed areas.
- Remove traffic controls.

The proposed works are expected to commence late 2022 and take up to 52 weeks to complete.

1.2.1 Key Terms

Key terms are defined in the glossary on page ii. It should be noted that in this BAR, the terms ‘proposal area’ and ‘study area’ are used depending on the context but apply to the same area, as below:

- Proposal area: the existing road plus a 10 m buffer from the existing road edge line. (See Figure 1-1 for overview of proposal area. Refer to Annexure F Maps for detailed maps.)
- Study Area: the area subject to field survey, effectively the proposal area.

Additionally, specific meanings are implied in the terms ‘impacted vegetation areas’ and ‘impacted trees’:

- Impacted vegetation areas: portions of the construction footprint where the proposal involves clearing of all vegetation strata and minor works.
- Impacted trees: portions of the construction footprint where the proposal is limited to tree removal, with minimal impact to understorey stratum.

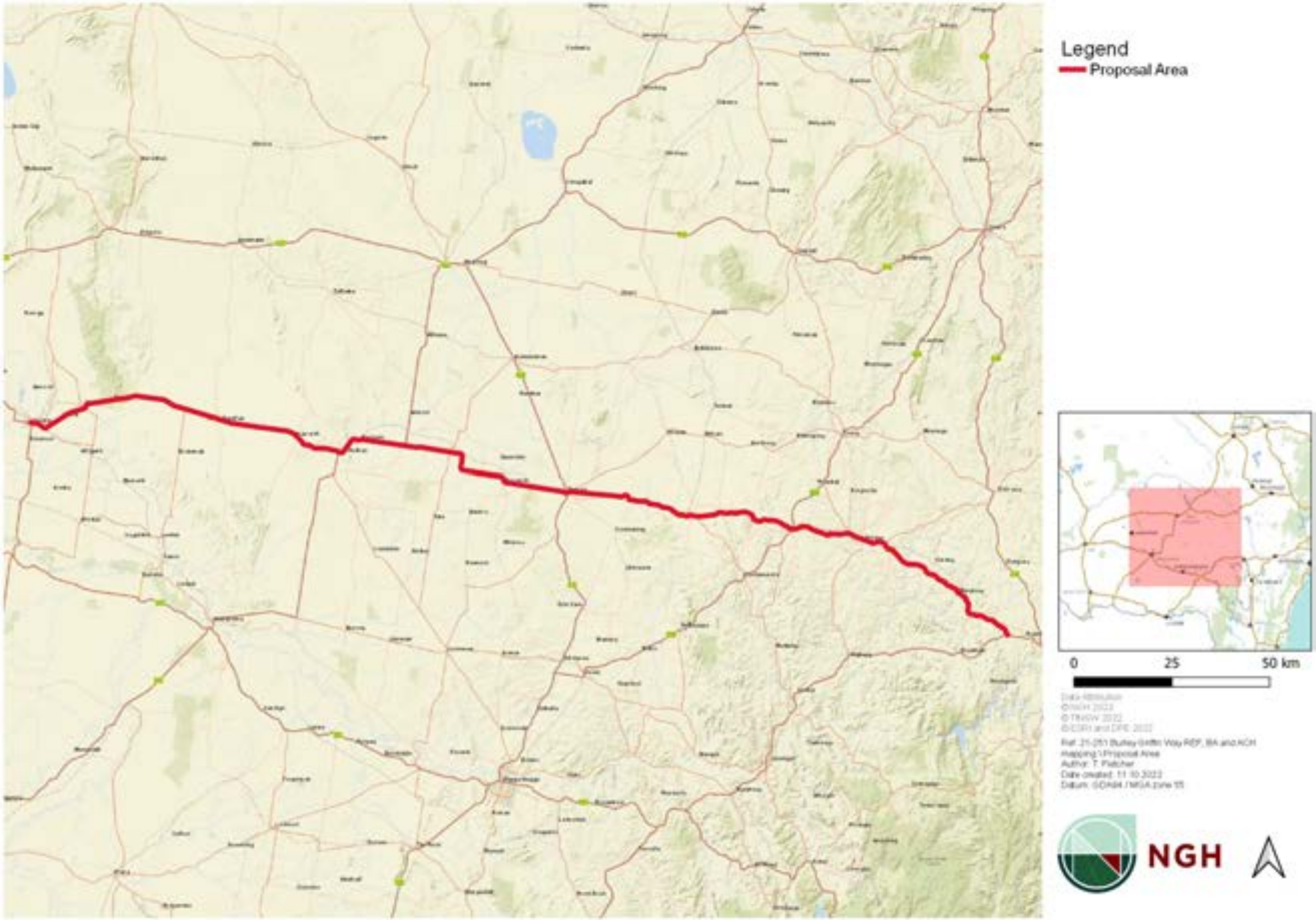

Figure 1-1 Overview and location of proposal area

1.3 Legislative Context

A Review of Environmental Factors (REF) is prepared to satisfy TfNSW duty under Section 5.5 of the EP&A Act to "examine and take into account to the fullest extent possible all matters affecting or likely to affect the environment by reason of that activity" and Section 5.7 in making decisions on the likely significance of any environmental impacts. This BAR forms part of the REF being prepared for the Burley Griffin Way Safety Review Safety Improvement Work. It assesses the biodiversity impacts of the proposal to meet the requirements of the EP&A Act.

Part 7 of the NSW *Biodiversity Conservation Act 2016* (BC Act) requires that the significance of the impact on threatened species, populations and threatened ecological communities is assessed using a test of significance (aka five-part test) listed in Section 7.3 of the BC Act. Similarly, Part 7A of the *Fisheries Management Act 1991* (FM Act) requires that significance assessments are undertaken in accordance with Division 12 of the FM Act. Where a significant impact is likely to occur, a species impact statement (SIS) must be prepared in accordance with the Environment Agency Head's requirements, or a Biodiversity Development Assessment Report (BDAR) must be prepared by an accredited assessor in accordance with the Biodiversity Assessment Method (BAM) (DPIE 2020a).

In September 2015, a "strategic assessment" approval was granted by the Federal Minister in accordance with the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The approval applies to TfNSW's road activities assessed under Division 5.1 (formerly Part 5) of the EP&A Act with respect to potential impacts on nationally listed threatened species, ecological communities and migratory species.

As a result, TfNSW road proposals assessed via an REF:

- Must address and consider potential impacts on EPBC Act listed threatened species, populations, ecological communities and migratory species, including application of the "avoid, minimise, mitigate and offset" hierarchy.
- Do not require referral to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for these matters, even if the activity is likely to have a significant impact.
- Must use the Biodiversity Offset Scheme (BOS) to offset impacts.

To assist with this, assessments of significance are required for all relevant biodiversity values in accordance with the *Matters of National Environmental Significance: Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999* (DoE 2013).

2. Methods

This section lists the personnel involved in this BAR along with methods employed for the vegetation assessment and threatened species assessments.

2.1 Personnel

Personnel involved in the assessment and an overview of their qualifications and experience are given in Table 2-1.

Table 2-1: Personnel

Name	Role	Experience	Qualifications
Sue Mahon	Project Manager (current)	18 years of environmental project management	Bachelor of Science (Environmental Management) (Hons) Graduate Certificate in Community and Corporate Sustainability Graduate Diploma in Landscape Architecture Advanced Certificate in Horticulture (Cert IV) (Burnley)
Zachary Bradley	Project Manager (previous)	6 years' experience as an environmental consultant	Bachelor of Environmental Science (2016)
Beth Kramer	BA team planning (Auditor)	17 years practical experience within the environmental field	Master of Environmental Management Bachelor of Science (Zoology and Environmental Science)
Dimity Bambrick	GIS mapping	5 years' experience within the environmental field	Bachelor of Science, Majors (Zoology) (Ecology & Conservation)
Nick Weigner	Report Author	4 years' experience within the environmental field	Honours degree (2019) 'A phylogenomic investigation of the Nepenthes genus', 1st Class Bachelor of Science (Zoology & Ecology) (2017) Undergraduate degree majoring in Zoology & Ecology, minor in Geology
Elijah Elias	Report Author	7 years' experience within the environmental field	Bachelor of Biodiversity and Conservation (2014)
Jessie Russo	Report Author	5 years' experience within the environmental field	Bachelor of Environmental Science (Hons) (Land Resources)
Bianca Heinze	Report author & GIS mapping (updates 2022)	14 years experience as ecologist with NGH	Bachelor of Applied Science
Gill Young	Fieldwork	Over 20 years' experience within the environmental field	Bachelor of Natural Resources, Second Class Honours (1999) Accredited NSW BAM Assessor (BAAS17086)
Lesley Seddon	Fieldwork	Over 20 years' experience within the environmental field	Bachelor of Environmental Science

Name	Role	Experience	Qualifications
Julie Gooding	Fieldwork	Over 15 years' experience within the environmental field	Bachelor of Science (Biology) Accredited NSW BAM Assessor (BAAS18074)

2.2 Background Research

Background searches were undertaken early in the assessment process to inform field work and habitat evaluation. Several data sources were used for this purpose as set out below (Table 2-2). The search date is provided. Existing data was validated by field surveys as described in Section 2.3.2.

Background searches (Annexure B) undertaken included Commonwealth and State databases to determine whether potential threatened flora and fauna species, populations, ecological communities, migratory species, and Areas of Outstanding Biodiversity Value (AOBV) occur or are likely to occur within the study area. Searches of the Groundwater Dependent Ecosystems Database and Priority Weeds Database were also undertaken.

Table 2-2: Database searches undertaken

Resource	Features	Location	Search date*
BioNet Atlas (DPE, 2020)	Threatened flora and fauna species, populations and ecological communities listed under the BC Act.	Locality	17/06/2021
BioNet Vegetation Classification database (BioNet VIS, 2021)	Description of Plant Community Types	Locality	28/07/2021
EPBC Act Protected Matters Search Tool (PMST)	Threatened flora and fauna, endangered populations and ecological communities, migratory species.	Locality	17/06/2021
National Flying-fox monitoring viewer	Flying-fox camps.	Locality	29/07/2021
DPI WeedWise	Priority weeds declared for the Riverina.	Riverina Region	28/07/2021
Biodiversity Values Map	Areas of Biodiversity Value	Locality	19/04/2022
Areas of Outstanding Biodiversity Value (AOBV)	Areas of Outstanding Biodiversity Value	Locality	19/04/2022
BOM's Atlas of Groundwater Dependent Ecosystems	Groundwater Dependent Ecosystems.	Study area	18/05/2021
DPI Fisheries Threatened Species	Key Fish Habitat, Fish community Status, Threatened species.	Locality	28/07/2021
SEED ***Datasets*** ***https://geo.seed.nsw.gov.au/***	Biodiversity Values Map; Native vegetation community mapping	Study area	28/07/2021

*The dates indicated are the most recent search date. Resources may have also been used prior to the listed date.

2.3 Vegetation Assessment

2.3.1 Vegetation Mapping Databases

Prior to conducting field surveys, a search was undertaken of the EES BioNet Vegetation Information System Classification Tool (BioNet VIS, 2021) database and the NSW SEED Mapping Portal to assess existing vegetation mapping information within the study area. This mapping helped inform the ground-truthed vegetation mapping. The final determination of PCTs in the study area was based on on-site data collection.

2.3.2 Field Survey

Flora

The objective of floristic surveys was to identify PCTs along the study area and map native vegetation. The approach was to:

- Stratify vegetation to identify patches that were floristically similar using rapid assessment points and GIS in-field mapping on tablets,
- Note dominant species to inform PCT identification.
- Undertake BAM plots in representative areas.
- Map vegetation according to PCT type and condition.

Vegetation Integrity Plots (BAM Plots) were undertaken between the 21st June to 14th July 2021 across the study area. Five teams of two NGH Ecologists were led by an Accredited BAM Assessor (Gill Young, BAAS17086). BAM Plots along with rapid assessment points were used for mapping.

Based on existing vegetation mapping and the results of the field survey, vegetation within the study area was assigned to a PCT in accordance with BioNet VIS (2021). Threatened Ecological Communities (TECs) were confirmed based on the relevant Scientific Committee Final Determinations for each TEC. Botanical nomenclature follows Harden (1990–2002) and the NSW PlantNet website (PlantNet 2021).

A complete floristic list detailing all flora species recorded across the site is provided in Annexure A.

Rapid Assessment Points

Rapid assessment points involved brief inspections along the study area to identify dominant species in each vegetation strata. These rapid assessment points also allowed for random meanders where time permitted to search for threatened species, although survey timing (winter) was not ideal for detecting many species.

2.3.3 Vegetation Survey and Classification

Vegetation Integrity Plots were undertaken in accordance with Chapter 4 of the BAM 2020. This method of data collection was chosen to provide robustness in PCT classification, as well as provide the raw data required to determine the presence or absence of potential EPBC Act listed Threatened Ecological Communities (TECs) known to the locality.

Locations of Vegetation Integrity Plots were selected in representative areas via stratification of the study area. Plot locations were selected based on safety (needing to be at least four to five metres from the road edge) and best representative vegetation. If there was enough easement width, typical BAM plots as listed below were conducted (even if outside study area boundary). Where the width was insufficient (e.g. farm boundary fence within 20 m of road edge), modified plots were undertaken to achieve equal coverage (e.g. 10 x 100 m rather than 20 x 50 m).

In total, 80 plots were undertaken. Typical plot methodology follows:

- A 20 x 20 m plot to assess the composition and structure attributes including trees, shrubs, grasses, forbs, ferns and other growth forms.
- A 20 x 50 m plot (1000 m^2) to assess the function attributes. This included the number of large trees, limb size class, the number of limbs containing hollows, tree regeneration and length of fallen logs.
- Five 1 m^2 sub-plots to assess average litter cover for each plot.

Plot locations are shown on the figures in Annexure F Maps with data provided in Annexure B.

2.4 Threatened Species Assessment

2.4.1 Desktop Research

Desktop research has informed the habitat assessments, targeted surveys, and impact assessment (including Tests and Assessments of Significance). Sources of desktop research have been referenced throughout this document, and include:

- Scientific journal articles.
- Government profile databases:
    - NSW Government Threatened Species Profiles ***https://www.environment.nsw.gov.au/threatenedspeciesapp/***
    - Australian Government Species Profile and Threats Database. ***http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl***.
- Reports available online including conservation advice, recovery plans, Scientific Committee Final Determinations, and referral and assessment guidelines.

2.4.2 Habitat Assessment

The species identified by database searches (Annexure B) were evaluated for their potential to occur in the study area based on habitat assessments undertaken in the field.

Threatened species have been considered likely to occur where:

- The geographic distribution of the species is known or predicted to include the IBRA subregion in which the study area is located.
- The study area contains habitat features or components associated with the species, or
- Past surveys undertaken within the study area indicate that the species is present.

Refer to Annexure C – Habitat Assessment Table for the habitat assessment table which assesses the likelihood of each threatened species, population, or community identified with the potential to occur in the study area. The likely occurrence of threatened biodiversity is based on the presence, condition, and type of habitat and previous records.

The habitat assessment approach increases the integrity of the survey to determine presence or absence of threatened species and reduces limitations relating to survey timing or cryptic species that are difficult to detect in surveys.

2.4.3 Targeted Flora Surveys

Targeted threatened flora surveys were not undertaken for this assessment. Threatened flora species with a moderate to high likelihood of occurrence within the study area have been assumed present within areas of suitable habitat. Tests of Significance (ToS) under the BC Act and Assessments of Significance (AoS) under the EPBC Act have been competed for these species (Annexure E).

2.4.4 Targeted Fauna Surveys

Opportunistic fauna sightings were recorded throughout fieldwork between the 21 June and 14 July 2021 by NGH ecologists on foot. Opportunistic surveys included recording the presence of any large stick nests. For mobile, diurnal threatened fauna species that would occur in the study locality such as various woodland birds, the time spent within the study area is considered to contribute to survey for these species.

Due to a restricted survey schedule, targeted surveys were not conducted for threatened fauna species identified as having a moderate to high likelihood of occurring within the study area (Annexure C – Habitat Assessment Table). Taking local records into consideration, these species have been assumed to utilise the study area either regularly or occasionally. Tests of Significance (ToS) under the BC Act and Assessments of Significance (AoS) under the EPBC Act have been competed for species that have a high likelihood of occurrence and are likely to depend on the habitat within the proposal area for breeding, foraging, or dispersal (Annexure E).

2.5 Aquatic Surveys

No aquatic surveys were required for this proposal.

2.6 Limitations

Random meanders (Cropper, 1993) were undertaken throughout the study area. No targeted searches for threatened flora were undertaken. The flora species recorded at each BAM plot location are considered sufficient to identify vegetation communities present within the study area and therefore to evaluate the probability of threatened flora species to occur.

Opportunistic fauna surveys were completed during the site survey between the 21 June and 14 July 2021. No targeted surveys for threatened species were undertaken. As such, not all species that utilise a study area may have been detected. The habitat assessment approach has been used to mitigate this limitation.

Due to time limitations and site size, vegetation stratification and BAM plots were conducted during the same site visit. As such, there may be some inconsistency with number of plots done per vegetation zone. Usually this would be undertaken over two separate site visits to ensure the correct number of plots per vegetation zone.

3. Existing Environment

3.1 Interim Biogeographic Regionalisation for Australia

Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions are geographically distinct bioregions based on common climates, geology, landforms, and native vegetation. The study area lies across four IBRA regions:

- NSW South Western Slopes (IBRA Subregions - Inland Slopes and Lower Slopes),
- Riverina (IBRA Subregion - Murrumbidgee).
- Cobar Peneplain (IBRA Subregion - Lachlan Plains).
- South Eastern Highlands (IBRA Subregion – Murrumbateman).

Around 80% (468,394 ha) of the study area occurs within the NSW South Western Slopes IBRA region. This region has a sub-humid climate characterised by hot summers and no dry season (NPWS, 2003). Average annual rainfall varies from 400 mm at Griffith in the west of the bioregion to 900 mm at Burrinjuck Dam (near Yass) in the east (BOM, 2022). In the hilly higher rainfall (eastern) parts of the bioregion, the vegetation is dominated by box *(Eucalyptus spp.)* woodlands (NPWS, 2003). The semi-arid western portion of the bioregion also features box woodlands which grade to mallee and *Acacia* shrublands to the west (NPWS, 2003). The South Western Slopes bioregion has been intensively cleared and cultivated (NPWS, 2003). The study area mostly occurs within a heavily cleared landscape. Local remnant vegetation is generally associated with hilltops and ridgelines.

3.2 Mitchell Landscapes

NSW Landscapes mapping (previously Mitchell landscapes) groups areas based on climate, topography, geology and soil, organisms, and combined conditions. The study area crosses 14 Mitchell landscapes, described in Table 3-1 below. All descriptions are from (DECC, 2002).

Table 3-1: Mitchells landscapes within the study area

Landscape Name	Meso Group	Description	Extent within study area (ha)
Springdale Hills	NSS Lower Slopes	Rounded ridges and a few peaks on Silurian sandstone, shale and acid volcanics, general elevation 300 to 530m, local relief 150m. Gravelly uniform clay loams and red-brown texture-contrast soils. Eucalypt and *Callitris* woodland with patches on mallee vegetation.	72.1
Weddin Range and Slopes	NSS Lower Slopes	Prominent strike ridges, cliffs, peaks and benched slopes on moderately folded Devonian quartz sandstone, siltstone and conglomerate, general elevation 350 to 720m, local relief 250m. Thin stony uniform sands on crests and benches, deeper red brown loamy sand on slopes occasional red-brown texture-contrast soil. Crests with diverse Eucalypt woodland and lower slopes dominated by Box woodland.	12
Burgooney Plains	CP Cocoparra	Extensive plains and low angle footslopes of Quaternary colluvium and alluvium, with low hills and rises of Devonian sandstones and siltstones, relief 5 to 15m. Lithosols and calcareous red earths. Moderate to dense, diverse woodlands.	151.3

Landscape Name	Meso Group	Description	Extent within study area (ha)
Cocoparra Ranges and Footslopes	CP Cocoparra	Steep crested ranges, ridges, hills and associated footslopes of Quaternary colluvium with outcrops of upper Devonian sandstone, conglomerate and siltstones. Cliff faces to 30m, bouldery hill slopes with overall relief to 260m. Extensive rock outcrop, shallow sandy lithosols, acid, neutral and calcareous red earths on slopes and deep sandy alluvium in creek lines. Woodlands dominated by Cypress Pine on ranges and Box dominated woodlands on lower slopes.	1.3
Ardlethan Hills	NSS Lower Slopes	Ardlethan Hills Landscape includes the Ardlethan land system. Rolling hills and rises on Ordovician quartzose sandstone, greywacke, chert, and phyllite, general elevation 200 to 412m, local relief 50 to 60m. Stony red and brown texture-contrast soils merging to calcareous red earth on valley floors. Woodland vegetation.	107.1
Young Hills and Slopes	NSS Upper Slopes Granites	Rounded hills and some steep slopes to tor covered ridges on massive and gneissic Silurian Devonian granites and granodiorite, general elevation 400 to 730m, local relief 100 to 250m. Gradational red earths on upper slopes and red-yellow texture-contrast soils on lower slopes reflecting poorer drainage. Extensively cleared with patches of remaining woodland.	104.1
Murrumbidgee - Tarcutta Channels and Floodplains	NSS Upper and Lower Slopes	Channels, floodplain and terraces of Murrumbidgee tributaries on Quaternary alluvium, general elevation 200 to 400m, local relief 25m. Undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces. Gallery woodland on banks open woodland on floodplain and terraces.	55.3
Murrumbidgee Depression Plains	RIV Murrumbidgee	Quaternary alluvial plains with numerous circular depressions interpreted as high floodplains or low terraces beyond the reach of average floodwaters, relief to 10m. Grey to brown clays and clay loams with linear patterns of sandy prior streams. Now extensive grasslands of white-top, windmill grass, sand broom, and spear grasses, heavily grazed and invaded by exotic species.	48.1
Junee Hills and Slopes	NSS Lower Slopes Granites	Rolling hills, low ranges and undulating plain on Silurian-Devonian massive granite and granodiorite, general elevation 300 to 450m, local relief 60m. Coarse siliceous sands amongst rock outcrop and tors, thin gritty red and yellow texture-contrast soils on slopes with harsh blocky subsoil. Eucalypt woodland on high rocky areas. Open forest on slopes.	1.3
Manitoba Hills and Footslopes	NSS Lower Slopes Granites	Manitoba Hills and Footslopes landscape includes parts of two land systems: Manitoba and Warrowie. Low ridges with outcrops and tors of granite with narrow, incised drainage contributing to major creeks. General elevation 200 to 310m, local relief to 30m. Calcareous and neutral red earths with hills of shallow loamy and sandy lithosols with abundant surface grit grading into red earths down slope. Moderate to open mallee vegetation.	25.9
Boorowa Volcanics	NSS Upper Slopes	Undulating low hills and rocky rises on Silurian dacite, crystal tuff, andesite and minor sandstone, general elevation 550 to 650m, with peaks to 780m. Red and yellow gradational earths, and yellow structured loams, thin stony loams within rock outcrops. Grassy woodland vegetation structure.	63.1
Frampton Hills	NSS Upper Slopes	Rounded ranges and hills with moderate slopes on Silurian slate, jasper, chert, amphibolite, and Devonian dacite and mudstone, general elevation 400 to 720m, local relief 100m. Shallow stony red brown structured loam. Open forest vegetation structure	44.8

Landscape Name	Meso Group	Description	Extent within study area (ha)
Marilba Range	NSS Upper Slopes	Steep strike ridges on steep dipping Devonian rhyolite, dacite, andesite, tuff and shale. General elevation 550 to 840m. Thin brown loams in rock outcrop grading to red-yellow harsh texture-contrast soil on the slopes. Open forest structure.	27.2

3.3 Catchments

The study area crosses two river catchment areas:

- Lachlan Catchment – briefly intersects this catchment between West Wyalong and Young, near Temora. The catchment features a number of significant wetlands systems which are located well north of the study area.
- Murrumbidgee & Lake George Catchment – the majority of the study area falls within this catchment. The Murrumbidgee is a highly productive and diverse catchment extending from the Snowy Mountains to the semi-arid inland NSW (MDBA, 2021). The Murrumbidgee River is an important water source for many wetlands including Fivebough and Tuckerbill swamps near Leeton as well as 16 wetlands listed as nationally significant in the directory of important wetlands (MDBA, 2021).

3.4 Plant Community Types and Vegetation Zones

Along the 285 km long study area, 19 PCTs were recorded and mapped. The native vegetation in the study area was assigned a PCT in accordance with the BioNet VIS (2021). Along with native vegetation, roadside vegetation includes exotic grassland and 'improved' pasture in adjacent farmland. Table 3-2 summarises PCTs within the study area including name, extent, and TEC association. PCT mapping is provided in Annexure F Maps. Full descriptions of PCTs that occur in the construction footprint are provided below.

Table 3-2: Plant Community Types in the study area

Veg. zone	PCT	TEC	Area (ha)	
			Study area	CF[1]
54	Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion	Not TEC	0.75	0
70	White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Not TEC	2.22	0.02
72	White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	Not TEC	8.89	0.05
74	Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	Critically Endangered (BC Act and EPBC Act) Box-gum Woodland	1.47	0.01
76	Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Endangered (BC Act and EPBC Act) Inland Grey Box Woodland	37.83	1.99
79	River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion	Not TEC	3.83	0
80	Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Endangered (BC Act and EPBC Act) Inland Grey Box Woodland	30.0	0.52
82	Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Endangered (BC Act and EPBC Act) Inland Grey Box Woodland	25.37	0.08
103	Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion	Not TEC	5.56	0.01
110	Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion	Endangered (BC Act and EPBC Act) Inland Grey Box Woodland	2.87	0.18

[1] CF = construction footprint

Veg. zone	PCT	TEC	Area (ha)	
			Study area	CF[1]
174	Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion	Not TEC	8.38	0
217	Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion	Not TEC	21.36	1.04
229	Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion	Not TEC	5.67	0
250	Derived tussock grassland of the central western plains and lower slopes of NSW	Critically Endangered (EPBC Act and BC Act) Box-gum Woodland	16.72	0.02
266	White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Critically Endangered (BC Act and EPBC Act) Box-gum Woodland	18.29	4.06
276	Yellow Box grassy tall woodland on alluvium loams and clays on flats in NSW South Western Slopes Bioregion	Critically Endangered (BC Act and EPBC Act) Box-gum Woodland	8.62	0.26
277	Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Critically Endangered (BC Act and EPBC Act) Box-gum Woodland	41.58	5.94
342	Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion	Critically Endangered (BC Act) Box-gum Woodland	0.65	0
796	Derived grassland of the NSW South Western Slopes	Critically Endangered (BC Act and EPBC Act) Box-gum Woodland	3.46	0.01

3.4.1 PCT 70 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Floodplain Transition Woodlands

PCT: 70

Conservation status: No associated TEC

Estimate of percent cleared: 65%

Condition: Good

Extent in the construction footprint: 0.02 ha

Vegetation zones and plots completed: 1 (plot 15)

Description: This PCT within the study area is a mid-high woodland dominated by White Cypress Pine (*Callitris glaucophylla*). Scattered eucalypts are present including Mugga Ironbark (*Eucalyptus sideroxylon)* and Western Grey Box (*Eucalyptus microcarpa*).

Shrubs are sparse and include Linear-leaf Grevillea (*Grevillea linearifolia*), Western Silver Wattle (*Acacia decora*), Cottonbush (*Maireana spp.*), and Black Rolypoly (*Sclerolaena muricata*). The ground cover is sparse dominated by grasses such as *Austrostipa scabra, Enteropogon acicularis, Rytidosperma spp.,* and *Austrostipa aristiglumis*. Forb species include *Calotis cuneifolia, Sida cunninghamii, Oxalis perennans, Brachyscome rigidula* and *Rock Fern (Cheilanthes sieberi subsp. Sieberi)*.

Occurs in the western half of the study area around Moonbooldool.

Floristic and structural summary of PCT 70 within the study area

Growth form	Typical species
Trees	White Cypress Pine, Western Grey Box
Shrubs	Box-leaved Wattle, Black Rolypoly, Olearia sp., Western Silver Wattle, Linear-leaf Grevillea
Grass and grass like	Speargrass, Wallaby Grass, Plains Grass, Tassel Sedge, Curly Windmill Grass
Forb	Hairy Cutleaf Daisy, Blueberry Lily, Common Everlasting, Mountain Burr-Daisy, River Bluebell, Climbing Saltbush, Caustic Weed, Native Carrot
Fern	Rock Fern
Other	Downy Dodder-laurel, Twining Glycine
Exotic	
High Threat Exotic	

Figure 3-1 Plot 15 PCT 70

3.4.2 PCT 72 White Cypress Pine woodland on sandy loams in central NSW wheatbelt

Vegetation formation: Semi-arid Woodlands (shrubby sub-formation)

Vegetation class: Western Peneplain Woodlands

PCT: 72

Conservation status: No associated TEC

Estimate of percent cleared: 40%

Condition: Good

Extent in the construction footprint: 0.05 ha

Vegetation zones and plots completed: 1 plot (31)

Description:

This PCT is a tall to mid-high woodland (up to 14 m) high dominated by White Cypress Pine (*Callitris glaucophylla*) and scattered Western Grey Box (*Eucalyptus microcarpa*) and Bulloak (*Allocasuarina luehmannii*).

The understorey contains a sparse cover of shrubs including Deane's Wattle (*Acacia deanei*), Black Rolypoly (*Sclerolaena muricata*), Silver Cassia (*Senna artemisioides* zygophylla), Ruby Saltbush (*Enchylaena tomentosa*) and hopbush (*Dodonaea viscosa*). The ground cover is mid-dense to sparse and is dominated by grass species such as *Austrostipa scabra, Rytidosperma caespitosum, Austrostipa Aristiglumis and Enteropogon acicularis*, and forbs such as *Dianella revoluta, Einadia nutans, Solanum esuriale, Sida corrugate, Cheilanthes sieberi* and *Vittadinia gracilis*.

PCT 72 occurs in the western half of the study area from Ariah Park area at its' eastern most to Yenda.

Floristic and structural summary of PCT 72 within the study area

Growth form	Typical species
Trees	White Cypress Pine, Western Grey Box, Bulloak
Shrubs	Black Rolypoly, Ruby Saltbush, Hickory Wattle, Deans Wattle, Desert Goosefoot, Cotton Bush, Senna, Wedge-leaf Hop Bush
Grass and grass like	Slender Bamboo Grass, Curly Windmill Grass, Hairy Panic, Plains Grass, Cotton Panic Grass, Speargrass, Ringed Wallaby Grass, Windmill Grass
Forb	Blueberry Lily, Climbing Saltbush, Quena, Corrugated Sida, Woolly new Holland Daisy, Blue Crowfoot
Fern	Rock Fern
Other	Pink Bindweed
Exotic	
High Threat Exotic	

Figure 3-2 Plot 31 PCT 72

3.4.3 PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Floodplain Transition Woodlands

PCT: 74

Conservation status: No associated TEC

BC Act Critically Endangered - *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.*

EPBC Act Critically Endangered – *White box, Yellow Box, Blakley's Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: 73%

Condition: Good

Extent in the construction footprint: 0.01 ha

Vegetation zones and plots completed: 2 plots (4, 56)

Description: This PCT is a tall woodland usually about 20 m high dominated by Yellow Box (*Eucalyptus melliodora*) usually with River Red Gum (*Eucalyptus camaldulensis*) and sometimes with Buloke (*Allocasuarina luehmannii*). Other tree species may include White Cypress Pine (*Callitris glaucophylla*), Western Grey Box (*Eucalyptus microcarpa*) and Poplar Box (*Eucalyptus populnea subsp. bimbil*) in northern areas along the Lachlan River.

Shrubs are sparse or isolated and include Varnish Wattle (*Acacia verniciflua*), Amulla (*Eremophila debilis*) and Creeping Saltbush (*Atriplex semibaccata*). The ground cover often dominated by grasses and forbs and includes a large proportion of exotic species. Native grasses include *Austrostipa scabra subsp. scabra, Rytidosperma racemosum, Austrostipa bigeniculata, Chloris divaricata var. divaricate, Bothriochloa macra, Rytidosperma setaceum, Elymus scaber and Eriochloa pseudoacrotricha.* Common weed species within the study area included *Romulea rosea var. australis, Oxalis pes-caprae, Marrubium vulgare, Hypochaeris glabra, Arctotheca calendula* and *Panicum capillare.*

PCT 74 occurs from Temora in the east to Ardlethan in the central part of the study area.

Floristic and structural summary of PCT 74 within the study area

Growth form	Typical species
Trees	Yellow Box, River Red Gum
Shrubs	Amulla, Varnish Wattle, Creeping Saltbush
Grass and grass like	Speargrass, Wallaby Grass, Yanganbil, Slender Chloris, Red Grass, Common Wheatgrass, Early Spring Grass
Forb	Climbing Saltbush, Late-flower Flax-lily, Blue Crowfoot
Fern	-
Other	Twining glycine, Silky glycine
Exotic	
High Threat Exotic	

Figure 3-3 Plot 4 PCT 74

3.4.4 PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

Vegetation formation: Grassy Woodlands

Vegetation class: Floodplain Transition Woodlands

PCT: 76

Conservation status: Associated TECs

BC Act Endangered - *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*

EPBC Act Endangered - *Grey Box (Eucalyptus microcarpa) Grassy woodlands and derived native grasslands of South-eastern Australia.*

Estimate of percent cleared: 92%

Condition: Good

Extent in the construction footprint: 1.99 ha

Vegetation zones and plots completed: 5 plots (6, 10, 16, 59, 75)

Description: This PCT is a tall woodland (up to 25 m high) dominated by Western Grey Box (*Eucalyptus microcarpa*). Yellow Box (*Eucalyptus melliodora*), White Cypress Pine (*Callitris glaucophylla*), and Kurrajong (*Brachychiton populneus*) were also present.

The shrub layer was sparse and includes *Maireana decalvans, Myoporum montanum, Cassinia arcuate, Acacia verniciflua, Chenopodium desertorum subsp. Anidiophyllum, Atriplex semibaccata, Acacia aspera, Eremophila debilis, Acacia decora* and *Acacia mearnsii*.

A mid-dense grass ground cover is present composed of *Panicum effusum, Lomandra filiformis, Enteropogon acicularis, Austrostipa aristiglumis, Bothriochloa macra, Austrostipa scabra* and *Rytidosperma setaceum.* Native forbs include *Einadia nutans, Dianella tarda, Dianella revoluta, Hydrocotyle laxiflora, Einadia hastata, Vittadinia cuneata, Calotis cuneata, Wahlenbergia spp., Mentha satureioides, Lepidium pseudohyssopifolium*, and *Sida corrugata*.

In the study area PCT 76 occurs between Stockinbingal in the east and Moonbooldool in the west.

Floristic and structural summary of PCT 76 within the study area

Growth form	Typical species
Trees	Western Grey Box, Yellow Box, Kurrajong
Shrubs	Black Cotton Bush, Western Boobialla, Sifton Bush, Green Wattle, Varnish Wattle, Creeping Saltbush
Grass and grass like	Speargrass, Small-flowered Wallaby Grass, Hair Panic, Common Wheatgrass, Umbrella Grass
Forb	Climbing Saltbush, Late-flower Flax Lily, Sticky Everlasting, Berry Saltbush, Corrugated Sida
Fern	Rock Fern
Other	-
Exotic	
High Threat Exotic	

Figure 3-4 Plot 10 PCT 76

3.4.5 PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Floodplain Transition Woodlands

PCT: 80

Conservation status: Associated TECs

BC Act Endangered - *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*

EPBC Act Endangered - *Grey Box (Eucalyptus microcarpa) Grassy woodlands and derived native grasslands of South-eastern Australia.*

Estimate of percent cleared: 83%

Condition: Good

Extent in the construction footprint: 0.52 ha

Vegetation zones and plots completed: 13 plots (1, 3, 22, 40, 54, 55, 57, 58, 60, 65, 67, 68, 69)

Description: This PCT is a tall woodland up to 25 m high but averaging about 20m co-dominated by Western Grey Box (*Eucalyptus microcarpa*) and White Cypress Pine (*Callitris glaucophylla*) with the pine tending to be shorter than the eucalypts. Other trees may include Yellow Box (*Eucalyptus melliodora*), Buloke (*Allocasuarina luehmannii*), *Pittosporum angustifolium* and Kurrajong (*Brachychiton populneus*).

A sparse layer of shrubs were present including *Atriplex spp., Enchylaena tomentosa, Acacia decora, Dodonaea viscosa subsp. Cuneata, Dillwynia sericea, Acacia deanei* and *Acacia paradoxa.* A sparse to mid-dense ground cover includes *Panicum effusum, Xerochrysum viscosum, Rytidosperma spp., Lomandra multiflora subsp. Multiflora, Lomandra filiformis subsp. Coriacea, Cheilanthes sieberi, Einadia nutans, Lomandra confertifolia, Hydrocotyle laxiflora and Wahlenbergia fluminalis.*

Occurs on sandy-loam to clay-loam soils on alluvial or stagnant alluvial plains in the predominantly winter rainfall belt of southern-central NSW with an average annual rainfall of between 400 to 550 mm. Mainly restricted to the eastern section of the Riverina Bioregion and the western section of the NSW South-western Slopes Bioregion.

This PCT is known to occasionally intergrade with BC Act Critically Endangered - *Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion.* However, this PCT within the study area does not conform to this TEC due the absence of key characteristic species including Bull Mallee (*Eucalyptus behriana*), White Mallee (*E. dumosa*), Red Mallee (*E. socialis*), Blue Mallee (*E. polybractea*) and Green Mallee (*E. viridis*).

PCT 80 occurs between from Wallendbeen/Stockinbingal area in the east to Kamarah in the west.

Floristic and structural summary of PCT 80 within the study area

Growth form	Typical species
Trees	Western Grey Box, White Cypress Pine
Shrubs	Wedge-leaf Hop-bush, Green Wattle, Peach Heath, Kangaroo Thorn, Ruby Saltbush,
Grass and grass like	Hairy Panic, Wallaby Grass, Speargrass, Weeping Grass, Matrush
Forb	Sticky Everlasting, Climbing Saltbush, Berry Saltbush, Purple Burr-daisy, Tall Bluebell, River Bluebell
Fern	Rock Fern
Other	-
Exotic	
High Threat Exotic	

Figure 3-5 Plot 3 PCT 80

3.4.6 PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Floodplain Transition Woodlands

PCT: 82

Conservation status: Associated TECs

BC Act Endangered - *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*

EPBC Act Endangered - *Grey Box (Eucalyptus microcarpa) Grassy woodlands and derived native grasslands of South-eastern Australia.*

Estimate of percent cleared: 75%

Condition: Good

Extent in the construction footprint: 0.084 ha

Vegetation zones and plots completed: 7 plots (19, 23, 24, 26, 27, 29, 30)

Description: This PCT is a tall woodland between 12 and 25 m high dominated by Western Grey Box (*Eucalyptus microcarpa*), Poplar Box (*Eucalyptus populnea subsp. bimbil*) and White Cypress

Pine (*Callitris glaucophylla*). Kurrajong (*Brachychiton* populneus) and the occasional Buloke (*Allocasuarina luehmannii*). Shrubs are sparse-mid and include Black Rolypoly (*Sclerolaena muricata*), Rough Wattle (*Acacia aspera*), Varnish Wattle (*Acacia verniciflua*), *Atriplex spp*., Ruby Saltbush (*Enchylaena tomentosa*), and Western Silver Wattle (*Acacia decora*).

The ground cover is sparse-mid and contains native species such as Blue Crowfoot (*Erodium crinitum*), Plains Grass (*Austrostipa aristiglumis*), Weeping Grass (*Microlaena stipoides*), Curly Windmill Grass (*Enteropogon acicularis*), Red Grass (*Bothriochloa macra*), Climbing Saltbush (*Einadia nutans*), Knob Sedge (*Carex inversa*), Corrugated Sida (*Sida corrugate*), Blueberry Lily (*Dianella revoluta*), Sticky Everlasting (*Xerochrysum viscosum*, Hyssop Loosestrife (*Lythrum hyssopifolia*), and Slender Bamboo Grass (*Austrostipa verticillate*).

Occurs on red-brown earths soils comprising Quaternary alluvium often as terraces on old alluvial plains or undulating peneplain landforms overlaying a range of underlying rock types including sandstone. Distributed in central western NSW mostly in the eastern section of the Cobar Peneplain Bioregion near Nymagee, Tottenham and Boona and extending southwards Griffith.

In the study area, PCT occurs in the western half and occurs between Ardlethan (eastern most) to Yenda.

Floristic and structural summary of PCT 82 within the study area

Growth form	Typical species
Trees	Western Grey Box, Bimble Box, White Cypress Pine, Kurrajong
Shrubs	Black Rolypoly, Rough Wattle, Varnish Wattle, Ruby Saltbush, Western Silver Wattle
Grass and grass like	Plains Grass, Weeping Grass, Curly Windmill Grass, Red Grass, Slender Bamboo Grass
Forb	Climbing Saltbush, Corrugated Sida, Blueberry Lily, Sticky Everlasting
Fern	Rock fern
Other	Pink Bindweed, Variable Glycine, Twinning Glycine
Exotic	
High Threat Exotic	

Figure 3-6 Plot 23 PCT 82

3.4.7 PCT 103 Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion

Vegetation formation: Semi-arid Woodlands (Shrubby sub-formation)

Vegetation class: Western Peneplain Woodlands

PCT: 103

Conservation status: No Associated TECs

This PCT is known to be associated with EPBC Act Endangered - *Poplar Box Grassy Woodland on Alluvial Plains.* However, this PCT within the study area does not conform to this TEC due Poplar Box (*Eucalyptus populnea*) not being the dominant canopy species.

Estimate of percent cleared: 50%

Condition: Good

Extent in the construction footprint: 0.01 ha

Vegetation zones and plots completed: 1 plot (28)

Description: This PCT is an open woodland up to 25 m high dominated by Poplar Box (*Eucalyptus populnea subsp. bimbil*), with White Cypress Pine (*Callitris glaucophylla*) and Western Grey Box (*Eucalyptus microcarpa*) present occasionally. A sparse shrub layer was present consisting of

Rough Wattle (*Acacia aspera*), Ruby Saltbush (*Enchylaena tomentosa*), Desert Goosefoot (*Chenopodium desertorum*), Wedge-leaf Hop-bush (*Dodonaea viscosa subsp. Cuneata*), Hickory Wattle (*Acacia implexa*), and Small-fruited Hakea (*Hakea microcarpa*).

The ground cover is comprised of a mixture of native grasses and forbs including Speargrass (*Austrostipa scabra*), Hairy Cutleaf Daisy (*Brachyscome rigidula*), Curly Windmill Grass (*Enteropogon acicularis*), Bunch Wiregrass (*Aristida behriana*), Blueberry Lily (*Dianella revoluta*), Brown's Lovegrass (*Eragrostis brownii*), Quena (*Solanum esuriale*), Cotton Panic Grass (*Digitaria brownii*), Windmill Grass (*Chloris Truncata*), and Scrambles Eggs (*Goodenia pinnatifida*).

Occurs in the far western half of the study area between Binya and Yenda through the Binya State Forest.

Floristic and structural summary of PCT 103 within the study area

Growth form	Typical species
Trees	Poplar Box, White Cypress Pine, Western Grey Box
Shrubs	Rough Wattle, Ruby Saltbush, Wedge-leaf Hop-bush, Hickory Wattle
Grass and grass like	Speargrass, Bunch Wiregreass, Curly Windmill Grass, Brown's Lovegrass, Windmill Grass
Forb	Hairy Cutleaf Daisy, Blueberry Lily, Quena
Fern	Rock fern
Other	-
Exotic	
High Threat Exotic	

Figure 3-7 Plot 28 PCT 103

3.4.8 PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion

Vegetation formation: Dry Sclerophyll Forests (Shrubby sub-formation)

Vegetation class: Western Slopes Dry Sclerophyll Forests

PCT: 110

Conservation status: Associated TECs

BC Act Endangered - *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions*

EPBC Act Endangered - *Grey Box (Eucalyptus microcarpa) Grassy woodlands and derived native grasslands of South-eastern Australia.*

Estimate of percent cleared: 75%

Condition: Good

Extent in the construction footprint: 0.18 ha

Vegetation zones and plots completed: 1 plot (64)

Description: This PCT is a mid-high woodland dominated by Western Grey Box (*Eucalyptus microcarpa*) with Black Cypress Pine (*Callitris endlicheri*) and sometimes White Cypress Pine (*Callitris glaucophylla*). A sparse shrub layer includes*, Dodonaea viscosa subsp. cuneata, Acacia genistifolia, Acacia deanei subsp. deanei, Acacia doratoxylon, Exocarpos cupressiformis* and *Acacia aspera*.

A mid-dense to sparse ground cover includes *Elymus scaber, Austrostipa spp., Rytidosperma spp., Panicum effusum, Calotis cuneata, Wahlenbergia stricta, Einadia hastata, Goodenia pinnatifida* and *Lomandra filiformis.*

PCT 110 extends from the central part of the study area around Jindalee National Park west to Moonbooldool in small isolated fragments

Floristic and structural summary of PCT 110 within the study area

Growth form	Typical species
Trees	Western Grey Box, White Cypress Pine
Shrubs	Hop-bush, Dean's Wattle, Early Wattle, Rough Wattle, Cherry Ballart
Grass and grass like	Wallaby Grass, Spear Grass, Hairy Panic, Foxtail Speargrass, Wattle Matt-rush
Forb	Tall Bluebell, Mountain Burr-daisy, Berry Saltbush, Scrambles Eggs
Fern	-
Other	-
Exotic	
High Threat Exotic	

3.4.9 PCT 217 Mugga Ironbark - Western Grey Box - Cypress Pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

Vegetation formation: Dry Sclerophyll Forests (Shrubby sub-formation)

Vegetation class: Western Slopes Dry Sclerophyll Forests

PCT: 217

Conservation status: No associated TEC

This PCT is known to occasionally intergrade with BC Act Critically Endangered - *Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion.* However, this PCT within the study area does not conform to this TEC due the absence of key characteristic species including Bull Mallee (*Eucalyptus behriana*), White Mallee (*E. dumosa*), Red Mallee (*E. socialis*), Blue Mallee (*E. polybractea*) and Green Mallee (*E. viridis*).

Estimate of percent cleared: 69%

Condition: Good

Extent in the construction footprint: 1.04 ha

Vegetation zones and plots completed: 6 plots (5, 11, 12, 61, 66, 74)

Description: This PCT is a tall open forest to woodland (up to 25m high) dominated by Mugga Ironbark (*Eucalyptus sideroxylon*) and Western Grey Box (*Eucalyptus microcarpa*) with both White Cypress Pine (*Callitris glaucophylla*) and Black Cypress Pine (*Callitris endlicheri*). Mugga Ironbark may dominate some sites. White Box (*Eucalyptus albens*) was also present occasionally.

The shrub layer is generally sparse to mid, dominant species include *Acacia aspera, Cassinia arcuate, Acacia decora, Cassinia aculeata, Olearia decurrens, Melichrus urceolatus, Platysace linearifolia* and *Cassinia longifolia*.

The ground cover is sparse to mid-dense with *Rytidosperma spp., Austrostipa scabra, Lomandra filiformis subsp. Filiformis, Rytidosperma carphoides, Dianella revoluta, Einadia hastata* and *Xerochrysum viscosum*.

PCT 217 occurs between the Wallandbeen area (east) and Ariah Park/Pucawan (west) in the central part of the study area.

Floristic and structural summary of PCT 217 within the study area

Growth form	Typical species
Trees	Mugga Ironbark, Western Grey Box, White Cypress Pine, Blac Cypress Pine
Shrubs	Rough Wattle, Sifton Bush, Dolly Bush, Western Silver Wattle
Grass and grass like	Wallaby Grass, Spear Grass, Wattle Matt-rush
Forb	Blueberry Lily, Berry Saltbush
Fern	-
Other	-
Exotic	

Figure 3-8 Plot 11 PCT 217

3.4.10 PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW

Vegetation formation: Grasslands

Vegetation class: Western Slopes Grasslands

PCT: 250

Conservation status: Associated TECs

BC Act Critically Endangered - *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*

EPBC Critically Endangered - *White box, Yellow Box, Blakley's Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: unknown

Condition: Low-Good

Extent in the construction footprint: 0.023 ha

Vegetation zones and plots completed: 2 plots (37, 39)

Description: This PCT is a mid-high grassland that has been derived from the clearing of woodland vegetation in central west NSW. Scattered River Oak trees (*Casuarina cunninghamiana subsp. Cunninghamiana*) and small shrubs such as Bluebush (*Maireana microphylla)*, Ruby Saltbush (*Enchylaena tomentosa*), Black Rolypoly (*Sclerolaena muricata*), Prickly Saltwort (*Salsola tragus*), and Desert Goosefoot (*Chenopodium desertorum*) were present.

The ground cover is mid – dense, dominant grasses and forbs present included Plains Grass (*Austrostipa aristiglumis*), Curly Windmill Grass (*Enteropogon acicularis*), Pale Twinleaf (*Zygophyllum glaucum*), Climbing Saltbush (*Einadia nutans*), Woolly New Holland Daisy (*Vittadinia gracilis*), Speargrass (*Austrostipa scabra*), Weeping Grass (*Microlaena stipoides*), Ringed Wallaby Grass (*Rytidosperma caespitosum*), and Yanganbil (*Austrostipa bigeniculata*).

PCT 250 occurs between the Ardlethan and Barellan areas in the western half of the study area.

Floristic and structural summary of PCT 250 within the study area

Growth form	Typical species
Trees	River Oak
Shrubs	Bluebush, Black Rolypoly, Ruby Saltbush, Prickly Saltwort
Grass and grass like	Weeping Grass, Ringed Wallaby Grass, Yanganbil, Plains Grass
Forb	Pale Twinleaf, Woolly New Holland Daisy, Climbing Saltbush
Fern	-
Other	Silky Glycine
Exotic	
High Threat Exotic	

Figure 3-9 Plot 37 PCT 250

3.4.11 PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Western Slopes Grassy Woodlands

Conservation status: Associated TECs

BC Act Critically Endangered - *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*

EPBC Critically Endangered - *White box, Yellow Box, Blakley's Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: 94%

Condition: Good

Extent in the construction footprint: 4.06 ha

Vegetation zones and plots completed: 6 plots (42, 46, 47, 48, 50, 70)

Description: This PCT is a tall woodland (up to 25 m high) dominated by White Box (*Eucalyptus albens*). Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*) was also scattered throughout. The shrub layer is sparse and included the occasional Hickory Wattle (*Acacia implexa*).

The ground cover is mid-dense, common native grasses included Plains Grass (*Austrostipa aristiglumis*), Red Grass (*Bothriochloa macra*), Hairy Panic (*Panicum effusum*), Mat Rush (*Lomandra filiformis subsp. Filiformis*), Speargrass (*Austrostipa scabra*), Weeping Grass (*Microlaena stipoides*), Straw Wallaby Grass (*Rytidosperma richardsonii*), and Wallaby Grass (*Rytidosperma racemosum var. racemosum*). Native forbs were also present throughout the study area, species include Bidgee-widgee (*Acaena novae-zelandiae*), Kidney Weed (*Dichondra repens*), Common Woodruff (*Asperula conferta*), Native Geranium (*Geranium solanderi*), Mountain Burr-daisy (*Calotis cuneata*), and Scrambled Eggs (*Goodenia pinnatifida*).

PCT 266 occurs in the far eastern part of the study area west to the Wallendbeen area, intergrading with PCT 277 and PCT 796.

Floristic and structural summary of PCT 266 within the study area

Growth form	Typical species
Trees	White Box, Yellow Box, Blakely's Red Gum
Shrubs	Hickory Wattle
Grass and grass like	Plains Grass, Red Grass, Hairy Panic, Weeping Grass, Wallaby Grass
Forb	Bidgee–widgee, Common Woodruff, Native Geranium
Fern	-
Other	Silky Glycine, Slender Tick-trefoil
Exotic	
High Threat Exotic	

3.4.12 PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Western Slopes Grassy Woodlands

Conservation status: Associated TECs

BC Act Critically Endangered - *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*

EPBC Critically Endangered - *White box, Yellow Box, Blakley's Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: 90%

Condition: Good

Extent in the construction footprint: 0.26 ha

Vegetation zones and plots completed: 1 plot (73)

Description: This PCT is a tall grassy woodland dominated by Yellow Box (*Eucalyptus melliodora*), with White Cypress Pine (*Callitris glaucophylla*) scattered throughout. The shrub layer is mid – dense, species included Black Wattle (*Acacia mearnsii*), *Senna artemisioides zygophylla,* Amulla (Eremophila debilis), and Desert Goosefoot (*Chenopodium desertorum*).

The ground cover is dense dominated by native grasses including Plains Grass (*Austrostipa aristiglumis*), Weeping Grass (*Microlaena stipoides*), Ringed Wallaby Grass (*Rytidosperma caespitosum*), Curly Windmill Grass (*Enteropogon acicularis*), Speargrass (*Austrostipa scabra*), and Yanganbil (*Austrostipa bigeniculata*). Forbs include Climbing Saltbush *(Einadia nutans*), Fuzzweed (*Vittadinia cuneata*), River Bluebell (*Wahlenbergia fluminalis*), Berry Saltbush (*Einadia hastata*), and Twinning Glycine (*Glycine clandestine*).

PCT 276 occurs between the Springdale area in the east through to Ariah Park in the west in the central part of the study area.

Floristic and structural summary of PCT 276 within the study area

Growth form	Typical species
Trees	Yellow Box, White Cypress Pine
Shrubs	Black Wattle, Senna
Grass and grass like	Plains Grass, Speargrass, Weeping Grass
Forb	Climbing Saltbush, Fuzzweed, River Bluebell
Fern	Rock Fern
Other	Pink Bindweed, Twining Glycine
Exotic	
High Threat Exotic	

Figure 3-10 Plot 73 PCT 276

3.4.13 PCT 277 Blakely's Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Vegetation formation: Grassy Woodlands

Vegetation class: Western Slopes Grassy Woodlands

Conservation status: Associated TECs

BC Act Critically Endangered - *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*

EPBC Critically Endangered - *White box, Yellow Box, Blakley’s Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: 94%

Condition: Low-Good

Extent in the construction footprint: 5.94 ha

Vegetation zones and plots completed: 14 Plots (8, 9, 43, 44, 45, 9, 51, 52, 63, 76, 77, 78, 80, 81)

Description: This PCT is a tall woodland (up to 20 m high) dominated by Blakely's Red Gum (*Eucalyptus blakelyi*) and Yellow Box (*Eucalyptus melliodora*). Other trees such as Kurrajong (*Brachychiton populneus*) and White Cypress Pine (*Callitris glaucophylla*) are also scattered throughout. The shrubs layer is sparse with scattered species including Bitter Cryptandra (*Cryptandra amara*), Black Rolypoly (*Sclerolaena muricata*) and Cotton Bush (*Maireana spp.*).

The ground cover is dense and is dominated by grass species including Wallaby Grass (*Rytidosperma caespitosum*), River Bluebell (*Wahlenbergia fluminalis*), Curly Windmill Grass (*Enteropogon acicularis*), Hairy panic (*Panicum effusum*), Red Grass (*Bothriochloa macra*), Speargrass (*Austrostipa scabra*), *Sida sp.*, Fuzzweed (*Vittadinia muelleri*), Yanganbil (*Austrostipa bigeniculata*), Climbing Saltbush (*Einadia nutans*), Brown's Lovegrass (*Eragrostis brownii*), Common Wheatgrass (*Elymus scaber*) and Hairy Joyweed (*Alternanthera nana*).

PCT 277 occurs in the eastern part of the study area between the intersection with the Hume Highway west to the Stockinbingal area, intergrading with PCT 266. Occasional isolated occurrences are mapped west of Temora.

Floristic and structural summary of PCT 277 within the study area

Growth form	Typical species
Trees	Blakey's Red Gum, Yellow Box, Kurrajong, White Cypress Pine
Shrubs	Black Rolypoly, Cottonbush
Grass and grass like	Wallaby Grass, Curly Windmill Grass, Red Grass, Speargrass
Forb	River Bluebell, Climbing Saltbush, Sticky Everlasting
Fern	-
Other	-
Exotic	
High Threat Exotic	

Figure 3-11 Plot 8 PCT 277

3.4.14 796 Derived grassland of the NSW South Western Slopes

Vegetation formation: Grassy Woodlands

Vegetation class: Western Slopes Grassy Woodlands

Conservation status: Associated TECs

BC Act Critically Endangered – 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

EPBC Critically Endangered – *White box, Yellow Box, Blakley’s Red Gum grassy woodlands and derived native grasslands.*

Estimate of percent cleared: Unknown

Condition: Low to Good

Extent in the construction footprint: 0.01 ha

Vegetation zones and plots completed: 2 Plots (13, 14)

Description:

This PCT within the study area is a derived grassland resulting from the clearing of various grassy woodland and forest communities. Occurs on any landscape position formerly occupied by woodland and dry forest communities, from which these grassland communities are derived.

A tree layer is almost absent from this PCT with White Cypress Pine (*Callitris glaucophylla*) scattered throughout occasionally. The shrub layer is sparse with only small shrub species present such as Black Rolypoly (*Sclerolaena muricata*) and Cottonbush (*Maireana spp.*).

The groundcover is dense, common native grass species include Plains Grass (*Austrostipa aristiglumis*), Red Grass (*Bothriochloa macra*), Curly Windmill Grass (*Enteropogon acicularis*), Yanganbil (*Austrostipa bigeniculata*), Speargrass (*Austrostipa scabra*) and Wallaby Grass (*Rytidosperma spp*.). Scattered forbs were also present, such as Fuzzweed (*Vittadinia muelleri*), Woolly New Holland Daisy (*Vittadinia gracilis*), and Climbing Saltbush (*Einadia nutans*).

In this study area, PCT 796 occurs between Galong along with PCT 277 and 266, in the eastern part of the study area.

Figure 3-12 Plot 13 PCT 796

3.5 Threatened Ecological Communities

3.5.1 NSW Biodiversity Conservation Act 2016

Two TECs listed under the BC Act are associated with PCTs present within the ea. These TECs were confirmed during fieldwork on site by NGH Ecologists:

- Inland Grey Box Woodland EEC, and
- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC.

These TECs and extent within both the study area and construction footprint is listed in Table 3-3 below. TEC locations are shown in Annexure F Maps.

Table 3-3: BC Act TECs on site

TEC	Status (BC Act)	Associated PCTs within the study area	Extent within the study area (ha)	Extent within construction footprint (ha)
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	Endangered	PCTs 76; 80; 82; 110	96.07	2.77
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	Critically Endangered	PCTs 74; 250; 266; 276; 277; 342; 796	90.97	10.30

3.5.2 Environment Protection and Biodiversity Conservation Act 1999

Two TECs listed under the EPBC Act are associated with PCTs identified on site:

- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland CEEC (PCT 74, 250, 266, 276, 277, 342, 796), and
- Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands EEC (PCT 76,80, 82, 110).

An assessment to determine the presence of these TECs is provided in Table 3-4 below. Reference was made to the approved conservation advice for the TEC available in the Commonwealth Species Profile and Threats (SPRAT) database. TEC locations are shown in Annexure F Maps.

Table 3-4: Key diagnostic characteristics of EPBC TECs

Diagnostic Characteristic	Presence on site	Extent within study area (ha)
EPBC Critically Endangered - White box - Yellow box - Blakely's Red Gum grassy woodlands and derived native grasslands		
0.1 hectares or greater in size.	QGIS area calculations identified 40 patches of the TEC within the study area. 25 patches are >0.1 ha, however it is possible the remaining 15 patches are connected to larger patches outside the study area. Therefore, we can assume a minimum of 25 patches that meet the area threshold are located within the study area.	6.51

Diagnostic Characteristic		Presence on site	Extent within study area (ha)
The perennial vegetation of the ground layer is dominated by native species, and which contains at least 12 native, non-grass understorey species		At least 25 patches on site have an understorey that meet these thresholds	
Understorey species should be an important species (e.g. grazing-sensitive, regionally significant or uncommon species; such as Kangaroo Grass or orchids)		BAM plot records do not provide detailed information for all patches. A precautionary approach has been adopted, therefore, it is assumed important understorey species are present within each patch.	
EPBC Act Endangered Grey Box (*Eucalyptus microcarpa*) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia			
The minimum patch size is 0.5 hectare		QGIS area calculations identified four continuous patches of the TEC within the study area. One patch is >0.5 ha, however it is possible the remaining three patches are connected to larger patches outside the study area. Therefore, we can assume a minimum of one patch meets the area threshold for the TEC within the study area.	
The canopy layer contains Grey Box (*E. microcarpa*) as the dominant or co-dominant tree species		Grey Box is the dominant canopy species in two patches. Data regarding the other patches is unknown.	
The vegetative cover of non-grass weed species in the ground layer is less than 30% at any time of the year		All patches have weed coverage of <30%	1.66
Woodland patches (0.5 to 10%	At least 50% of the vegetative cover in the ground layer comprises perennial native species at any time of the year	All patches have adequate ground layer composition.	
	Eight or more perennial native species are present in the mid and ground layers at any time of the year	All patches have adequate mid and ground layer composition	
Patches with canopy (2 ha or more in area)	At least 8 trees/ are hollow bearing or have a diameter at breast height of 60 cm or more	Two patches have adequate hollow-bearing tree density	

Diagnostic Characteristic		Presence on site	Extent within study area (ha)
	at least 10% of the vegetative ground cover comprises perennial native grasses at any time of the year	All patches have adequate native ground	
Patches of derived grassland (≥0.5 ha in area)	Woodland density doesn't meet previous criteria or is a derived grassland with clear evidence that the site formerly was a woodland with a tree canopy dominated or co-dominated by *E. microcarpa*	Some patches are considered derived grassland. BAM plot records do not provide detailed information for every patch, therefore, the exact number of patches of derived grassland is unknown.	
	At least 50% of the vegetative cover in the ground layer is made up of perennial native species at any time of the year;	All patches have adequate ground layer composition	
	12 or more native species are present in the ground layer at any time of the year	All patches have adequate ground layer composition	

3.6 Groundwater Dependent Ecosystems

A search of the Bureau of Meteorology's National Atlas of Groundwater Dependent Ecosystems (GDEs) found that the majority of vegetation within the study area has low potential for GDEs. A small area just west of Wallendbeen has a moderate potential for terrestrial GDEs (Figure 3-13). However, this area does not occur within the construction footprint. Given the above, and the fact that the proposal is unlikely to decease the availability of groundwater, the impact of the proposal on GDEs is considered negligible.

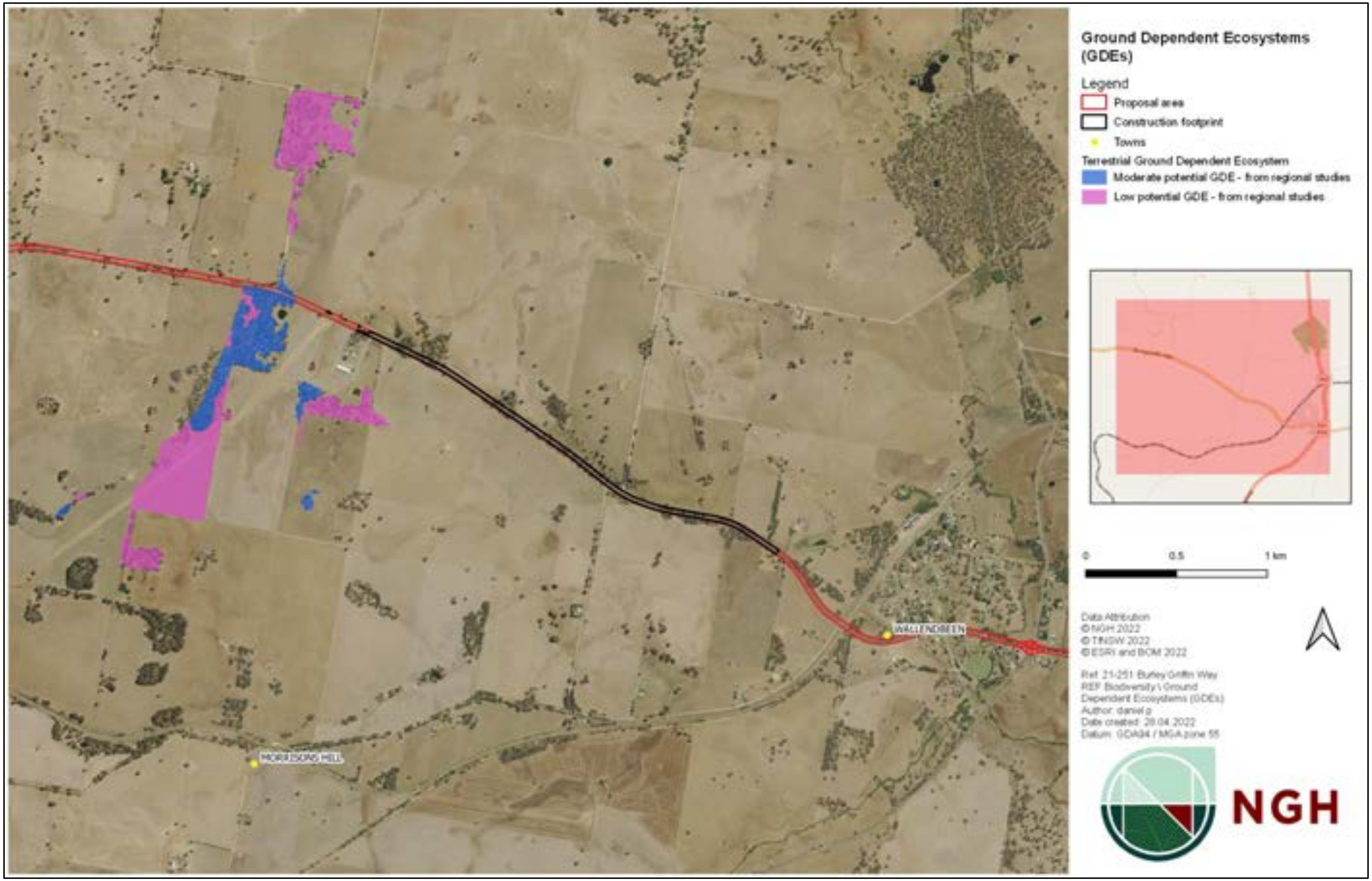

Figure 3-13 Groundwater Dependent Ecosystems

3.7 Threatened Species

3.7.1 Habitat Resources in the Study Area

Habitat in the western portion of the study area includes woodland, shrubland, and grassland. In the eastern portion of the study area, roadside corridor habitat has a higher degree of connectivity with the surrounding landscape and consists mostly of woodland and scattered trees. Vegetation in this portion has a higher abundance of understorey and groundcover strata and is surrounded by a grazing land use which includes scattered trees and remnant vegetation. The western portion of the study area is situated on a dry plain with naturally sparse vegetation (e.g. mallee) and is surrounded by heavily cleared and cropped paddocks. The study area passes through three large blocks of remnant vegetation in the Binya State Forest (PCT 103 Poplar Box shrubby woodland), Ingalba Nature Reserve, and Jindalee National Park.

The resources provided by the roadside vegetation in the study area are limited to occasional foraging habitat and breeding habitat where hollow-bearing trees (HBTs) are present. Besides these resources, the roadside vegetation provides connectivity between larger patches of habitat in a highly fragmented landscape.

Fauna foraging resources found in the study area include nectar and pollen used by insects, birds, and mammals (e.g. *Eucalyptus spp.*, *Acacia spp.*); native and exotic grass grains used by birds (e.g. Superb Parrot); and prey species (e.g. small birds) for predators (e.g. raptors). Nesting resources are also present for tree nesting birds (e.g. woodswallows) and hollow-nesting animals (e.g. cockatoos and parrots). Ground nesting animals (e.g. Malleefowl) could occur where there are large patches of adjacent habitat.

The study area contains a range of habitat values for threatened fauna, though most are common foraging resources that are prevalent in the surrounding landscape. Over 644 hollow-bearing trees (HBTs) were recorded within the study area (see Annexure F Maps). These provide valuable roosting opportunities for hollow-dependent birds, microbats, and mammals.

3.7.2 Database Search Results

The habitat assessment (Annexure C – Habitat Assessment Table) identified one threatened flora and 17 threatened fauna species as having a high likelihood of depending upon resources within the study area (Table 3-5). This is based on nearby records, important habitat features, and the presence of associated PCTs. Tests of Significance under the BC Act and Assessments of Significance under the EPBC Act have been competed for these species (discussed in Section 5.4).

Table 3-5: Threatened flora and fauna summary

Scientific Name	Common Name	Listing
Flora		
Ammobium craspedioides	Yass Daisy	Vulnerable – EPBC Act & BC Act
Fauna		
Artamus cyanopterus cyanopterus	Dusky Woodswallow	Vulnerable – BC Act
Calyptorhynchus lathami	Glossy Black-Cockatoo	Vulnerable – BC Act

Scientific Name	Common Name	Listing
Certhionyx variegatus	Pied Honeyeater	Vulnerable – BC Act
Chthonicola sagittate	Speckled Warbler	Vulnerable – BC Act
Climacteris affinis	White-browed Treecreeper	Endangered – BC Act
Climacteris picumnus victoriae	Brown Treecreeper	Vulnerable – BC Act
Daphoenositta chrysoptera	Varied Sittella	Vulnerable – BC Act
Pachycephala inornata	Gilbert's Whistler	Vulnerable – BC Act
Grantiella picta	Painted Honeyeater	Vulnerable – BC Act Vulnerable – EPBC Act
Hylacola cautus	Shy Heathwren	Vulnerable – BC Act
Lophochroa leadbeateri	Major Mitchell's Cockatoo	Vulnerable – BC Act
Melanodryas cucullata	Hooded Robin	Vulnerable – BC Act
Petroica phoenicea	Flame Robin	Vulnerable – BC Act
Polytelis swainii	Superb Parrot	Vulnerable – BC Act Vulnerable – EPBC Act
Pomatostomus temporalis temporalis	Grey-crowned Babbler	Vulnerable – BC Act
Stagonopleura guttata	Diamond Firetail	Vulnerable – BC Act
Petaurus norfolcensis	Squirrel Glider	Vulnerable – BC Act

3.8 Wildlife Connectivity Corridors

Habitat connectivity varies significantly along the 285 km study area. Between Griffith in the west and the next town of Yenda (~18 km) the roadside vegetation consists of a single line of irregularly spaced trees (with gaps of 100 m or more in places) amongst cropped fields. This area provides virtually no habitat for fauna although generalist species such as ravens and magpies are likely to utilise these areas.

Roadside vegetation is slightly more continuous east of Binya State Forest and potentially provides connectivity or dispersal routes for mobile species (e.g. birds and microbats which are not edge shy, or wide-ranging species such as quolls). From the town of Binya a wide (~30-50 m) corridor provides habitat for small sedentary species (e.g. pardalotes) as well as a movement corridor which may connect small patches (~5-10 ha) of bushland (e.g. Garoolgan Rest Area to Barellan, Moomboodool, Kamarah, woodland around Ardlethan Tin Mine and Ardlethan State Forest). Between Binya and Kamarah, roadside vegetation may provide the only corridor for species adverse to crossing longer gaps (>100 m) of open habitat (e.g. grey shrike-thrush).

In the eastern portion of the study area, east of Burley Griffin Way/Newell Hwy intersection, the roadside corridor is again well supported by other patches of native vegetation in the adjacent landscape. From Ariah Park east, the importance of the Burley Griffin Way roadside vegetation for connectivity declines with reduced width and continuity. Here corridors are provided along various minor roads and paddock woodland patches. The study area passes through Ingalba Nature Reserve (NR) just west of Temora and supports connectivity between this large remnant and Pucawan NR a few km away. However, the importance of roadside vegetation as a corridor between these two reserves is low due to sufficient other native vegetation that can provide this function including along Tara-Betric Road and the various small bushland patches between.

The study area provides corridors of good width (>50 m) around Springdale which again is supported well by other vegetation remnants in the surrounding landscape. Between Stockinbingal and Flagstaff Memorial NR, the landscape is heavily cleared and the roadside vegetation is discontinuous and narrow. Here it adds little value to wildlife connectivity. Between Flagstaff Memorial NR and Jindalee National Park (NP), the roadside vegetation is wide (up to 100 m) and well supported by ribbons of vegetation along gullies and ridges. In these areas roadside vegetation is not critical for maintaining connectivity.

East from Jindalee NP to the intersection with the Hume Hwy, the surrounding landscape is a mosaic of cleared land, scattered trees, and small patches in contrast to the landscape in the western portion of the study area. Here, the roadside vegetation does contribute to a corridor but it not critical to maintaining landscape connectivity.

In summary, native vegetation along Burley Griffin Way contributes a non-critical role in landscape connectivity in the eastern portion of the study area. Meanwhile in parts of the western portion of the study area, such as between Kamarah and Binya, roadside vegetation along Burley Griffin Way critically contributes to landscape connectivity.

3.8.1 Adjacent Habitat Values

Binya State Forest adjoins Cocoparra National Park which harbours a number of resident and migratory birds including threatened species such as Glossy-Black Cockatoo (*Calyptorhynchus lathami*), Hooded Robin (*Melanodryas cucullata cucullata*), Speckled Warbler (*Chthonicola sagittata*), Varied Sittella (*Daphoenositta chrysoptera*), Grey-Crowned Babbler (*Pomatostomus temporalis temporalis*), Diamond Firetail (*Stagonopleura guttata*) and Shy Heathwren (*Hylacola cauta*) (NPWS, 2022).

Ingalba NR contains open box and ironbark woodland and dry heath and protects regionally significant plant species (NPWS, 2006). A number of threatened woodland birds have been recorded including Hooded Robin, Grey-Crowned Babbler, Black-Chinned Honeyeater *(Melithreptus gularis gularis*) and Painted Honeyeater (*Grantiella picta*) (NPWS, 2006). Malleefowl (*Leipoa ocellata*) were once present at Ingalba NR, but individuals or active breeding mounds have not been observed for over twenty years and it is considered to be locally extinct (NPWS, 2006).

Jindalee NP contains woodland habitat (including Box-Gum Woodland EEC) and numerous threatened species have been recorded there: Regent Honeyeater *(Anthochaera phrygia)*, Swift Parrot *(Lathamus discolor),* Superb Parrot *(Polytelis swainsonii),* Little Lorikeet *(Glossopsitta pusilla*), Brown Treecreeper *(Climacteris picumnus victoriae),* Speckled Warbler, Black-Chinned Honeyeater, Varied Sittella, Flame Robin *(Petroica phoenicea)*, Diamond Firetail, Grey-Crowned Babbler, Hooded Robin, Little Eagle *(Hieraaetus morphnoides),* Turquoise Parrot (*Neophema pulchella*), Painted Honeyeater, Squirrel Glider (*Petaurus norfolcensis)* and Eastern Pygmy-Possum *(Cercartetus nanus)* (OEH, 2011). The threatened Pine Donkey Orchid (*Diuris tricolor)* has also been recorded (OEH, 2011).

3.8.2 Key Biodiversity Areas

Key Biodiversity Areas (KBAs) are places of global significance for the conservation of birds and other wildlife, identified around the world by BirdLife and other conservation groups (BirdLife Australia, 2022). They supersede Important Bird Areas. Australia's KBA National Co-ordination Group includes representatives from DCCEEW (BirdLife Australia, 2022). The study area intersects two KBAs: South-west Slopes of NSW and Binya & Cocoparra National Parks. The Binya and Cocoparra KBA recognises the rich diversity of woodland birds present in Binya SF and the southern part of Cocoparra NP including one of largest known populations of Painted Honeyeater (*Certhionyx variegatus*) (BirdLife International, 2022). Other species include Flame Robin and Malleefowl (BirdLife International, 2022). The South-west Slopes KBA incorporates the core breeding area for Superb Parrot. More than half of the eastern portion of the study area occurs within this KBA (Figure 3-14).

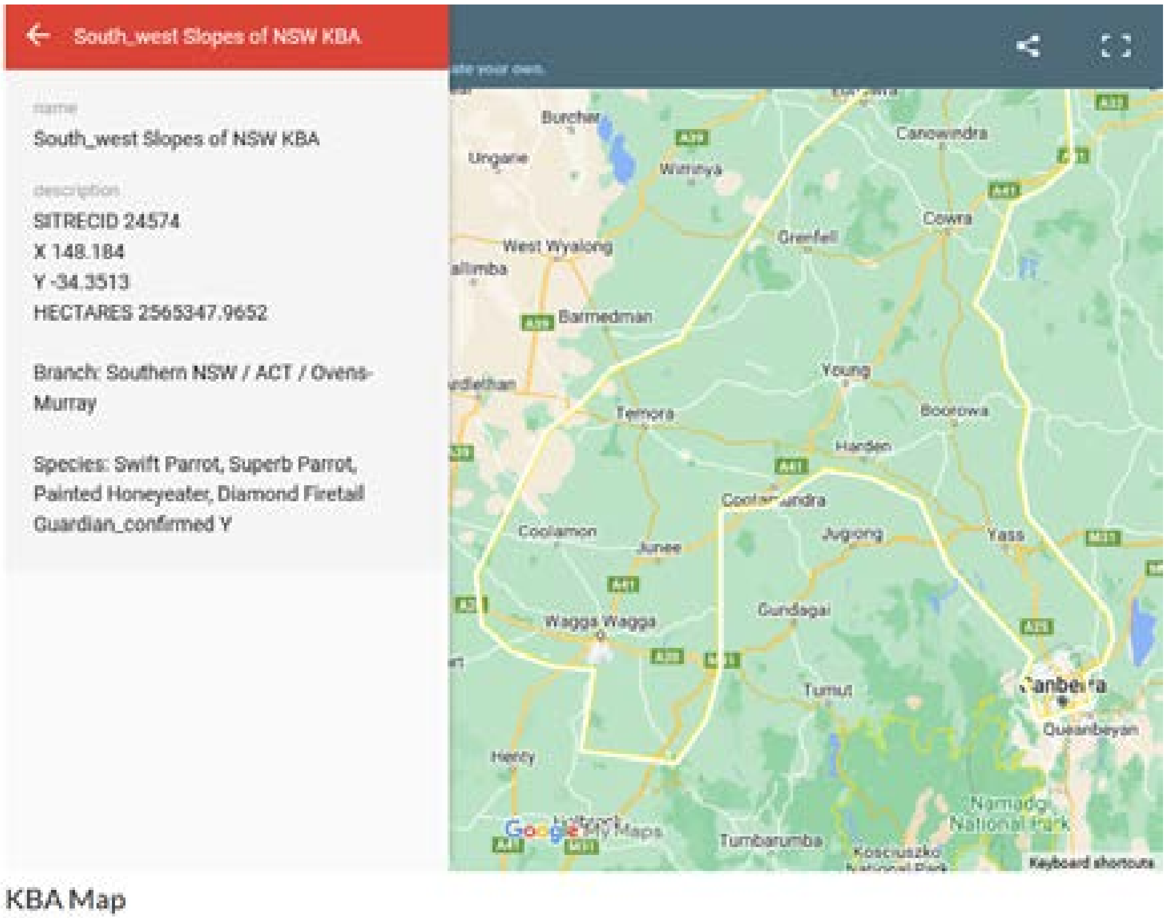

Figure 3-14 South-western Slopes KBA with the study area visible as the road between Ardlethan, Temora, Harden and Yass (BirdLife International, 2022)

3.9 Areas of Outstanding Biodiversity Value (where applicable)

No areas of outstanding biodiversity value occur within or adjacent to the study area.

3.10 SEPPs (where applicable)

The study area is located across eight LGAs. The Biodiversity and Conservation SEPP (2021) applies to three of these LGAs: Yass Valley, Hilltops, and Narrandera. Both Chapter 3 and Chapter 4 of the SEPP apply in these councils across differing land zones. Despite this, activities assessed under Part 5 of the EP&A Act are not subject to these sections of the SEPP. Koalas and their habitats are assessed under the BC Act, as has been undertaken in this BA.

3.11 Matters of National Environmental Significance

The Matters of National Environmental Significance (MNES) returned from the Protected Matters search on 26 April 2022 are given in Annexure B. Table 3-6 provides comment on search results. Note: threatened species and communities were discussed in Sections 3.5 and 3.7.2.

Table 3-6: Matters of National Environmental Significance

Matters of National Significance	MNES Search Results	Comment
World Heritage Properties	None	Not applicable.
National Heritage Places	None	Not applicable.
Wetlands of International Importance	5	- Tuckerbil swamp (37.82 km downstream; via Murrumbidgee River, Mirrool Creek, Little Mirool Creek and Main Gogeldrie Drain), and Fivebough Swamp (10.84 km further downstream from Tuckerbil Swamp via Main Gogeldrie Drain, total 48.66 km downstream from site) - Hattah-kulkyne lakes, 300 – 400 km upstream - Riverland, 400 – 500 km upstream - Banrock station wetland complex, 500 – 600 km upstream - The Coorong, and lakes Alexandrina and Albert wetland, 600 – 700 km upstream
Great Barrier Reef Marine Park	None	Not applicable.
Commonwealth Marine Areas	None	Not applicable. Subject site is not within marine environment.
Threatened Ecological Communities	6	Refer to Section 3.5
Threatened Species	50	Refer Section 3.7.
Migratory Species	18	No migratory species likely to depend upon habitat resources in the proposal area, although may occur (e.g. White-bellied Sea-eagle, White-throated Needletail). Refer to Annexure C for details.

4. Avoidance and Minimisation

The proposal has been an iterative process with the objective being to align the construction footprint to avoid biodiversity impacts wherever possible. Where it was not possible to avoid all impacts, the proposal was revised to minimise impacts as far as possible. The result is a construction footprint which has minimal impact upon vegetation connectivity at a landscape scale. Through early identification of biodiversity constraints, the following refinements were made to proposal design to avoid and minimise potential impacts to biodiversity:

- Minor shoulder works involving total vegetation removal reduced to six locations along 10.72 km of the proposal area.
- Limiting works in most high constraint areas to individual tree removal, with trees mulched and stumps ground using machinery located on the road. This would minimise impacts to surrounding vegetation including the ground cover.
- Avoiding remnant vegetation containing high density of HBTs.
- Avoiding eight specific HBTs that may be critical breeding habitat for Superb Parrot.
- Minimising works in roadside areas with native understory that could contain threatened flora in the understorey.
- Avoiding vegetation important for maintaining connectivity.
- Minimising impacts upon TECs and threatened species habitat.

Initial constraints analysis identified the proposal area could impact 489 ha of native vegetation, including 175.5 ha of high constraint vegetation. TfNSW has responded to iteratively redesign the construction footprint to reduce biodiversity impacts. The final construction footprint was drastically reduced from 489 ha to 14.7 ha, comprised of 14.18 ha (rounded herein to 14.2 ha) of native vegetation and 0.51 ha (rounded herein to 0.5 ha) of exotic vegetation (see Table 4-1).

Some areas or features were avoided for reasons other than protecting biodiversity values. This includes avoiding landscape features that may contain Aboriginal Sites or Places or roadside memorials. The primary reason for avoiding these areas may not have been to avoid biodiversity impacts but biodiversity impacts may have been avoided by this process as well.

Table 4-1: Construction footprint comparison assessment

Constraint Area	Initial Impact (ha), 1st design	Revised Impact (ha), 2nd design	Final Impact area (ha)
High	175.5	34.1	8.3
Moderate	62.6	11.4	5.5
Low	250.8	14.5	0.9
Total	**488.9**	**60**	**14.7**

5. Impact Assessment

Impacts to biodiversity from the proposal are primarily in the form of native vegetation clearing resulting in direct loss of TECs and fauna habitat, described in Sections 5.1 and sections 5.2.

5.1 Construction Direct Impacts

5.1.1 Removal of Native Vegetation and TEC

Vegetation Removal Including Ground Cover

The proposal is located within a linear vegetated area within the broader cleared agricultural landscape. It provides connectivity of woodland across the region. The linear nature of the vegetation has reduced its quality due to exacerbated edge effects from agricultural areas and the roadside environment. The proposal would result in the direct loss of 14.2 ha of native roadside vegetation as summarised in Table 5-1. Estimates of removal have been informed by design files provided by TfNSW. The proposed vegetation removal is linear in nature with the existing shape of the road reserve and would therefore increase existing edge effects. About 229 ha of native vegetation would remain in the proposal area and wider road reserve across the 285 km long proposal area.

The removal of native vegetation is part of the Key Threatening Process (KTP) - Clearing of native vegetation listed under Schedule 4 of the BC Act. The proposal is not considered to significantly increase this KTP given the large area the vegetation clearing would occur across a span of 285 km.

A large proportion of the native vegetation to be cleared are TECs. Of the 14.2 ha of native vegetation clearing, 2.8 ha is Grey Box Woodland EEC, and 10.3 ha is Box Gum Woodland CEEC (NSW listed) (Table 5-2). Calculations were undertaken using field BAM plot data and a GIS program to calculate which patches of these vegetation types would qualify for the more stringent Commonwealth definitions of TEC. As presented in Table 3-4, 6.5 ha of EPBC Act listed Box Gum Woodland CEEC would be cleared along with 1.7 ha of EPBC Act listed Grey Box Woodland EEC.

Table 5-1: Summary of direct impacts on native vegetation

Plant Community Type (PCT)	Status		Construction footprint[1] (ha)
	BC Act	EPBC Act	
PCT 54 Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion	Not TEC	Not TEC	1
PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt	Not TEC	Not TEC	0.02
PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion	Not TEC	Not TEC	0.05
PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion	Critically Endangered	Critically Endangered	0.01
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions	Endangered	Endangered	1.99
PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion	Not TEC	Not TEC	0
PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion	Endangered	Endangered	0.52
PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion	Endangered	Endangered	0.08

Plant Community Type (PCT)	Status		Construction footprint[1] (ha)
PCT 103 Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion	Not TEC	Not TEC	0.006
PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion	Endangered	Endangered	0.18
PCT 174 Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion	Not TEC	Not TEC	0
PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion	Not TEC	Not TEC	1.04
PCT 229 Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion	Not TEC	Not TEC	0
PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW	Critically Endangered	Critically Endangered	0.02
PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion	Critically Endangered	Critically Endangered	4.06
PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion	Critically Endangered	Critically Endangered	0.26
PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion	Critically Endangered	Critically Endangered	5.94
PCT 342 Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion	Critically Endangered	Critically Endangered	0
PCT 796 Derived grassland of the NSW South Western Slopes	Critically Endangered	Critically Endangered	0.007

Plant Community Type (PCT)	Status	Construction footprint[1] (ha)
Total		**14.18**

Note: 1- Area to be cleared based on ground-truthed vegetation mapping within the study area.

Table 5-2 Clearing areas of TEC

TEC	Status			Construction footprint[1] (ha)	Total clearing by EEC
	BC Act	EPBC Act			
Grey Box Woodland	Endangered	Endangered	PCT 76	1.99	2.77
			PCT 80	0.52	
			PCT 82	0.08	
			PCT 110	0.18	
Box Gum Woodland	Critically Endangered	Critically Endangered	PCT 74	0.01	
			PCT 250	0.02	
			PCT 266	4.06	
			PCT 276	0.26	
			PCT 277	5.94	
			PCT 342	0	

TEC	Status		Construction footprint[1] (ha)	Total clearing by EEC
		PCT 796	0.007	10.29
Total TEC				**13.06**

Hazardous Tree Removal

Many hazardous trees have been identified within the proposal area. These trees are planned to be individually removed with the trunks mulched and stumps ground using machinery. The large machinery use to mulch and grind stumps will be generally restricted to the already existing road corridor to minimise impacts on surrounding vegetation.

All trees that are planned to be removed have been mapped in GIS software and area calculation have been made to generate a total area of trees removed. This area has been included in the total clearing areas by PCT from all other direct impacts as per Table 5-1. Mapping the tree removal areas through this method means a precautionary approach has been taken assuming that some impacts to the PCTs under the canopy of these trees may be subject to some impacts (and hence some removal/disturbance of ground cover vegetation).

A total of 64 HBTs are included in this hazardous tree removal. A full list of HBTs and their number/size of hollows is provided in Annexure G. Removal of these HBTs may impact on threatened species, hence assessment of significance have been provided in Annexure E.

A soft fall felling method for the HBTs under the supervision of a fauna spotter catcher ecologist is recommended to assist with minimising impacts as described in the Tests of Significance.

5.1.2 Removal of Threatened Fauna Habitat

Fauna habitat will be lost through the removal of 14.2 ha of native vegetation within the proposal area. An estimated 64 of the 644 HBTs recorded within the proposal area would be removed. Microhabitat requirements such as hollows of particular dimensions or foraging habitat containing favoured flora species have been considered for each species. Table 5-3 lists the impacts of the proposal according to the potential impact type identified during habitat evaluation and/or significance assessments. With the impacts of the proposal spread over such an extensive area, impact assessment targeted key habitat areas based on literature and records.

For example, key Squirrel Glider habitat was identified at Jindalee NP which the proposal area borders at the northern end. It is unlikely that the proposal area itself would host the Jindalee Squirrel Glider population but would rather provide support to the population through connectivity and shelter resources. As such, connectivity between Jindalee NP and other sizeable woodland/forest remnants were considered along with HBTs along the corresponding stretch of Burley Griffin Way.

Tests of Significance (BC Act) and Assessments of Significance (EPBC Act) were undertaken for the species listed below which are likely to utilise habitat within the proposal area (Annexure C and E). The results of these assessments are discussed in Section 5.4.

Table 5-3: Impacts on threatened fauna and flora

Species	Potential impact type	Impact (ha/ individuals)	Habitat retained
Squirrel Glider	Fragmentation, loss of connectivity	0.3 ha habitat/corridor loss	Connectivity maintained, 11.3 ha habitat retain
	Removal of HBT	0 HBT	11 HBT

Species	Potential impact type	Impact (ha/ individuals)	Habitat retained
Speckled Warbler Shy Heathwren Dusky Woodswallow White-browed Treecreeper Brown Treecreeper Diamond Firetail Varied Sittella Gilbert's Whistler Hooded Robin Flame Robin Grey-crowned Babbler	Fragmentation, loss of connectivity	Increased gap size near Erigolia Rd intersection and parallel to Kamarah Tank Rd	Connectivity maintained
Glossy Black-Cockatoo Pink Cockatoo[2]	Fragmentation, loss of connectivity Removal of HBT	Up to 60 HBT's (excluding trees with small hollows)	Connectivity maintained > 500 HBT
Superb Parrot	Fragmentation, loss of connectivity Removal of HBT Clearing of Box Gum Woodland foraging habitat	64 HBT; an estimated 7-8 have suitable parameters for nesting 12.4 ha	Connectivity maintained >500 HBT retained ~129.6 ha
Pied Honeyeater	Fragmentation, loss of connectivity Clearing of specific foraging habitat	0.6 ha cleared with *Eremophila* spp.	
Painted Honeyeater	Fragmentation, loss of connectivity Clearing of specific foraging habitat	1.3 ha cleared with mistletoe species	

5.1.3 Removal of Threatened Flora

The proposal would not lead to the direct loss of any known individuals of threatened flora as none were recorded within the proposal area. Yass Daisy is likely to occur based on microhabitat preferences and known extant populations. **Table 5-4** summarises the extent of Yass Daisy habitat to be impacted compared to that available in the proposal area for Yass Daisy is highly restricted in extent of occurrence, with the population centred around the Yass-Harden area at the far eastern

[2] Also known as Major Mitchell's Cockatoo. Alternative common name used out of respect for Australian First Nations People

end of the proposal area. Up to 6.3 ha of roadside Box/Gum Woodland vegetation (PCT 277 and PCT 266) would be removed in the 'habitat area' identified (refer to Figure 9-6 in Annexure E).

Table 5-4: Summary of direct impacts on threatened flora

Threatened species	Ecosystem or species credit species	Status		Potential habitat impacted	Habitat retained
		BC Act	EPBC Act		
Yass Daisy	Species	V	V	6.3 ha	22.4 ha

5.1.4 Aquatic Impacts

No threatened aquatic species, populations, or communities have been identified in the proposal area or are considered likely to occur. No aquatic impacts are anticipated with the implementation of standard TfNSW mitigation measures.

5.1.5 Injury and Mortality

There is potential for wildlife injury or death to occur during the construction phase. Species at risk include nocturnal species such as possums, gliders, and microbats which shelter during the day. Ground dwelling species such as snakes, lizards, and small mammals could also be directly impacted. There is also the risk of displaced fauna succumbing to predation or stress induced by competing with existing resident populations for resources, particularly shelter/refuge habitat. Impacts will be mitigated through measures outlined in TfNSW's *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects.* This guideline includes 10 separate guides on how to manage biodiversity impacts during road work. These include Guide 1 pre-clearing process, Guide 4 clearing vegetation and bushrock, Guide 6 weed management, and Guide 9 fauna handling and other relevant guides.

5.1.6 Groundwater Dependent Ecosystems

The proposal area contains native vegetation that has a low or moderate likelihood of being groundwater dependent. Due to the scope of works the proposal is not considered to have an impact on groundwater or groundwater dependent ecosystems. This is discussed in Section 3.6.

5.2 Indirect and Operational Impacts

5.2.1 Edge Effects on Adjacent Native Vegetation and Habitat

Much of the vegetation in the proposal are consists of a narrow roadside strip of vegetation already subjected to edge effects, particularly in the western portion. Edge effects and habitat degradation may be exacerbated where the width of the vegetation corridor is reduced, e.g. the 3 km stretch east of Temora. However, this impact is limited to a few locations across the 285 km proposal area and is unlikely to substantially modify the quality and composition of native vegetation.

Where the proposal area traverses intact woodland/forest patches such as Binya SF, the proposed clearing would step the edge back by 10 m rather than introduce a new edge into virgin vegetation. Where the proposal involves clearing the only vegetation in the corridor such as east of Ariah Park, this affect connectivity (discussed below) but does not introduce edge effects. Standard clearing management measures such as weed hygiene controls during construction would minimise this effect.

5.2.2 Wildlife Connectivity and Habitat Fragmentation

Vegetation in the proposal area contributes to overall landscape connectivity across 285 km. In stretches such as in the eastern portion, landscape connectivity is supported by the habitat matrix of woodland remnants, scattered trees, and vegetated corridors. In other areas road corridor vegetation provides the only habitat corridors for wildlife connectivity. The proposal may potentially disrupt this connectivity as many fauna will not cross extended gaps of open canopy.

Although the roadside vegetation either side of Binya SF is discontinuous, it provides a crucial corridor to species adverse to gap crossing. Many woodland and forest birds are unlikely to cross gaps between trees greater than 100 m (Robertson & Radford, 2009; Brooker & Brooker, 2002). Between Binya SF and Erigolia Rd to the east, a distance of ~1.8km, the roadside vegetation is the only east-west corridor within several kilometres (~8km north and ~3.5km south). Refer to Figure 5-1.

The figures which follow (Figure 5-1 to Figure 5-5) have been created from screen shots of the GIS application used for mapping. Data attributions can be found on the fully formed maps (Figure 9-6).

Figure 5-1 Roadside vegetation east of Binya SF is discontinuous

Further east, the existing corridor becomes tenuous around the township of Binya, with garden plantings critical in maintaining functional connectivity in the east-west direction. The gaps between trees in this area are often around 100 m. Refer to Figure 5-2.

Figure 5-2 Tenuous vegetation corridor near townsip of Binya

Another area where the roadside vegetation in the proposal area may provide the only east-west corridor in the locality is either side of the township of Moonbooldool. For around 5 km west and 2.5 km east of the township, woodland birds such as Hooded Robin may depend upon the vegetation in the proposal area for dispersal (Figure 5-3). Other areas where the proposal area may provide an important connectivity function is between Kamarah and Ardlethan, along with the parallel Kamarah Tank Rd.

Figure 5-3 Roadside vegetation is important corridor near Moonbooldool

The construction footprint involves native vegetation removal along a 120 m strip a short distance east of the Erigolia Rd intersection and clusters of trees along about 600 m to the north-west of Dobells Rd intersection (west of Kamarah). No clearing is proposed in the corridors around Moonbooldool. At Erigolia Rd this would create a gap of around 65 m across the road, although continuous vegetation would remain directly east-west on the same side of the road along Binya Silos Rd. In the same area, east of the intersection there currently exists a gap of 110 m, which may reduce the value of the corridors to some species (Figure 5-4).

Figure 5-4 The construction footprint would not fragment already tenuous vegetation links around Erigolia Rd intersection

North-west of Dobells Rd, the vegetation removed would greatly affect the connectivity along Burley Griffin Way and create long gaps of unvegetated corridor. However, landscape connectivity would be maintained through the trees lining Kamarah Tank Rd which runs parallel to the proposal area about 30 m north (Figure 5-5).

Figure 5-5 Roadside vegetation along Kamarah Tank Rd maintains a corridor

The proposal would therefore not be expected to reduce the ability of species to disperse east-west from Binya SF to other woodland patches in the landscape as for the most part the vegetation along

Burley Griffin Way would be maintained. Where vegetation is to be cleared, the increased vegetation gap created across the road would not reduce connectivity east-west or increase the gap above the 100 m threshold that many species can tolerate, or above the existing gap distances.

5.2.3 Invasion and Spread of Weeds

The proposal has the potential to spread weeds during vegetation removal and through the movement of vehicles and machinery into or out of the proposal area. Weeds are easily transported as seeds and propagules on machinery brought to the proposal area. Equally, they can be carried away to other areas from the site or spread within it. High Threat Weeds were detected during BAM plots, mostly exotic grasses such as *Paspalum spp.*, the spread of which threatened native grassy woodland communities. African Lovegrass *(Eragrostis curvula)* was recorded (e.g. Plot 41). This weed can be difficult to control once established. Environmental weeds such as Blackberry (*Rubus fruticosus spp.*), Bridal Creeper (*Asparagus asparagoides)*, and African Boxthorn *(Lycium ferocissimum)* (e.g. Plot 41, 59, 7, respectively) were recorded along with common pasture weeds such as St John's Wort *(Hypericum perforatum)* and Common Sowthistle (*Sonchus oleraceus)*. Preventing the spread of weeds such as these is most important to protecting biodiversity values. With strict safeguards relating to weed hygiene as detailed in **Table 6-1**, weed spread should be manageable. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

5.2.4 Invasion and Spread of Pests

During construction the proposal has the potential to facilitate the spread of existing pest populations (i.e. rabbits) by providing shelter habitat in stockpiles of coarse woody debris. The risk is considered low due to the minimal native vegetation disturbance along the proposal area as a whole. TfNSW's strict hygiene management measures would be followed during construction and that would assist in preventing the spread of pests.

5.2.5 Invasion and Spread of Pathogens and Disease

During construction the proposal has the potential introduce or spread pathogens within the proposal area. This is particularly the case for fungus and diseases spread through the introduction and movement of soil. TfNSW's strict hygiene management measures would be followed during construction which would assist in preventing pathogens and disease.

5.2.6 Changes to Hydrology

Only minor alterations are expected to occur to the existing hydrological conditions within the proposal area. Proposed work includes widening or replacement of existing culverts and the reshaping of existing table drains as part of the road formation. Increased run off and nutrient load are likely to be minor due to the extent of works with the implementation of appropriated erosion and sediment controls.

5.2.7 Noise, Light, Dust and Vibration

Temporary disturbance to wildlife from noise emissions and light spill during construction and night works are likely to be localised to within 50-100 m of the work area. Impacts are not likely to have a significant long-term impact on wildlife that may occur within the proposal area or surrounding environment.

Noise, light, and vibration may disturb any microbats that may be roosting in the bark and hollows of trees within the proposal area. These species are tolerant to these types of anthropogenic disturbance as they commonly roost in culverts and trees beside busy roadways. However, during construction enough disturbance may be present such that it serves as a deterrent to the species returning to roost. Given that microbats are likely to have a range of roosting locations across their local range and roosting habitat (including HBTs) is prevalent in the surrounding landscape, they are unlikely to be significantly impacted.

5.3 Cumulative Impacts

Given the small extent of native vegetation and habitat proposed to be removed across such a large proposal area, the proposal is not considered to have significant ecological impacts in the local and regional context. However, impacts to biodiversity from this and other proposals along the Burley Griffin Way are likely to occur as a result of ongoing safety improvement works. These impacts would be mitigated or offset in accordance with the Transport Biodiversity Policy (2022) and Tree and Hollow Replacement Guidelines (2022).

5.4 Significant Impact Assessments

Significant impact assessments were undertaken for threatened species and ecological communities with a high likelihood of being dependent upon the resources in the proposal area. These assessments were supported by Scientific Determinations, Conservation Advice and Recovery Plans where available. Depending on the conservation status of each entity, either a Test of Significance (ToS) under the BC Act and/or an Assessment of Significance (AoS) under the EPBC Act was undertaken. The assessments are presented in Annexure E. Assessments have been grouped where species share ecological traits or habitat requirements such as woodland birds, blossom-feeding birds, and cockatoos/parrots.

Table 5-5 summarises the results of each NSW ToS question by species and provides an outcome of whether a significant impact is likely (yes or no). On balance, a significant impact upon NSW threatened species and communities is considered unlikely as a result of the proposal. It should be noted however that the ToS found that the importance of the habitat to be removed was high for:

- Box-Gum Woodland.
- Yass Daisy.
- Squirrel Glider.
- Glossy Black-Cockatoo.
- Superb Parrot.
- Pink Cockatoo.
- Pied Honeyeater.
- Painted Honeyeater.

The ToS also found that the proposal constitutes a key threatening process for:

- Glossy Black-Cockatoo.
- Pink Cockatoo.
- Superb Parrot.
- Painted Honeyeater.

Table 5-5: Summary of BC Act ToS

Threatened species or communities	Significance assessment question					Likely significant impact?
	a	b	c	d	e	
Threatened Ecological Communities						
Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions	-	N	N	n/a	N	**N**
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	-	N	Y	n/a	N	**N**
Flora						
Yass Daisy	N	-	Y	-	N	**N**
Fauna						
Squirrel Glider	N	-	Y	-	N	**N**
Speckled Warbler	N	-	N	-	N	**N**
Shy Heathwren	N	-	N	-	N	**N**
Dusky Woodswallow	N	-	N	-	N	**N**
White-browed Treecreeper	N	-	N	-	N	**N**
Brown Treecreeper	N	-	N	-	N	**N**

	Significance assessment question					Likely significant
Diamond Firetail	N	-	N	-	N	**N**
Varied Sittella	N	-	N	-	N	**N**
Gilbert's Whistler	N	-	N	-	N	**N**
Hooded Robin	N	-	N	-	N	**N**
Flame Robin	N	-	N	-	N	**N**
Grey-crowned Babbler	N	-	N	-	N	**N**
Glossy Black-Cockatoo	N	-	Y	-	Y	**N**
Pink Cockatoo	N	-	Y	-	Y	**N**
Superb Parrot	N	-	Y	-	Y	**N**
Pied Honeyeater	N	-	Y	-	N	**N**
Painted Honeyeater	N	-	Y	-	Y	**N**

Notes: Y= Yes (negative impact), N= No (no or positive impact), n/a= not applicable, ?= unknown impact

Table **5-6** provides the summary for EPBC Act AoS. On balance, a significant impact is **not** considered likely for EPBC Act listed species and communities. It should be noted however that the AoS found that the Superb Parrot and Yass Daisy populations in the study area are 'important populations'. For Superb Parrot, the proposal has the potential to:

- Affect habitat critical to survival.
- Disrupt breeding.
- Interfere substantially with species' recovery.

For Box Gum Woodland, the proposal has potential to:

- Reduce the extent of the community.
- Affect habitat critical to survival.
- Interfere with community recovery.

For Grey Box Woodland, the proposal has the potential to:

- Lead to a substantial change in community composition.

For Superb Parrot, the National Recovery Plan states that *"if removal of habitat critical to the survival cannot be avoided or mitigated, then an offset should be provided"* (p.11 (DAWE, 2021). Offsets are incorporated into the proposal and discussed in Section 7.

Table 5-6: Summary of EPBC Act significance assessments

	Superb Parrot	**Yass Daisy**
Important population?	**Yes**	**Yes**
Decrease size of population?	N	N
Reduce area of occupancy?	N	N
Fragment population?	N	N
Affect habitat critical to survival?	Y	N
Disrupt breeding?	Y	N
Affect habitat to cause species decline?	N	N
Invasive species?	N	N
Introduce disease?	N	N
Interfere substantially with recovery?	Y	N
Significant impact likely?	**No**	**No**

	Box Gum Woodland	**Grey Box Woodland**
Reduce extent of community?	Y	N
Fragment or increase EC fragmentation?	N	N

Affect habitat critical to survival?	Y	N
Modify or destroy abiotic factors?	N	N
Substantial change in composition?	N	Y
Substantial reduction in quality?	N	N
Interfere with recovery?	Y	N
Significant impact likely?	**No**	**No**

6. Mitigation

Mitigation measures recommended for the proposal are detailed in **Table 6-1** and include recommendations arising from significant impact assessments:

- Pre-clearance surveys for Yass Daisy between Harden and Hume Hwy intersection.
- Installation of nest boxes to replace hollows (some HBT bear multiple hollows) at a ratio of 1:1 on a like-for-like basis.
- Planting of frangible native vegetation at key connectivity corridor locations as detailed in this report.

Table 6-1: Mitigation measures

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Removal of native vegetation	Native vegetation removal will be minimised through detailed design.	Detailed design	Effective	Loss of 14.2 ha of native vegetation including 64 HBTs
	Pre-clearing surveys will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Prior to construction	Effective	
	Vegetation removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	
	Native vegetation will be re-established in accordance with *Guide 3: Re-establishment of native vegetation* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	Post construction	Effective	
	The unexpected species find procedure is to be followed under *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) if threatened ecological communities, not assessed in the biodiversity assessment, are identified in the construction footprint.	During construction	Proven	
	Biodiversity impacts will be mitigated or offset in accordance the *TfNSW Biodiversity Policy 2022* and *Tree and Hollow Replacement Guidelines* (2022)	Prior to construction	Effective	
Removal of threatened species habitat and habitat features	Habitat removal will be minimised through detailed design.	Detailed design	Effective	Loss of 14.2 ha of native vegetation including 64 HBTs
	Habitat removal will be undertaken in accordance with *Guide 4: Clearing of vegetation and removal of bushrock* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Loss of 14.2 ha of native vegetation including 64 HBTs

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
	Habitat will be replaced or re-instated in accordance with *Guide 5: Re-use of woody debris and bushrock* and *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Proven	Loss of 14.2 ha of native vegetation including 64 HBTs
	Nest boxes would be used to replace loss of HBTs in accordance with *Guide 8: Nest boxes* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) or more current transport guides.	During construction	Proven	Loss of 64 HBTs
Aquatic impacts	Aquatic habitat will be protected in accordance with *Guide 10: Aquatic habitats and riparian zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011) and Section 3.3.2 *Standard precautions and mitigation measures* of the *Policy and guidelines for fish habitat conservation and management Update 2013* (DPI (Fisheries NSW) 2013).	During construction	Effective	None
Groundwater dependent ecosystems	Specific mitigation not required.	N/a	n/a	n/a
Changes to hydrology	Specific mitigation not required.	N/a	n/a	n/a
Fragmentation of identified habitat corridors	Connectivity measures will be implemented in accordance with the *Wildlife Connectivity Guidelines for Road Projects* (RTA 2011).	Detailed design, during construction and post construction	Effective	None
	Incorporate plantings of native, frangible vegetation at key locations along the proposal area to secure and bolster connectivity.	During or post construction	Effective	None
	Any connectivity measures implemented will be installed under the supervision of an experienced ecologist.	During construction	Effective	None

Impact	Mitigation measures	Timing and duration	Likely efficacy of mitigation	Residual impacts anticipated
Edge effects on adjacent native vegetation and habitat	Exclusion zones will be set up at the limit of clearing in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Minimal
Injury and mortality of fauna	Fauna will be managed in accordance with *Guide 9: Fauna handling* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Minimal
Invasion and spread of weeds	Weed species will be managed in accordance with *Guide 6: Weed management* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Minimal
Invasion and spread of pests	Pest species will be managed within the construction footprint.	During construction	Effective	Minimal
Invasion and spread of pathogens and disease	Pathogens will be managed in accordance with *Guide 2: Exclusion zones* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011).	During construction	Effective	Minimal

7. Offset Strategy

Offset thresholds for REF projects assessed under Division 5.1 of the EP&A Act are outlined in the Glossary of Transport's *Biodiversity Policy 2022* (Policy Number: CP22004). The residual impacts to biodiversity from the proposal are considered to trigger the need for offsetting as there would be clearing of a nationally listed and NSW listed CEEC in moderate to good condition:

- BC Act listed: 10.30 ha of White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Associated PCTs 74; 250; 266; 276; 277; 342; 796).
- EPBC Act listed: 6.51 ha White box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands (Associated PCTs 74; 250; 266; 276; 277; 342; 796).

Works involving clearing of any habitat for a known species credit fauna species or clearing of breeding habitat (as defined by the TBDC) for dual-credit fauna species where clearing greater than one hectare in moderate to good condition.

As discussed in Section 5.4, the *National Recovery Plan* for Superb Parrot recommends offsets when clearing of habitat critical for survival cannot be avoided. The Superb Parrot habitat clearing is wholly Box-Gum Woodland TEC. Offsets for the TEC therefore encompass Superb Parrot also. Biodiversity impacts would be mitigated or offset in accordance with the TfNSW *Biodiversity Policy 2022* and associated Guidelines. A Biodiversity Offset Strategy will be developed and implemented. It will account for funded aspects of the work and will be staged in line with delivery phases.

8. Conclusion

Fourteen PCTs intersect with the construction footprint including two TECs listed under both NSW and Commonwealth legislation; they are:

- Inland Grey Box Woodland endangered ecological community (EEC).
- White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland critically endangered ecological community (CEEC).

The construction footprint will result in the removal of around 14.2 ha of native vegetation and 64 HBTs. Potential impacts arising for threatened fauna includes habitat fragmentation, loss of connectivity, loss of hollow-bearing trees, and loss of specific foraging habitat. Around 6.3 ha of potential habitat for the threatened Yass Daisy would be cleared. Around 10.3 ha of Box Gum Woodland EEC and 6.5 ha of Box Gum Woodland CEEC would be removed. Around 2.7 ha and 1.6 ha of Grey Box Woodland EEC and CEEC would be impacted by tree removal.

Tests of Significance under NSW legislation and Assessments of Significance under Commonwealth legislation found that significant impacts are not likely. Removal of Box-Gum Woodland TEC is inconsistent with the Superb Parrot and Box Gum Woodland National Recovery Plans. The assessments concluded a significant impact is not likely given the clearing is dispersed over a large area, the roadside is already subject to edge effects such as weeds, and the proposal would not affect connectivity between remnants.

Standard mitigation measures used by TfNSW for biodiversity management, would minimise and manage impacts. Site specific mitigation measures include:

- Pre-clearance surveys for Yass Daisy between Harden and Hume Hwy intersection.
- Planting of frangible native vegetation at key connectivity corridor locations as detailed in this report.
- A Biodiversity Offset Strategy will be developed in accordance with TfNSW *Biodiversity Policy 2022.* This will mitigate clearing of Box-Gum Woodland TEC and impacts to the Superb Parrot.

In summary, the project has been developed iteratively with the aim of avoiding impacts to biodiversity in the first instance. The final impact area impacts about 4% of the original high constraint native vegetation. Impacts to areas that cannot be avoided will be minimised through mitigation strategies. Biodiversity impacts would be mitigated or offset in accordance with TfNSW's Biodiversity Policy (2022) and related Guidelines. The project is unlikely to cause a significant impact to any threatened species or community.

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Annexure A – Species Recorded in the Study Area

Recorded Flora

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Anthericaceae	*Arthropodium milleflorum*	Pale Vanilla-lily	-	-
Flora	Anthericaceae	*Tricoryne elatior*	Yellow Autumn-lily	-	-
Flora	Apiaceae	*Hydrocotyle laxiflora*	Stinking Pennywort	-	-
Flora	Asphodelaceae	*Bulbine bulbosa*	Bulbine Lily	-	-
Flora	Asteraceae	*Brachyscome dentata*		-	-
Flora	Asteraceae	*Calotis cuneata*	Mountain Burr-Daisy	-	-
Flora	Asteraceae	*Calotis lappulacea*	Yellow Burr-daisy	-	-
Flora	Asteraceae	*Cassinia aculeata*	Dolly Bush	-	-
Flora	Asteraceae	*Cassinia arcuata*	Sifton Bush	-	-
Flora	Asteraceae	*Cassinia quinquefaria*		-	-
Flora	Asteraceae	*Cassinia sifton*		-	-
Flora	Asteraceae	*Chrysocephalum apiculatum*	Common Everlasting	-	-
Flora	Asteraceae	*Pseudognaphalium luteoalbum*	Jersey Cudweed	-	-
Flora	Asteraceae	*Solenogyne dominii*		-	-
Flora	Asteraceae	*Vittadinia cuneata*	A Fuzzweed	-	-
Flora	Asteraceae	*Vittadinia gracilis*	Woolly New Holland Daisy	-	-
Flora	Asteraceae	*Vittadinia muelleri*	A Fuzzweed	-	-
Flora	Asteraceae	*Xerochrysum viscosum*	Sticky Everlasting	-	-
Flora	Boraginaceae	*Cynoglossum australe*		-	-
Flora	Brassicaceae	*Lepidium africanum*	Common Peppercress	-	-
Flora	Brassicaceae	*Lepidium pseudohyssopifolium*	Peppercress	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Campanulaceae	*Wahlenbergia communis*	Tufted Bluebell	-	-
Flora	Campanulaceae	*Wahlenbergia luteola*	Bluebell	-	-
Flora	Campanulaceae	*Wahlenbergia spp.*	Bluebell	-	-
Flora	Campanulaceae	*Wahlenbergia spp.*	Bluebell	-	-
Flora	Campanulaceae	*Wahlenbergia stricta*	Tall Bluebell	-	-
Flora	Casuarinaceae	*Allocasuarina littoralis*	Black She-Oak	-	-
Flora	Casuarinaceae	*Allocasuarina luehmannii*	Bulloak	-	-
Flora	Casuarinaceae	*Allocasuarina verticillata*	Drooping Sheoak	-	-
Flora	Chenopodiaceae	*Atriplex semibaccata*	Creeping Saltbush	-	-
Flora	Chenopodiaceae	*Atriplex spp.*	A Saltbush	-	-
Flora	Chenopodiaceae	*Chenopodium desertorum subsp. anidiophyllum*		-	-
Flora	Chenopodiaceae	*Einadia hastata*	Berry Saltbush	-	-
Flora	Chenopodiaceae	*Einadia nutans*	Climbing Saltbush	-	-
Flora	Chenopodiaceae	*Einadia spp.*		-	-
Flora	Chenopodiaceae	*Einadia spp.*		-	-
Flora	Chenopodiaceae	*Enchylaena tomentosa*	Ruby Saltbush	-	-
Flora	Chenopodiaceae	*Maireana decalvans*	Black Cotton Bush	-	-
Flora	Chenopodiaceae	*Maireana enchylaenoides*	Wingless Fissure-weed	-	-
Flora	Chenopodiaceae	*Maireana microcarpa*		-	-
Flora	Chenopodiaceae	*Maireana microphylla*	Small-leaf Bluebush	-	-
Flora	Chenopodiaceae	*Maireana pentagona*	Hairy Bluebush, Slender Fissure-weed	-	-
Flora	Chenopodiaceae	*Maireana spp.*	Cotton Bush, Bluebush, Fissure-weed	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Convolvulaceae	*Dichondra repens*	Kidney Weed	-	-
Flora	Cupressaceae	*Callitris endlicheri*	Black Cypress Pine	-	-
Flora	Cupressaceae	*Callitris glaucophylla*	White Cypress Pine	-	-
Flora	Cupressaceae	*Callitris spp.*		-	-
Flora	Cyperaceae	*Carex appressa*	Tall Sedge	-	-
Flora	Cyperaceae	*Carex inversa*	Knob Sedge	-	-
Flora	Cyperaceae	*Carex spp.*		-	-
Flora	Cyperaceae	*Cyperus gracilis*	Slender Flat-sedge	-	-
Flora	Cyperaceae	*Cyperus spp.*		-	-
Flora	Cyperaceae	*Schoenoplectus spp.*		-	-
Flora	Ericaceae	*Astroloma humifusum*	Native Cranberry	-	-
Flora	Ericaceae	*Brachyloma spp.*	Daphne heaths	-	-
Flora	Ericaceae	*Lissanthe strigosa*	Peach Heath	-	-
Flora	Euphorbiaceae	*Chamaesyce drummondii*	Caustic Weed	-	-
Flora	Fabaceae (Faboideae)	*Daviesia mimosoides*		-	-
Flora	Fabaceae (Faboideae)	*Desmodium varians*	Slender Tick-trefoil	-	-
Flora	Fabaceae (Faboideae)	*Dillwynia phylicoides*	Parrot-pea	-	-
Flora	Fabaceae (Faboideae)	*Glycine canescens*	Silky Glycine	-	-
Flora	Fabaceae (Faboideae)	*Glycine clandestina*	Twining glycine	-	-
Flora	Fabaceae (Faboideae)	*Hardenbergia violacea*	False Sarsaparilla	-	-
Flora	Fabaceae (Faboideae)	*Pultenaea microphylla*	A Bush Pea	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia aspera*	Rough Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia buxifolia*	Box-leaved Wattle	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Fabaceae (Mimosoideae)	*Acacia centrinervia*		-	-
Flora	Fabaceae (Mimosoideae)	*Acacia dealbata*	Silver Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia deanei*	Green Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia decora*	Western Silver Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia decurrens*	Black Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia genistifolia*	Early Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia hakeoides*	Hakea Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia implexa*	Hickory Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia longifolia*		-	-
Flora	Fabaceae (Mimosoideae)	*Acacia rubida*	Red-stemmed Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia spp.*	Wattle	-	-
Flora	Fabaceae (Mimosoideae)	*Acacia verniciflua*	Varnish Wattle	-	-
Flora	Geraniaceae	*Erodium crinitum*	Blue Crowfoot	-	-
Flora	Geraniaceae	*Geranium retrorsum*	Cranesbill Geranium	-	-
Flora	Geraniaceae	*Geranium solanderi*	Native Geranium	-	-
Flora	Goodeniaceae	*Goodenia hederacea subsp. hederacea*		-	-
Flora	Goodeniaceae	*Goodenia pinnatifida*	Scrambles Eggs	-	-
Flora	Juncaceae	*Juncus australis*	Rush	-	-
Flora	Juncaceae	*Juncus filicaulis*		-	-
Flora	Juncaceae	*Juncus spp.*	A Rush	-	-
Flora	Lamiaceae	*Mentha satureioides*	Native Pennyroyal	-	-
Flora	Lauraceae	*Cassytha pubescens*	Downy Dodder-laurel	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Lomandraceae	*Lomandra filiformis*		-	-
Flora	Lomandraceae	*Lomandra filiformis subsp. coriacea*	Wattle Matt-rush	-	-
Flora	Lomandraceae	*Lomandra filiformis subsp. filiformis*		-	-
Flora	Lomandraceae	*Lomandra filiformis subsp. flavior*	Wattle Matt-rush	-	-
Flora	Lomandraceae	*Lomandra multiflora subsp. multiflora*	Many-flowered Mat-rush	-	-
Flora	Loranthaceae	*Amyema miquelii*	Box Mistletoe	-	-
Flora	Loranthaceae	*Amyema pendula*	Drooping Mistletoe	-	-
Flora	Lythraceae	*Lythrum hyssopifolia*	Hyssop Loosestrife	-	-
Flora	Malvaceae	*Brachychiton populneus*	Kurrajong	-	-
Flora	Malvaceae	*Brachychiton spp.*		-	-
Flora	Malvaceae	*Brachychiton spp.*		-	-
Flora	Malvaceae	*Sida corrugata*	Corrugated Sida	-	-
Flora	Myoporaceae	*Eremophila debilis*	Amulla	-	-
Flora	Myoporaceae	*Myoporum montanum*	Western Boobialla	-	-
Flora	Myrtaceae	*Angophora floribunda*	Rough-barked Apple	-	-
Flora	Myrtaceae	*Callistemon spp.*		-	-
Flora	Myrtaceae	*Eucalyptus albens*	White Box	-	-
Flora	Myrtaceae	*Eucalyptus blakelyi*	Blakely's Red Gum	-	-
Flora	Myrtaceae	*Eucalyptus bridgesiana*	Apple Box	-	-
Flora	Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	-	-
Flora	Myrtaceae	*Eucalyptus camaldulensis*	River Red Gum	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Myrtaceae	*Eucalyptus cinerea*	Argyle Apple	-	-
Flora	Myrtaceae	*Eucalyptus dealbata*	Tumbledown Red Gum	-	-
Flora	Myrtaceae	*Eucalyptus goniocalyx*	Bundy	-	-
Flora	Myrtaceae	*Eucalyptus macrorhyncha*	Red Stringybark	-	-
Flora	Myrtaceae	*Eucalyptus melliodora*	Yellow Box	-	-
Flora	Myrtaceae	*Eucalyptus microcarpa*	Western Grey Box	-	-
Flora	Myrtaceae	*Eucalyptus moluccana*	Grey Box	-	-
Flora	Myrtaceae	*Eucalyptus polyanthemos*	Red Box	-	-
Flora	Myrtaceae	*Eucalyptus populnea*	Bimble Box	-	-
Flora	Myrtaceae	*Eucalyptus populnea*	Bimble Box	-	-
Flora	Myrtaceae	*Eucalyptus rubida*	Candlebark	-	-
Flora	Myrtaceae	*Eucalyptus siderophloia*	Grey Ironbark	-	-
Flora	Myrtaceae	*Eucalyptus sideroxylon*	Mugga Ironbark	-	-
Flora	Myrtaceae	*Kunzea spp.*		-	-
Flora	Onagraceae	*Oenothera stricta*		-	-
Flora	Oxalidaceae	*Oxalis perennans*		-	-
Flora	Oxalidaceae	*Oxalis spp.*		-	-
Flora	Phormiaceae	*Dianella longifolia*	Blueberry Lily	-	-
Flora	Phormiaceae	*Dianella longifolia var. longifolia*	A Blue Flax Lily	-	-
Flora	Phormiaceae	*Dianella revoluta*	Blueberry Lily	-	-
Flora	Phormiaceae	*Dianella tarda*	Late-flower Flax-lily	-	-
Flora	Pinaceae	*Pinus radiata*	Radiata Pine	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Plantaginaceae	*Plantago debilis*	Shade Plantain	-	-
Flora	Plantaginaceae	*Plantago varia*		-	-
Flora	Plantaginaceae	*Veronica calycina*	Hairy Speedwell	-	-
Flora	Plantaginaceae	*Veronica gracilis*		-	-
Flora	Poaceae	*Aristida behriana*	Bunch Wiregrass	-	-
Flora	Poaceae	*Aristida ramosa*	Purple Wiregrass	-	-
Flora	Poaceae	*Austrodanthonia spp.*	A Wallaby Grass	-	-
Flora	Poaceae	*Austrostipa aristiglumis*	Plains Grass	-	-
Flora	Poaceae	*Austrostipa aristiglumis*	Plains Grass	-	-
Flora	Poaceae	*Austrostipa bigeniculata*	Yanganbil	-	-
Flora	Poaceae	*Austrostipa densiflora*	Foxtail Speargrass	-	-
Flora	Poaceae	*Austrostipa scabra*	Speargrass	-	-
Flora	Poaceae	*Austrostipa spp.*	A Speargrass	-	-
Flora	Poaceae	*Bothriochloa macra*	Red Grass	-	-
Flora	Poaceae	*Chloris divaricata var. divaricata*	Slender Chloris	-	-
Flora	Poaceae	*Chloris truncata*	Windmill Grass	-	-
Flora	Poaceae	*Chloris truncata*	Windmill Grass	-	-
Flora	Poaceae	*Chloris ventricosa*	Tall Chloris	-	-
Flora	Poaceae	*Cymbopogon refractus*	Barbed Wire Grass	-	-
Flora	Poaceae	*Cynodon dactylon*	Common Couch	-	-
Flora	Poaceae	*Dichanthium sericeum*	Queensland Bluegrass	-	-
Flora	Poaceae	*Digitaria divaricatissima*	Umbrella Grass	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Poaceae	*Elymus scaber*	Common Wheatgrass	-	-
Flora	Poaceae	*Enneapogon nigricans*	Niggerheads	-	-
Flora	Poaceae	*Enteropogon acicularis*	Curly Windmill Grass	-	-
Flora	Poaceae	*Enteropogon spp.*	Windmill Grass	-	-
Flora	Poaceae	*Eragrostis brownii*	Brown's Lovegrass	-	-
Flora	Poaceae	*Eragrostis brownii*	Brown's Lovegrass	-	-
Flora	Poaceae	*Eragrostis elongata*	Clustered Lovegrass	-	-
Flora	Poaceae	*Eragrostis leptostachya*	Paddock Lovegrass	-	-
Flora	Poaceae	*Eragrostis parviflora*	Weeping Lovegrass	-	-
Flora	Poaceae	*Eriochloa pseudoacrotricha*	Early Spring Grass	-	-
Flora	Poaceae	*Microlaena stipoides*	Weeping Grass	-	-
Flora	Poaceae	*Panicum effusum*	Hairy Panic	-	-
Flora	Poaceae	*Panicum queenslandicum*	Yadbila Grass	-	-
Flora	Poaceae	*Panicum spp.*	Panicum	-	-
Flora	Poaceae	*Paspalidium distans*		-	-
Flora	Poaceae	*Paspalidium spp.*		-	-
Flora	Poaceae	*Poa sieberiana var. cyanophylla*		-	-
Flora	Poaceae	*Poa sieberiana var. sieberiana*	Snowgrass	-	-
Flora	Poaceae	*Rytidosperma bipartitum*	Wallaby Grass	-	-
Flora	Poaceae	*Rytidosperma caespitosum*	Ringed Wallaby Grass	-	-
Flora	Poaceae	*Rytidosperma pallidum*	Redanther Wallaby Grass; Silvertop Wallaby Grass	-	-
Flora	Poaceae	*Rytidosperma racemosum*	Wallaby Grass	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Poaceae	*Rytidosperma racemosum var. obtusatum*	Wallaby Grass	-	-
Flora	Poaceae	*Rytidosperma racemosum var. racemosum*	Wallaby Grass	-	-
Flora	Poaceae	*Rytidosperma richardsonii*	Straw Wallaby-grass	-	-
Flora	Poaceae	*Rytidosperma setaceum*	Small-flowered Wallaby-grass	-	-
Flora	Poaceae	*Rytidosperma spp.*		-	-
Flora	Poaceae	*Rytidosperma spp.*		-	-
Flora	Poaceae	*Sporobolus creber*	Slender Rat's Tail Grass	-	-
Flora	Poaceae	*Sporobolus spp.*	Rat's Tail Couch	-	-
Flora	Poaceae	*Themeda triandra*		-	-
Flora	Polygonaceae	*Rumex brownii*	Swamp Dock	-	-
Flora	Proteaceae	*Grevillea linearifolia*	Linear-leaf Grevillea	-	-
Flora	Pteridaceae	*Cheilanthes sieberi*	Rock Fern	-	-
Flora	Pteridaceae	*Cheilanthes sieberi subsp. sieberi*	Rock Fern	-	-
Flora	Rosaceae	*Acaena novae-zelandiae*	Bidgee-widgee	-	-
Flora	Rosaceae	*Acaena ovina*	Acaena	-	-
Flora	Rubiaceae	*Asperula conferta*	Common Woodruff	-	-
Flora	Santalaceae	*Exocarpos cupressiformis*	Cherry Ballart	-	-
Flora	Sapindaceae	*Dodonaea viscosa*	Sticky Hop-bush	-	-
Flora	Sapindaceae	*Dodonaea viscosa subsp. cuneata*	Wedge-leaf Hop-bush	-	-
Flora	Sapindaceae	*Dodonaea viscosa subsp. spatulata*	Broad-leaf Hopbush	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora	Solanaceae	*Solanum prinophyllum*	Forest Nightshade	-	-
Flora	Solanaceae	*Solanum spp.*		-	-
Flora	Thymelaeaceae	*Pimelea curviflora*	Rice Flower	-	-
Flora	Thymelaeaceae	*Pimelea linifolia*	Slender Rice Flower	-	-
Flora - Exotic Species	Apiaceae	*Cyclospermum leptophyllum*	Slender Celery	-	-
Flora - Exotic Species	Apiaceae	*Foeniculum vulgare*	Fennel	-	-
Flora - Exotic Species	Asparagaceae	*Asparagus asparagoides*	Bridal Creeper	-	-
Flora - Exotic Species	Asteraceae	*Arctotheca calendula*	Capeweed	-	-
Flora - Exotic Species	Asteraceae	*Cirsium vulgare*	Spear Thistle	-	-
Flora - Exotic Species	Asteraceae	*Conyza bonariensis*	Flaxleaf Fleabane	-	-
Flora - Exotic Species	Asteraceae	*Conyza parva*	Fleabane	-	-
Flora - Exotic Species	Asteraceae	*Gazania spp.1*		-	-
Flora - Exotic Species	Asteraceae	*Gazania spp.2*		-	-
Flora - Exotic Species	Asteraceae	*Hypochaeris glabra*	Smooth Catsear	-	-
Flora - Exotic Species	Asteraceae	*Hypochaeris radicata*	Catsear	-	-
Flora - Exotic Species	Asteraceae	*Lactuca serriola*	Prickly Lettuce	-	-
Flora - Exotic Species	Asteraceae	*Onopordum illyricum subsp. illyricum*	Illyrian Thistle	-	-
Flora - Exotic Species	Asteraceae	*Onopordum spp.*		-	-
Flora - Exotic Species	Asteraceae	*Sonchus oleraceus*	Common Sowthistle	-	-
Flora - Exotic Species	Asteraceae	*Taraxacum officinale*	Dandelion	-	-
Flora - Exotic Species	Asteraceae	*Tragopogon dubius*	Goatsbeard	-	-
Flora - Exotic Species	Asteraceae	*Tragopogon spp.*		-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora - Exotic Species	Boraginaceae	*Echium plantagineum*	Patterson's Curse	-	-
Flora - Exotic Species	Brassicaceae	*Brassica nigra*	Black Mustard	-	-
Flora - Exotic Species	Brassicaceae	*Lepidium spp.*	A Peppercress	-	-
Flora - Exotic Species	Brassicaceae	*Sisymbrium officinale*	Hedge Mustard	-	-
Flora - Exotic Species	Caryophyllaceae	*Paronychia brasiliana*	Chilean Whitlow Wort, Brazilian Whitlow	-	-
Flora - Exotic Species	Caryophyllaceae	*Petrorhagia nanteuilii*	Proliferous Pink	-	-
Flora - Exotic Species	Clusiaceae	*Hypericum perforatum*	St. Johns Wort	-	-
Flora - Exotic Species	Convolvulaceae	*Convolvulus arvensis*	Field Bindweed	-	-
Flora - Exotic Species	Cyperaceae	*Cyperus eragrostis*	Umbrella Sedge	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Chamaecytisus palmensis*	Tree Lucerne	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Trifolium angustifolium*	Narrow-leaved Clover	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Trifolium arvense*	Haresfoot Clover	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Trifolium campestre*	Hop Clover	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Trifolium repens*	White Clover	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Trifolium subterraneum*	Subterranean Clover	-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Ulex spp.*		-	-
Flora - Exotic Species	Fabaceae (Faboideae)	*Vicia sativa*	Common vetch	-	-
Flora - Exotic Species	Gentianaceae	*Centaurium erythraea*	Common Centaury	-	-
Flora - Exotic Species	Geraniaceae	*Erodium botrys*	Long Storksbill	-	-
Flora - Exotic Species	Iridaceae	*Freesia spp.*		-	-
Flora - Exotic Species	Iridaceae	*Romulea rosea var. australis*	Onion Grass	-	-
Flora - Exotic Species	Lamiaceae	*Marrubium vulgare*	White Horehound	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora - Exotic Species	Lamiaceae	*Salvia verbenaca*	Vervain	-	-
Flora - Exotic Species	Malaceae	*Crataegus monogyna*	Hawthorn	-	-
Flora - Exotic Species	Malaceae	*Malus domestica*	Apple	-	-
Flora - Exotic Species	Malaceae	*Malus pumila*	Apple	-	-
Flora - Exotic Species	Malvaceae	*Malva neglecta*	Dwarf Mallow	-	-
Flora - Exotic Species	Malvaceae	*Sida rhombifolia*	Paddy's Lucerne	-	-
Flora - Exotic Species	Malvaceae	*Sida spp.*		-	-
Flora - Exotic Species	Oleaceae	*Ligustrum lucidum*	Large-leaved Privet	-	-
Flora - Exotic Species	Oleaceae	*Olea europaea*	Common Olive	-	-
Flora - Exotic Species	Onagraceae	*Epilobium ciliatum*		-	-
Flora - Exotic Species	Oxalidaceae	*Oxalis corniculata*	Creeping Oxalis	-	-
Flora - Exotic Species	Oxalidaceae	*Oxalis pes-caprae*	Soursob	-	-
Flora - Exotic Species	Oxalidaceae	*Oxalis thompsoniae*		-	-
Flora - Exotic Species	Plantaginaceae	*Plantago coronopus subsp. coronopus*		-	-
Flora - Exotic Species	Plantaginaceae	*Plantago lanceolata*	Lamb's Tongues	-	-
Flora - Exotic Species	Poaceae	*Avena sativa*	Oats	-	-
Flora - Exotic Species	Poaceae	*Avena spp.*	Oats	-	-
Flora - Exotic Species	Poaceae	*Briza maxima*	Quaking Grass	-	-
Flora - Exotic Species	Poaceae	*Bromus catharticus*	Praire Grass	-	-
Flora - Exotic Species	Poaceae	*Bromus diandrus*	Great Brome	-	-
Flora - Exotic Species	Poaceae	*Bromus hordeaceus*	Soft Brome	-	-
Flora - Exotic Species	Poaceae	*Bromus rubens*	Red Brome	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora - Exotic Species	Poaceae	*Cynosurus echinatus*	Rough Dog's Tail	-	-
Flora - Exotic Species	Poaceae	*Dactylis glomerata*	Cocksfoot	-	-
Flora - Exotic Species	Poaceae	*Eragrostis cilianensis*	Stinkgrass	-	-
Flora - Exotic Species	Poaceae	*Eragrostis curvula*	African Lovegrass	-	-
Flora - Exotic Species	Poaceae	*Eragrostis pilosa*	Soft Lovegrass	-	-
Flora - Exotic Species	Poaceae	*Eragrostis spp.*	A Lovegrass	-	-
Flora - Exotic Species	Poaceae	*Eragrostis spp.*	A Lovegrass	-	-
Flora - Exotic Species	Poaceae	*Festuca pratensis*	Meadow Fescue	-	-
Flora - Exotic Species	Poaceae	*Festuca spp.*		-	-
Flora - Exotic Species	Poaceae	*Holcus lanatus*	Yorkshire Fog	-	-
Flora - Exotic Species	Poaceae	*Lolium perenne*	Perennial Ryegrass	-	-
Flora - Exotic Species	Poaceae	*Lolium rigidum*	Wimmera Ryegrass	-	-
Flora - Exotic Species	Poaceae	*Lolium spp.*	A Ryegrass	-	-
Flora - Exotic Species	Poaceae	*Panicum capillare*	Witchgrass	-	-
Flora - Exotic Species	Poaceae	*Panicum spp.*	Panicum	-	-
Flora - Exotic Species	Poaceae	*Paspalum dilatatum*	Paspalum	-	-
Flora - Exotic Species	Poaceae	*Phalaris aquatica*	Phalaris	-	-
Flora - Exotic Species	Poaceae	*Setaria parviflora*		-	-
Flora - Exotic Species	Poaceae	*Setaria pumila*	Pale Pigeon Grass	-	-
Flora - Exotic Species	Poaceae	*Sporobolus africanus*	Parramatta Grass	-	-
Flora - Exotic Species	Poaceae	*Sporobolus spp.*	Rat's Tail Couch	-	-
Flora - Exotic Species	Poaceae	*Vulpia spp.*	Rat's-tail Fescue	-	-
Flora - Exotic Species	Polygonaceae	*Acetosella vulgaris*	Sheep Sorrel	-	-

Type	Family	Scientific Name	Common Name	BC Act	EPBC Act
Flora - Exotic Species	Polygonaceae	*Polygonum aviculare*	Wireweed	-	-
Flora - Exotic Species	Polygonaceae	*Rumex conglomeratus*	Clustered Dock	-	-
Flora - Exotic Species	Polygonaceae	*Rumex crispus*	Curled Dock	-	-
Flora - Exotic Species	Polygonaceae	*Rumex spp.1*	Dock	-	-
Flora - Exotic Species	Polygonaceae	*Rumex spp.2*	Dock	-	-
Flora - Exotic Species	Primulaceae	*Lysimachia arvensis*	Scarlet Pimpernel	-	-
Flora - Exotic Species	Rosaceae	*Rosa rubiginosa*	Sweet Briar	-	-
Flora - Exotic Species	Rosaceae	*Rubus fruticosus sp. agg.*	Blackberry complex	-	-
Flora - Exotic Species	Rosaceae	*Sanguisorba minor subsp. muricata*	Sheep's Burnet	-	-
Flora - Exotic Species	Rubiaceae	*Galium aparine*	Goosegrass	-	-
Flora - Exotic Species	Scrophulariaceae	*Orobanche minor*	Broomrape	-	-
Flora - Exotic Species	Scrophulariaceae	*Verbascum thapsus subsp. thapsus*	Great Mullein	-	-
Flora - Exotic Species	Solanaceae	*Lycium ferocissimum*	African Boxthorn	-	-
Flora - Exotic Species	Solanaceae	*Solanum laxum*	Potato Climber	-	-
Flora - Exotic Species	Solanaceae	*Solanum nigrum*	Black-berry Nightshade	-	-
Flora - Exotic Species	Solanaceae	*Solanum spp.*		-	-
Flora - Exotic Species	Verbenaceae	*Verbena bonariensis*	Purpletop	-	-

Recorded Fauna

Class	Family	Scientific Name	Common Name	Status	
				BC Act	EPBC Act
Amphibia		*Anura spp.*	Frog Species	-	-
Reptiles	Scincidae	*Scincidae spp.*	Skink sp.	-	-
Aves	Accipitridae	*Aquila audax*	Wedge-tailed Eagle	-	-
Aves	Accipitridae	*Milvus migrans*	Black Kite	-	-
Aves	Ardeidae	*Ardea modesta*	Eastern Great Egret	-	-
Aves	Cacatuidae	*Cacatua galerita*	Sulphur-crested Cockatoo	-	-
Aves	Cacatuidae	*Eolophus roseicapillus*	Galah	-	-
Aves	Columbidae	*Ocyphaps lophotes*	Crested Pigeon	-	-
Aves	Corcoracidae	*Corcorax melanorhamphos*	White-winged Chough	-	-
Aves	Corcoracidae	*Struthidea cinerea*	Apostlebird	-	-
Aves	Corvidae	*Corvus coronoides*	Australian Raven	-	-
Aves	Falconidae	*Falco berigora*	Brown Falcon	-	-
Aves	Falconidae	*Falco cenchroides*	Nankeen Kestrel	-	-
Aves	Falconidae	*Falco subniger*	Black Falcon	Vulnerable	-
Aves	Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	-	-
Aves	Meliphagidae	*Manorina melanocephala*	Noisy Miner	-	-
Aves	Monarchidae	*Grallina cyanoleuca*	Magpie-lark	-	-
Aves	Psittacidae	*Northiella haematogaster*	Blue Bonnet	-	-
Aves	Psittacidae	*Platycercus eximius*	Eastern Rosella	-	-
Aves	Psittacidae	*Polytelis swainsonii*	Superb Parrot	Vulnerable	Vulnerable
Aves	Psittacidae	*Psephotus haematonotus*	Red-rumped Parrot	-	-
Aves	Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail	-	-

Annexure B – Database Search Results

Results are appended overleaf.

Annexure C – Habitat Assessment Table

Likelihood of Occurrence Criteria

Likelihood	Criteria
Recorded	The species was observed in the study area during the current survey
High	It is highly likely that a species inhabits the study area and is dependant on identified suitable habitat (ie. for breeding or important life cycle periods such as winter flowering resources), has been recorded recently in the locality (10km) and is known or likely to maintain resident populations in the study area. Also includes species known or likely to visit the study area during regular seasonal movements or migration.
Moderate	Potential habitat is present in the study area. Species unlikely to maintain sedentary populations, however may seasonally use resources within the study area opportunistically or during migration. The species is unlikely to be dependent (i.e.. for breeding or important life cycle periods such as winter flowering resources) on habitat within the study area, or habitat is in a modified or degraded state. Includes cryptic flowering flora species that were not seasonally targeted by surveys and that have not been recorded.
Low	It is unlikely that the species inhabits the study area and has not been recorded recently in the locality (10km). It may be an occasional visitor, but habitat similar to the study area is widely distributed in the local area, meaning that the species is not dependent (ie. for breeding or important life cycle periods such as winter flowering resources) on available habitat. Specific habitat is not present in the study area or the species are a non-cryptic perennial flora species that were specifically targeted by surveys and not recorded.
None	Suitable habitat is absent from the study area. Based on a field assessment of the habitat constraints or microhabitats on the study area, the habitat is identified as being substantially degraded such that the species is unlikely to utilise the study area (or specific vegetation zones), or an expert report that is prepared that states the species is unlikely to be present on the study area or specific vegetation zones.

Habitat Assessment Table

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Threatened Ecological Communities					
Acacia loderi shrublands	E		The Acacia loderi Shrublands are known from the Broken Hill Complex, Murray-Darling Depression, Cobar Peneplain, Riverina, Mulga Lands and Darling Riverine Plains Bioregions. Sites occur from south-western NSW to north-western Victoria and eastern South Australia. In NSW, the community is mainly confined to south-western NSW, extending east to Hillston and north to White Cliffs. The major stands occur between Broken Hill, Ivanhoe and Wilcannia, while isolated stands occur beyond these areas.	NA	Low. Associated PCT's with key characteristic species were not detected within the study area during site surveys
Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions	E		Acacia melvillei Shrubland in the Riverina and Murray-Darling Depression bioregions is the name given to the ecological community that is dominated by Acacia melvillei (Yarran). Acacia melvillei Shrubland typically has an open canopy of shrubs or small trees, sometimes with scattered mid-stratum shrubs, and with a sometimes sparse, but highly variable ground layer dominated by grasses, chenopods and herbs. The structure and species composition of the community varies depending on disturbance history and temporal variability in rainfall.	NA	None. No associated PCTs occur within the study area
Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression Bioregions	E		Allocasuarina luehmannii Woodland in the Riverina and Murray-Darling Depression bioregions is the name given to the ecological community dominated by Buloke (Allocasuarina luehmannii), sometimes with co-occurring tree species. The community typically comprises an open tree canopy with a sparse and highly variable ground layer dominated by grasses and herbs, sometimes with scattered shrubs and/or small trees.	NA	None. No associated PCTs occur within the study area
Coolac-Tumut Serpentinite Shrubby Woodland in the NSW South Western Slopes and South Eastern Highlands Bioregions	E		Serpentinite Shrubby Woodland is restricted to soils derived from serpentinite in the Tumut-Coolac-Gundagai area. The largest occurrence is on the Honeysuckle range to the east of Tumut which extends from Argalong to the Murrumbidgee River. There are other smaller areas near Coolac and Gundagai.	NA	None. No associated PCTs occur within the study area
Fuzzy Box Woodland on alluvial Soils of the South Western Slopes, Darling Riverine Plains and	E		Alluvial soils of the South West Slopes, Brigalow Belt South and Darling Riverine Plains Bioregions. Mainly in the Dubbo-Narromine-Parkes-Forbes area.	NA	None. No associated PCTs occur within the study area

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Brigalow Belt South Bioregions					
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-eastern Australia (EPBC) / *Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions* (BC)	E	E	Inland Grey Box Woodland occurs predominately within the Riverina and South West Slopes regions of NSW down to the Victorian border. It includes Albury to the east and may extend out west towards Hay. This community also extends across the slopes and plains in Central and Northern NSW up to the Queensland Border. This includes Yetman and Inverell in the North, Molong to the east of the Central Slopes and plains and out towards Nymagee to the west.	NA	Recorded. Associated with PCTs identified within the study area which meet the EPBC requirements for this TEC. AoS and ToS required.
Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes Bioregion	CE		Mallee and Mallee-Broombush dominated woodland and shrubland, lacking Triodia, in the NSW South Western Slopes has a very highly restricted distribution, with known occurrences falling with a region of less than 4000 km2 bounded by Lake Cowal - Temora - Ardlethan - Ungarie. It is estimated that the total area remaining is around 2300 hectares within the local government areas of Bland and Temora. Most remaining areas are on private property or within roadside easements, though small areas are known from the following Natures Reserves: Buddigower, The Charcoal Tank, portions of South West Woodland (former Blue Mallee Flora Reserve and State Forest and Wyalong State Forest) and possibly Big Bush.	NA	Low. Associated PCT's with key characteristic species were not detected within the study area during site surveys
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	E	E	This ecological community is scattered across the eastern parts of the alluvial plains of the Murray-Darling river system. The community is also known as Boree particularly in the southern part of its distribution. Typically, it occurs on red-brown earths and heavy textured grey and brown alluvial soils within a climatic belt receiving between 375 and 500 mm mean annual rainfall. This EEC is known from parts of the Local Government Areas of Berrigan, Bland, Bogan, Carrathool, Conargo, Coolamon, Coonamble, Corowa, Forbes, Gilgandra, Griffith, Gwydir, Inverell, Jerilderee, Lachlan,	NA	None. No associated PCTs occur within the study area

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			Leeton, Lockhart, Moree Plains, Murray, Murrumbidgee, Narrabri, Narranderra, Narromine, Parkes, Urana, Wagga Wagga and Warren, and but may occur elsewhere in these bioregions.		
Natural Temperate Grassland of the South Eastern Highlands		CE	Natural Temperate Grassland of the South Eastern Highlands is normally treeless and is dominated by native perennial tussock grasses up to a 1 m high. The dominant species depends on drainage patterns, soil characteristics and/or disturbance history and include Themeda triandra (Kangaroo grass), Poa siebriana (snowgrass) and Poa labillardieri (Common tussock grass) in areas that have been lightly grazed and Austrostipa bigeniculata (Kneed speargrass), Austrostipa scabra (Slender speargrass), Bothriochloa macra (Red grass) and Rytidosperma (Wallaby grass) species in areas with higher grazing pressure.	NA	None. No associated PCTs occur within the study area
Monaro Tableland Cool Temperate Grassy Woodland in the South Eastern Highlands Bioregion	CE		Remnants may occur on the lower, more fertile parts of the landscape where resources such as water and nutrients are abundant; sites on midslope situations where resources are scarcer are more common.	NA	None. No associated PCTs occur within the study area
Werriwa Tablelands Cool Temperate Grassy Woodland in the South Eastern Highlands and South East Corner Bioregions	E		Werriwa Grassy Woodlands (WGW) occur in the Southern Tablelands of NSW, occupying broad valley floors and gentle slopes and low rises of the moderately undulating Southern Tablelands of NSW. It has been commonly recorded on a wide variety of substrates including basalt, fine-grained sedimentary rocks, granite, acid volcanics and alluvium but rarely on steep ridge lines on the tablelands. Geographically, it occurs on the eastern fall of the Great Dividing Range between Golspie in the north and Majors Creek in the south.	NA	None. No associated PCTs occur within the study area
Poplar Box Grassy Woodland on Alluvial Plains		E	This community covers native grassy eucalypt woodland where poplar/bimble box is the main tree canopy species present. Other tree species may occasionally occur depending on the characteristics of the site, these include Callitris glaucophylla (white cypress pine), Casuarina cristata (belah), Eucalyptus coolabah (coolibah), Eucalyptus largiflorens (black box), Eucalyptus melanophloia (silver-leaved ironbark), Eucalyptus microcarpa (inland grey box) and Eucalyptus pilligaensis (narrow-leaved grey box).	NA	None. No associated PCTs occur within the study area

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	E		Sandhill Pine Woodland has been recorded in the far south-western portion of the NSW South Western Slopes bioregion near Urana, extending through the Riverina bioregion, from the Urana – Narranderra district in the east, into the southern part of the Murray-Darling Depression bioregion, as far west as the South Australian border.	NA	None. No associated PCTs occur within the study area
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	CE	CE	Remnants generally occur on fertile lower parts of the landscape where soil fertility is relatively high compared to the surrounding landscape. Sites with particular characteristics, including varying age classes in the trees, patches of regrowth, old trees with hollows and fallen timber on the ground are very important as wildlife habitat.	NA	Recorded. Associated with PCTs identified within the study area and construction footprint. ToS & AoS required.
Fish					
Murray Cod *(Maccullochella peeli)*	E FM Act		Widely distributed in waterways of the Murray-Darling Basin. There are approx. 13,245km of waterways in the Murray-Darling Basin that may be suitable habitat. Murray Cod has specific habitat requirements. Sedentary and territorial rather than free ranging and has a distinct preference for woody debris (snags), debris piles and bank side vegetation that provides shelter from high water velocities.	PMST	Low. Suitable habitat not present in construction footprint
Macquarie Perch (*Macquaria australasica*)	E FM Act		A riverine, schooling species, they are found in the Murray-Darling Basin (particularly upstream reaches) of the Lachlan, Murrumbidgee and Murray rivers, and parts of south-eastern coastal NSW, including the Hawkesbury/Nepean and Shoalhaven catchments. Inhabit cool, shaded pristine streams and rivers. Prefers clear water and deep rocky holes with lots of cover. As well as aquatic vegetation, additional cover may comprise of large boulders, debris and overhanging banks.	PMST	Low. Suitable habitat not present in construction footprint
Amphibians					

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Booroolong Frog (*Litoria booroolongensis*)	E	E	Lives along permanent streams with some fringing vegetation cover such as ferns, sedges or grasses with riffles, cobble banks and other rock structures within stream margins. Breeding occurs in spring and early summer and tadpoles metamorphose in late summer to early autumn. Restricted to NSW and north-eastern Victoria, predominantly along the western-flowing streams of the Great Dividing Range. It has disappeared from much of the Northern Tablelands, however several populations have recently been recorded in the Namoi catchment.	PMST	Low. No records in the area, suitable habitat not present
Southern Bell Frog (*Litoria raniformis*)	E	V	Usually found in or around permanent or ephemeral Black Box/Lignum/Nitre Goosefoot swamps, Lignum/Typha swamps and River Red Gum swamps or billabongs along floodplains and river valleys. They are also found in irrigated rice crops, particularly where there is no available natural habitat. During the breeding season animals are found floating amongst aquatic vegetation (especially cumbungi or Common Reeds) within or at the edge of slow-moving streams, marshes, lagoons, lakes, farm dams and rice crops.	1 Bionet record	Moderate. Some areas of suitable habitat occur across the study area, however works within the construction footprint would not impact on suitable habitat.
Birds					
Speckled Warbler (*Chthonicola sagittate*)	V		Has a patchy distribution throughout south-eastern Queensland, the eastern half of NSW and into Victoria, as far west as the Grampians. The species is most frequently reported from the hills and tablelands of the Great Dividing Range, and rarely from the coast. Lives in a wide range of Eucalyptus dominated communities that have a grassy understorey, often on rocky ridges or in gullies. Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy. Large, relatively undisturbed remnants are required for the species to persist in an area.	154 Bionet records	High – would depend on connectivity provided by study area near Binya SF. ToS required
Shy Heathwren (*Hylacola cautus*)	V		Inhabits mallee woodlands with a relatively dense understorey of shrubs and heath plants. The central NSW population (for example in Cocoparra NP) also occurs at low densities in rocky hilltop vegetation with a thick shrub layer such as Broombush or Tea-tree. Appears to occur in all age classes of vegetation, though believed to prefer either one to five years following fire when the resprouting eucalypts provide dense vegetation cover or in long unburnt (greater than 40 years) areas which have a well developed shrub layer. Feeds on the ground, almost entirely on insects	8 Bionet records	High would depend on connectivity provided by study area near Binya SF. ToS required

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			(cockroaches, grasshoppers, bugs, lerps, beetles, caterpillars, moths, ants, spiders and insect eggs) and rarely on seeds, including those of saltbush. Breeds late winter to early summer and builds a dome-shaped nest in a concealed location on the ground, using a variety of plant materials. Occurs across southern Australia extending from the wheatbelt in southern Western Australia east to central NSW, including Kangaroo Island.		
Spotted Harrier (*Circus assimilis*)	V		Occurs in grassy open woodland including Acacia and mallee remnants, inland riparian woodland, grassland and shrub steppe. It is found most commonly in native grassland, but also occurs in agricultural land, foraging over open habitats including edges of inland wetlands. Builds a stick nest in a tree and lays eggs in spring (or sometimes autumn). Preys on terrestrial mammals (eg bandicoots, bettongs, and rodents), birds and reptile, occasionally insects and rarely carrion. Occurs throughout the Australian mainland, except in densely forested or wooded habitats of the coast, escarpment and ranges, and rarely in Tasmania.	21 Bionet records	Moderate – would not depend on habitat or connectivity within study area.
White-bellied Sea-Eagle (*Haliaeetus leucogaster*)	V	M	Distributed around the Australian coastline, including Tasmania, and well inland along rivers and wetlands of the Murray Darling Basin. Habitats are characterised by the presence of large areas of open water including larger rivers, swamps, lakes, and the sea. Also occurs at sites near the sea or sea-shore, such as around bays and inlets, beaches, reefs, lagoons, estuaries and mangroves; and at, or in the vicinity of freshwater swamps, lakes, reservoirs, billabongs and saltmarsh.	8 Bionet records	Moderate – would not depend on habitat or connectivity within study area.
Little Eagle (*Hieraaetus morphnoides*)	V		The Little Eagle is found throughout the Australian mainland excepting the most densely forested parts of the Dividing Range escarpment. Occurs as a single population throughout NSW. Occupies open eucalypt forest, woodland or open woodland, Sheoak or Acacia woodlands, and riparian woodlands of interior NSW are also used. Nests in tall living trees within a remnant patch, where pairs build a large stick nest in winter.	84 Bionet records	Moderate – would not depend on habitat or connectivity within study area.
Square-tailed Kite (*Lophoictinia isura*)	V		The Square-tailed Kite ranges along coastal and subcoastal areas. In NSW, it is a regular resident in the north, north-east and along the major west-flowing river systems. Found in a variety of timbered habitats including dry woodlands and open forests. Preference for timbered watercourses. In arid north-western NSW, has been observed in stony country with a ground	4 Bionet records	Moderate – would not depend on habitat or connectivity within study area. .

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			cover of chenopods and grasses, open acacia scrub and patches of low open eucalypt woodland.		
Blue-billed Duck (*Oxyura australis*)	V		Prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation. Completely aquatic, swimming low in the water along the edge of dense cover. Widespread in NSW, but most common in the southern Murray-Darling Basin area. Birds disperse during the breeding season to deep swamps up to 300 km away. It is generally only during summer or in drier years that they are seen in coastal areas.	72 Bionet records	Low. Records present are from deep ponds, dams and wetlands to the west of Griffith. No potential habitat occurs within the Construction footprint
Freckled Duck (*Stictonetta naevosa*)	V		Prefer permanent freshwater swamps and creeks with heavy growth of Cumbungi, Lignum or Tea-tree. During drier times they move from ephemeral breeding swamps to more permanent waters such as lakes, reservoirs, farm dams and sewage ponds.	50 Bionet records	Low. Majority of the records are from deep ponds, dams and wetlands to the west of Griffith. No potential habitat occurs within the Construction footprint
Magpie Goose (*Anseranas semipalmata*)	V		Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges, aquatic or terrestrial habitats; and often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Activities are centred on wetlands, mainly those on floodplains of rivers and large shallow wetlands formed by run-off.	25 Bionet records	Low. Records within the study area, however no suitable habitat occurs within the construction footprint
White-throated Needletail *(Hirundapus caudacutus)*		M	Arrive in Australia from their breeding grounds in the northern hemisphere in about October each year and leave somewhere between May and August. Are non-breeding migrants in Australia. Breeding takes place in northern Asia.	3 Bionet records	Moderate – would not depend on habitat or connectivity within study area.
Australasian Bittern (*Botaurus poiciloptilus*)	E	E	Favours permanent freshwater wetlands with tall, dense vegetation, particularly Typha spp. and Eleocharis. Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges.	20 Bionet records	Low. Majority of the records are from deep ponds, dams and wetlands to the west of Griffith. No potential habitat occurs within the Construction footprint

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Dusky Woodswallow (*Artamus cyanopterus cyanopterus*)	V		Widespread in eastern, southern and south western Australia. Occurs throughout most of New South Wales, but sparsely scattered in, or largely absent from, much of the upper western region. Primarily inhabit dry, open eucalypt forests and woodlands, including mallee associations, with an open or sparse understorey of eucalypt saplings, acacias and other shrubs, and ground-cover of grasses or sedges and fallen woody debris. It has also been recorded in shrublands, heathlands and very occasionally in moist forest or rainforest. Also found in farmland, usually at the edges of forest or woodland.	228 Bionet records	High - would depend on connectivity provided by study area near Binya SF. ToS required
Bush Stone-curlew (*Burhinus grallarius*)	E		Found throughout Australia except for the central southern coast and inland, the far south-east corner, and Tasmania. In northern Australia is it still common, however and in the south-east it is either rare or extinct throughout its former range. Inhabits open forests and woodlands with a sparse grassy groundlayer and fallen timber. The species is largely nocturnal, being especially active on moonlit nights.	5 Bionet records Recent (2007, 2009) records around Griffith. Historical records around Temora	Low - unlikely to be dependent upon roadside habitat in the proposal area.
Gang-gang Cockatoo (*Callocephalon fimbriatum*)	V		In spring and summer, generally found in tall mountain forests and woodlands, particularly in heavily timbered and mature wet sclerophyll forests. In autumn and winter, the species often moves to lower altitudes in drier more open eucalypt forests and woodlands,particularly box-gum and box-ironbark assemblages, or in dry forest in coastal areas and often found in urban areas. May also occur in sub-alpine Snow Gum (Eucalyptus pauciflora) woodland and occasionally in temperate rainforests. In NSW, it is distributed from the south-east coast to the Hunter region, inland to the Central Tablelands and south-west slopes, and regularly in the ACT. It is rare at the extremities of its range, with isolated records known from as far north as Coffs Harbour and as far west as Mudgee.	2 Bionet records Scattering of records (mostly historical)b etween Harden and Yass; species more common further east	Moderate. species has potential to utilise the Construction footprint as foraging and breeding habitat from Stockinbingal east.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
				and south	
Glossy Black-Cockatoo (*Calyptorhynchus lathami*)	V		Uncommon, but widespread throughout suitable forest and woodland habitats, from the central Queensland coast to East Gippsland in Victoria, and inland to the southern tablelands and central western plains of NSW, with a small population in the Riverina. Dependent on large hollow-bearing eucalypts for nest sites. Inhabits open forest and woodlands of the coast and the Great Dividing Range up to 1000 m in which stands of she-oak species, particularly Black She-oak (Allocasuarina littoralis), Forest She-oak (A. torulosa) or Drooping She-oak (A. verticillata) occur. In the Riverina area, inhabits open woodlands dominated by Belah (Casuarina cristata). Feeds almost exclusively on the seeds of several species of she-oak (Casuarina and Allocasuarina species), shredding the cones with the massive bill.	24 Bionet records, from the far west to the far east of the proposal area.	High. This species is likely to utilise the Construction footprint for foraging and breeding. ToS required
Pink Cockatoo *(Lophochroa leadbeateri)*	V		Inhabits a wide range of treed and treeless inland habitats, always within easy reach of water. Feeds mostly on the ground, especially on the seeds of native and exotic melons and on the seeds of species of saltbush, wattles and cypress pines. Found across the arid and semi-arid inland, from south-western Queensland, south to north-west Victoria, through most of South Australia, north into the south-west Northern Territory and across to the west coast between Shark Bay. In NSW it is found regularly as far east as about Bourke and Griffith, and sporadically further east.	101 Bionet records, from the far west to the far east of the proposal area.	High. This species is likely to utilise the Construction footprint as foraging and breeding habitat ToS required.
Black-necked Stork (*Ephippiorhynchus asiaticus*)	E		In NSW, the species becomes increasingly uncommon south of the Clarence Valley, and rarely occurs south of Sydney. Floodplain wetlands (swamps, billabongs, watercourses and dams) of the major coastal rivers are the key habitat in NSW. Secondary habitat includes minor floodplains, coastal sandplain wetlands and estuaries.	1 Bionet record	Low. A single record from a deep pond west of Griffith. No potential habitat occurs within the Construction footprint.
White-browed Treecreeper *(Climacteris affinis)* population in Carrathool local government area south of the Lachlan River and Griffith local government area	E Popula tion		Endangered population occurs in the Carrathool local government area south of the Lachlan River and Griffith local government area lying between the Murrumbidgee and Lachlan River. The species occurs in a range of semi-arid and arid tall shrublands and woodlands across the southern half of Australia. In NSW, the species occupies a variety of habitats including Mulga, Brigalow, Gidgee, Belah, Buloke and White Cypress.	35 Bionet records, western part of proposal area	High. This species is likely to utilise the Construction footprint as foraging and breeding habitat. ToS required

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
Brown Treecreeper (eastern subspecies) (*Climacteris picumnus victoriae*)	V		Found in eucalypt woodlands (including Box-Gum, stringybarks or other rough-barked eucalypts) and dry open forest of the inland slopes and plains inland of the Great Dividing Range; mainly inhabits woodlands dominated with an open grassy understorey, sometimes with one or more shrub species; also found in mallee and Eucalyptus camaldulensis Forest bordering wetlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses	371 Bionet records all along proposal area	High. This species is likely to utilise the Construction footprint as foraging and breeding habitat. ToS required
Diamond Firetail (*Stagonopleura guttata*)	V		Found in grassy eucalypt woodlands, including Box-Gum Woodlands and Snow Gum Eucalyptus pauciflora Woodlands. Also occurs in open forest, mallee, Natural Temperate Grassland, and in secondary grassland derived from other communities. Often found in riparian areas (rivers and creeks), and sometimes in lightly wooded farmland.	115 Bionet records all along proposal area	High. This species is likely to utilise the Construction footprint as foraging and breeding habitat. ToS required
Grey Falcon (*Falco hypoleucos*)	E		Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast, and near wetlands where surface water attracts prey. Sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range.	1 Bionet record	Low. This species may be a vagrant visitor to the area.
Black Falcon (*Falco subniger*)	V		Widely, but sparsely, distributed in New South Wales, mostly occurring in inland regions.	11 Bionet records all along the proposal area	Recorded. This species is unlikely to depend on habitat in the Construction footprint
Brolga (Grus rubicunda)	V		Often feed in dry grassland or ploughed paddocks or even desert claypans, they are dependent on wetlands too, especially shallow swamps, where they will forage with their head entirely submerged. Was formerly found across Australia, except for the south-east corner, Tasmania and the south-western third of the country. It is still abundant in the northern tropics, but very sparse across the southern part of its range.	3 Bionet records	Low. No suitable habitat occurs within the construction footprint. Bionet records are over 15 years old.
Malleefowl (*Leipoa ocellata*)	E	V	Predominantly inhabit mallee communities, preferring the tall, dense and floristically-rich mallee found in higher rainfall (300 - 450 mm mean annual rainfall) areas. Utilises mallee with a spinifex understorey, but usually at	1 Bionet record Record	Low. Species is unlikely to rely on Construction footprint for breeding and

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			lower densities than in areas with a shrub understorey. Less frequently found in other eucalypt woodlands, such as Inland Grey Box, Ironbark or Bimble Box Woodlands with thick understorey, or in other woodlands such dominated by Mulga or native Cypress Pine species.	from 2002 in Binya SF	foraging.
Regent Honeyeater (*Anthochaera phrygia*)	CE	CE	Inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak, that inhabit woodlands that support a significantly high abundance and species richness of bird species, and have large numbers of mature trees, high canopy cover and abundance of mistletoes.	4 Bionet records Records spread across footprint, most recent from 1999	Moderate. This species may utilise the Construction footprint as foraging habitat.
Pied Honeyeater (*Certhionyx variegatus*)	V		Widespread throughout acacia, mallee and spinifex scrubs of arid and semi-arid Australia. Occasionally occurs further east, on the slopes and plains and the Hunter Valley. Inhabits wattle shrub, primarily Mulga (*Acacia aneura*), mallee, spinifex and eucalypt woodlands, usually when shrubs are flowering; feeds on nectar, predominantly from various species of emu-bushes (Eremophila spp.).	9 Bionet records All records around Griffith and Yenda townships	Moderate. No records exist within 2 km of construction footprint. Species has potential to forage within small portion of western extent of construction footprint.
White-fronted Chat (*Epthianura albifrons*)	V		In NSW, it occurs mostly in the southern half of the state, in damp open habitats along the coast, and near waterways in the western part of the state. Along the coastline, it is found predominantly in saltmarsh vegetation and mangroves but also in open grasslands and sometimes in low shrubs bordering wetland areas.	56 Bionet records Records spread across majority of footprint. More than half around Griffith township.	Moderate. This species is unlikely to rely on Construction footprint as breeding habitat. This species may utilise Construction footprint as foraging habitat.
Painted Honeyeater (*Grantiella picta*)	V	V	Nomadic and occurs at low densities throughout its range. The greatest concentrations of the bird and almost all breeding occurs on the inland slopes of the Great Dividing Range in NSW, Victoria and southern	112 Bionet records Majority of	High. This species is likely to utilise portions of the Construction footprint

Common Name (Scientific Name)	Status: BC Act	Status: EPBC Act	Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
			Queensland. Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests.	records centred around Griffith and Yenda townships	as foraging and potentially breeding habitat. ToS/AoS required
Black-chinned Honeyeater (eastern subspecies) (*Melithreptus gularis gularis*)	V		Occupies mostly upper levels of drier open forests or woodlands dominated by box and ironbark eucalypts, especially Eucalyptus sideroxylon, E. albens, E. microcarpa, E. melliodora, E. blakelyi and E. tereticornis. Inhabits open forests of smooth-barked gums, stringybarks, ironbarks, river sheoaks (nesting habitat) and tea-trees. Tends to occur in the largest woodland patches in the landscape as birds forage over large home ranges of at least 5 hectares. Widespread in NSW, with records from the tablelands and western slopes of the Great Dividing Range to the north-west and central-west plains and the Riverina.	60 Bionet records All records occur in Nature Reserves, National Parks or State Forest only	Moderate. This species is unlikely to rely on the Construction footprint as foraging and potentially breeding habitat. According to record distribution is most likely to occur in high quality habitat.
Satin Flycatcher (*Myiagra cyanoleuca*)		M	Found along the east coast of Australia in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	PMST	None. No potential habitat within Construction footprint.
Yellow Wagtail (*Motacilla flava*)		M	Occupies a range of damp or wet habitats with low vegetation, from damp meadows, marshes, waterside pastures, sewage farms and bogs to damp steppe and grassy tundra.	PMST	None. No potential habitat within Construction footprint.
Varied Sittella (*Daphoenositta chrysoptera*)	V		Inhabits eucalypt forests and woodlands, especially those containing rough-barked species and mature smooth-barked gums with dead branches, mallee and Acacia woodland. Sedentary and inhabits most of mainland Australia except the treeless deserts and open grasslands. Distribution in NSW is nearly continuous from the coast to the far west.	76 Bionet records all along the proposal area.	High. This species is likely to utilise the Construction footprint as foraging and potentially breeding habitat. ToS required
Australian Bustard (*Ardeotis australis*)	E		Mainly inhabits tussock and hummock grasslands, though prefers tussock grasses to hummock grasses; also occurs in low shrublands and low open grassy woodlands; occasionally seen in pastoral and cropping country, golf courses and near dams. In NSW, they are mainly found in the north-west	1 Bionet record	Low. This species may utilise the Construction footprint as foraging habitat however only one

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			corner and in the lower western and central west plains regions. Occasional vagrants are still seen as far east as the western slopes and Riverine plain. Breeding now only occurs in the north-west region of NSW.		record within 10 km of the proposal area.
Gilbert's Whistler (*Pachycephala inornata*)	V		Sparsely distributed over much of the arid and semi-arid zone of inland southern Australia, from the western slopes of NSW to the Western Australian wheatbelt. Occurs in a range of habitats within NSW, preferring a dense shrub layer. Widely recorded in mallee shrublands, box-ironbark woodlands, Cypress Pine and Belah woodlands and River Red Gum forests, though at this stage it is only known to use this habitat along the Murray, Edwards and Wakool Rivers.	57 Bionet records around Binya SF and mostly historical records (prior to 2000) around Temora	High. This species is likely to utilise the Construction footprint as foraging and potentially breeding habitat in the vicinity of Cocoparra Range NP and Binya SF ToS required
Plains-wanderer (*Pedionomus torquatus*)	E	CE	Live in semi-arid, lowland native grasslands that typically occur on hard red-brown soils. Records in NSW in the past 30 years come from an area of the western Riverina bounded by Hay and Narrandera on the Murrumbidgee River in the north, the Cobb Highway in the west, the Billabong Creek in the south, and Urana in the east.	PMST	Low. No known populations from the Proposal area.
Hooded Robin (*Melanodryas cucullata cucullate*)	V		Prefers lightly wooded country, usually open eucalypt woodland, acacia scrub and mallee, often in or near clearings or open areas. Requires structurally diverse habitats featuring mature eucalypts, saplings, some small shrubs and a ground layer of moderately tall native grasses. Sedentary species.	110 Bionet records all along proposal area	High. This species would depend on connectivity between Griffin and Temora for dispersal. ToS required
Scarlet Robin (*Petroica boodang*)	V		Lives in dry eucalypt forests and woodlands. The understorey is usually open and grassy with few scattered shrubs. Lives in both mature and regrowth vegetation. Occasionally occurs in mallee or wet forest communities, or in wetlands and tea-tree swamps. In NSW, it occurs from the coast to the inland slopes.	16 Bionet records all along proposal area.	Moderate. This species may utilise the Construction footprint for dispersal or foraging habitat but would not depend on it.
Flame Robin	V		Breeds in upland tall moist eucalypt forests and woodlands, often on ridges	53 Bionet	High. This species is

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
(*Petroica phoenicea*)			and slopes. Prefers clearings or areas with open understoreys. Occasionally occurs in temperate rainforest, and also in herbfields, heathlands, shrublands and sedgelands at high altitudes.	records	likely to utilise the Construction footprint as for foraging and dispersal, particularly between Griffith and Ardlethan. ToS required
Grey-crowned Babbler (eastern subspecies) (*Pomatostomus temporalis temporalis*)	V		Inhabits open Box-Gum Woodlands on the slopes, and Box-Cypress-pine and open Box Woodlands on alluvial plains. Woodlands on fertile soils in coastal regions. In NSW, the eastern sub-species occurs on the western slopes of the Great Dividing Range, and on the western plains reaching as far as Louth and Balranald.	217 Bionet records, mostly west of Stockinbingal	High. This species is likely to utilise the Construction footprint for foraging and dispersal habitat, particularly between Griffith and Ardlethan. ToS required
Purple-crowned Lorikeet (*Glossopsitta porphyrocephala*)	V		Found in open forests and woodlands, particularly where there are large flowering eucalypts. Also recorded from mallee habitats. Feeds primarily on nectar and pollen of flowering Eucalypts, including planted trees in urban areas. May rarely raid orchards to feed on ripe fruit. Breeds away from feeding areas, utilising hollow branches or holes in trees. Also roosts in dense vegetation up to several kilometres away from feeding areas.	1 Bionet record	Low. This species may utilise the Construction footprint for foraging and potentially breeding habitat, however it is considered unlikely for this species to occur within the study area due to low records.
Little Lorikeet (*Glossopsitta pusilla*)	V		Distributed widely across the coastal and Great Divide regions of eastern Australia from Cape York to South Australia. NSW provides a large portion of the species' core habitat, with lorikeets found westward as far as Dubbo and Albury. Forages primarily in the canopy of open Eucalyptus forest and woodland, yet also finds food in *Angophora, Melaleuca* and other tree species. Riparian habitats are particularly used, due to higher soil fertility and hence greater productivity.	19 Bionet records, mostly historical (1970s) with a few recent records around	Moderate. This species unlikely to depend upon habitat within the Construction footprint.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
				Stockinbing al (2002)	
Swift Parrot (*Lathamus discolor*)	E	CE	Breeds in Tasmania during spring and summer, migrating in the autumn and winter months to south-eastern Australia from Victoria and the eastern parts of South Australia to south-east Queensland. In NSW mostly occurs on the coast and south west slopes. Favoured feed trees include winter flowering species such as Swamp Mahogany *Eucalyptus robusta*, Spotted Gum *Corymbia maculata*, Red Bloodwood *C. gummifera*, Mugga Ironbark *E. sideroxylon*, and White Box *E. albens*.	50 Bionet records, particularly around Temora and Stockinbing al where Grey Box PCTs are important	Moderate. This species is unlikely to depend on the Construction footprint for dispersal or foraging habitat.
Turquoise Parrot (*Neophema pulchella*)	V		Lives on the edges of eucalypt woodland adjoining clearings, timbered ridges and creeks in farmland. Range extends from southern Queensland through to northern Victoria, from the coastal plains to the western slopes of the Great Dividing Range.	30 Bionet records. Mostly historical (1970s-90s) around Temora. Recent records Binya SF	Moderate. This species is unlikely to depend on the Construction footprint for dispersal, foraging or breeding.
Superb Parrot (*Polytelis swainsonii*)	V	V	Inhabit Box-Gum, Box-Cypress-pine and Boree Woodlands and River Red Gum Forest. In the Riverina the birds nest in the hollows of large trees (dead or alive) mainly in tall riparian River Red Gum Forest or Woodland. On the South West Slopes nest trees can be in open Box-Gum Woodland or isolated paddock trees. Species known to be used are Blakely's Red Gum, Yellow Box, Apple Box and Red Box. Nest in small colonies, often with more than one nest in a single tree. Breed September-January. May forage up to 10 km from nesting sites, primarily in grassy box woodland. Feeds in trees and understorey shrubs and on the ground and their diet	287 Bionet records all along proposal area	Recorded. Close to key breeding area near Yass. ToS/AoS required

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			consists mainly of grass seeds, herbaceous plants, fruits, berries, nectar, buds, flowers, insects and grain. On the South-western Slopes their core breeding area is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this region are mainly absent during winter, when they migrate north to the region of the upper Namoi and Gwydir Rivers. The other main breeding sites are in the Riverina along the corridors of the Murray, Edward and Murrumbidgee Rivers where birds are present all year round. It is estimated that there are less than 5000 breeding pairs left in the wild.		
Night Parrot (*Pezoporus occidentalis*)	PE	E	Known to occur within Spinifex grasslands in stony or sandy areas and samphire and chenopod associations on floodplains, salt lakes and clay pans. Suitable habitat is characterized by the presence of large and dense clumps of Spinifex, and it may prefer mature spinifex that is long and unburnt.	PMST	None. No known populations in the area and the key habitat feature of large old growth spinifex is absent from the study area.
Rufous Fantail (*Rhipidura rufifrons*)		M	Found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	PMST	None. No potential habitat within study area.
Australian Painted Snipe (*Rostratula australis)*	E	E	In NSW many records are from the Murray-Darling Basin including the Paroo wetlands, Lake Cowal, Macquarie Marshes, Fivebough Swamp and more recently, swamps near Balldale and Wanganella and wetlands on the Hawkesbury River and the Clarence and lower Hunter Valleys. Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	2 Bionet records	Low. No potential habitat of marshes and swamps are present within the study area.
Curlew Sandpiper (*Calidris ferruginea*)	E	CE	Generally occupies littoral and estuarine habitats, and in NSW is mainly found in intertidal mudflats of sheltered coasts. It also occurs in non-tidal swamps, lakes and lagoons on the coast and sometimes inland. Inland records are probably mainly of birds pausing for a few days during migration.	16 Bionet records	Low. Majority of the records are from permanent ponds, dams and wetlands to the west of Griffith. No potential habitat occurs within the study area.
Black-tailed Godwit	V		A coastal species, usually found in sheltered bays, estuaries and lagoons	14 Bionet	Low. Majority of the

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
(*Limosa limosa*)			with large intertidal mudflats and/or sandflats. Further inland, it can also be found on mudflats and in water less than 10 cm deep, around muddy lakes and swamps.	records	records are from permanent ponds, dams and wetlands to the west of Griffith. No potential habitat occurs within the study area.
Eastern Curlew (*Numenius madagascariensis*)		CE	In NSW, occurs across the entire coast but is mainly found in estuaries such as the Hunter River, Port Stephens, Clarence River, Richmond River and ICOLLs of the south coast. Generally occupies coastal lakes, inlets, bays and estuarine habitats, and in NSW is mainly found in intertidal mudflats and sometimes saltmarsh of sheltered coasts.	PMST	Low. No potential habitat occurs within the study area.
Barking Owl *(Ninox connivens)*	V		Inhabits woodland and open forest, including fragmented remnants and partly cleared farmland. Common in parts of northern Australia, but now sparse distribution in NSW. Core populations exist on the western slopes and plains and in some northeast coastal and escarpment forests.	34 Bionet records, mostly historical records scattered along proposal area	Moderate. This species is unlikely to depend upon the Construction footprint habitat.
Insects					
Golden Sun Moth *(Synemon plana)*	E	CE	NSW populations are found in the area between Queanbeyan, Gunning, Young and Tumut. Historical distribution extended from Bathurst (central NSW) through the NSW Southern Tablelands, through to central and western Victoria, to Bordertown in eastern South Australia. Occurs in Natural Temperate Grasslands and grassy Box-Gum Woodlands in which groundlayer is dominated by wallaby grasses *Austrodanthonia spp.*.	11 historical (1999,2000) Bionet records between Binalong and Yass.	low. Suitable habitat for this species occurs in the study area, however nearby records are over 20 years old and it is unlikely that this species still occurs within the study area.
Mammals					
Eastern Pygmy-possum *(Cercartetus nanus)*	V		Found in a broad range of habitats from rainforest through sclerophyll (including Box-Ironbark) forest and woodland to heath, except in north-	1 Bionet record	Low. Unlikely to occur or depend on habitat in

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			eastern NSW where they are encountered in rainforest.	(2000) near Stockinbingal	construction footprint.
Spotted-tailed Quoll *(Dasyurus maculatus)*	V	E	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest, from the sub-alpine zone to the coastline. Individual animals use hollow-bearing trees, fallen logs, small caves, rock outcrops and rocky-cliff faces as den sites.	PMST	Low. No records in the area and not associated with any PCTs on site
Squirrel Glider *(Petaurus norfolcensis)*	V		Widely though sparsely distributed in eastern Australia. Inhabits mature or old growth Box, Box-Ironbark woodlands and River Red Gum forest west of the Great Dividing Range and Blackbutt-Bloodwood forest with heath understorey in coastal areas. Prefers mixed species stands with a shrub or Acacia midstorey. Require abundant tree hollows for refuge and nest sites.	11 Bionet records, mostly around Jindalee NP	High. Likely to depend on construction footprint for dispersal between Flatstaff Memorial NR, Jindalee NP and vegetation to the north. ToS required.
Koala *(Phascolarctos cinereus)*	V	V	In NSW it mainly occurs on the central and north coasts with some populations in the west of the Great Dividing Range. Inhabit eucalypt woodlands and forests. Feed on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	2 Bionet records	Low. This species may utilise the study area as foraging and potentially breeding habitat however records within 10 km over 15 years old
Greater Glider *(Petauroides volans)*	V	V	Largely restricted to eucalypt forests and woodlands. Typically found in highest abundance in taller, montane, moist eucalypt forests with relatively old trees and abundant hollows. Favours forests with a diversity of eucalypt species, due to seasonal variation in its preferred tree species.	PMST	Low. This species is not known to occur in this region
Grey-headed Flying-fox *(Pteropus poliocephalus)*	V	V	Occur in subtropical and temperate rainforests, tall sclerophyll forests and woodlands, heaths and swamps as well as urban gardens and cultivated fruit crops. Roosting camps are generally located within 20 km of a regular food source and commonly found in gullies, close to water, in vegetation with a dense canopy. Individual camps may have tens of thousands of animals and are used for mating.	PMST	Moderate. Closest roosting camps are near Yass (~15km) and Young (~30km). May utilise but would not depend on construction footprint for foraging.
Bilby	PE	V	Prefers arid habitats because of the spinifex grass and acacia shrub.	1 Bionet	None. One record from

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
(Macrotis lagotis)			Presumed extinct in the wild within NSW.	record (1932)	1932. Wild populations of this species are now considered extinct in NSW.
Large-eared Pied Bat *(Chalinolobus dwyeri)*	V	V	Found mainly in areas with extensive cliffs and caves, from Rockhampton in Queensland south to Bungonia in the NSW Southern Highlands. Roosts in caves (near their entrances), crevices in cliffs, old mine workings and in the disused, bottle-shaped mud nests of the Fairy Martin (*Petrochelidon ariel*), frequenting low to mid-elevation dry open forest and woodland close to these features. Found in well-timbered areas containing gullies.	PMST 0 Bionet records	Low.
Little Pied Bat *(Chalinolobus picatus)*	V		Found in inland Queensland and NSW (including Western Plains and slopes) extending slightly into South Australia and Victoria. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress pine forest and mallee and Bimbil box woodlands. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings.	5 Bionet records between Griffith and Yass	Moderate. This species may utilise the Construction footprint as foraging and potentially roosting habitat but unlikely to depend upon it.
Southern Myotis *(Myotis macropus)*	V		Found in the coastal band from the north-west of Australia, across the top-end and south to western Victoria. It is rarely found more than 100 km inland, except along major rivers. Generally roost in groups of 10 - 15 close to water in caves, mine shafts, hollow-bearing trees, storm water channels, buildings, under bridges and in dense foliage.	1 Bionet record	Low. This species may utilise the study area as foraging habitat, however this species is considered unlikely to occur due to low records.
Corben's Long-eared Bat *(Nyctophilus corbeni)*	V	V	The distribution coincides approximately with the Murray Darling Basin with the Pilliga Scrub region being the distinct stronghold for this species. Inhabits a variety of vegetation types, including Mallee, *Allocasuarina leuhmanni* and Box eucalypt dominated communities, but it is distinctly more common in Box/Ironbark/Cypress-pine vegetation that occurs in a north-south belt along the western slopes and plains of NSW and southern Queensland. Roosts in tree hollows, crevices, and under loose bark.	2 Bionet records. Occurs Copoparra NP and a record near Yass.	Moderate. This species unlikely to depend upon construction footprint.
Inland Forest Bat	V		Distribution of this species, particularly in NSW, is very poorly known.	1 Bionet	Low. Western portion of

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
(Vespadelus baverstocki)			Generally in areas with annual rainfall less than 400 millimetres. Roosts in tree hollows, abandoned buildings, and in very small hollows in stunted trees only a few metres high. Habitat requirements are poorly known but has been recorded from a variety of woodland formations, including Mallee, Mulga and River Red Gum. Most records are from drier woodland habitats with riparian areas. However, other habitats may be used for foraging and/or drinking.	record west of Griffith	construction footprint falls within distribution but unlikely to depend upon it for habitat.
Reptiles					
Pink-tailed Legless Lizard *(Aprasia parapulchella)*	V	V	Known from the Central and Southern Tablelands, and the South Western Slopes. A concentration of populations in the Canberra/Queanbeyan Region, Cooma, Yass, Bathurst, Albury and West Wyalong. Inhabits sloping, open woodland areas with predominantly native grassy groundlayers, particularly those dominated by Kangaroo Grass (*Themeda triandra*). Sites are typically well-drained, with rocky outcrops or scattered, partially-buried rocks. Commonly found beneath small, partially-embedded rocks and appear to spend considerable time in burrows below these rocks.	PMST	Low. No records in the locality however suitable vegetation occurs in the eastern part of the construction footprint between Harden and Yass. Recommend unexpected finds protocol
Striped Legless Lizard *(Delma impar)*	V	V	Occurs in the Southern Tablelands, the South West Slopes, the Upper Hunter and possibly on the Riverina. Populations are known in the Goulburn, Yass, Queanbeyan, Cooma, Muswellbrook and Tumut areas. Also occurs in the ACT, Victoria and south-eastern South Australia. Found mainly in Natural Temperate Grassland but has also been captured in grasslands that have a high exotic component. Habitat is where grassland is dominated by perennial, tussock-forming grasses such as Kangaroo Grass Themeda triandra, spear-grasses Austrostipa spp., Poa tussocks Poa spp., and occasionally wallaby grasses *Austrodanthonia spp*. Sometimes present in modified grasslands with a significant content of exotic grasses. Sometimes found in grasslands with significant amounts of surface rocks, which are used for shelter.	PMST	Low. No records in the locality however suitable vegetation occurs in the eastern part of the construction footprint between Harden and Yass. Recommend unexpected finds protocol
Flora					
Yass Daisy *(Ammobium craspedioides)*	V	V	Found in moist or dry forest communities, Box-Gum Woodland and secondary grassland derived from clearing of these communities. Grows in association with a large range of eucalypts (Eucalyptus blakelyi, E.	22 Bionet records between	High. Records from areas adjacent to Proposal area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			bridgesiana, E. dives, E. goniocalyx, E. macrorhyncha, E. mannifera, E. melliodora, E. polyanthemos, E. rubida). Apparently unaffected by light grazing, as populations persist in some grazed sites. Found in a number of TSRs, Crown reserves, cemeteries and roadside reserves within the region. Eg. near Crookwell on the Southern Tablelands to near Wagga Wagga on the South Western Slopes. Most populations are in the Yass region.	Binalong and Yass.	ToS/AoS required
Hoary Sunray *(Leucochrysum albicans var. tricolor)*		E	Occurs in a wide variety of grassland, woodland and forest habitats, generally on relatively heavy soils. Can occur in modified habitats such as semi-urban areas and roadsides. Highly dependent on the presence of bare ground for germination. Endemic to south-eastern Australia. In NSW it currently occurs on the Southern Tablelands adjacent areas in an area roughly bounded by Albury, Bega and Goulburn, with a few scattered localities know from beyond this region.	PMST	None. No known populations within the locality.
Spiny Peppercress *(Lepidium aschersonii)*	V	V	Found on ridges of gilgai clays dominated by Brigalow (*Acacia harpophylla*), Belah (*Casuarina cristata*), Buloke (*Allocasuarina luehmanii*) and Grey Box (*Eucalyptus microcarpa*). In the south has been recorded growing in Bull Mallee (*Eucalyptus behriana*). Often the understorey is dominated by introduced plants. The species grows as a component of the ground flora, in grey loamy clays. Vegetation structure varies from open to dense, with sparse grassy understorey and occasional heavy litter. Occurs in the marginal central-western slopes and north-western plains regions of NSW (and potentially the south western plains).	2 historical (1915) Bionet records around Temora	Low. No gilgai depressions/wetlands in construction footprint.
Winged Peppercress *(Lepidium monoplocoides)*	E	E	Occurs on seasonally moist to waterlogged sites, on heavy fertile soils, with a mean annual rainfall of around 300-500 mm. Predominant vegetation is usually an open woodland dominated by *Allocasuarina luehmannii* (Bulloak) and/or eucalypts, particularly *Eucalyptus largiflorens* (Black Box) or Eucalyptus populnea (Poplar Box). Widespread in the semi-arid western plains regions of NSW.	PMST	None. No known populations within the Study area.
Small Scurf-pea *(Cullen parvum)*	E		In Victoria and NSW, plants are found in grassland, River Red Gum (*Eucalyptus camaldulensis*) Woodland or Box-Gum Woodland, sometimes on grazed land and usually on table drains or adjacent to drainage lines or watercourses, in areas with rainfall of between 450 and 700 mm. Plants tend to die back in dry seasons and resprout with rain in winter or spring; in	4 Bionet records	Low. Population near Galong found in 2005 (~5 km away from proposal area). Habitat in construction footprint not

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			dry years, plants apparently do not always produce shoots but survive below the ground.		important to this population.
Slender Darling Pea *(Swainsona murrayana)*	V	V	Collected from clay-based soils, ranging from grey, red and brown cracking clays to red-brown earths and loams. Grows in a variety of vegetation types including bladder saltbush, black box and grassland communities on level plains, floodplains and depressions and is often found with Maireana species. Plants have been found in remnant native grasslands or grassy woodlands that have been intermittently grazed or cultivated. Found throughout NSW, it has been recorded in the Jerilderie and Deniliquin areas of the southern riverine plain, the Hay plain as far north as Willandra National Park, near Broken Hill and in various localities between Dubbo and Moree.	PMST	Low. Associated with PCTs on site however no known local populations.
Silky Swainson-pea *(Swainsona sericea)*	V		Found in Natural Temperate Grassland and Eucalyptus pauciflora Woodland on the Monaro. Found in Box-Gum Woodland in the Southern Tablelands and South West Slopes. Sometimes found in association with *Callitris spp*. Recorded from the Northern Tablelands to the Southern Tablelands and further inland on the slopes and plains. There is one isolated record from the far north-west of NSW. Its stronghold is on the Monaro. Also found in South Australia, Victoria and Queensland.	2 Bionet records (1915 near Ardlethan and 1999 near Bowning	Low. Bowning population unlikely to depend on habitat in the construction footprint.
Sand-hill Spider Orchid *(Caladenia arenaria)*	E	E	Occurs in woodland with sandy soil, especially that dominated by White Cypress Pine (*Callitris glaucophylla*). Is found mostly on the south west plains and western south west slopes. The original description is of a plant from Nangus, west of Gundagai (1865) and there is a report of the species from Adelong near Tumut. The Sand-hill Spider Orchid is currently only known to occur in the Riverina between Urana and Narranderra.	503 Bionet records, all generalised to 10km and located between Ardlethan and Temora	Low. Extant population not likely to depend upon construction footprint May be associated with PCT 54, 70, 72, 80, 82, 103. Conservation advice (Threatened Species Scientific Committee, 2015) states extant populations occur south of Narrandera (which is south of proposal area) and that the Ardlethan population needs to be

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
					confirmed.
Pine Donkey Orchid *(Diuris tricolor)*	V		The Pine Donkey Orchid grows in sclerophyll forest among grass, often with native Cypress Pine (*Callitris spp.*). Associated species include *Callitris glaucophylla*, *Eucalyptus populnea*, *Eucalyptus intertexta*, Ironbark and *Acacia* shrubland. The understorey is often grassy with herbaceous plants such as *Bulbine* species. Sporadically distributed on the Western Slopes of NSW, extending from south of Narrandera all the way to the north of NSW.	2 Bionet records, generalised to 10km and occurring between Yenda and Stockinbingal	Low. Profile states occurs south of Narrandera (~50km south of proposal area), although believed to occur in Jindalee NP, east of Stockinbingal (OEH, 2011)Construction footprint unlikely to be important habitat.
Tarengo Leek Orchid *(Prasophyllum petilum)*	E	E	Grows in open sites within Natural Temperate Grassland at the Boorowa and Delegate sites. Also grows in grassy woodland in association with *Poa labillardieri*, *Eucalyptus aggregata* and *Leptospermum spp*. near Queanbeyan and within the grassy groundlayer dominated by *Themeda* under Box-Gum Woodland at Ilford (and Hall, ACT). Natural populations are known in NSW, near Boorowa, Queanbeyan area, at Hall in the ACT, Ilford, Delegate and a new population c.10 km west of Muswellbrook.	PMST	Low. Associated with a PCT on site, however no known local populations.
Floating Swamp Wallaby-grass *(Amphibromus fluitans)*	V	V	Grows mostly in permanent swamps. The species needs wetlands which are at least moderately fertile and which have some bare ground, conditions which are produced by seasonally-fluctuating water levels. Habitats in south-western NSW include swamp margins in mud, dam and tank beds in hard clay and in semi-dry mud of lagoons with *Potamogeton* and *Chamaeraphis* species. The species is virtually aquatic, often with only the flower heads above the water. It has been recorded recently in lagoons beside the Murray River near Cooks Lagoon (Shire of Greater Hume), Mungabarina Reserve, East Albury, at Ettamogah, Thurgoona (Charles Sturt University Campus), near Narranderra, and also further west along the Murray River (near Mathoura) and in Victoria. There is a recent record of this species near Laggan in Upper Lachlan Shire.	PMST	None. No adequate habitat exists in the Proposal area.
A spear-grass *(Austrostipa metatoris)*	V	V	Grows in sandy areas of the Murray Valley; habitats include sandhills, sandridges, undulating plains and flat open mallee country, with red to red-brown clay-loam to sandy-loam soils. Associated species include	PMST	Low. Associated with a PCT on site, however no known local populations.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			Eucalyptus populnea, E. intertexta, Callitris glaucophylla, Casuarina cristata, Santalum acuminatum and *Dodonaea viscosa*. Most records occur in the Murray Valley. Scattered records also occur in central NSW including Lake Cargelligo, east of Goolgowi, Condobolin and south west of Nymagee. Otherwise only known from near Bordertown in south east South Australia, where it may be locally extinct.		
A spear-grass *(Austrostipa wakoolica)*	E	E	Confined to the floodplains of the Murray River tributaries of central-western and south-western NSW, it grows in open woodland on grey, silty clay or sandy loam soils; habitats include the edges of a lignum swamp with box and mallee; creek banks in grey, silty clay; mallee and lignum sandy-loam flat; open Cypress Pine forest on low sandy range; and a low, rocky rise. Associated species include Callitris glaucophylla, Eucalyptus microcarpa, E. populnea, Austrostipa eremophila, A. drummondii, Austrodanthonia eriantha and Einadia nutans.	PMST	Low. Associated with a PCT on site, however no known local populations.
Holly-leaf Grevillea *(Grevillea ilicifolia subsp. Ilicifolia)*	CE		Recorded from shrubby mallee communities. At Nericon near Griffith, Weare (1988) reports it as having occurred in 'dense mallee' in the early 1950s; the sole known plant of this population surviving in recent decades was growing in sandy loam soil in a disturbed remnant association of mallee eucalypts (*Eucalyptus gracilis, E. socialis and E. dumosa*), with *Callitris glaucophylla, Acacia brachybotrya and Olearia pimeleoides*. Near Lake Cargelligo, it occurs in red sandy soil in a mallee association of Eucalyptus socialis, *E. leptophylla*, and *Callitris verrucosa*, with a shrubby understorey of *Acacia montana, Dodonaea viscosa subsp. cuneata*, *Triodia sp., Prostanthera serpyllifolia, Santalum sp., Myoporum sp*., and *Phebalium squamulosum*. In NSW, it occurs, or has occurred, at highly disjunct localities in the central west and central south of the State.	4 Bionet records around Griffith	Low. Profile states than Griffith population is now thought to be extinct. Other population ~100km from proposal area.
Pomaderris cocoparrana	E	E	Confined to rocky sites at higher altitudes in the Cocoparra Ra. near Griffith. (PlantNet)	27 Bionet records	Low. Proposal area not within the known distribution of any populations.
Austral Toadflax *(Thesium australe)*	V	V	Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast, in very small populations scattered across eastern NSW, along the coast, and from the Northern to Southern	PMST	None. No associated PCTs on site, no records within the study area.

Common Name (Scientific Name)	Status		Habitat requirements	Number of records (BioNet)	Likelihood of occurrence
	BC Act	EPBC Act			
			Tablelands. It is also found in Tasmania and Queensland and in eastern Asia. Occurs in grassland on coastal headlands or grassland and grassy woodland away from the coast. Often found in association with Kangaroo Grass (Themeda triandra).		

Annexure D – Plot-Based Field Data Sheets

Field data appended overleaf.

Annexure E Threatened Species Assessments

Biodiversity Conservation Act 2016 Five-part test

The *Biodiversity Conservation Act 2016* (BC Act) specifies a set of five factors which must be considered by decision makers in assessing the effect of a proposed development or activity on threatened species, populations, ecological communities, or their habitats.

These factors are collectively referred to as the 'five-part test' or Test of Significance (ToS). ToS have been undertaken for the following BC Act listed entities:

Threatened Ecological Communities

- Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions (Endangered)
- 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 (Critically Endangered)

Fauna

- Squirrel Glider (Petaurus norfolcensis)
- Woodland Birds
    - Speckled Warbler (*Chthonicola sagittate*); Dusky Woodswallow (*Artamus cyanopterus cyanopterus*); White-fronted Chat (*Epthianura albifrons*), White-browed Treecreeper (*Climacteris affinis*); Brown Treecreeper (*Climacteris picumnus victoriae*); Diamond Firetail (*Stagonopleura guttata*); Varied Sittella (*Daphoenositta chrysoptera*); Gilbert's Whistler (*Pachycephala inornata*); Hooded Robin (*Melanodryas cucullata cucullata*); Scarlet Robin (*Petroica boodang*); Flame Robin (*Petroica phoenicea*); Shy Heathwren (*Hylacola cautus*); and Grey-crowned Babbler (*Pomatostomus temporalis temporalis*).
- Cockatoos and Parrots
    - Glossy Black-Cockatoo (*Calyptorhynchus lathami*); Pink Cockatoo (*Lophochroa leadbeateri*) and Superb Parrot (*Polytelis swainii*).
- Blossom Feeding Birds
    - Pied Honeyeater (*Certhionyx variegatus*); Painted Honeyeater (*Grantiella picta*)

Flora

Yass Daisy (Ammobium craspedioides)

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

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

N/A

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Box-Gum Woodland) is present in fragmented stretches across the entire 285 km study area. The TEC will mostly be impacted in the eastern portion of the study area over approximately 150 km.

Approximately 91 ha of the TEC occurs within the study area according to State Vegetation Mapping. Approximately 10.30 ha of this will be cleared or modified as part of the proposal. This equates to the removal of 11.44% of the TEC within the study area and 0.08% within the local occurrence. The local occurrence was calculated by buffering the study area by 5 km which identified up to 12,900 ha of TEC within it.

Each occurrence of TEC within the construction footprint is adjacent to patches of the same TEC outside the footprint no further than 100 m away. As part of the National Recovery Plan for the TEC, scattered trees shouldn't be separated by more than 100 m to ensure landscape connectivity is maintained for a healthy ecosystem (DECCW, 2010b). Aerial photography of the tree canopies was used to verify local connectivity for this analysis.

All the vegetation to be impacted is directly adjacent to the road and is previously impacted by edge effects, structural modification, and weed invasion. The proposal will exacerbate these effects by removing vegetation in all strata along the roadside within the six impacted vegetation areas. This will shift the edge effect deeper toward the intact portion of remnants. However, it is unlikely to be of sufficient magnitude to substantially modify composition and affect local TEC occurrence.

Edge effects will also be exacerbated where the seven trees near Galong are to are cleared by removing the protective canopy layer and exposing the understorey to higher light and fluctuating temperatures. However, this affect is highly localised and unlikely to shift community composition such that the vegetation no longer qualifies as Box-Gum Woodland EEC.

Taken together, the removal/modification of 0.08% of the local occurrence of Box-Gum Woodland is not expected to place the local occurrence at risk of extinction

c) In relation to the habitat of a threatened species or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

i) Up to 10.30 ha of habitat would be removed or modified as a result of the proposal. The extent of the adjoining TEC (calculated by associated PCTs) within 5 km of the study area is estimated at 12,900 ha.

ii) The 10.30 ha of habitat to be impacted is linear and occurs across a 285 km long proposal area, marginally increasing the disconnect between areas of habitat either side of Burley Griffin Way. The landscape is already considered fragmented as the study area is surrounded by cleared agricultural land. The areas of the TEC to be cleared have adjacent vegetation of the same TEC no more than 100 m away.

As such, the TEC is not likely to be further fragmented.

iii) According to the National Recovery Plan, all areas of Box-Gum Woodland TEC should be considered critical to the survival of the TEC (DECCW, 2010b). Degraded areas that do not qualify for TEC listing should also be considered important as they support higher quality areas. Although the areas of the TEC in the construction footprint do not present any unique or special habitat features that are not also found in adjoining habitat (i.e. hollow-bearing trees), the importance of the habitat is high.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the following Key Threatening Processes (KTPs) relevant to TECs:

- Clearing of native vegetation,
- Invasion and establishment of exotic vines and scramblers,
- Invasion of native plant communities by exotic perennial grasses,
- Removal of dead wood and dead trees, and
- Loss of hollow-bearing trees.

The clearing of native vegetation is the greatest KTP to the Box-Gum Woodland. The National Recovery Plan for the TEC indicates the need for avoidance of physical disturbance and to maintain or improve connectivity for the continued existence of the community. The impact of physical disturbance is unavoidable due to the nature of the proposal, however, due to the TEC being retained in adjacent areas to the impact, it is likely habitat connectivity will be maintained.

The following exotic vines and scramblers were recorded within the proposal site: Blackberry (*Rubus fruticosus spp.*) and Bridal Creeper (*Asparagus asparagoides*) (Plot 41 and 59 respectively). Exotic species can benefit from disturbance to natural vegetation and soil which could occur during all stages of the construction process. Preventing the spread of weeds such as these is most important to protecting biodiversity values. With strict safeguards relating to weed hygiene as detailed in Table 6-1, weed spread should be manageable. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

The proposal may assist in the spread of existing invasive weed species onsite if no active mitigation measures are undertaken. The proposal has the potential to spread weeds during tree removal and through the movement of vehicles and machinery into or out of the proposal area. Weeds are easily transported as seeds and propagules on machinery brought to the proposal area. They can also be carried away to other areas from the site or spread within it. High Threat Weeds detected during BAM plots include exotic grasses such as *Paspalum spp.*, the spread of which is highly threatening to native grassy woodland communities such as the Box-Gum Woodland. African Lovegrass (*Eragrostis curvula*) was recorded (e.g. Plot 41), a weed which can be difficult to control once established. To prevent road construction activities from introducing a new KTPs to the site, mitigation measures have been recommended in Table 6-1. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

The removal of deadwood, either standing or fallen, can cause the broadscale change of woodlands into paddocks. Deadwood and dead trees (fallen or standing) may be removed during the construction process as a safety measure to reduce machinery obstacles or to tidy up the roadsides. “Mulching on Site” is included in the description of this KTP as this removes future dead wood. Mulching felled timber is part of the proposal. To minimise this potential impact wood debris that is removed from the proposal site should be replaced into the surrounding vegetation or areas further from the roads edge in accordance with TfNSW Biodiversity Guidelines.

In NSW terrestrial vertebrate species that are reliant on tree hollows for shelter and nests include at least 46 mammals, 81 birds, 31 reptiles, and 16 frogs (Gibbons and Lindenmayer 1997, Gibbons and Lindenmayer 2002). A total of 64 HBTs out of 644 HBTs recorded within the study area will be removed as part of the proposal. Some of these HBTs are located within the Box-Gum Woodland TEC. It is unknown how many HBTs are present in the adjoining habitat, however, general observation made during the field surveys indicated a high abundance of HBTs.

The removal of 64 HBTs (within the impacted vegetation areas) will contribute to this KTP.

-

Conclusion

The proposal would affect up to 10.30 ha of Box-Gum Woodland TEC which occurs linearly along Burley Griffin Way. The TEC to be removed occurs in a fragmented landscape and the proposal would not substantially exacerbate that. Several KTPs would be exacerbated by the proposal including clearing of native vegetation, invasion of exotic vines, scramblers and grasses, removal of dead wood, and loss of hollow-bearing trees. The effects of these KTPs could be mitigated to some extent by recommendations given in Section 6*.* In summary, the vegetation to be removed is considered of high importance to the long-term survival of the local TEC (based on the National Recovery Plan), however, its' removal is not considered to directly place the local occurrence at risk of extinction.

Inland Grey Box Woodland in the Riverina, NSW South Western Slopes, Cobar Peneplain, Nandewar and Brigalow Belt South Bioregions

a. In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

N/A

b. In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

i. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

i. There is 96.07 ha of Inland Grey Box Woodland EEC within the study area according to State Vegetation Mapping. The proposed development will result in the removal of 2.77 ha of the EEC including 68 trees. This includes trees from PCT 76, 80, 82 and 110. This equates to 2.88% of the associated PCTs within the study area. However, there is 9,682 ha of the associated PCTs (possibly Grey Box Woodland EEC) mapped within a 5 km locality of the study area, making the approximate removal of the EEC 0.03% from the 5km locality.

The road upgrade and maintenance proposed by TfNSW will impact the canopy layer of the EEC through the activity of tree removal. This may have an adverse effect on the extent of the ecological community within the study area due to the permanent removal of the canopy layer. However, the EEC in the construction footprint only equates to 0.03% of that in the 5 km locality and thus the proposal is unlikely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii. The proposed activities are likely to adversely modify the composition of the EEC within the study area as 68 trees within 2.77 ha are to be permanently removed. It is unclear whether the removal of the canopy layer would shift the vegetation over time to the derived grassland state. The derived grassland occurs where the canopy and mid layer has been removed to less than 10% cover (NSW Scientific Committee, 2004-2007), thus it would depend on the persistence of the mid layer following canopy removal. Much of the EEC to be removed is supported by a surrounding landscape matrix of similar habitat.

c. In relation to the habitat of a threatened species or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

i. Up to 2.77 ha of the EEC equivalent vegetation (PCTs 76, 80, 82 and 88) will be substantially modified throughout the proposal. Removal of all 68 trees in these patches will impact the canopy species of the EEC.

ii. The 2.77 ha of habitat to be removed is in a linear form and is dispersed across a 285 km long proposal area. Removing this vegetation will marginally increase the disconnect between areas of habitat either side of Burley Griffin Way. Therefore, it is unlikely that the area of EEC proposed to be modified is to become fragmented or isolated as a result of the proposal.

iii. The habitat that would be modified is mostly viable habitat for this community. Incremental clearing of the EEC is a key threat, especially for remnants of particularly high quality (DEWHA, 2010). The roadside remnants in the construction footprint are not considered to be of particularly high quality therefore the importance to long-term survival of the EEC is considered to be moderate.

d. Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e. Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the following KTPs relevant to TECs:

- Clearing of native vegetation,
- Invasion and establishment of exotic vines and scramblers,
- Invasion of native plant communities by exotic perennial grasses, and
- Removal of dead wood and dead trees.

The clearing of native vegetation is the greatest KTP to the Inland Grey Box Woodland EEC. This impact is unavoidable throughout the proposal. Mitigation measures which are detailed in Section 6 of the proposal details the process of tree removal. Hazardous trees identified within the development footprint are planned to be individually removed by an arborist. The trees will then be mulched and stumps ground using machinery on site. The machinery used is to be restricted to the already existing road corridors to minimise impacts on surrounding vegetation. The presence of a fauna spotter onsite during tree removal is recommended in the case of fauna utilising the deadwood at the tree removal locations. Assuming mitigation techniques during the construction process are strictly adhered to, it is unlikely for the KTP to have an increased impact on the EEC.

The following exotic vines and scramblers were recorded within the proposal site: Blackberry (*Rubus fruticosus spp.*) and Bridal Creeper (*Asparagus asparagoides*) (Plot 41 and 59 respectively). Exotic species can benefit from disturbance to natural vegetation and soil which could occur during all stages of the construction process. Preventing the spread of weeds such as these is most important to protecting biodiversity values. With strict safeguards relating to weed hygiene as detailed in Table 6-1, weed spread should be manageable. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

The proposal may assist in the spread of existing invasive weed species onsite if no active mitigation measures were undertaken. The proposal has the potential to spread weeds during tree removal and through the movement of vehicles and machinery into or out of the proposal area. Weeds are easily transported as seeds and propagules on machinery brought to the proposal area. They can also be carried away to other areas from the site or spread within it. High Threat Weeds detected during BAM plots include exotic grasses such as *Paspalum spp.*, the spread of which is highly threatening to native grassy woodland communities. African Lovegrass (*Eragrostis curvula*) was also recorded (Plot 41), a weed which can be difficult to control once established. To prevent road construction activities from exacerbating an existing key threatening process on the site, mitigation measures have been recommended in Table 6-1. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation.

The removal of deadwood, either standing or fallen, can cause the broadscale change of woodlands into paddocks. Removal of deadwood and dead trees is part of this proposal. “Mulching on Site” is included in the description of this KTP as this removes future dead wood. To minimize the effect of the proposal, dead trees removed and existing woody debris within the proposal area should be replaced into the surrounding vegetation further from the roads edge. The presence of a fauna spotter onsite during tree removal is recommended in the case of fauna utilising the deadwood at the tree removal locations.

Conclusion

The proposal would modify around 2.77 ha of Inland Grey Box Woodland EEC including the removal of all 68 trees in the canopy of affected patches (refer to Figure 9-1 to Figure 9-3). Impacts to the EEC arising from the proposal are unlikely to be significant if mitigation measures listed in this report are enacted to protect the surrounding vegetation.

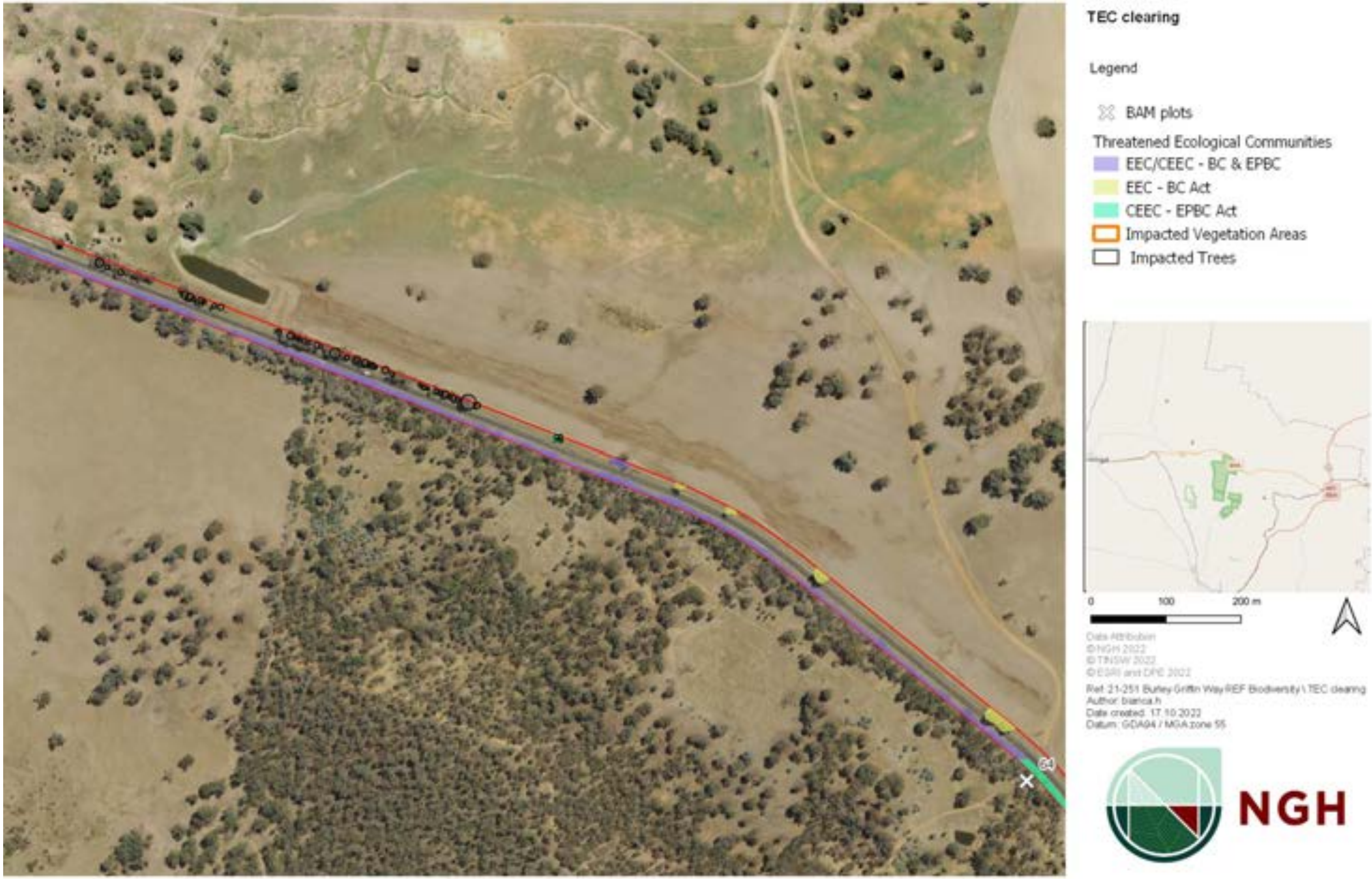


Figure 9-1 Grey Box Woodland to be cleared near Jindalee

Figure 9-2 Grey Box Woodland to be cleared near Stockinbingal

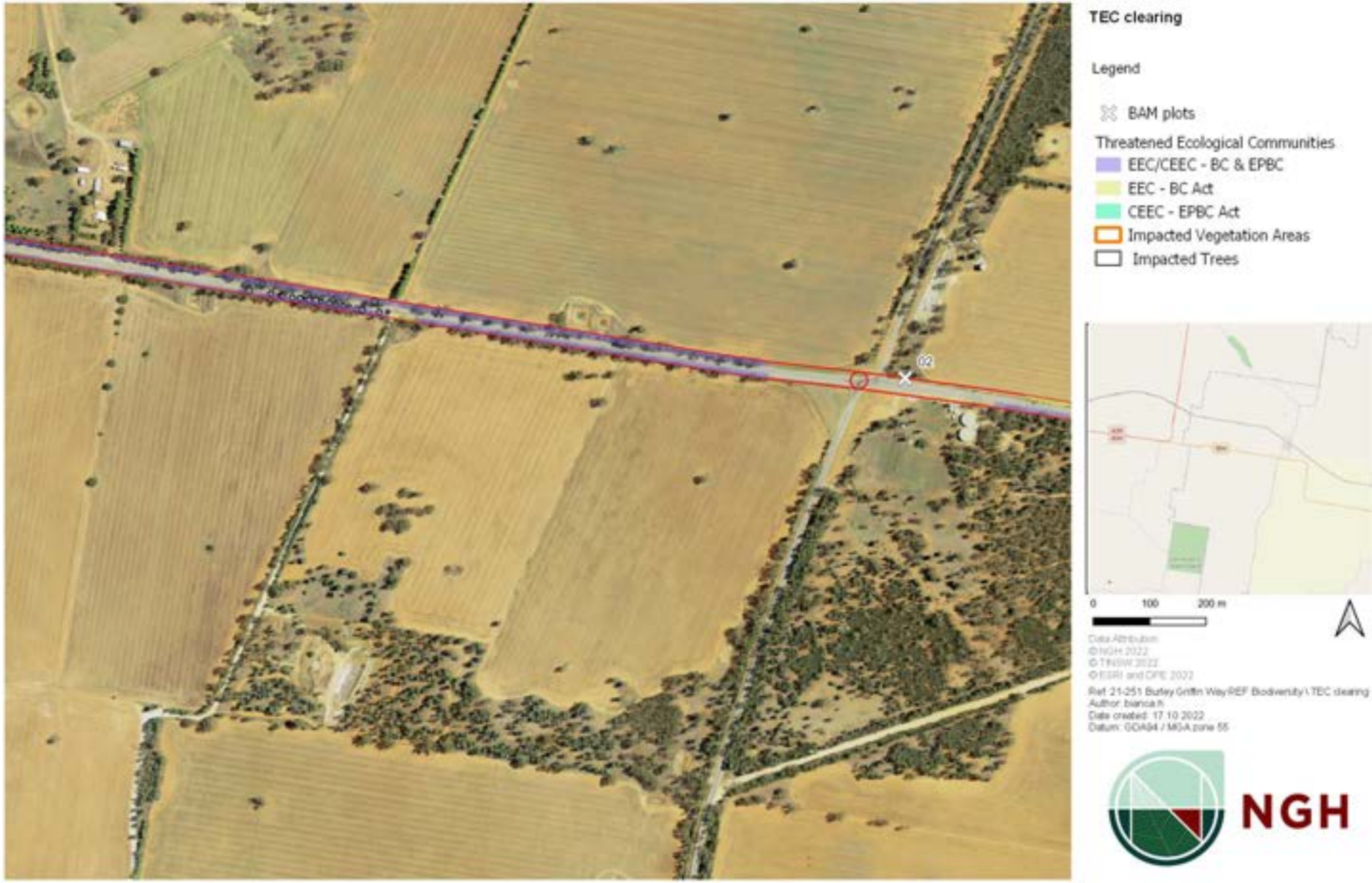


Figure 9-3 Grey Box Woodland to be cleared near Ariah Park

Arboreal, hollow-dependent mammals

Squirrel Glider (*Petaurus norfolcensis)*

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

No targeted surveys were undertaken for these species. Database records indicate a local population occurs in Jindalee NP which is confirmed by the Statement of Management Intent (OEH, 2011). Along the border of Jindalee NP, a distance of 2.3km, the study area contains foraging habitat for Squirrel Glider in the form of grassy woodlands (PCT 110 Western Grey Box–Cypress Pine shrubby woodland, PCT 277 Blakely's Red Gum–Yellow Box grassy tall woodland, PCT 217 Mugga Ironbark–Western Grey Box–Cypress Pine tall woodland, and PCT 342 Mugga Ironbark–mixed Box woodland).

The study area also provides connective corridors between Jindalee NP and Flagstaff Memorial Nature Reserve (~5 km west), as well as linking across the road to a large patch of vegetation along Congou Hill ridge. Along with the PCTs listed above, this 7.1 km corridor is also vegetated by PCT 80 Western Grey Box–White Cypress Pine tall woodland. Total key habitat area is 11.6 ha. The construction footprint would remove 0.3 ha of habitat along this key corridor.

As discussed in Section 3.8, the roadside vegetation between Flagstaff Memorial NR and Jindalee NP is wide (up to 100 m) and is well supported by ribbons of vegetation along gullies and ridges in the surrounding landscape. On this basis, the construction footprint it is not critical for maintaining connectivity between habitat patches important for dispersal and population dynamics.

Eleven HBTs were recorded along Burley Griffin Way between Flagstaff Memorial NR and Jindalee NP. These consist of stags, *E. albens*, and *E. melliodora* trees with a range of hollows including the small and medium entrance trunk hollows preferred by Squirrel Gliders (NSW Scientific Committee, 2008). Zero HBTs would be removed along the road corridor in the key habitat area.

Considering the above, the proposal is unlikely to have an adverse effect on the life cycle of Squirrel Gliders such that a viable local population of these species would be placed at risk of extinction.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

I. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

II. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A

c) In relation to the habitat of a threatened species or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

Around 0.3 ha of foraging habitat would be removed or modified between Jindalee NP and Flagstaff Memorial

NR. These areas assist in connectivity between large woodland remnants and may provide foraging resources supplementary to that available within remnants.

As discussed in Section 3.8, the roadside vegetation between Flagstaff Memorial NR and Jindalee NP provides a wide corridor approximately 7.1 km in length (Figure 9-4). Vegetation width varies between 20 m and 60m on either/both sides of the road. Landscape connectivity is also well supported by ribbons of vegetation along gullies and ridges.

The existing disturbance width along the road varies between 13 m and 20 m. The construction footprint occurs in seven discrete locations along the 7.1 km section, in some locations consisting of a single tree and in others a narrow strip of clearing on one side of the road between 50 m and 200 m in length. The longer sections are shown in Figure 9-5 below. The construction footprint affects one side of the road only while the vegetated corridor on the south side of Burley Griffin Way is maintained. As such, the proposal is unlikely to increase fragmentation or cause isolation for the Jindalee NP Squirrel Glider population.

The habitat in the proposal area would be of moderate importance to the Jindalee NP Squirrel Glider population given that it is part of the connectivity between adjacent important woodland areas that assist dispersal and increase habitat area. The habitat to be cleared (construction footprint) is considered low importance. Its' removal would not significantly reduce habitat connectivity.

Figure 9-4 Roadside vegetation between Flagstaff Memorial NR and Jindalee NP

Figure 9-5 Construction footprint detail between Flagstaff Memorial NR and Jindalee NP

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area

of outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal contributes to the following KTPs relevant to this species:

- Clearing of native vegetation
- Loss of hollow-bearing trees

Mitigation measures are outlined in Table 6-1 to minimise the impacts to Squirrel Glider

Conclusion

The proposal would remove 0.3 ha of foraging habitat in the key habitat area for the Jindalee NP Squirrel Glider population in the form of narrow lines of trees along the roadside. The proposal would remove low importance habitat and not affect the connectivity or lifecycle of the species such that the local population would be placed at risk of extinction.

Woodland Birds

Speckled Warbler (*Chthonicola sagittate*); Dusky Woodswallow (*Artamus cyanopterus cyanopterus*); White-browed Treecreeper (*Climacteris affinis*); Gilbert's Whistler (*Pachycephala inornata*); Hooded Robin (*Melanodryas cucullata cucullata*); Flame Robin (*Petroica phoenicea*); Shy Heathwren (*Hylacola cautus*); and Grey-crowned Babbler (*Pomatostomus temporalis temporalis*).

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

Shy Heathwren, Gilbert's Whistler, and White-browed Treecreeper are confined to the far west of the proposal area and are associated with Binya SF. The Binya SF White-browed Treecreeper population near Griffith is the Carrathool endangered population which is isolated by habitat clearing and is thought to number 20 pairs or less (NSW Scientific Committee, 2000-2003). Treecreepers are poor disperses across fragmented landscapes (NSW Scientific Committee, 2000-2003). All three species above are sedentary and at a local level are confined to Binya SF. They would not depend upon the habitat in the proposal area except for occasional dispersal east-west.

Speckled Warbler, Dusky Woodswallow, Hooded Robin, Flame Robin, and Grey-crowned Babbler occur along most of the proposal area but the roadside vegetation is unlikely to host a population. Rather, the proposal area would form part of a larger home range. Records for the sedentary woodland birds Brown Treecreeper, Diamond Firetail, and Varied Sittella are dotted all along the proposal area with apparent strongholds in large woodland remnants such as Binya SF, Ingalba NR, and Jindalee NP. Dispersal between these remnants which are 100 km and 50 km apart respectively is unlikely given the fragmented nature of the intervening landscape (Doerr, Doerr, & Davies, 2011; NSW Scientific Committee, 2008-2010), particularly in the western portion of the study area. Diamond Firetails are unable to persist in remnants smaller than 200 ha (NSW Scientific Committee, 2000-2003). Brown Treecreeper and Varied Sittella make use of remnants as well as mosaic landscapes (e.g. scattered trees) where trees are less than 100 m apart (Doerr, Doerr, & Davies, 2011).

As such, although the proposal area may provide foraging and nesting opportunities, the core contribution of the proposal area to these species is the provision of a vegetated corridor connecting woodland patches dispersed through the landscape. It is this role of landscape connectivity that the proposal’s impact upon the above listed species is being considered.

In the far west of the proposal area, Burley Griffin Way passes through Binya SF which is contiguous with Cocoparra NP. This large remnant woodland is inhabited by several threatened species and provides important breeding and foraging habitat (refer to Section 3.8). The study area does not provide important breeding and foraging habitat for these species. Speckled Warbler, Dusky Woodswallow, Hooded Robin, Flame Robin, Grey-crowned Babbler, Brown Treecreeper, Diamond Firetail, and Varied Sittella lifecycles would depend on the connectivity linkages provided by the roadside vegetation to other patches of woodland dotted throughout the highly cleared landscape. To a lesser extent, Shy Heathwren, Gilbert's Whistler, and White-browed Treecreeper may also depend on these corridors for dispersal (if undertaken). A detailed discussion is given in Section 5.2.2 of specific wildlife corridors along the proposal area. In summary, the proposal would therefore not be expected to reduce the ability of species to disperse east-west from Binya SF to other woodland patches in the landscape as for the most part the vegetation along Burley Griffin would be maintained. Where vegetation is to be cleared, the increased vegetation gap created across the road would not reduce connectivity east-west or increase the gap above the 100 m threshold that many species can tolerate, or above the existing gap distances. Considering the above, the proposal is considered unlikely to have an adverse effect on the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:
i) Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

ii) Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A

c) In relation to the habitat of a threatened species or ecological community:
i) The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and
ii) Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result

of the proposed development or activity, and
iii) The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

i) In the corridor between Binya SF east to Binya village, 120 m of a single row of trees would be removed. This habitat aids landscape connectivity and species dispersal. East of Kamarah, individual trees along 600 m would be removed.

ii) As already discussed in a), while the potential for causing isolation is present due to the already highly fragmented nature of the vegetation in the local area between Binya SF and Binya as well as between Kamarah and Ardlethan, the construction footprint is located such that connectivity will be maintained in an east-west direction.

iii) The importance of the habitat to be removed is moderate as it provides a role in maintaining functional connectivity at a landscape scale but is not crucial as there is sufficient other vegetation in the immediate area for connectivity to be maintained.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

In the part of the construction footprint discussed herein (near Erigolia Rd and Dobells Rd intersections), the relevant KTP is clearing of native vegetation. Clearing vegetation has a range of impacts (OEH 2022). The main potential impact of relevance here is fragmentation leading to isolation of habitat as the connectivity in this area is already tenuous. As already discussed, the construction footprint is not critical in maintaining connectivity in the immediate vicinity. It is noted that connectivity in the immediate area could be strengthened by revegetation plantings to the west of the Erigolia Rd intersection where there is an existing vegetation gap of more than 100 m and along Kamarah Tank Rd or indeed along Burley Griffin Way. Even shrub plantings would assist connectivity.

Conclusion

Within the construction footprint 120 m of a single row of trees would be removed east of Binya SF and along 600 m of road east of Kamarah. In these places, vegetation growing along Burley Griffin Way has been identified as important in aiding species dispersal and maintaining landscape connectivity. Although the removal of native vegetation in these areas is unlikely to cause local population extinction, it does add to the depletion of landscape connectivity overall. It is recommended that wherever possible along the proposal area but particularly in the areas identified above, revegetation works occur to replace trees with friable shrubs suitable for roadsides.

Cockatoos and Parrots

Glossy Black-Cockatoo (*Calyptorhynchus lathami*); Pink Cockatoo (*Lophochroa leadbeateri*); and Superb Parrot (*Polytelis swainii*).

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

All three species are associated with most of the vegetation types found in the study area:

- Glossy Black-Cockatoo is associated with grassy woodlands (PCT 74, 76, 80, 82, 266, 277), semi-arid woodlands (PCT 72, 103), and dry sclerophyll forest (PCT 110, 217) (DPE, 2022).
- Pink Cockatoo is associated with grassy woodlands (PCT 74, 76, 80, 82), semi-arid woodlands (PCT 103), and dry sclerophyll forest (PCT 110, 217) (OEH, 2022).
- Superb Parrot is associated with grassy woodlands (PCT 74, 76, 80, 82, 266, 276, 277), semi-arid woodlands (PCT 72, 103), dry sclerophyll forest (PCT 110, 217), and derived grasslands (PCT 250, 796) (OEH, 2022).

Using known PCT associations, up to 7.96 ha for the Glossy Black-Cockatoo, 3.96 ha for the Pink Cockatoo, and 14.18 ha for the Superb Parrot would be cleared. Up to 64 of the 644 HBT recorded within the study area that may be used for shelter and breeding would be cleared. Refer to Annexure G for detailed information regarding hollow types and sizes.

Glossy Black-Cockatoo records occur sporadically right across the proposal area with more abundant records in the Binya SF area where they are known to occur. Pink Cockatoo occurs from Griffith to Temora. Superb Parrot records occur regularly along the study area but Burley Griffin Way traverses their core breeding area between about Stockinbingal and Yass. All are assumed to occur along the proposal area from time to time in suitable habitat, particularly where the road crosses through large woodland patches such as Binya SF, Ingalba NR, and Jindalee NP or the patchy mosaic woodland/scattered tree habitat that occurs in the eastern portion of the study area. All three (Glossy Black-Cockatoo, Pink Cockatoo and Superb Parrot) would utilise the proposal area as a movement corridor. Although these species are highly mobile and travel long distances, cockatoos and parrots generally prefer to move within vegetated corridors rather than across open country and utilise roadside vegetation for this purpose (Rycken, et al., 2022). Pink Cockatoo's travel along vegetated corridors including roadside remnants between foraging (and roosting/breeding) sites (DAWE, 2022).

Connectivity was discussed in detail in the woodland birds ToS above. Three key locations were identified where the proposal area is likely to play a crucial role in maintaining landscape connectivity: between Binya SF and Erigolia Rd to the east (~1.8 km); for around 5 km west and 2.5 km east of the township of Moonbooldool; and between Kamarah and Ardlethan. In these areas the construction footprint is sufficiently small and selective so that connectivity is maintained either directly or due to adjacent vegetation. As such, dispersal ability for Glossy Black-Cockatoo, Pink Cockatoo and Superb Parrot would be maintained.

Most parrots and cockatoos prefer remnants for breeding rather than streets/roadside verges (Davis, Taylor, & Major, 2012). (Note: this was a study conducted in urban and peri-urban landscape and may have been related to the availability of hollows rather than preference for habitat configuration.) Hollow bearing trees are considered a crucial habitat feature for all three Cockatoo and Parrot species. Sixty-four HBT are to be cleared along the proposal area. Glossy Black-Cockatoos utilise large upward facing spouts with an entrance diameter of at least 15 cm (Glossy Black Conservancy, 2022). Pink Cockatoos nest in large paddock (>75 DBH) tree hollows (greater than 13 cm), and often in Cypress Pines (*Callitris gracilis*) (DAWE, 2022)(DPE, 2022). Superb Parrots utilise large trees (>90 cm DBH) with a medium hollow-entrance-diameter of around 10-13 cm (DAWE, 2021). Road verges are often the only remaining areas with old hollow-bearing trees of suitable depth and diameter for Superb Parrots (Davey & Purchase, 2004) and the species is frequently recorded nesting in roadside trees (McGrath, 2019).

The HBTs to be cleared have been considered from Stockinbingal to Yass within the Superb Parrot core breeding area. Of the 64 recorded HBT that fall within the construction footprint, none have been recorded as having suitable nesting parameters for Superb Parrots. Pink Cockatoos have similar critical habitat, relying on large intact areas with suitable attributes, particularly old trees bearing hollows large enough to be suitable for nesting in as well as movement corridors for dispersal (DAWE, 2022) (BirdLife, 2022). Glossy Black Cockatoos require hollows with an entrance greater than 15 cm. Up to 52 of the 64 HBT's within the construction footprint have medium and large hollows. However, for all three bird species over 500 HBT will remain in connected habitat retained from outside the proposal area and approximately 129.6 ha of Superb Parrot habitat. This greatly decreases the likelihood of adversely impacting their lifecycles to the point of extinction.

To further minimise the risks of extinction, any road verge maintenance that involves the removal of habitat features should not occur unless a survey is undertaken for the presence of all three bird species during their breeding seasons where possible i.e. between September and December for Superb Parrots, August to November for Pink Cockatoos, and March to August for Glossy Black Cockatoos (Davey & Purchase, 2004)(DPE, 2022) (DPE, 2022). Pre-clearing surveys and supervision of felling by a spotter catcher or suitably qualified and experienced fauna handler would be utilised such that if a HBT is in use, interruption of breeding or mortality of individuals can be mitigated. Appropriate nest boxes should be installed to replace hollows lost in habitat suitable for the above cockatoos and parrots. Considering the above, the proposal is considered unlikely to have an adverse effect on the life cycle of these species such that a viable local population of these species is likely to be placed at risk of extinction.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

I. **Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

II. **Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.**

N/A

c) In relation to the habitat of a threatened species or ecological community:

i. **The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and**

ii. **Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and**

iii. **The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.**

i) Up to 7.96 ha for the Glossy Black-Cockatoo, 3.96 ha for the Pink Cockatoo, and 12.4 ha for the Superb Parrot would be removed or modified. This includes 64 HBT of a range of characteristics (refer to Annexure G for HBT details). .

ii) There are sections along the 285 km proposal area where connectivity is already tenuous. Habitat for Glossy Black-Cockatoo, Pink Cockatoo, and Superb Parrot is highly fragmented and all three species depend upon vegetated movement corridors for dispersal. In-depth analysis presented elsewhere in this ToS shows that fragmentation of existing corridors as a result of the proposal is unlikely. However, plantings could be taken along the road corridor to bolster vulnerable areas. This is discussed is Section 6.

Vegetated movement corridors such as those in the proposal area are critical to the survival of Pink Cockatoo (DAWE, 2022) and Glossy Black-cockatoo (DCCEEW, 2022b). Suitable hollow-bearing trees in the Superb Parrot core breeding area such as those between Stockinbingal and Yass in the proposal area are critical to its' survival (Baker-Gabb, 2011); HBTs meeting these parameters are to be retained. Sixty-four HBT are to be impacted by the proposed development. However, there are over 500 HBTs retained in adjoining areas equating to 129.6 ha of vegetation.

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of

outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal involves the following KTPs relevant to these species:

- Clearing of native vegetation
- Loss of hollow-bearing trees

These activities represent a very high risk to the Pink Cockatoo (DAWE, 2022) and constitute direct threats to Superb Parrot (DAWE, 2021) and Glossy Black-cockatoo (DCCEEW, 2022b).

Conclusion

The proposal includes activities that threaten Glossy Black-cockatoo, Pink Cockatoo, and Superb Parrot, namely clearing of native vegetation including hollow-bearing trees. However, a significant impact upon their populations is not considered likely. The proposal area contains roadside remnant and planted vegetation that provides critical vegetated corridors for dispersal for all three species. Clearing in the construction footprint is not likely to disrupt connectivity but does weaken existing linkages in key areas (i.e. between Binya SF and Erigolia Rd to the east; for around 5 km west and 2.5 km east of the township of Moonbooldool; and between Kamarah and Ardlethan). These linkages could be bolstered by planting frangible native vegetation along road corridors. Clearing of HBT in the construction footprint includes large and medium hollows. This could be partially offset by installing nest boxes in suitable vegetation at a ratio of at least 1:1 for hollows lost (type and size) based on Annexure G. Nest boxes should be suitable for the species they are serving..

Blossom Feeding Birds

Pied Honeyeater (*Certhionyx variegatus*); Painted Honeyeater (*Grantiella picta)*

a) In the case of a threatened species, whether the action proposed is likely to have an adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

There are less than 10 records of Pied Honeyeater within 10 km of the proposal and all are around Griffith and Yenda. Painted Honeyeater has been recorded at Binya SF, Ingalba NR and Jindalee NP. The proposal area crosses the northern parts of these reserves.

Pied Honeyeater has the potential to be associated with several vegetation communities in the proposal area including grassy woodlands (PCT 80, 82) and semi-arid woodlands (PCT 103). However, its core habitat is mallee (such as PCT 174) and Emu-bush (*Eremophila* spp.) shrubland (OEH, 2022). *Eremophila* spp. were recorded in the following BAM plots:

- Plot 4 (7% cover) in vegetation where the proposal area crosses Trigalong Creek ~2 km west of Temora. No clearing is proposed in this area.
- Plot 7 (0.2% cover in Mugga Ironbark community) just west of Temora. Clearing is proposed on the north side of the Burley Griffin Way for a distance of around 600 m, consisting of a single row of trees and ground cover to a width of 10 m from PCT 76 (0.6 ha).
- Plot 10 (2% cover) near the intersection with Old Wagga N Rd in the locality of Pucawan. No clearing is proposed in this area.
- Plot 16 (0.4% cover) in Moombooldool. No clearing is proposed in this area.
- Plot 73 (0.4% cover) at the crossroads with Joblings Lane south of Ariah Park. No clearing is proposed in this area.

Little is known about Pied Honeyeater ecology other than it is dispersive and nomadic, has beak adaptions to specialise foraging on *Eremophila* species, and nests in shrubs or small trees (BirdLife Australia, 2022). It is susceptible to loss of large old trees within woodland habitat and in vegetated corridors between (NSW Government, 2022). In terms of foraging habitat, the loss of 0.6 ha of tall grassy woodland which includes a low density of favoured *Eremophila* feed species is unlikely to drive the species to extinction. Dispersal corridors are discussed further below.

Although the Painted Honeyeater could occur all along the proposal area, of the more than 100 records within 10 km, the majority are centred around Griffith and Yenda townships (ALA, 2022). Recent and historical records should be given equal value for this nomadic species (DAWE, 2021b). This is likely due to the large population known to occur in Binya SF (BirdLife International, 2022). The proposal area intersects two key biodiversity areas (KBA) associated with Painted Honeyeater: Binya & Cocoparra (discussed in Section 3.8) and South-west Slopes of NSW & ACT (DAWE, 2021b). Larger remnant blocks of woodland and forest are most valuable but habitat critical to Painted Honeyeater occur where *Amyema* mistletoe species is present for foraging, as well as dispersal pathways (DAWE, 2021b). Mistletoe was recorded in only four of the 81 BAM plots and it is assumed that surrounding contiguous vegetation would also have mistletoe present:

- Plot 36 occurs in a patch of PCT 82 Western Grey Box – Poplar Box – White Cypress Pine tall woodland on the western edge of Binya SF along a 600 m remnant bordered in the west by the Northern Branch Canal and in the east by Whitton Stock Rd. No clearing is proposed in this area. It is directly adjacent to Binya SF. Note: the four plots located along the proposal area through Binya SF did not record Mistletoe.
- Plot 52 occurs near PCT 277 Blakely's Red Gum – Yellow Box grassy tall woodland approximately 3 km west of Harden. Roadside vegetation in this area (a 3 km length of road between Currawong Ck in the east and Demondrille Ck in the west) is patchy. The construction footprint includes six single trees and a 30 m cluster of trees, totally approximately 0.4 ha. From a foraging perspective, the construction footprint in this area would be marginal foraging habitat given how fragmented it already is, particularly compared to the more mosaic woodland landscape adjacent to the road.
- Plot 64 occurs in PCT 110 Western Grey Box - Cypress Pine shrubby woodland along the border of Jindalee NP (and the south side of the road). Along the border of Jindalee NP there are three discrete patches of clearing proposed, described from the east: ~180 m on the north side of the road, ~70 m clearing on the south side of the road and ~550 m of clearing on the north side of the road. The construction footprint in all three locations are approximately 10 m, making for approximately 0.8 ha of prime foraging habitat clearing in this location.

- Plot 66 occurs in PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland near a small patch of woodland which joins an extensive woodland area accessed via Porters Lane approximately 2.5 km east of Springdale. Approximately 100 m of clearing of good foraging habitat on the north side of Burley Griffin Way (about 10 m width) is proposed in this area (0.1 ha).

In terms of foraging habitat, around 0.4 ha of marginal foraging habitat and 0.9 ha of good foraging habitat for Painted Honeyeater would be cleared in discrete footprints along the proposal area. This total loss of 1.3 ha over a large proposal area and along a mostly narrow remnant corridor (as opposed to within large woodland blocks) is unlikely to drive the species to extinction. Dispersal corridors are discussed further below.

A detailed discussion regarding dispersal corridors and connectivity was given in the woodland birds ToS above. Three key locations were identified where the proposal area is likely to play a crucial role in maintaining landscape connectivity: between Binya SF and Erigolia Rd to the east, a distance of ~1.8km; for around 5km west and 2.5km east of the township of Moonbooldool and; between Kamarah and Ardlethan. In these areas the construction footprint is sufficiently small and selective so that connectivity is maintained either directly or due to adjacent vegetation. Thus, dispersal ability for Pied Honeyeater and Painted Honeyeater would be maintained and therefore the populations would not be at existential risk.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

III. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

IV. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A

c) In relation to the habitat of a threatened species or ecological community:

iv. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

v. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

vi. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

i) Clearing of areas of habitat meeting the specific foraging requirements of these dietary specialists is as follows: 0.6 ha of Pied Honeyeater *Eremophila* habitat; 1.3 ha of Painted Honeyeater *Amyema* habitat.

ii) As discussed in other ToS, there are sections along the 285 km proposal area where connectivity is already tenuous. Habitat for Pied Honeyeater and Painted Honeyeater is highly fragmented and both species depend upon vegetated movement corridors for dispersal. In-depth analysis presented elsewhere in this ToS shows that fragmentation of existing corridors as a result of the proposal is unlikely. However, plantings could be taken along the road corridor to bolster vulnerable areas. This is discussed is Section 6.

iii) Areas with *Eremophila* and large old trees are important to Pied Honeyeater, presumably for nectar when *Eremophila* are not in flower as well as for connectivity (NSW Government, 2022). Both would be cleared as part of this proposal. Any foraging and dispersal habitat is considered critical to the survival of Painted Honeyeater (DAWE, 2021b).

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of

outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the following KTPs relevant to these species:

- Clearing of native vegetation

The clearing of native vegetation is an unavoidable impact of the proposal but constitute habitat loss and degradation for Pied Honeyeater and Painted Honeyeater.

Conclusion

The proposal includes activities that threaten Pied Honeyeater and Painted Honeyeater, namely clearing of native vegetation. The proposal area contains roadside remnant and planted vegetation that provides critical vegetated corridors for dispersal. Clearing in the construction footprint is not likely to disrupt connectivity but does weaken existing linkages in key areas. These linkages could be bolstered by planting frangible native vegetation along road corridors, such as *Eremophila* spp. in the western portion of the proposal area. Around 0.6 ha and 1.3 ha of specialist foraging habitat would be removed for Pied and Painted Honeyeaters, respectively. For Painted Honeyeater this is identified as critical habitat (DAWE, 2021b). According to the National Recovery Plan, actions that remove critical habitat would interfere with the species' recovery. If removal cannot be avoided then an offset should be provided (DAWE, 2021b).

Flora

Yass Daisy (*Ammobium craspedioides*)

a) In the case of a threatened species, whether the action proposed is likely to have ana) adverse effect on the life cycle of the species such that a viable local population of the species is likely to be placed at risk of extinction.

The Yass Daisy is a rare perennial herb inhabiting sclerophyll woodland, forest and roadsides (Harden, 1992). It perennates by tuber (Thiele & Adams, 2014). Little information is available about the biology of Yass Daisy, however it is assumed to be insect pollinated (Encyclopedia Britannica, 2022) with wind-borne seeds (Tabassum & Bonser, 2017) as many other daisies of the Asteraceae family. The closest record (within 500m of proposal area) dates from 1999 near the village of Binalong.

The Yass district is the centre of distribution for this species (Fallding, 2002) and most records are confined to the district. There are 22 BioNet records of Yass Daisy between Binalong and Yass including areas adjacent to the proposal area. The Yass Daisy records within 10 km of the study area occur along the eastern most 3 km of the proposal area. Figure 9-6 shows location of records and inset shows the Yass Daisy habitat area used for calculations herein. Yass Daisy occurs in dry forest, Box-Gum Woodland, and secondary grassland derived from these communities (DEWHA, 2008). Within the habitat area PCTs 266, 277, and 796 occupy 28.7 ha of the proposal area. Of this, 6.3 ha falls within the construction footprint. Road widening is listed as threat to this species because it often grows on ungrazed roadsides (OEH, 2022). A targeted survey was not undertaken for Yass Daisy and it was not observed opportunistically during vegetation surveys. The survey was undertaken in June-July while Yass Daisy flowers in summer. Therefore, it is possible that the species was present but overlooked.

Tree removal would not affect the lifecycle of Yass Daisy given it will be conducted in a way to minimise impacts to biodiversity values other than the trees to be cleared. The areas of minor shoulder widening works would involve clearing all vegetation strata and this would impact individuals if they occur. However, the majority of available habitat would not be affected by the works and therefore the proposal is not expected to have an adverse effect such that it would be placed at risk of extinction.

b) In the case of an endangered ecological community or critically endangered ecological community, whether the proposed development or activity:

I. Is likely to have an adverse effect on the extent of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

II. Is likely to substantially and adversely modify the composition of the ecological community such that its local occurrence is likely to be placed at risk of extinction.

N/A

c) In relation to the habitat of a threatened species or ecological community:

i. The extent to which habitat is likely to be removed or modified as a result of the proposed development or activity, and

ii. Whether an area of habitat is likely to become fragmented or isolated from other areas of habitat as a result of the proposed development or activity, and

iii. The importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species or ecological community in the locality.

i. Around 6.3 ha of habitat for the Yass Daisy would be removed or modified.

ii. The proposal would not substantially alter the landscape habitat matrix and would not lead to fragmentation or isolation for Yass Daisy.

iii. Of the habitat to be removed, around 5.9 ha qualifies as EPBC Act listed Critically Endangered Box-Gum Woodland community. This habitat being in moderate to good condition is of moderate to the long-term persistence of the important population of Yass Daisy although it must be noted that a sub-population of the species is not known to occur in the construction footprint (or the proposal area).

d) Whether the proposed development or activity is likely to have an adverse effect on any declared area of outstanding biodiversity value (either directly or indirectly).

The proposal area does not contain an area of outstanding biodiversity value.

e) Whether the proposed development or activity is part of a key threatening process or is likely to increase the impact of a key threatening process.

The proposal is part of the following key threatening processes relevant to these species:

- Clearing of native vegetation
- Invasion of native plant communities by exotic perennial grasses

The clearing of native vegetation is an unavoidable impact of the proposal and has potential to destroy any undocumented communities of Yass Daisy occurring within the construction footprint. Additionally, the proposal is an identified threat to the species as many communities are found in remnant vegetation on road reserves. As stated in Table 6-1, clearing of native vegetation will be undertaken in accordance with *Guide 1: Pre-clearing process* of the *Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). This guide outlines the need to compile and implement a Construction Environmental Management Plan or a Flora and Fauna Management Sub-Plan to appropriately deal with unexpected species finds during the clearing process.

Invasion of native plant communities by exotic perennial grasses such as Serrated Tussock (*Nassella trichotoma*) is a potential indirect impact of the proposal relevant to the species. This can be mitigated by following strict weed management protocols. As stated in Table 6-1, weed management will be followed according to with *Guide 6: Weed management of the Biodiversity Guidelines: Protecting and managing biodiversity on RTA projects* (RTA 2011). A Weed Management Plan will be compiled specific to the project site (threatened species present, priority weeds, high constraint areas etc.) and implemented throughout the entire works from pre-clearing to rehabilitation.

Conclusion

Approximately 6.3 ha of Yass Daisy habitat (without a known population occurring) would be cleared along a 3 km stretch of Burley Griffin Way. The proposal has potential to increase the impacts of two KTPs. The clearing of native vegetation is considered unavoidable and impacts will need to be mitigated by implementation of a Construction Environmental Management Plan. The invasion of native plant communities by exotic perennial grasses can be avoided by following weed management protocols that will need to be outlined and implemented through a Weed Management Plan.

Figure 9-6 Yass Daisy records within 10km of the proposal area are all between Binalong and Yass at the far eastern end of the proposal area

- White box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands (Box-Gum Woodland)
- Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia (Inland Grey Box Woodland)

An action is likely to have a significant impact on a Critically Endangered or Endangered Ecological Community if there is a real chance or possibility that it will:

a) Reduce the extent or an ecological community

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands

White Box, Yellow Box, Blakely's Red Gum Grassy Woodland and Derived Native Grasslands (Box-Gum Woodland) is present in fragmented stretches across the entire 285 km study area. However, the TEC will only be impacted in the eastern portion of the proposal area over approximately 150 km.

Approximately 6.51 ha of Box-Gum Woodland within the study area is to be cleared as part of the proposal including impacted vegetation areas and impacted trees. The vegetation to be impacted is subject to edge effects and is highly disturbed in parts.

State Vegetation Mapping indicates that 12,900 ha of PCTs associated with Box-Gum Woodland occur within 5 km of the study area. The removal of 6.51 ha of vegetation constitutes approximately 0.05% of the total potential community within the locality.

The proposal will reduce the extent of Box-Gum Grassy Woodland by 6.51 ha. The extent to be cleared is not considered significant as connectivity is expected to be maintained between vegetation in the study area and in adjoining areas.

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

Approximately 1.66 ha of Inland Grey Box Woodland will be impacted as a result of the proposal. The proposal involves removing the canopy trees and retaining the shrub and ground strata. The 1.66 ha of habitat to be impacted is linear and occurs sporadically along the 285 km roadside proposal area. This area constitutes <0.02% of the approximately 9,682 ha of the TEC mapped within 5 km.

It is important to note that the adjoining vegetation outside the study area is not ground-truthed or condition assessed, therefore the area of extent of TEC is likely to be much lower than 9,682 ha. Even if the local extent was incorrect by a factor of 10 (i.e. being only 968 ha), this still equates to a small percentage impact (0.2%).

b) fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands

The 6.51 ha of habitat to be impacted is in a linear form and occurs across a 285 km long proposal area. This impact would marginally increase the disconnect between areas of habitat either side of Burley Griffin Way. The landscape is already considered fragmented as the study area is surrounded by cleared agricultural land. Most of the areas of the TEC to be cleared have adjacent vegetation of the same community no more than 100 m away, therefore the TEC is not likely to be fragmented significantly more than it already is.

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

The 1.66 ha of habitat that is proposed to be modified consists of mostly narrow and discontinuous roadside vegetation which is already fragmented. Modifying this vegetation by removing the canopy will increase the disconnect between treed areas of habitat either side of Burley Griffin Way. Many of the tree removal locations have a matrix of scattered trees and remnant patches adjacent. At Ariah Park (at the intersection of Mary Gilmore Way and Burley Griffin Way) where the TEC is surrounded by cropping land, the proposal has the potential to impact on connectivity and habitat functions. However, the community here consists of a single line of trees and understorey with nearby vegetation providing better habitat corridors in terms of width and landscape matrix (refer Figure 9-1 to Figure 9-3).

As such, the magnitude of additional fragmentation due to the proposal is not considered significant.

c) adversely affect habitat critical to the survival of an ecological community
White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands
The National Recovery Plan states that all areas of Box-Gum Woodland are areas of critical habitat, therefore the proposal area occurs in an area of critical habitat for this CEEC (DECCW, 2010). The proposal would result in the removal of 6.51 ha of Box-Gum Woodland constituting a 0.05% reduction over an approximately 150 km long portion of the proposal area. The Box-Gum Woodland to be removed would involve vegetation from patch edges rather than breaking apart of large blocks of vegetation into many smaller patches. The areas of the CEEC to be cleared do not present any unique or special habitat features that are not also found in adjoining habitat (i.e. hollow bearing trees). The removal of 6.51 ha of roadside fragments of Box-Gum Woodland cover a large area is unlikely to jeopardise the long-term survival of this TEC locally. The removal of this critical habitat is not considered to have an adverse impact upon the survival of Box-Gum Woodland as it is unlikely to fragment the habitat more than it already is.
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
Critical habitat for Inland Grey Box Woodland is not clearly defined. However, the Minister's Advice notes that Inland Grey Box Woodland provides critical habitat functions and connectivity between remnants is essential to the persistence of the community. Based on State Vegetation Mapping, the stretches of Inland Grey Box Woodland to be impacted are unlikely to be critical to the survival and dispersal of native species (refer to Section 5.2.2). While several BAM plots conducted in Inland Grey Box Woodland noted the presence of mature trees (>50 cm DBH), the construction footprint is in the vicinity of only three plots with mature trees (Plots 2, 6, 74). Due to the small areas to be modified in relation to the surrounding matrix, it is not expected that the proposal will adversely affect habitat critical to the Inland Grey Box Woodland survival.

d) modify or destroy abiotic (non-living) factors (such as water, nutrients, or soil) necessary for an ecological community's survival, including reduction of groundwater levels, or substantial alteration of surface water drainage patterns
White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands
The proposal does not involve works that would affect groundwater levels or substantially alter surface water drainage patterns, which would lead to modifying or destroying abiotic factors necessary for this TEC's survival. The trees to be removed in the six impacted vegetation areas will be felled then mulched. The mulch could be moved elsewhere which could disrupt the nutrient cycle in the soil where the trees were located (DPE, 2004). It is recommended in these areas that mulch and tree debris be retained in adjacent vegetated areas of the same TEC in order for the nutrients to be recycled back into the soil.
Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.
The proposal does not involve works that would result in the reduction of groundwater levels or a substantial alteration of surface water drainage patterns which would lead to modifying or destroying abiotic factors necessary for this TEC's survival. Nutrient cycling will be maintained by not removing deadwood from the tree removal areas and maintaining them onsite. Soil compaction will be avoided during the tree removal process as the machinery used is to be restricted to the already existing road corridors. This will not only protect surrounding vegetation and minimise soil compaction, but also minimise the risk of introducing soil borne pathogens to the area. There are multiple streams of varying Strahler orders that cross over Burley Griffin Way at the tree removal points. As detailed in Section 5 of this report, only minor alterations are expected to occur to the existing hydrological conditions within the proposal area. Increases in run off and nutrient load are likely to be minor due to the extent of works with the implementation of appropriated erosion and sediment controls.

e) cause a substantial change in the species composition of an occurrence of an ecological community, including causing a decline or loss of functionally important species, for example through regular burning or flora or fauna harvesting

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands

Within the six impacted vegetation areas in the construction footprint, all vegetation will be removed including trees, shrubs, and grasses. Adjacent to these areas are remaining areas of TEC which will ensure that the community is still able to persist in the locality.

In addition, around seven trees within the TEC will be removed. This patch occurs near Galong and is surrounded by retained Box-Gum Woodland. It is unlikely the removal of the trees will significantly decrease the connectivity of the community as an abundance of TEC will remain in adjacent areas, enabling seed dispersal to continue.

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

The proposal would cause a substantial change to the species composition of the Inland Grey Box Woodland as it involves the removal of the functionally important canopy layer. Ground and midstorey layers would not be directly altered by the proposal, however, microclimatic changes (e.g. light and moisture) caused by removing the canopy may lead to changes in species composition of the community.

f) cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including, but not limited to:

— assisting invasive species, that are harmful to the listed ecological community, to become established, or

— causing regular mobilisation of fertilisers, herbicides or other chemicals or pollutants into the ecological

community which kill or inhibit the growth of species in the ecological community, or

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands AND Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

Several exotic scramblers and invasive weed species have been recorded within the proposal area. The following exotic vines and scramblers were recorded in the proposal area: Blackberry (*Rubus fruticosus spp.*) and Bridal Creeper (*Asparagus asparagoides*) in Plots 41 and 59 respectively. Exotic species can benefit from disturbance to natural vegetation and soil which could occur during all stages of the construction process. Preventing the spread of weeds such as these is most important to protecting biodiversity values. With strict safeguards relating to weed hygiene as detailed in **Table 6-1** weed spread should be manageable.

The proposal may also assist in the spread of existing invasive weed species onsite if no active mitigation measures are undertaken. The proposal has the potential to spread weeds during tree removal and through the movement of vehicles and machinery into or out of the proposal area. Weeds are easily transported as seeds and propagules on machinery. They may also be carried away to other areas from the site or spread within it. High threat weeds detected during BAM plots include exotic grasses such as *Paspalum spp.*, the spread of which is highly threatening to native grassy woodland communities. African Lovegrass (*Eragrostis curvula*) was recorded in Plot 41, a weed which can be difficult to control once established.

To prevent road construction activities from introducing a new key threatening process to the site, mitigation measures have been recommended in Table 6-1. Rehabilitation of disturbed areas and ongoing weed management after the completion of construction activities would limit the establishment and spread of weed species during operation. If mitigation measures are strictly adhered to and remediation techniques are utilised, the impacts of the proposed development are unlikely to cause substantial reduction in the quality or integrity of an occurrence of either TEC.

g) Interfere with the recovery of an ecological community

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands

The National Recovery Plan for the Box–Gum Woodland lists the following recovery objectives (DECCW, 2010):

- achieving no net loss in extent and condition of the ecological community throughout its geographic distribution;
- increasing protection of sites with high recovery potential;
- increasing landscape functionality of the ecological community through management and restoration of degraded sites;

- increasing transitional areas around remnants and linkages between remnants; and
- bringing about enduring changes in participating land manager attitudes and behaviours towards environmental protection and sustainable land management practices to increase extent, integrity and function of Box-Gum Grassy Woodland.

The proposal will interfere with the first objective of 'achieving no net loss in extent and condition of the ecological community throughout its geographic distribution'. The proposal will remove 6.51 ha of Box-Gum Grassy Woodland CEEC. Although the proposed action contradicts objective one of the recovery plan, the small extent and dispersed construction footprint is not considered significant. Due to the abundance of Box-Gum Grassy Woodland adjoining the impacted areas, it is unlikely the proposed action will significantly impact or impede the recovery of the TEC within these areas.

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

The proposal has the ability to interfere with the recovery of the Inland Grey Box Woodland. The proposed tree removal will directly impact the canopy layer of the community and could inhibit the ability for any present shrub or groundcover species to survive. Only 1.66 ha of the TEC is proposed to be removed which equates to <0.02% of the estimated community in the locality (5 km). This amount of vegetation removal is not expected to interfere with the recovery of the community more broadly.

Conclusion

White Box - Yellow Box - Blakely's Red Gum grassy woodlands and derived native grasslands

The proposal would result in the reduction of the local occurrence of Box-Gum Woodland CEEC by 6.51 ha. This reduction would occur in small linear sections across a 285 km long proposal area within areas of the local occurrence that are prone to edge effects, primarily exotic plant invasion, and a subsequent reduction in diversity. As outlined above, the proposed development does not adhere to the National Recovery Plan for the Box Gum Grassy Woodland as it will result in the reduction of the extent and condition of the ecological community. However, these direct impacts not considered significant given the retention of the vast majority of the community within the study area and locality. Indirect impacts, such as weed and pathogen invasion, are processes that already occur within the study area. The mitigation measures outlined in the BAR would minimise the risk of the proposal exacerbating these processes.

Grey Box (Eucalyptus microcarpa) Grassy Woodlands and Derived Native Grasslands of South-Eastern Australia.

The proposed development is not likely to have an adverse effect on the Inland Grey Box Woodland EEC from within the study area due to the small scale of impact across a large area and because only one stratum of vegetation is to be removed (canopy).

Vulnerable species

Fauna

Superb Parrot (*Polytelis swainsonii*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
a) Will the action lead to a long-term decrease in the size of an important population of a species?
Superb Parrot records occur regularly all along the study area but Burley Griffin Way traverses their core breeding area between about Stockinbingal and Yass and as such is a key source population. The far eastern portion of the study area supports an important population of Superb Parrot and this area/population is discussed below.   Superb Parrot records occur regularly (287 BioNet records as recently as 2021) all along the study area but Burley Griffin Way traverses their core breeding area between about Ariah Park and Yass (Rycken, et al., 2022). The population in this area is an 'important population'. The study area contains roadside native vegetation which is considered suitable for foraging and breeding for the Superb Parrot. Suitable hollow-bearing trees in the Superb Parrot core breeding area (such as those between Ariah Park and Yass in the proposal area) are critical to its' survival (Baker-Gabb, 2011). Road verges are often the only remaining areas with old hollow-bearing trees of suitable depth and diameter for Superb Parrot (Davey & Purchase, 2004) and the species is frequently recorded nesting in roadside trees (McGrath, 2019).   Around 142 ha of habitat (PCT 74, 76, 79, 80, 110, 217, 266, 276, 277, 342, 796) occurs in the core breeding area. Around 12.4 ha would be cleared in the core breeding area which extends from near Yass to west of Temora. There were 622 HBT recorded within the core breeding area; 64 would be removed. HBTS that are considered potentially suitable for Superb Parrot (based on DBH and hollow entry diameter only) are to be avoided (i.e. retained). The *National Recovery Plan* considers such HBTs critical to the survival of the species (DAWE, 2021). As this is to be retained, it is unlikely the proposal would lead to a long-term decrease in the population.
b) Will the action reduce the area of occupancy of an important population of a species?
The proposal area traverses the area of occupancy of the important population of Superb Parrot. The proposal involves removal of small discrete areas (up to five metres wide) and individual trees along the 146 km of road corridor (i.e. 146 km of the proposal area falls within South-west Slopes KBA aka Superb Parrot important breeding area). The proposal does not disrupt connectivity nor sterilise large patches of habitat such that the species would not be able to occupy them. Therefore, the area of occupancy would not be reduced.
c) Will the action fragment an existing important population into two or more populations?
While the potential for causing isolation is present due to the already highly fragmented nature of the vegetation in the local area between Binya SF and Binya, and Kamarah and Ardlethan, the construction footprint is located such that connectivity will be maintained in an east-west direction. This is particularly true in the area of the important Superb Parrot population as connectivity is well supported in the habitat matrix of scattered trees, ribbons of vegetation along tracks, roads and waterways along with patches of forests and woodland. Therefore the action is not expected to fragment the existing important population.
d) Will the action adversely affect habitat critical to the survival of a species?
The National Recovery Plan for the Superb Parrot states that habitat critical to the survival of the Superb Parrot can be any potential nest trees with suitable hollows (average 10cm entrance diameter) and tree DBH (113cm). Co-ordinates of HBTs with medium size hollows and DBH greater than 90cm in the core breeding area have been provided to TfNSW and these will not be cleared.   Box Gum Woodlands and Key Biodiversity Areas (Eastern Portion of construction footprint) are all considered critical habitat (DAWE, 2021). As such, the action would remove (i.e. adversely affect) habitat critical to the survival of Superb Parrot (12.4 ha).   From Yass, this includes a 3km and 2km length of road where all patches of Box-gum Woodland habitat within ten metres of the existing road edge would be removed for minor shoulder works. Figure 9-7 near Goondah shows that within the construction footprint native vegetation occurs in pockets and also shows the matrix of neighbouring similar habitat.   The proposal will result in the disturbance and/or removal of 12.4 ha of Box Gum Woodland habitat; this is critical habitat as defined by the National Recovery Plan.

e) Will the action disrupt the breeding cycle of an important population?

Superb Parrot nest singly or in loose colonies of up to nine pairs (Baker-Gabb, 2011). Although potential nest trees are to be avoided, if adjacent clearing is undertaken between September and December, there is a possibility of disrupting the breeding of multiple pairs within an important population.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The Box-Gum Woodland habitat and HBT in the study area, and particularly within the South-west Slopes KBA, that is to be removed are considered critical to the long-term survival of the species, according to (DAWE, 2021). TfNSW has sought to minimise impacts to these habitats by focusing on individual tree removal where possible rather than clearing of all vegetation layers. However, in the sections near Yass (discussed earlier) to maintain and improve road safety, minor shoulder works are required and this involves underscrubbing and tree removal. This removal cannot be avoided. The National Recovery Plan states that offsets should be provided when removal of habitat critical to survival cannot be avoided or mitigated. Offsets are a recommendation of this report for the 12.4 ha of Superb Parrot habitat.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal is not likely to lead to an increase in invasive fauna species that are harmful to the Superb Parrot. The proposal would therefore be unlikely to result in invasive species that are harmful to vulnerable species becoming established in their potential habitat.

h) Will the action introduce disease that may cause the species to decline?

The proposal is unlikely to introduce disease such as Psittacine Beak and Feather Disease to the construction footprint. However, the proposal may intensify competition and use of nest trees, and thus may increase the likelihood of transmission of the virus due to loss of hollow bearing trees (DAWE, 2021).

i) Will the action interfere substantially with the recovery of the species?

The Draft National Recovery Plan for the Superb Parrot (DAWE, 2021) states that any removal of habitat critical to the survival is likely to interfere with the recovery of the species.

Figure 9-7 Example of Superb Parrot Box Gum Woodland habitat in the construction footprint near Goondah

Painted Honeyeater (*Grantiella picta)*

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
a) Will the action lead to a long-term decrease in the size of an important population of a species?

The proposal area intersects two key biodiversity areas (KBA) associated with Painted Honeyeater: Binya & Cocoparra (discussed in Section 3.8) and South-west Slopes of NSW & ACT (DAWE, 2021b). These are likely to be key source populations and therefore the Painted Honeyeater population in the proposal area is considered an 'important population'.

Suitable breeding and foraging habitat for the Painted Honeyeater occurs within the construction footprint. Using known PCT associations up to 11.09 ha of habitat would be disturbed and/or removed for this species, this area measure includes the clearing of the following PCTs considered associated with the species (PCTs 74, 76, 80, 82, 103, 110, 217, 266, 276, 277). These PCTs are considered key foraging habitat based on their classification as Box-Gum Woodlands and their association with native Mistletoes that are considered a key food source to the species (DAWE, 2021a). Mistletoes were recorded in four of the 81 BAM plots conducted suggesting a relatively low abundance within the construction footprint. Based on the species habitat requirements the presence of Box-Gum PCTs within the construction footprint suggests suitable breeding habitat and the low abundance of Mistletoes may indicate low quality foraging habitat (DAWE, 2021a).

Although the Painted Honeyeater could occur all along the proposal area, of the more than 100 records within 10km, the majority are centred around Griffith and Yenda townships and are concentrated in existing protected areas or reserves (ALA, 2022). This is likely due to the large population known to occur in Binya SF (BirdLife International, 2022).Recent and historical records should be given equal value for this nomadic species (DAWE, 2021b). The proposal area intersects two key biodiversity areas (KBA) associated with Painted Honeyeater: Binya & Cocoparra (discussed in Section 3.8) and South-west Slopes of NSW & ACT (DAWE, 2021b). Larger remnant blocks of woodland and forest are most valuable but habitat critical to Painted Honeyeater occur where *Amyema* mistletoe species is present (for foraging), as well as dispersal pathways (DAWE, 2021b). Given the distribution of records concentrated in existing protected areas (Binya SF and Cocoparra NP) totalling 12,657 ha, the relatively low abundance of mistletoes recorded within the construction footprint and the high mobility of this species it is unlikely the proposal will impact on an important population to the extent that it will lead to a long-term decrease in its size.

b) Will the action reduce the area of occupancy of an important population of a species?

The proposal area falls largely within the centre of the known distribution for this species. In terms of foraging habitat, around 0.4ha of marginal foraging habitat and 0.9 ha of good foraging habitat for Painted Honeyeater would be cleared in discrete footprints along the proposal area. This loss over a large proposal area and along a mostly narrow remnant corridor (as opposed to within large woodland blocks) is unlikely to reduce the area of occupancy for the important population. The NSW Tests of Significance provide more detail on habitat loss.

c) Will the action fragment an existing important population into two or more populations?

As discussed in NSW ToS, there are sections along the 285 km proposal area where connectivity is already tenuous. Habitat for Painted Honeyeater is highly fragmented and the species depends upon vegetated movement corridors for dispersal. In-depth analysis presented elsewhere in this report shows that fragmentation of existing corridors as a result of the proposal is unlikely. However, plantings could be taken along the road corridor to bolster vulnerable areas – this is discussed is Section 6.

d) Will the action adversely affect habitat critical to the survival of a species?

Habitat critical to the survival of the species relevant to this proposal include box-gum woodlands and box-ironbark forests on the inland slopes for breeding and all preferred foraging species (DAWE, 2021a). Although low abundance of mistletoes in the study area would suggest poor quality foraging habitat, the Painted Honeyeater also utilise nectar producing trees (*Eucalyptus spp.*) to supplement dietary requirements not gained from mistletoe spp. These include Box-gum woodland species present in the road reserve.

The proposal would result in the disturbance and/or removal of up to 1.3 ha of suitable habitat for the Painted Honeyeater. The habitat within the proposal area contains several Box-Gum Eucalypt PCTs (PCTs 74, 76, 80, 82, 103, 110, 217, 266, 276, 277) considered breeding habitat critical to the survival of the species (DAWE, 2021a). Further this species utilises these nectar producing trees as a foraging source and this would classify them as critical foraging habitat. The Painted Honeyeater is susceptible to loss of large old trees within woodland habitat and in vegetated corridors between (NSW Government, 2022). The proposal will therefore adversely impact habitat critical to the survival of the species.

TfNSW has refined the construction footprint to minimise impacts to biodiversity while balancing the need to maintain and improve road safety for people. According to the National Recovery Plan, any removal of habitat critical to survival that cannot be avoided should be offset. Offsets are a recommendation

e) Will the action disrupt the breeding cycle of an important population?

The important population in the study area is associated with the Binya & Cocoparra KBA and the South-west Slopes KBA. In the western portion of the study area, breeding resources are concentrated in the large woodland blocks including Binya SF, Cocoparra NP, Ingalba NR and Jindalee NP rather than the proposal area. Clearing of mistletoe foraging habitat in the eastern portion of the study area around Harden, along the border of Jindalee NP and east of Springdale would total 1.3 ha in discrete footprints along more than 100 km. TfNSW has sought to minimise impacts by removing trees using a flail mower and stump grinder positioned on the road rather than from the shoulder itself. Individual nests may be lost if clearing takes place during October to March but the breeding of the important population is unlikely to be wholly disrupted.

f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?

The proposal would result in the disturbance and/or removal of up to 1.3 ha of suitable habitat for the Painted Honeyeater. The habitat within the proposal area contains several Box-Gum Woodland PCTs (PCTs 74, 76, 80, 82, 103, 110, 217, 266, 276, 277) considered breeding habitat critical to the survival of the species (DAWE, 2021a).

Although this habitat will be destroyed, because there is suitable habitat available in local reserves (Binya SF and Cocoparra NP) totalling 12,657 ha and the species is highly mobile, the loss of this habitat is not such that the species is likely to decline.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal has the potential to contribute to the spread of invasive species, mainly through the clearing of vegetation and transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal is not likely to lead to an increase in invasive fauna species. The proposal would therefore be unlikely to result in invasive species that are harmful to vulnerable species becoming established in their potential habitat.

h) Will the action introduce disease that may cause the species to decline?

The proposal has the potential to contribute to the spread of disease through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of disease on site. The proposal would therefore be unlikely to result in disease which may cause the species to decline.

i) Will the action interfere substantially with the recovery of the species?

As discussed, the identified areas of foraging habitat containing mistletoe are habitat critical to the survival of Painted Honeyeater (DAWE, 2021b). According to National Recovery Plan for the Painted Honeyeater actions that remove that habitat would interfere with the recovery of the species. If removal of habitat cannot be avoided, then an offset should be provided (DAWE, 2021b). Offsets are a recommendation of this report.

Flora

Yass Daisy (*Ammobium craspedioides*)

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:
a) Will the action lead to a long-term decrease in the size of an important population of a species?
The population of Yass Daisy centred around Yass including around the proposal area qualify as an important population. An important population of Yass Daisy occurs in the vicinity of the proposal area although none were recorded along the route. The proposal involves clearing 6.3 ha (potential) habitat, most of it being moderate to good condition Box-Gum Woodland TEC (PCTs 266 and 277). Figure 9-6 shows location of records and inset shows the Yass Daisy habitat area used for calculations herein. Tree removal would not affect the persistence of the Yass Daisy given it will be conducted in a way to minimise impacts to biodiversity values (e.g. minimal soil disturbance). The areas of minor shoulder widening works would involve clearing all vegetation strata and this would impact individuals if they occur. However, the majority of available habitat (28.7 ha available) would not be affected by the works (22.4 ha unaffected). With the implementation of the appropriate mitigation measures, it is considered unlikely that a long-term decrease of the important population would occur.
b) Will the action reduce the area of occupancy of an important population of a species?
The proposal would result in the disturbance and removal of up to 6.3 ha of habitat for the Yass Daisy within the centre of its' restricted distribution. However, the species does not occupy all potential habitat within this distribution, occurring instead in discrete sub-populations. The proposal would not affect the ability of a known sub-population to flower, be pollinated, set-seed, would not impede wind-borne seed dispersal or prevent colonisation of new areas. Therefore, the proposal would not reduce the area of occupancy for the important population of Yass Daisy.
c) Will the action fragment an existing important population into two or more populations?
As above, an existing population is not known to occur in the proposal area and the proposal would not affect the ability of the Yass Daisy to colonise new suitable habitat via seed. Therefore, the proposal would not fragment the important population.
d) Will the action adversely affect habitat critical to the survival of a species?
There have been no formal descriptions of habitat critical for Yass Daisy (e.g. in a recovery plan). While high quality Box-Gum Woodland such as the 5.9 ha of EPBC Act listed Critically Endangered Box Gum Woodland to be removed along the 3 km length of proposal area, would be important for the long-term survival of the species, it is unlikely to be critical as there are no current known sub-populations in the construction footprint.
e) Will the action disrupt the breeding cycle of an important population?
As above, an existing population is not known to occur in the proposal area and the proposal would not affect the ability of the Yass Daisy to colonise new suitable habitat via seed. Therefore, the breeding cycle is not likely to be disrupted.
f) Will the action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?
Around 6.3 ha of habitat would be modified or destroyed. A known population of Yass Daisy does not occur in the construction footprint (or the proposal area for that matter) and therefore it is not anticipated that the important population of Yass Daisy would decline.
g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?
The proposal has the potential to contribute to the spread of invasive species, mainly through the clearing of vegetation and transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of weeds on site. The proposal is not likely to lead to an increase in invasive fauna species. The proposal would therefore be unlikely to result in invasive species that are harmful to vulnerable species becoming established in their potential habitat.

h) Will the action introduce disease that may cause the species to decline?
The proposal has the potential to contribute to the spread of disease through the transfer and introduction of plant material and soil on machinery. Mitigation measures have been recommended to prevent the spread of disease on site. The proposal would therefore be unlikely to result in disease which may cause the species to decline.
i) Will the action interfere substantially with the recovery of the species?
A recovery plan has not been adopted for the Yass Daisy. This species is listed under the ‘Keep-watch species’ management stream (EES, 2020). Relatively large populations of this species occur within reserves where current management is sufficient to ensure their long-term security. A population is not known to occur in the proposal area. On that basis, the proposal is not expected to interfere substantially with the recovery of the Yass Daisy.

Annexure F Maps

The following map sets follow overleaf:

F.1 Proposal area (26-map set)

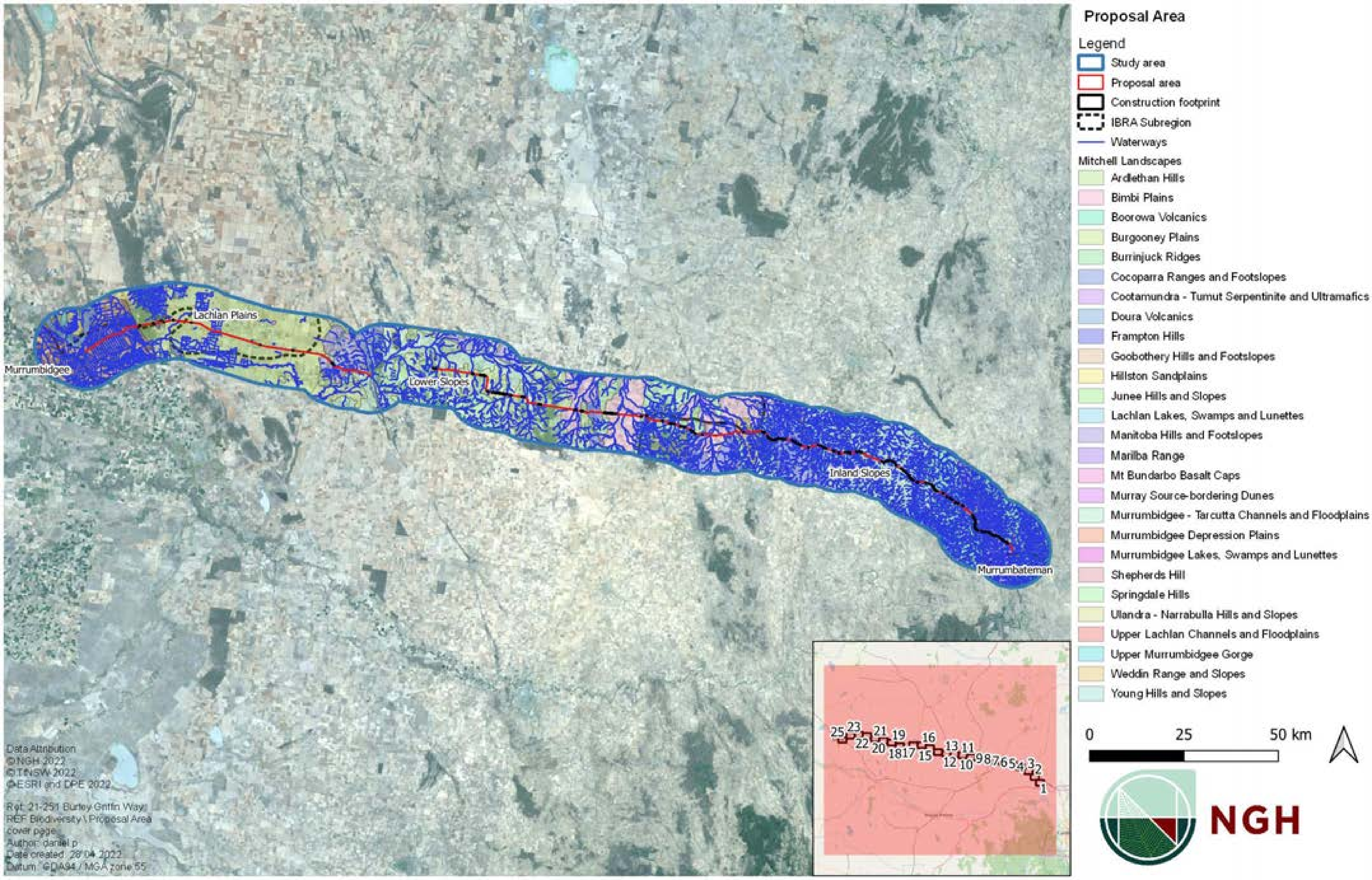
F.2 Survey effort (67-map set)

F.3 PCTs within the proposal area (67-map set)

F.4 TECS within the proposal area (67-map set)

F.1 Proposal area

Maps follow overleaf (26-map set).



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Doura Volcanics
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Goobothery Hills and Footslopes
Hillston Sandplains
Junee Hills and Slopes
Lachlan Lakes, Swamps and Lunettes
Manitoba Hills and Footslopes
Marilba Range
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Murray Source-bordering Dunes
Murrumbidgee - Tarcutta Channels and Floodplains
Murrumbidgee Depression Plains
Murrumbidgee Lakes, Swamps and Lunettes
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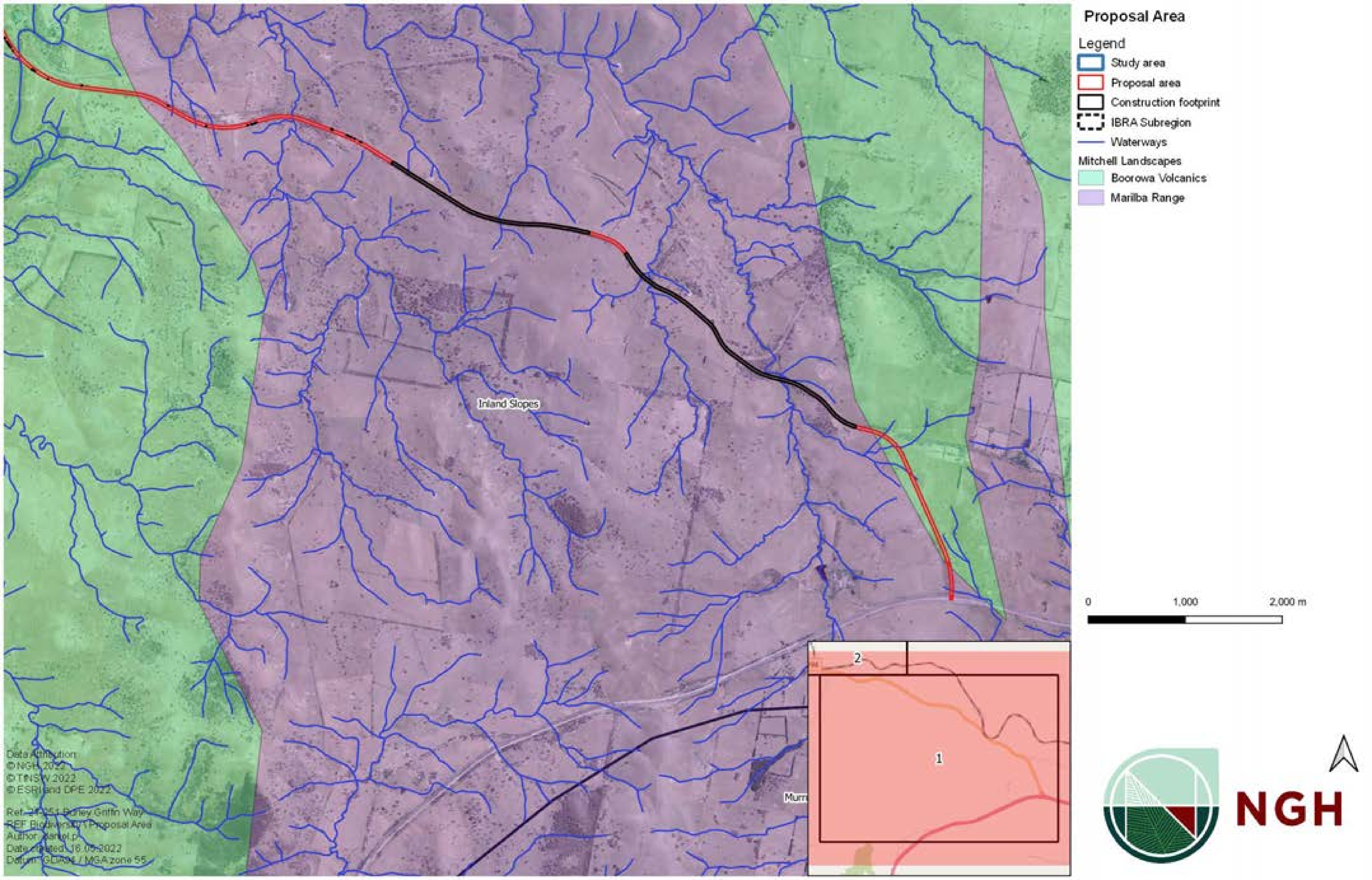

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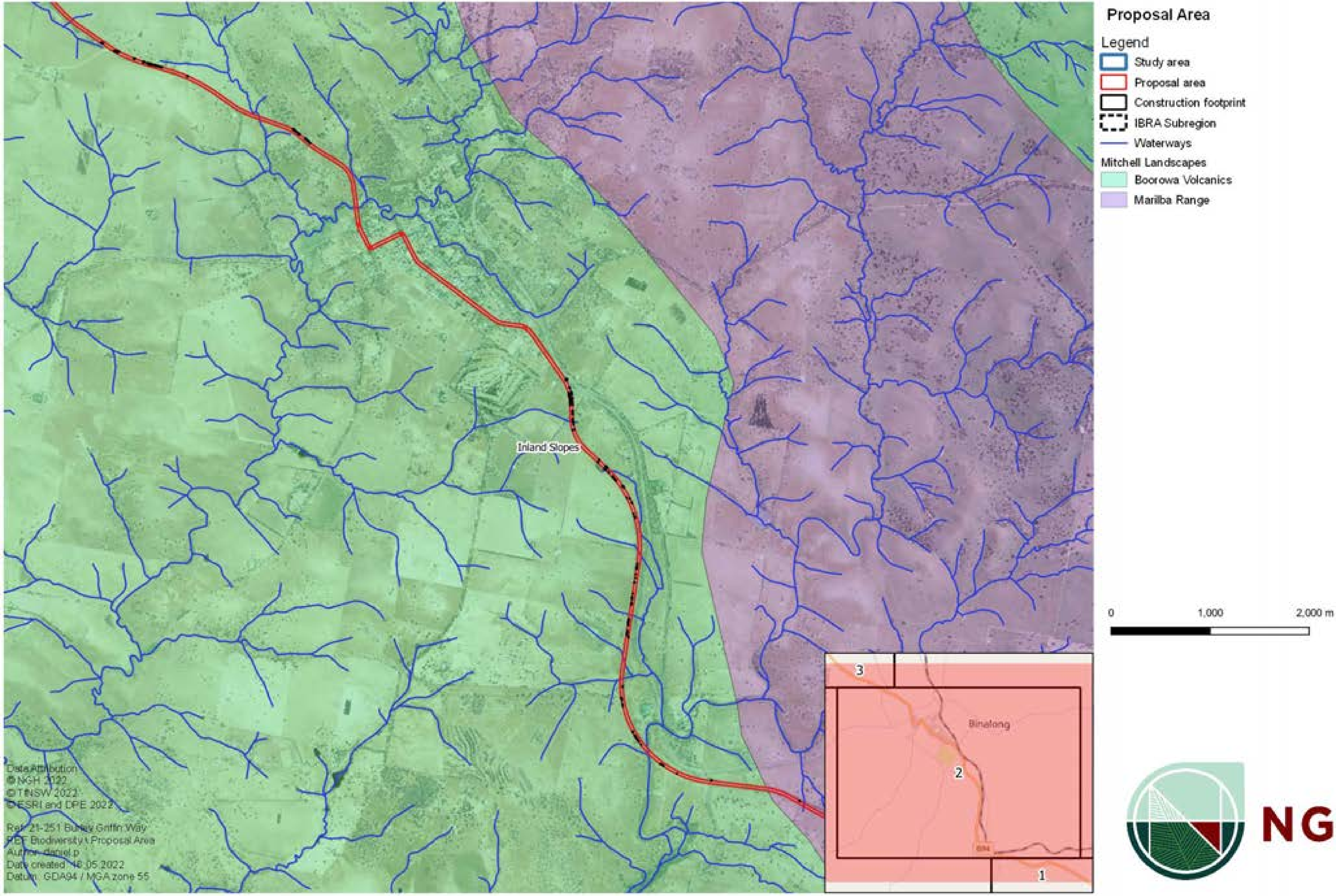
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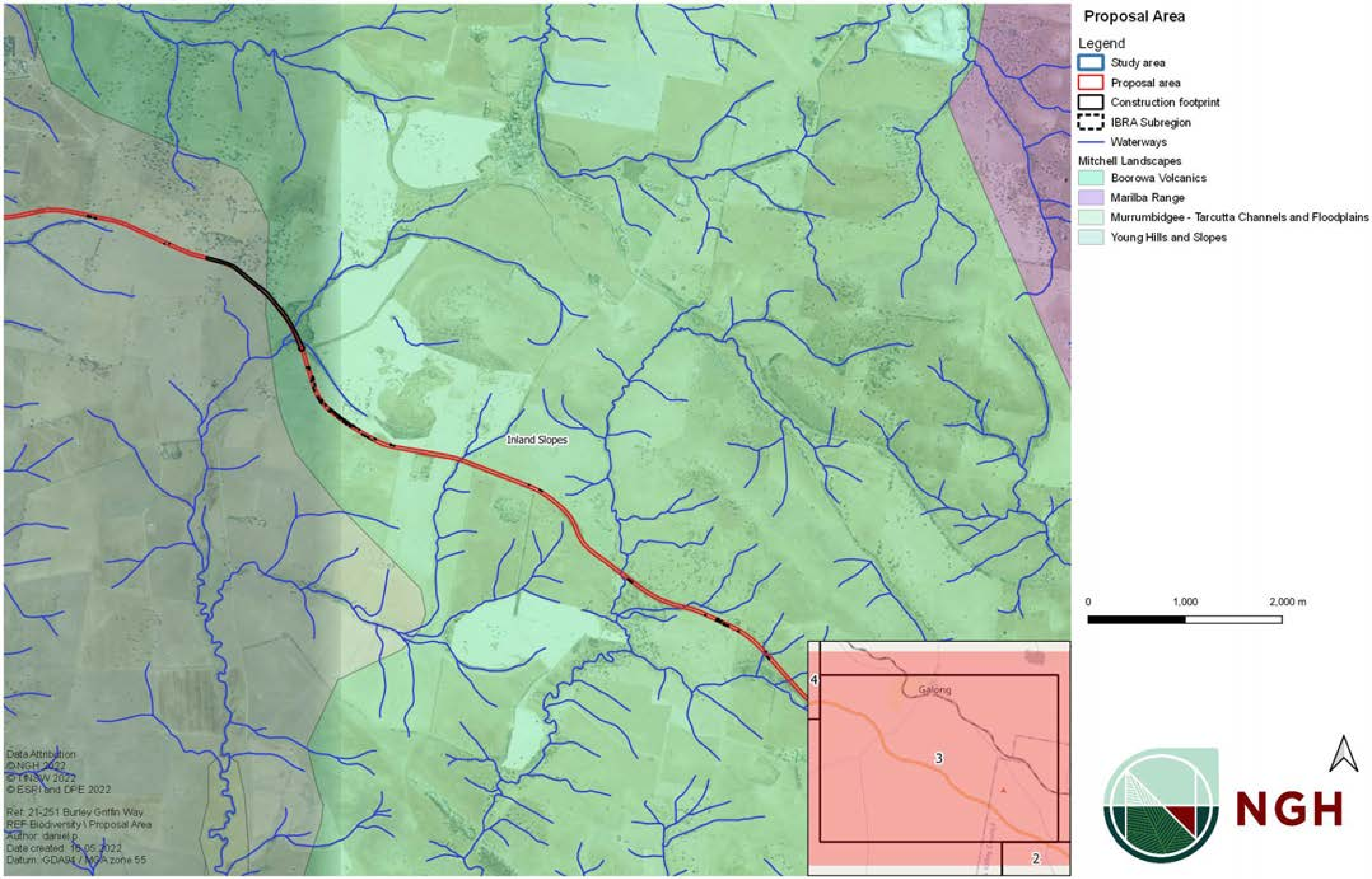

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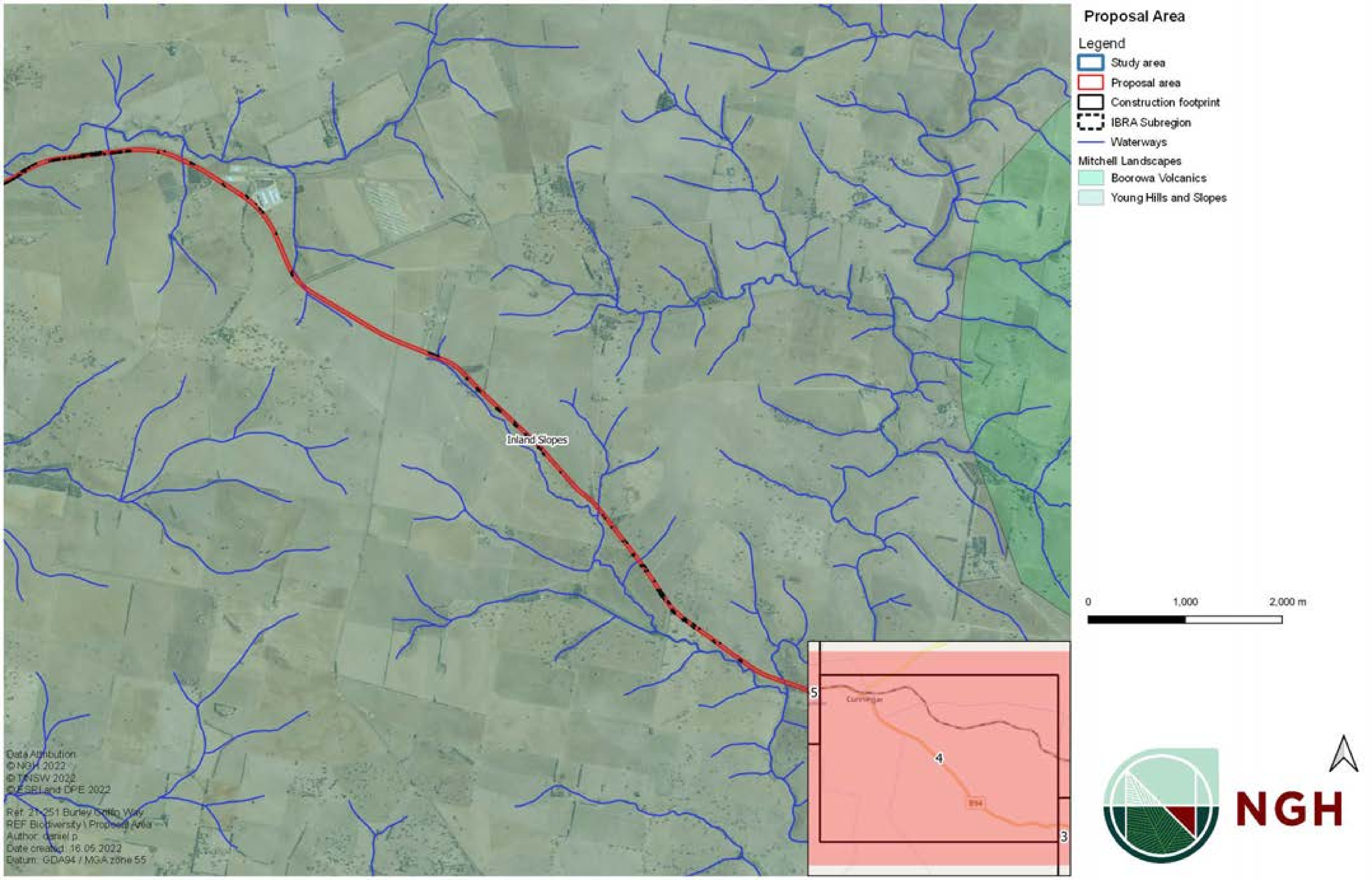

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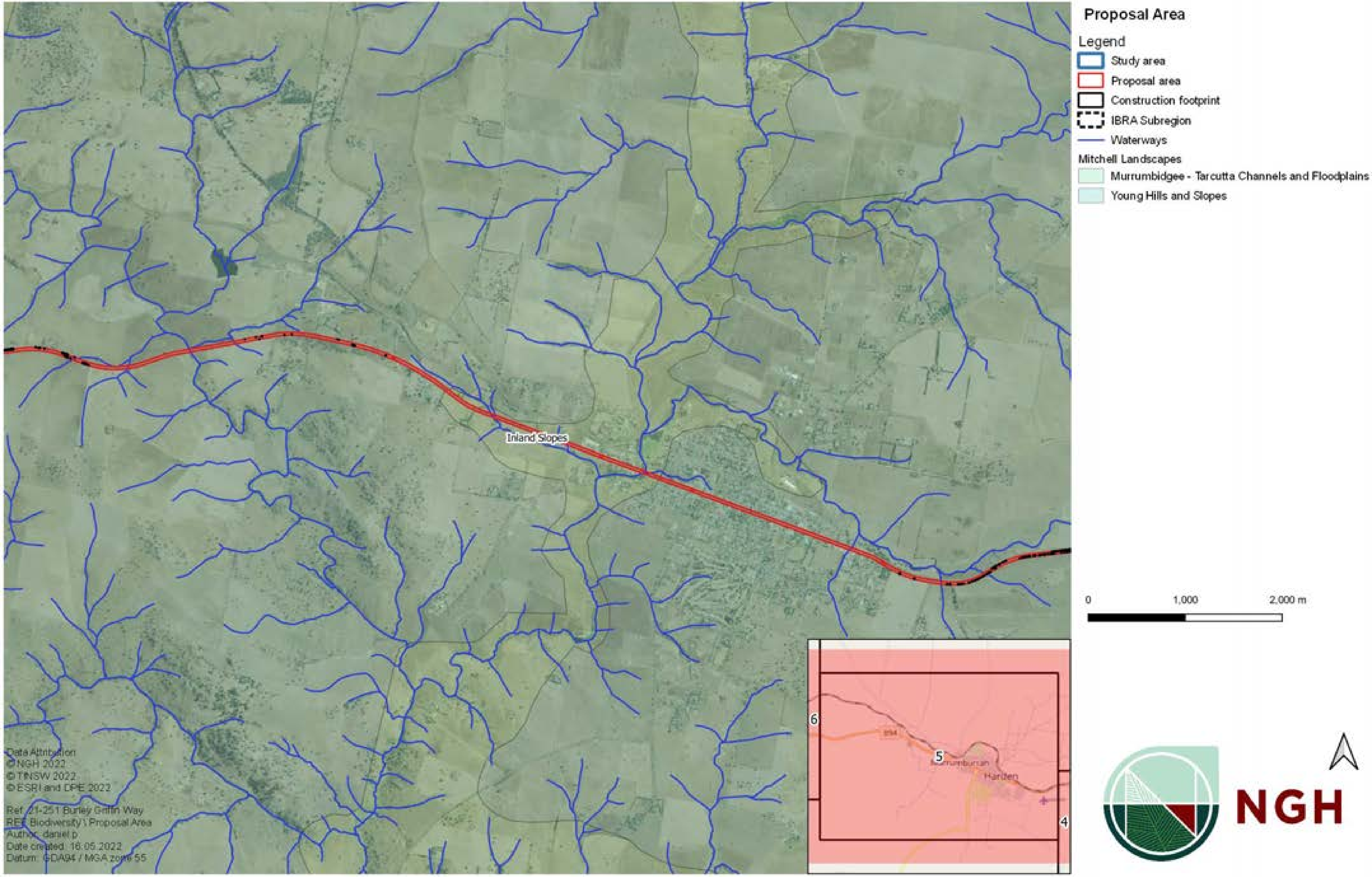
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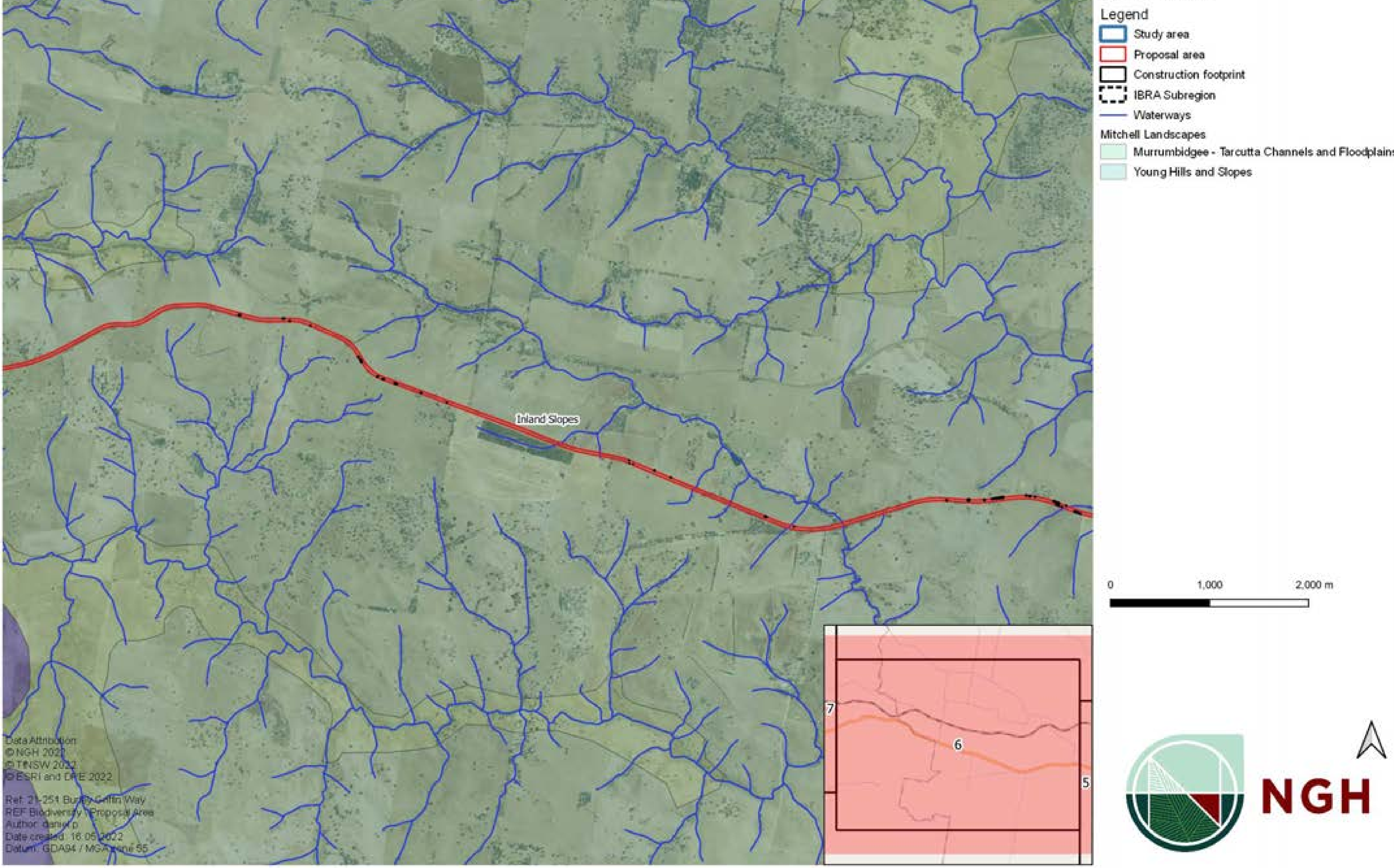

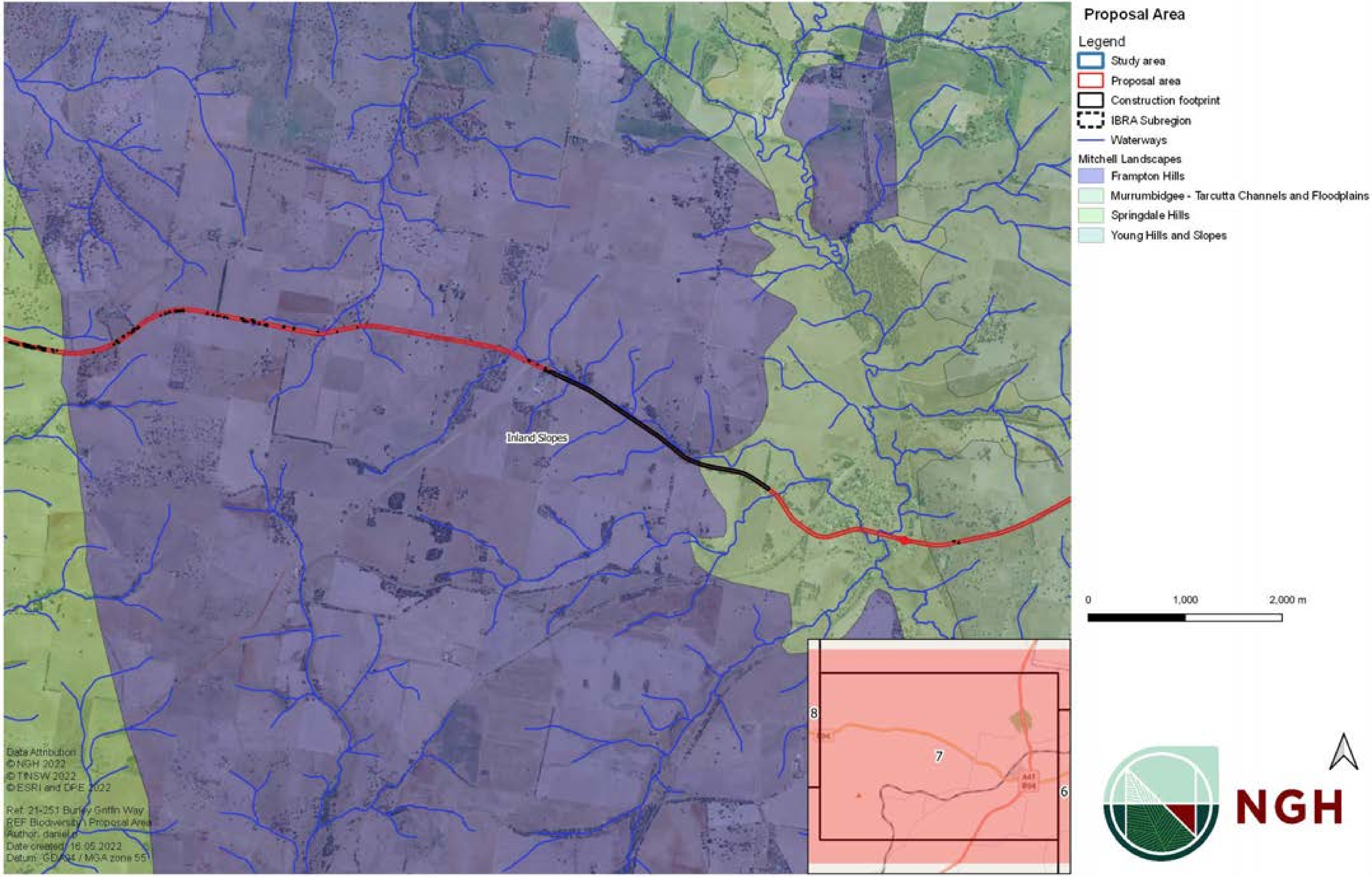
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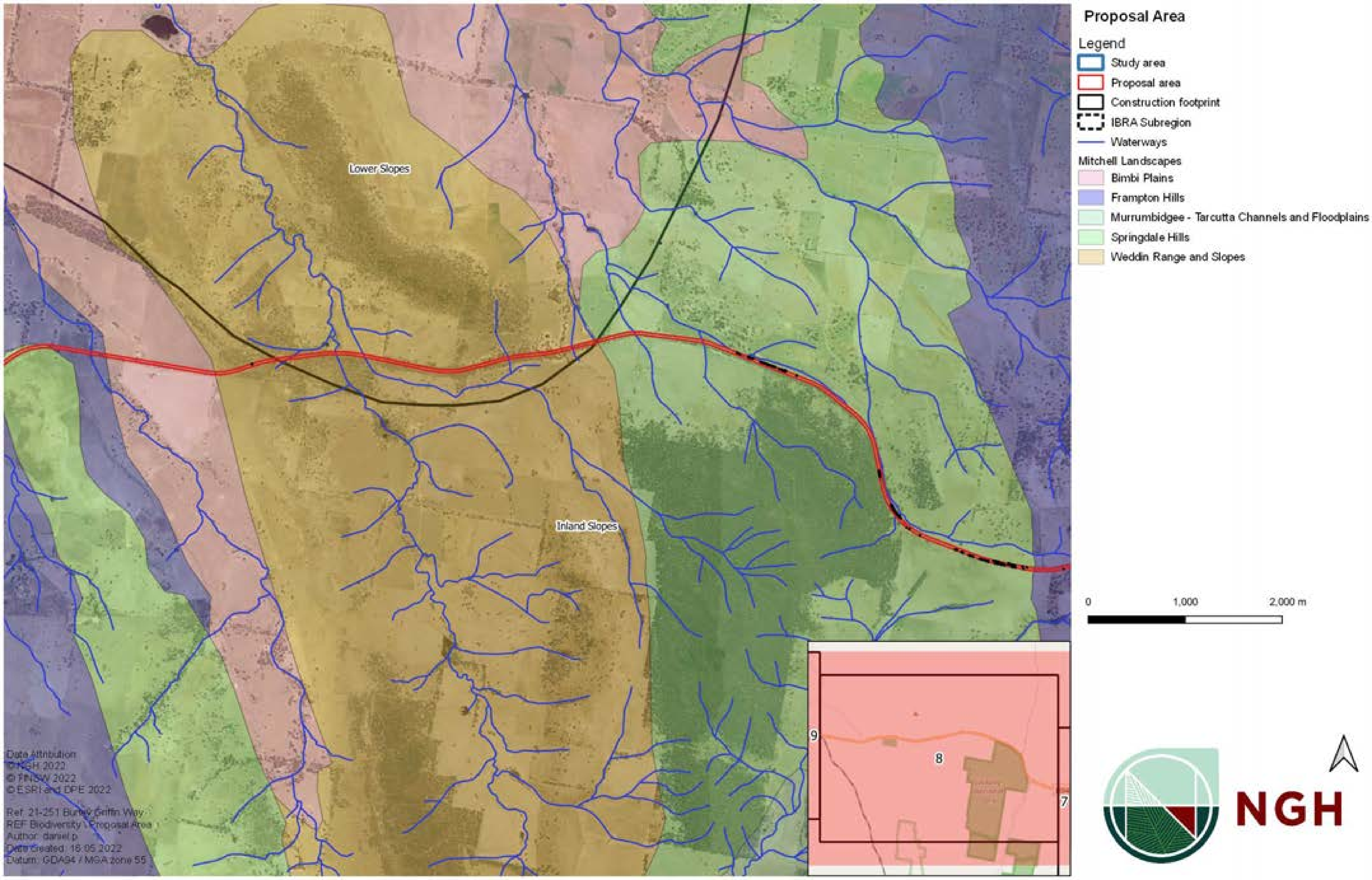

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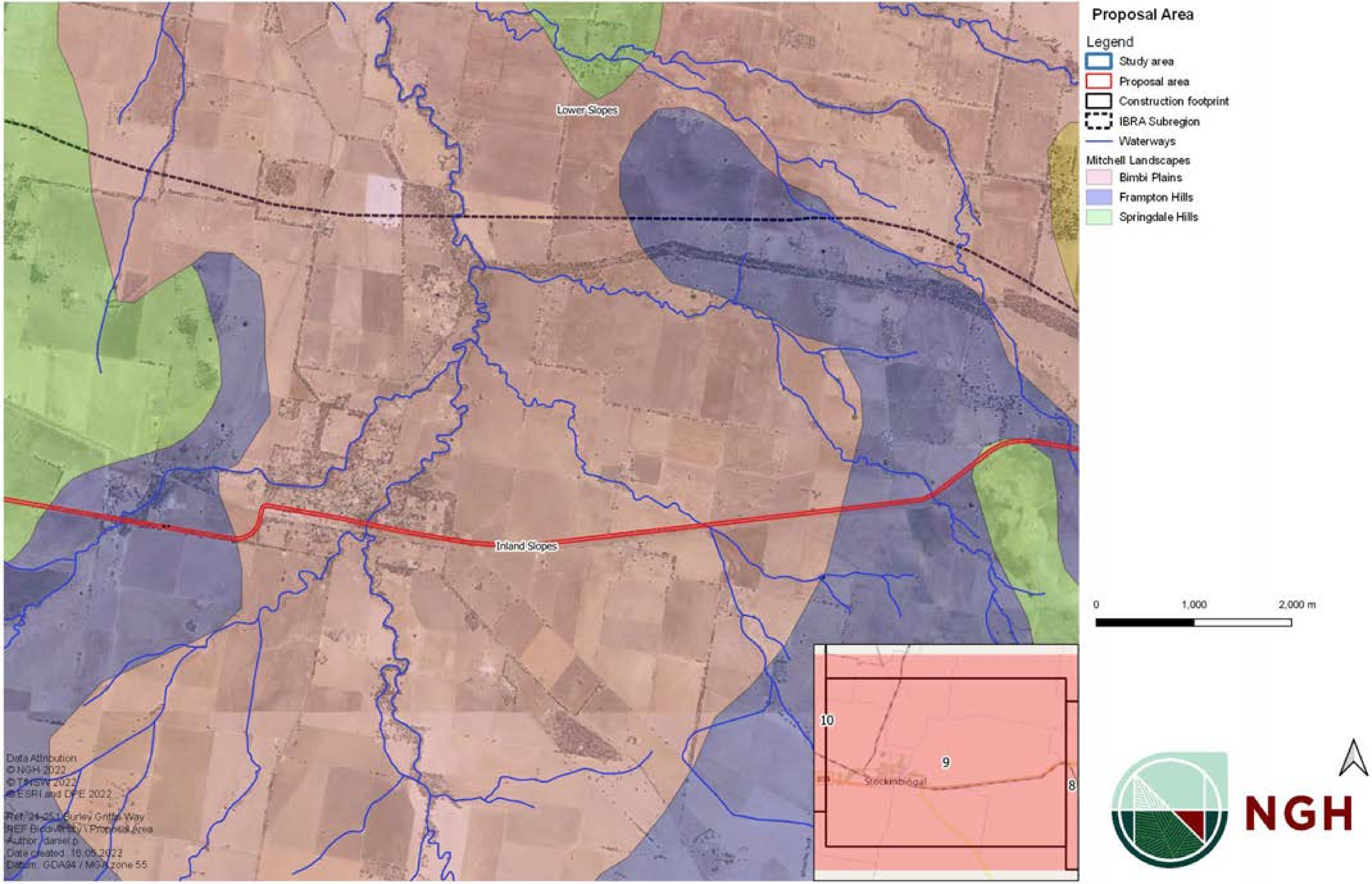

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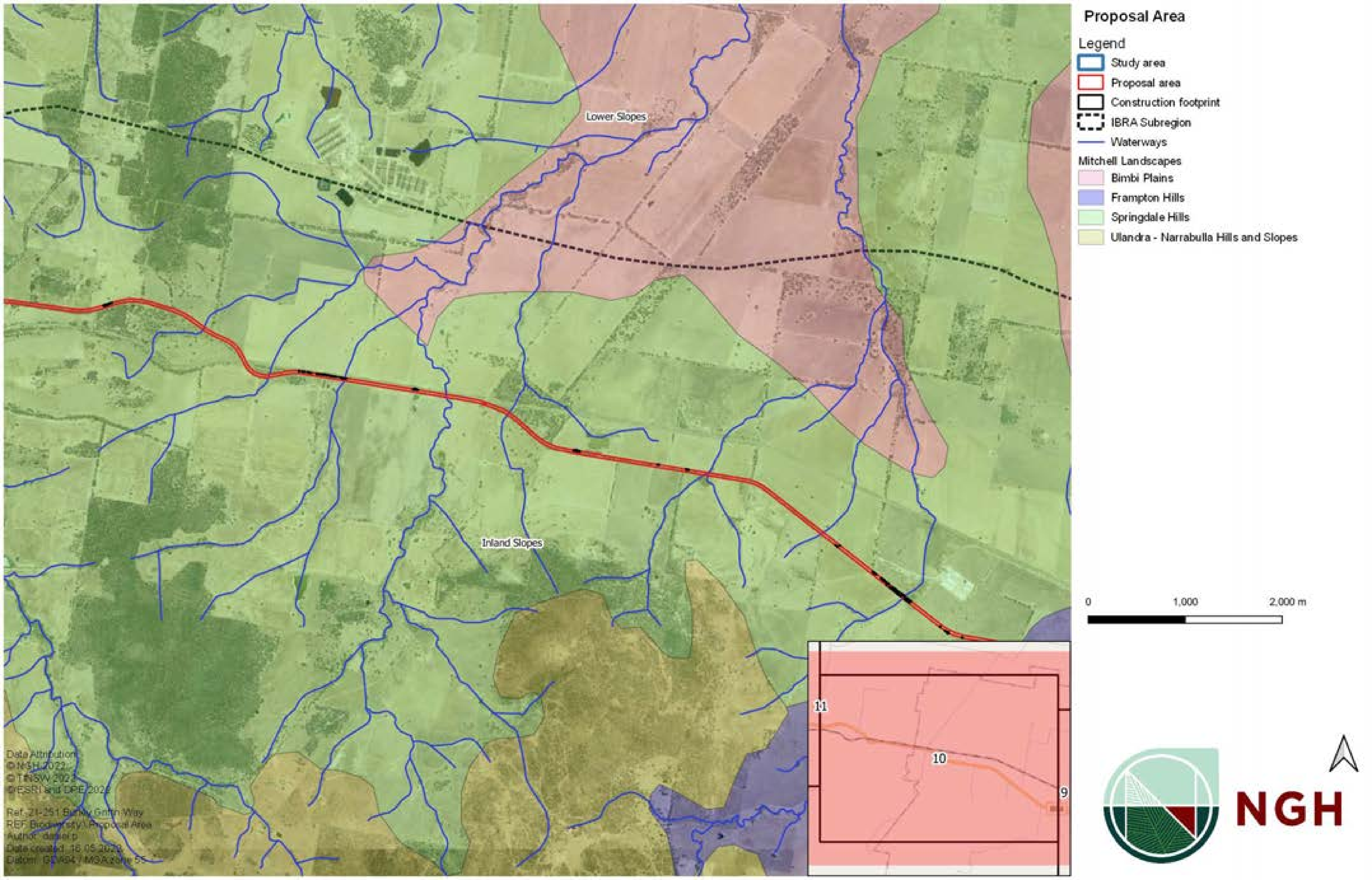
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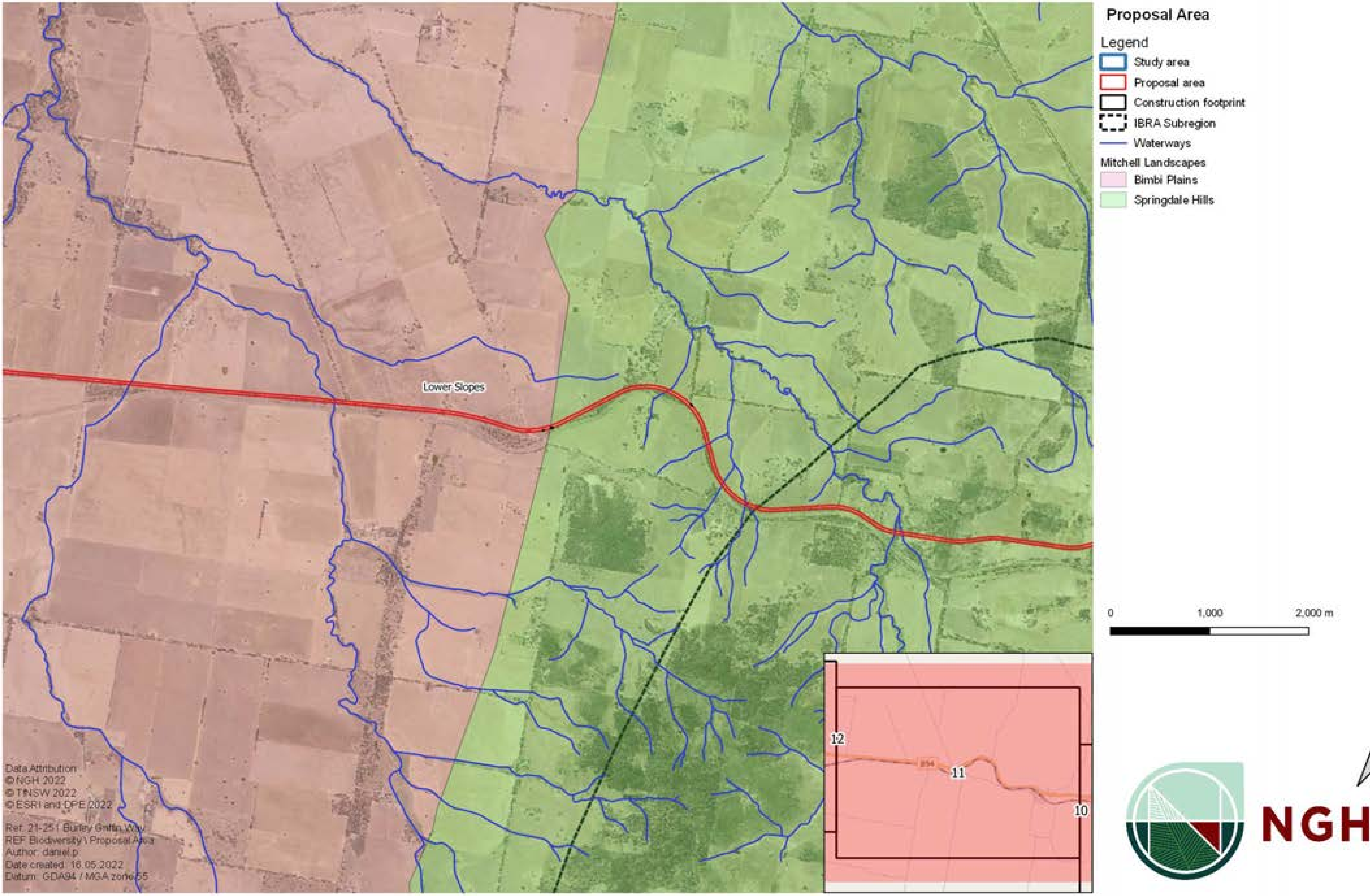

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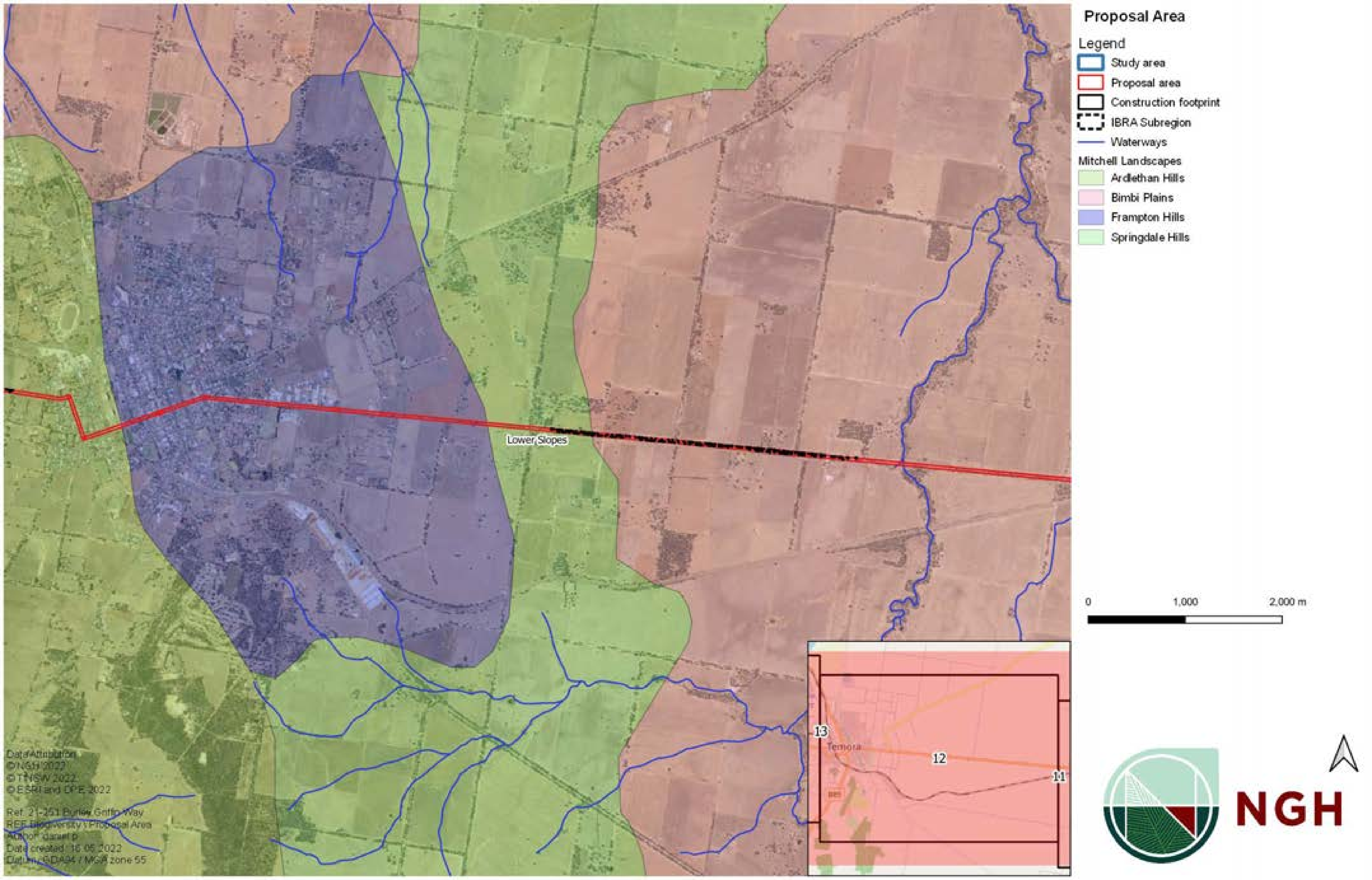

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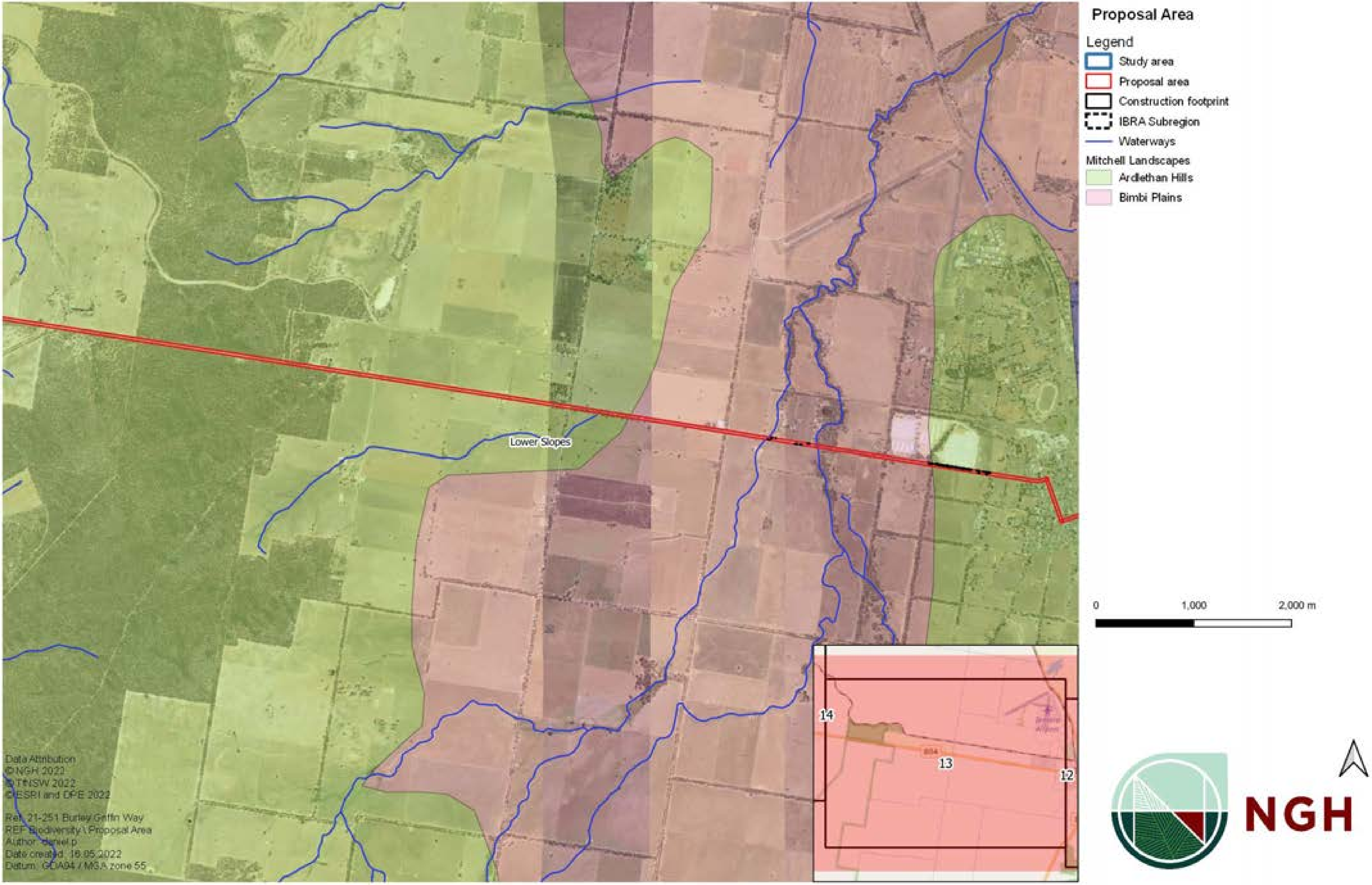

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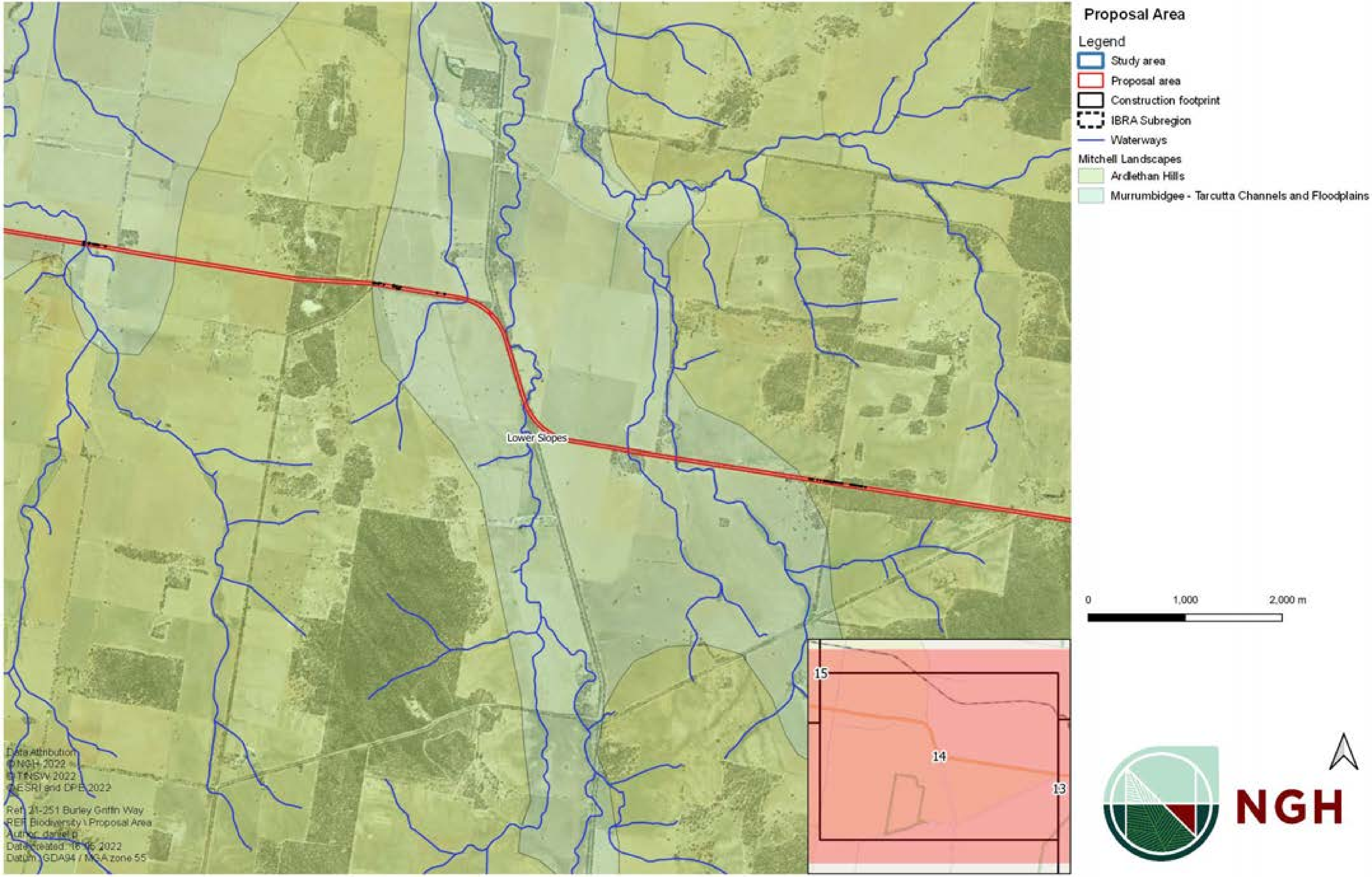
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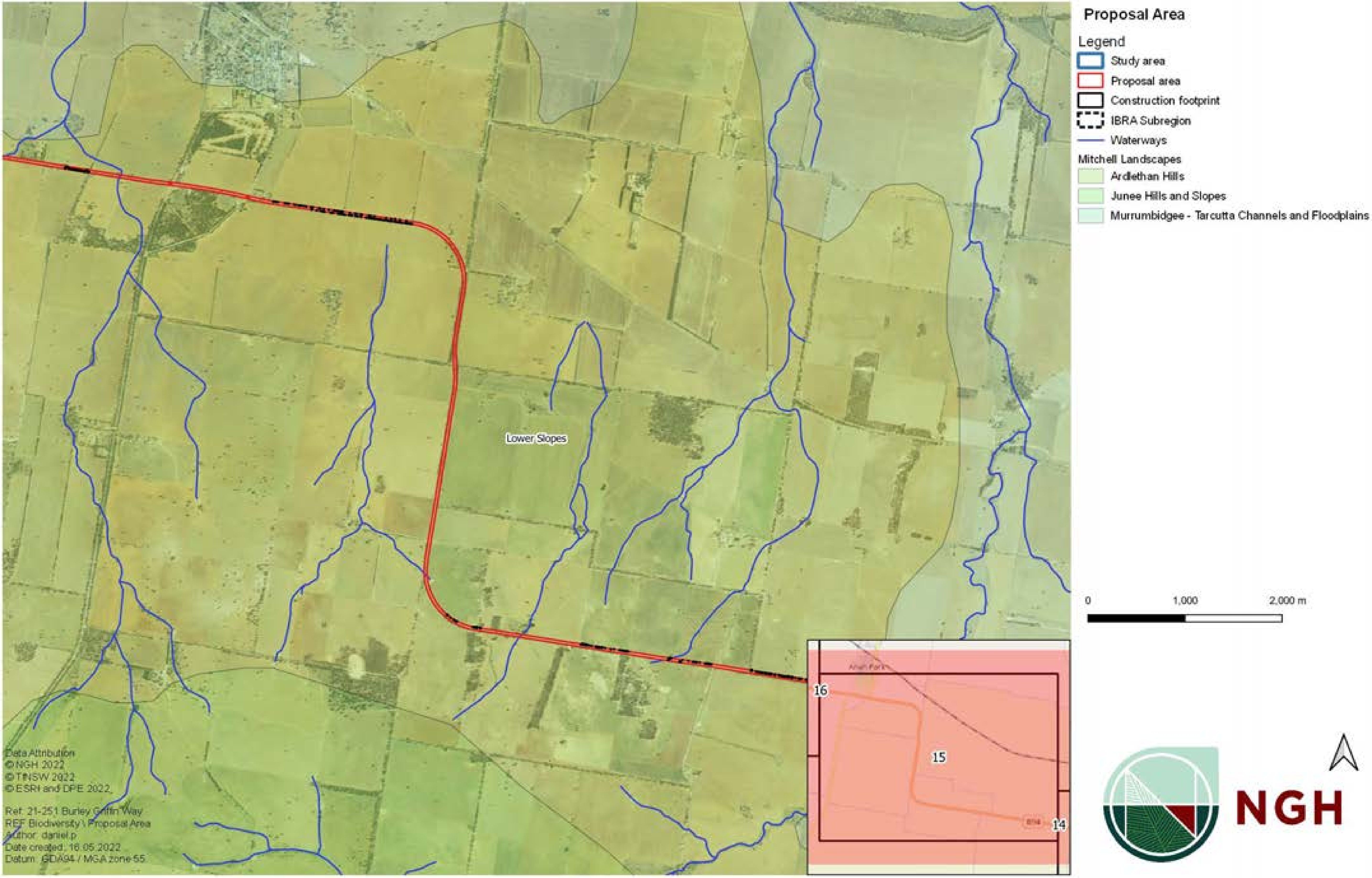
REF Biodiversity \ Proposal Area
Author: daniel p
Date created: 16.05.2022
Datum: GDA94 / MGA zone 55


Proposal Area
Legend
Study area
Proposal area
Construction footprint
IBRA Subregion
Waterways
Mitchell Landscapes
Ardlethan Hills
Junee Hills and Slopes
Murrumbidgee - Tarcutta Channels and Floodplains
Lower Slopes
0
1,000
2,000 m
16
15
14
Data Attribution
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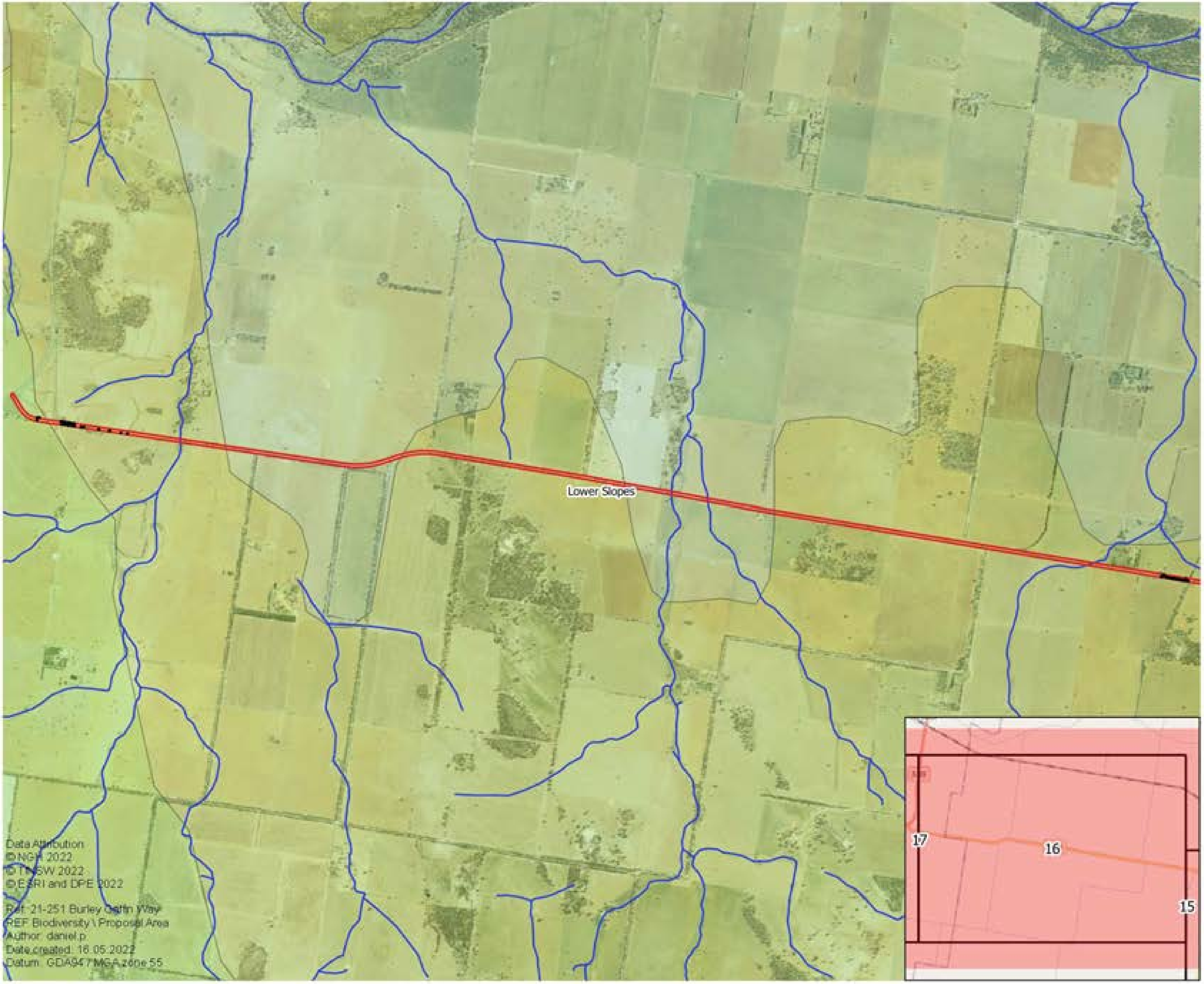


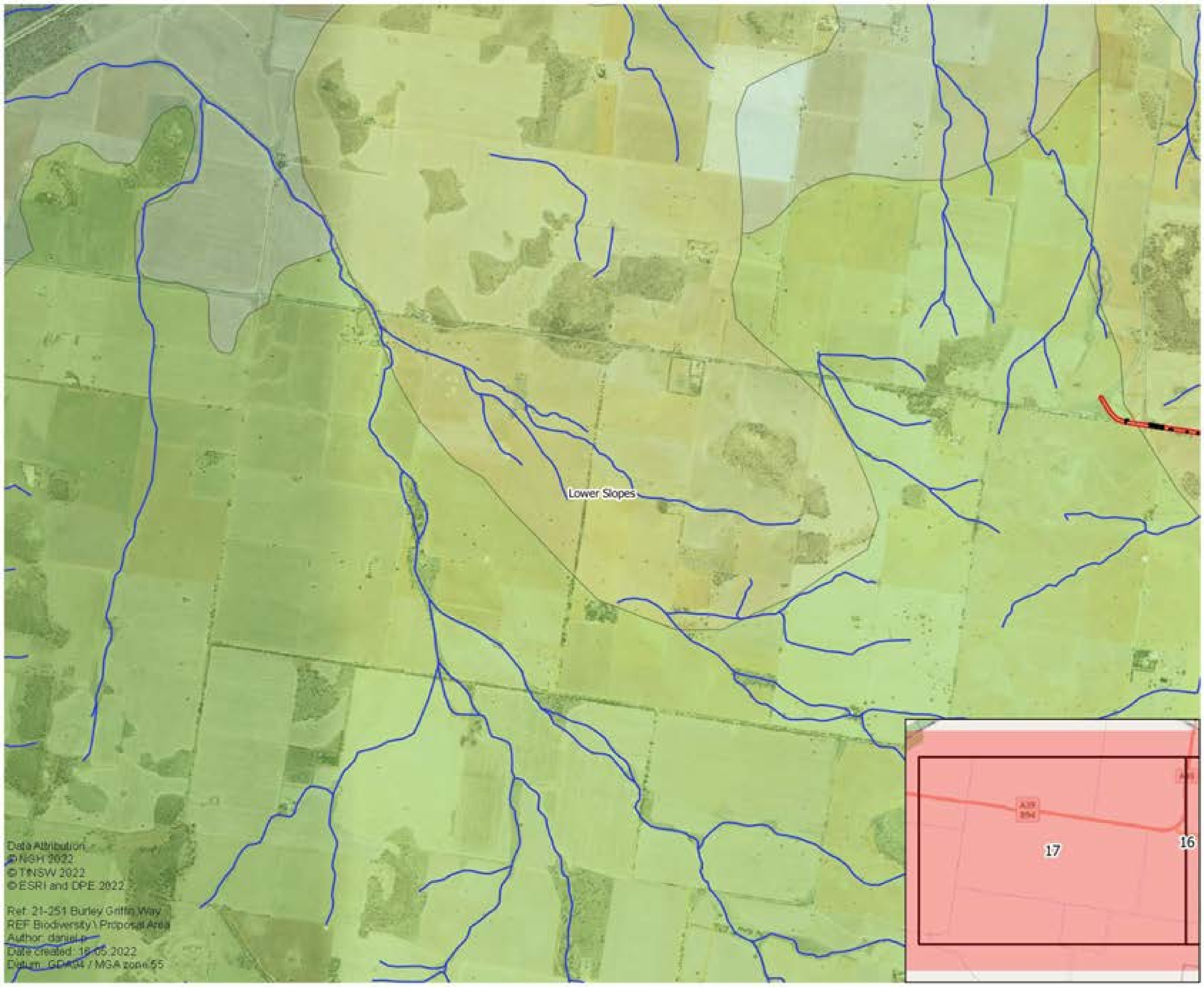
Proposal Area

Legend

- Study area
- Proposal area
- Construction footprint
- IBRA Subregion
- Waterways

Mitchell Landscapes

- Ardlethan Hills
- Junee Hills and Slopes
- Murrumbidgee - Tarcutta Channels and Floodplains



Proposal Area

Legend

- Study area
- Proposal area
- Construction footprint
- IBRA Subregion
- Waterways

Mitchell Landscapes

- Ardlethan Hills
- Junee Hills and Slopes
- Murrumbidgee - Tarcutta Channels and Floodplains

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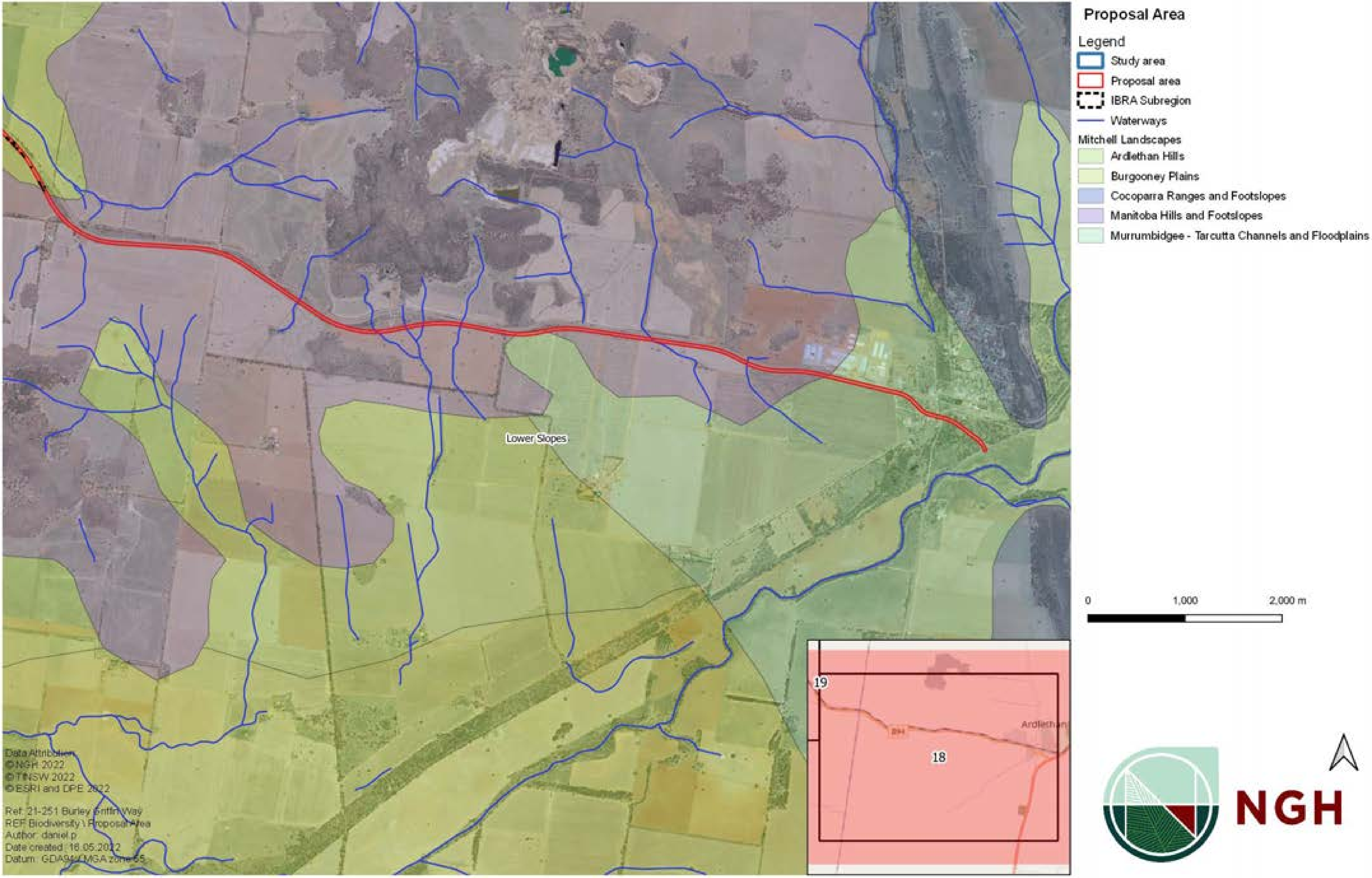
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IBRA Subregion
Waterways
Mitchell Landscapes
Ardlethan Hills
Burgooney Plains
Cocoparra Ranges and Footslopes
Manitoba Hills and Footslopes
Murrumbidgee - Tarcutta Channels and Floodplains
Lower Slopes
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Ardlethan
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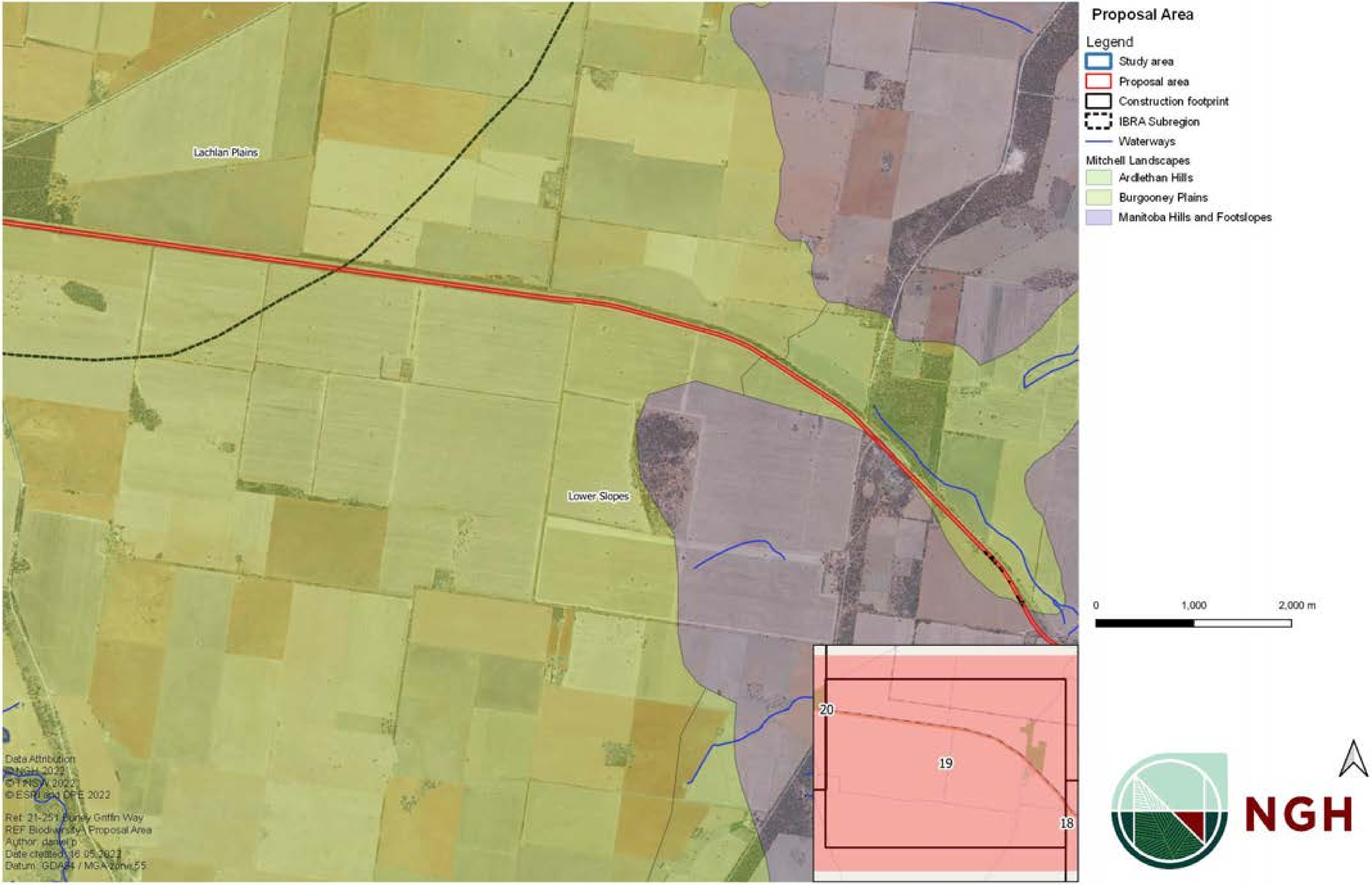
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Mitchell Landscapes
Ardlethan Hills
Burgooney Plains
Manitoba Hills and Footslopes
Lachlan Plains
Lower Slopes
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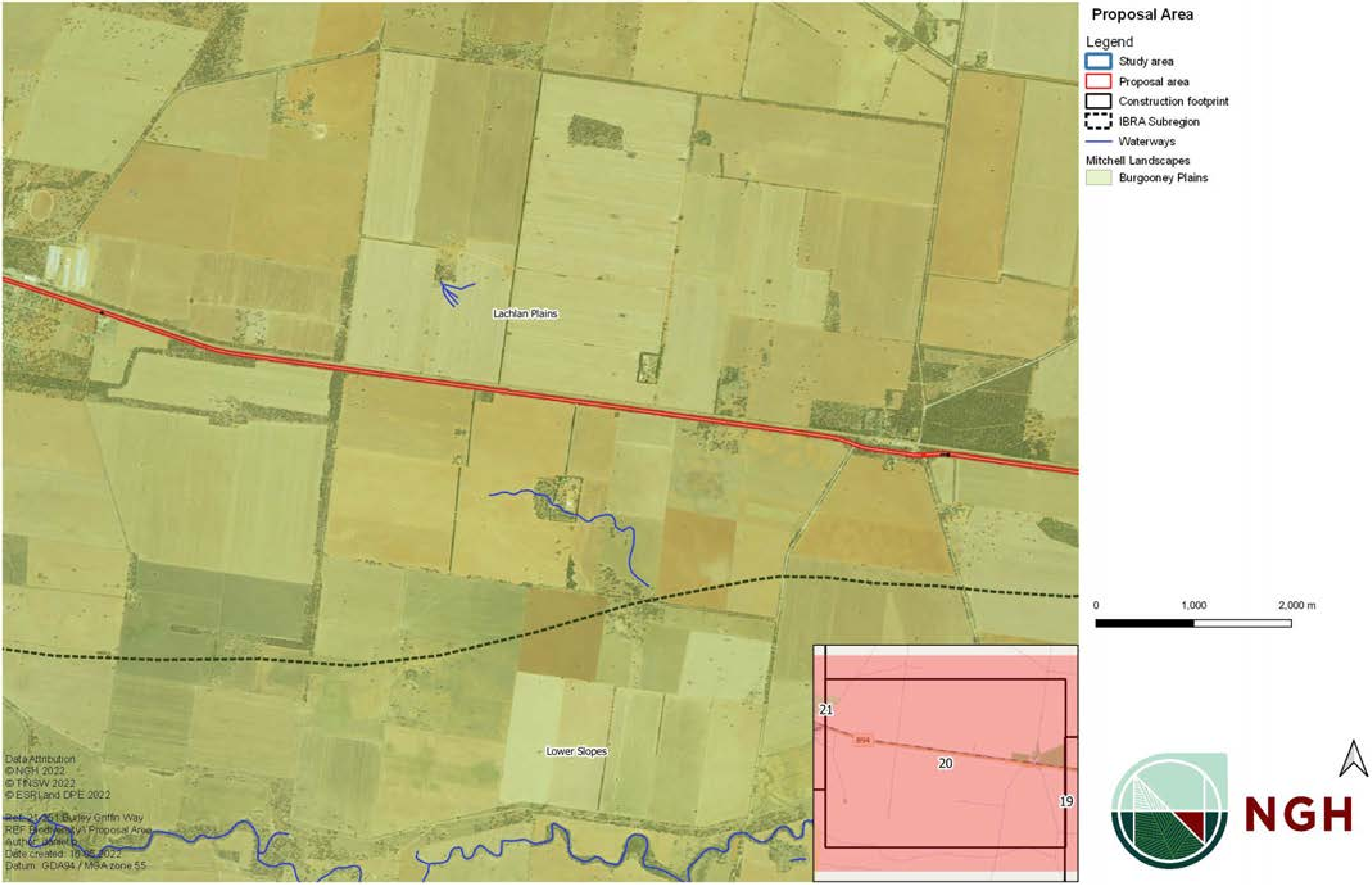
Datum: GDA94 / MGA zone 55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Construction footprint
IBRA Subregion
Waterways
Mitchell Landscapes
Burgooney Plains
Lachlan Plains
Lower Slopes
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Burley Griffin Way
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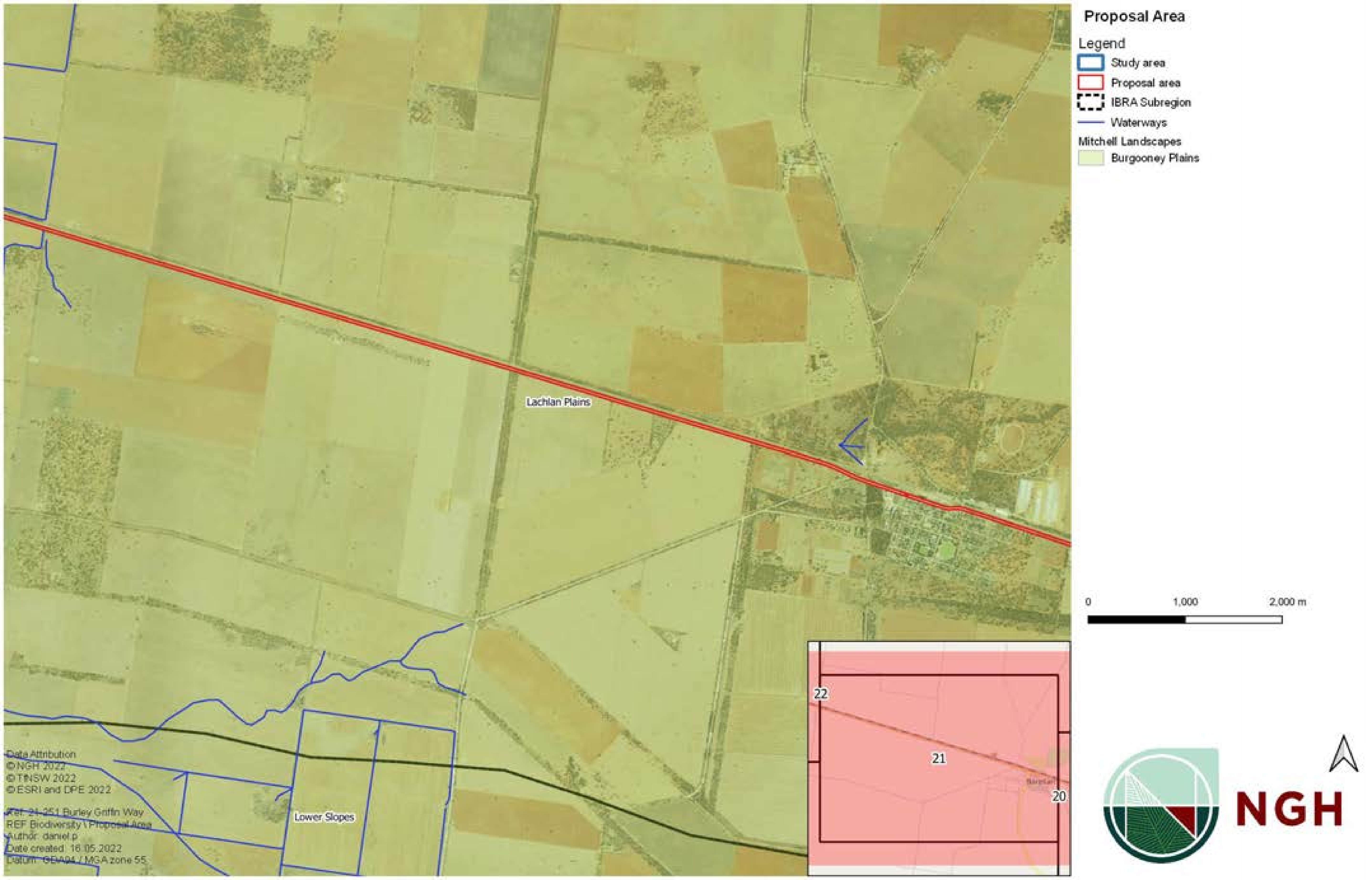
Datum: GDA94 / MGA zone 55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Mitchell Landscapes
Burgooney Plains
Lachlan Plains
Lower Slopes
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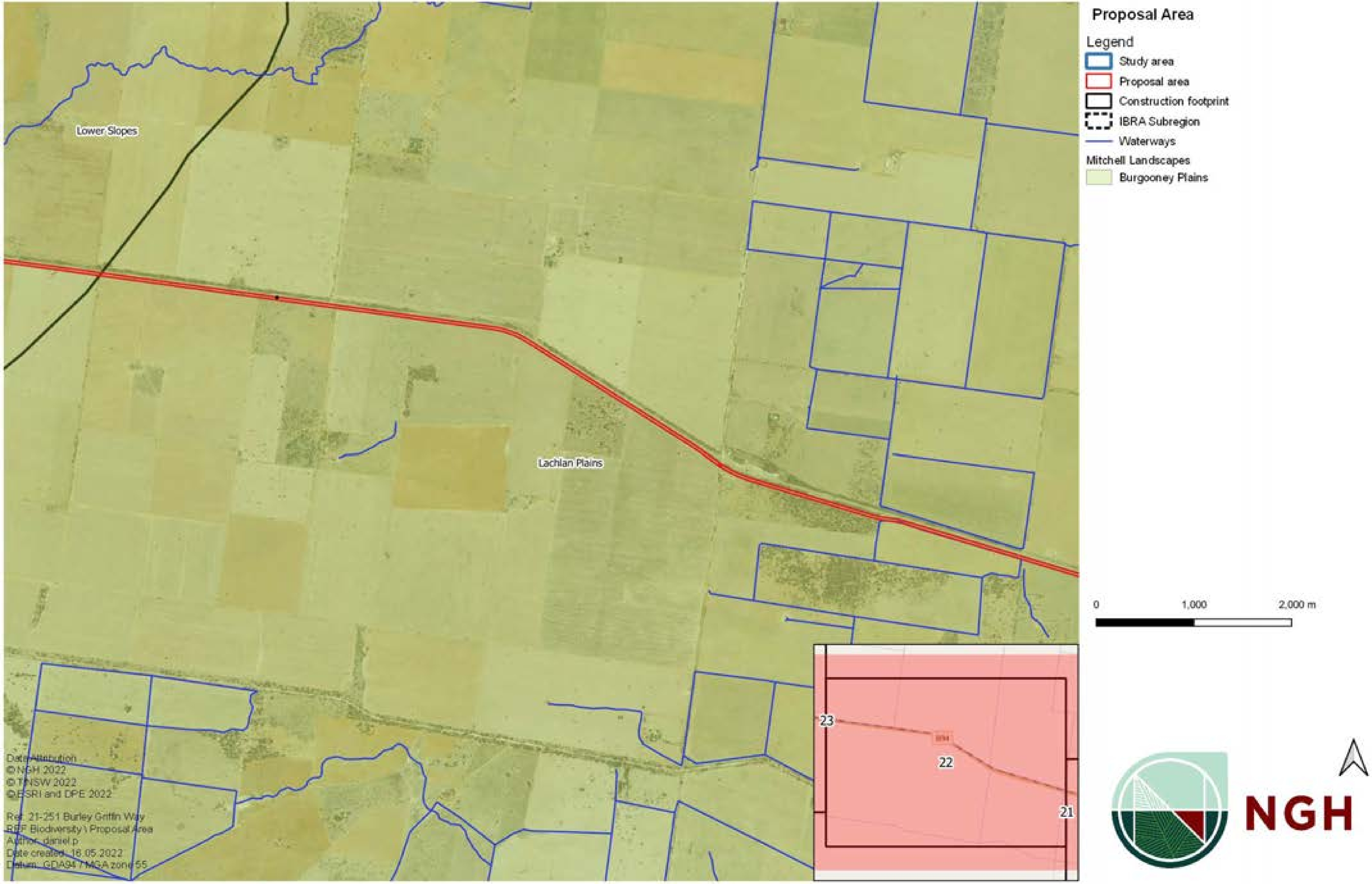
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Construction footprint
IBRA Subregion
Waterways
Mitchell Landscapes
Burgooney Plains
Lower Slopes
Lachlan Plains
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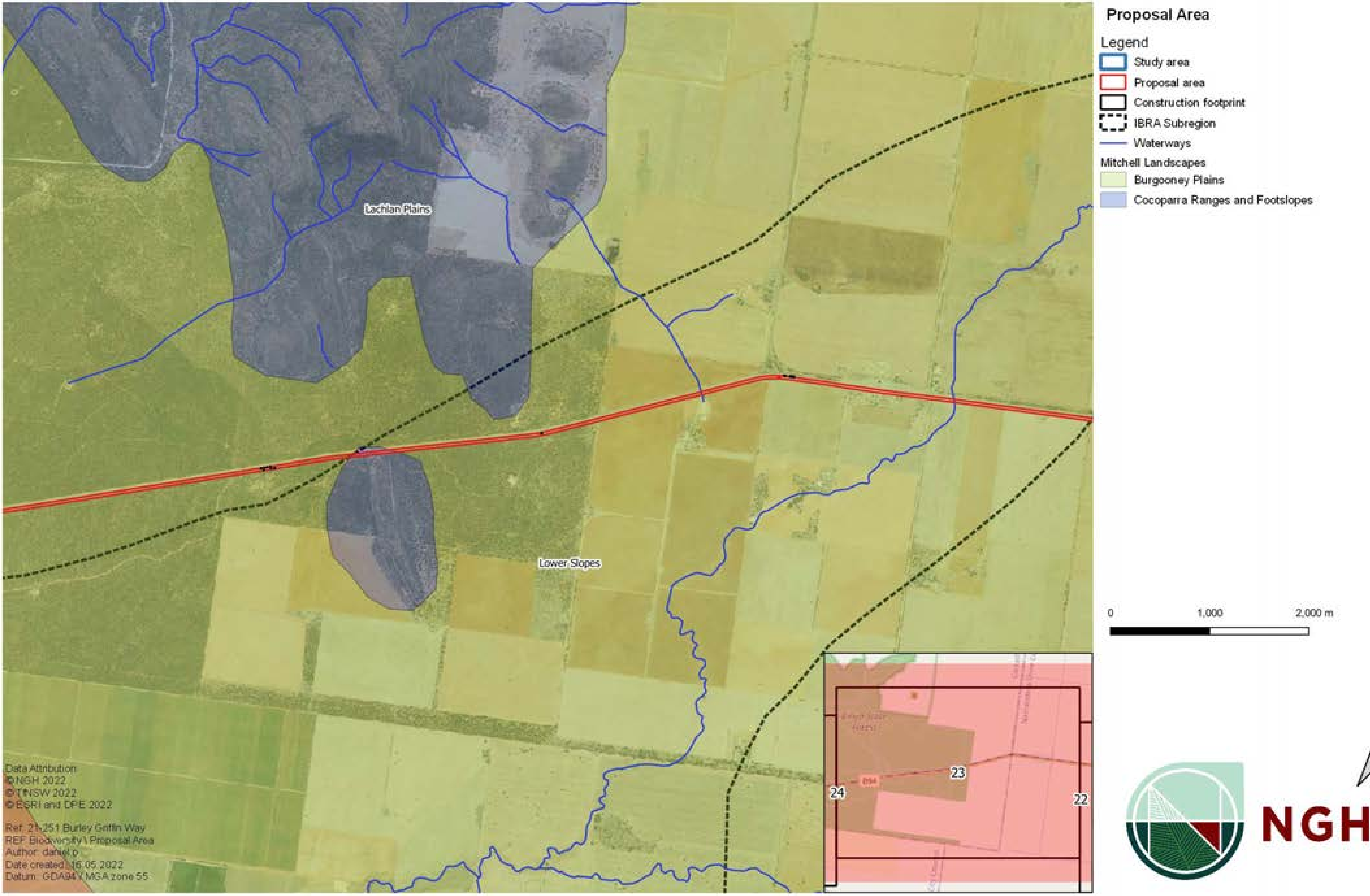
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Study area
Proposal area
Construction footprint
IBRA Subregion
Waterways
Mitchell Landscapes
Burgooney Plains
Cocoparra Ranges and Footslopes
Lachlan Plains
Lower Slopes
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2,000 m
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Data Attribution
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REF Biodiversity \ Proposal Area
Author: daniel.p
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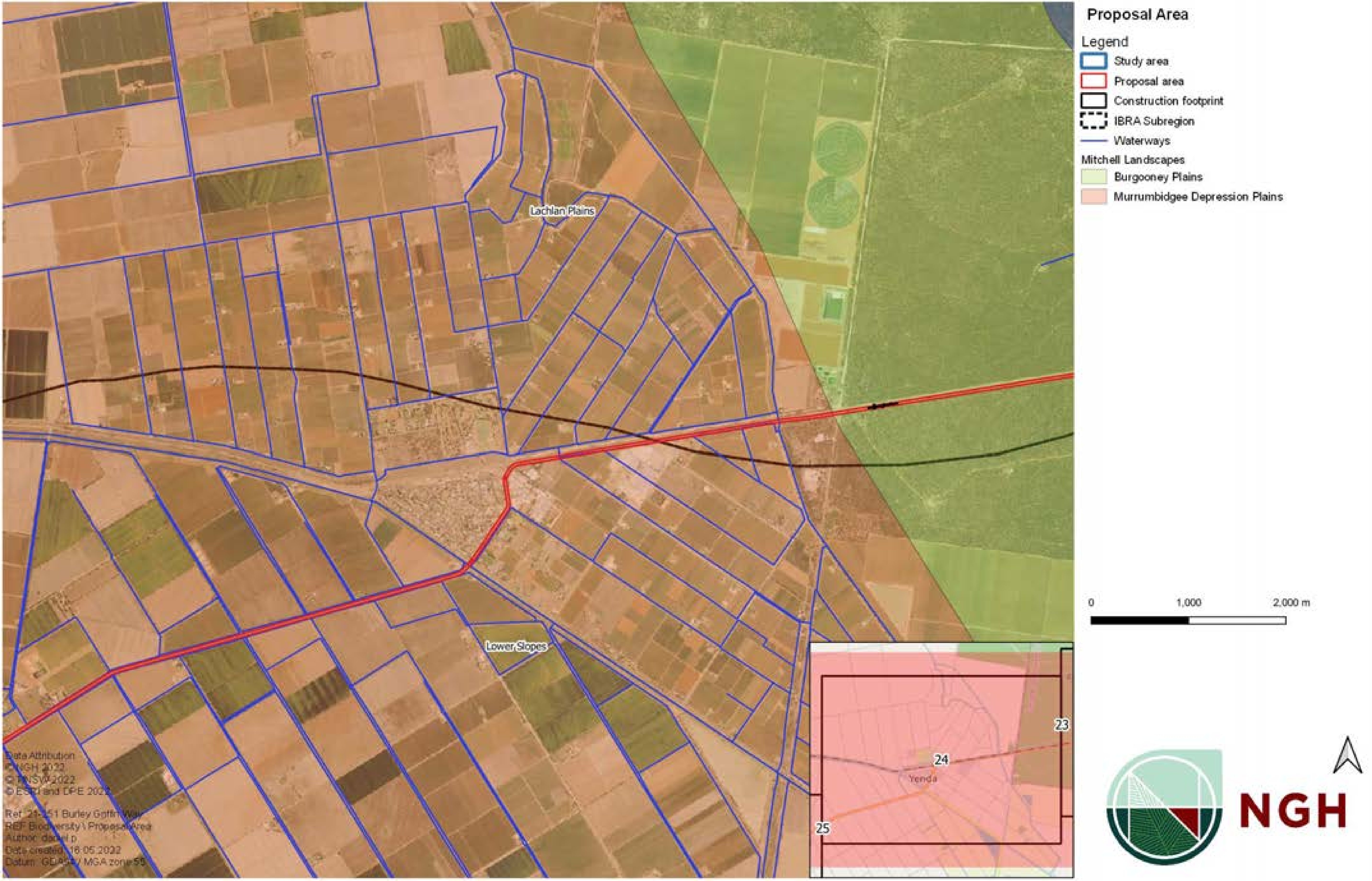

Proposal Area
Legend
Study area
Proposal area
Construction footprint
IBRA Subregion
Waterways
Mitchell Landscapes
Burgooney Plains
Murrumbidgee Depression Plains
Lachlan Plains
Lower Slopes
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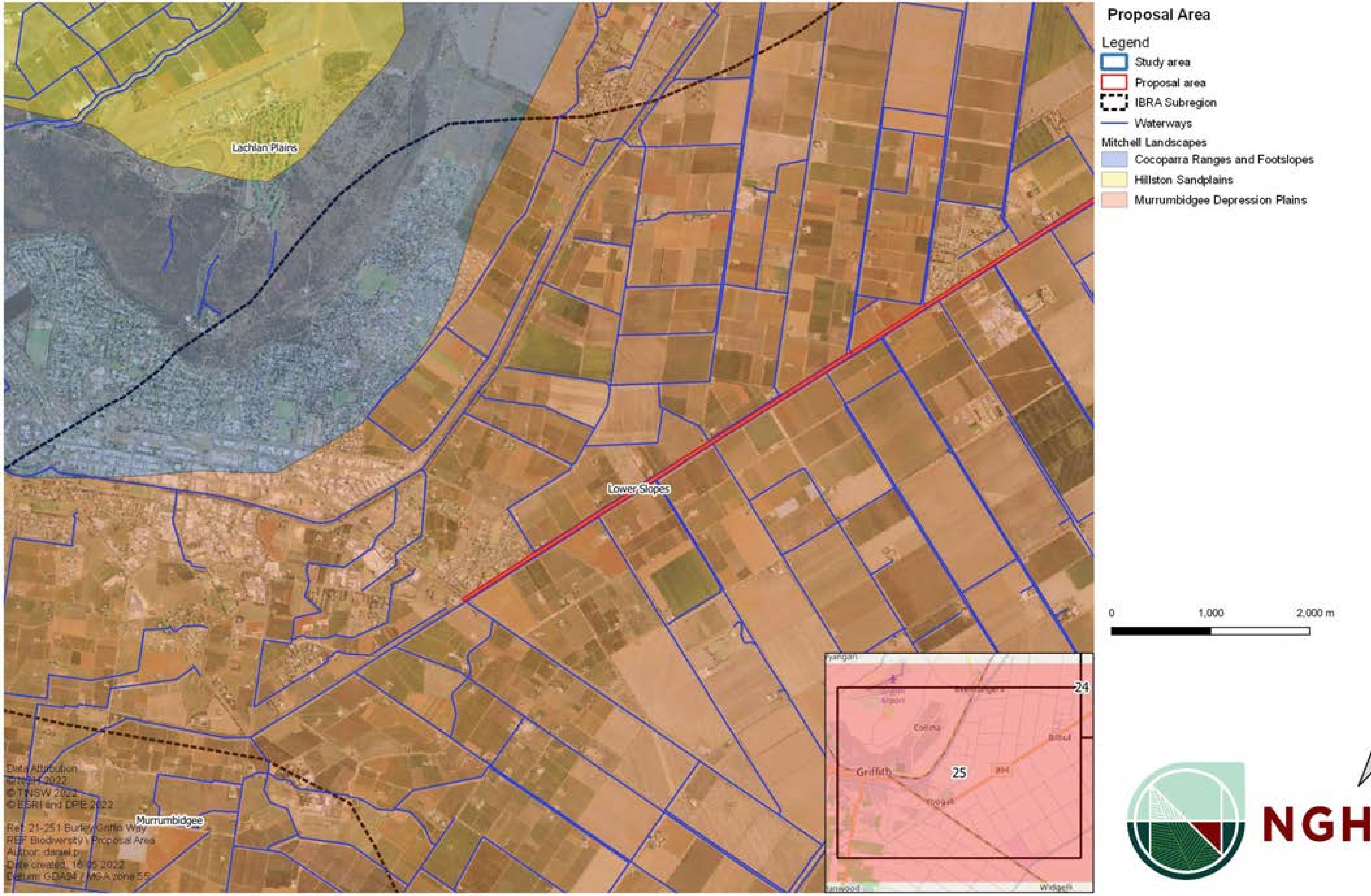
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Proposal area
IBRA Subregion
Waterways
Mitchell Landscapes
Cocoparra Ranges and Footslopes
Hillston Sandplains
Murrumbidgee Depression Plains
Lachlan Plains
Lower Slopes
Murrumbidgee
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Data Attribution
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F.2 Survey effort

Maps follow overleaf (67-map set).

Survey Effort
Legend
Proposal area
Construction footprint
BAM plot locations
HBT recordings
Threatened fauna
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Ref: 21-251 Burley Griffin Way
REF Biodiversity \ Survey Effort - cover page
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Date created: 28.04.2022
Datum: GDA94 / MGA zone 55
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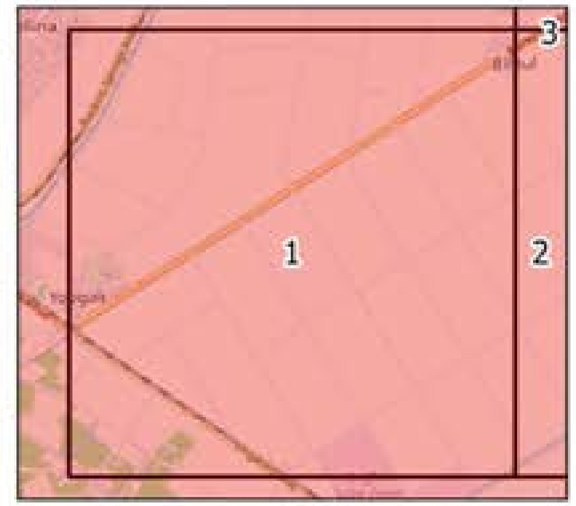
Survey Effort

Legend

Proposal area

BAM plot locations



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Legend

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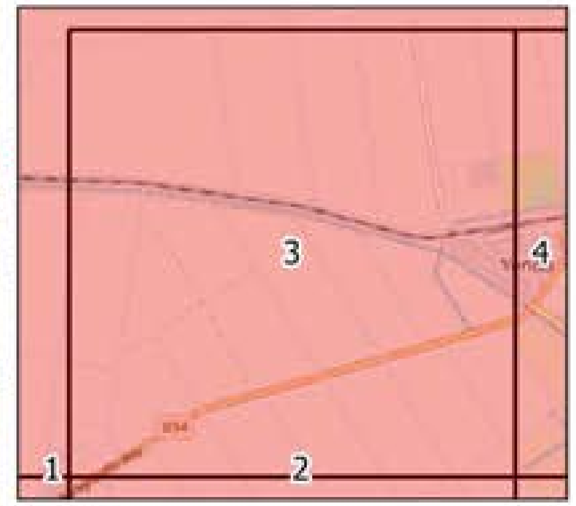
Survey Effort

Legend

Proposal area

BAM plot locations



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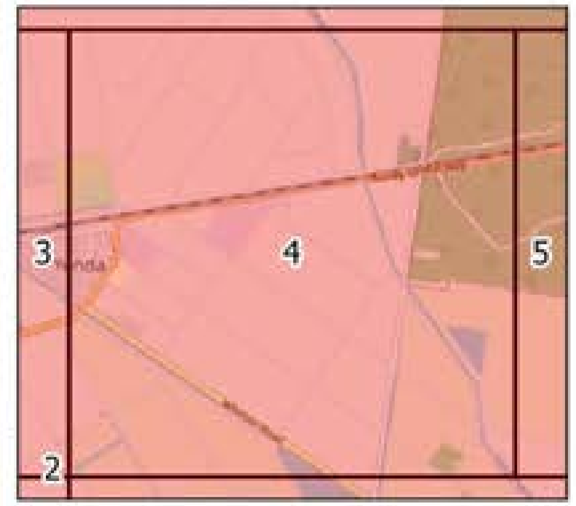
Survey Effort

Legend

Proposal area

Construction footprint

BAM plot locations



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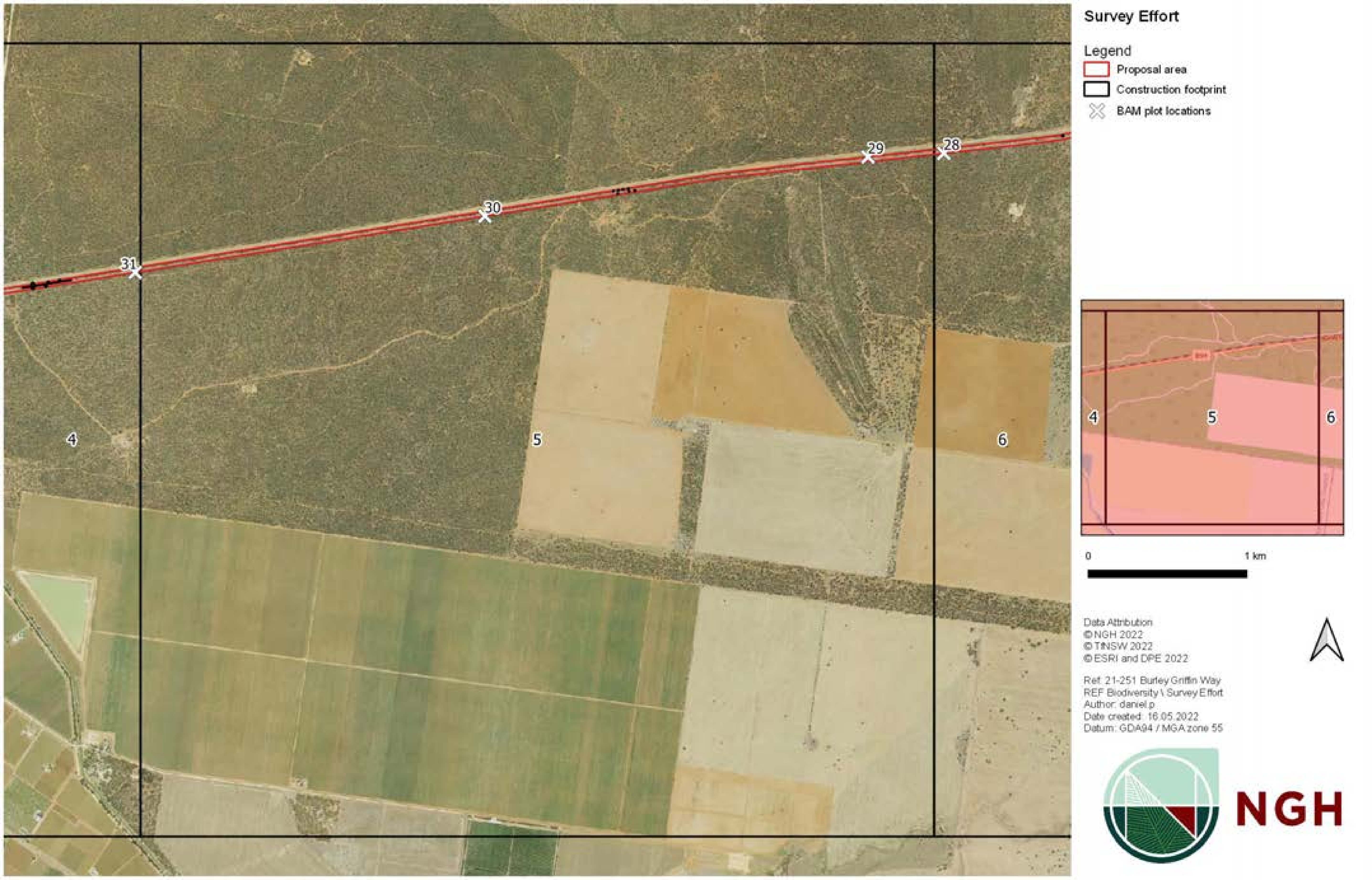

Survey Effort
Legend
Proposal area
Construction footprint
BAM plot locations
28
29
30
31
4
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1 km
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Legend

Proposal area

Construction footprint

BAM plot locations

0 1 km

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Legend

- Proposal area
- Construction footprint
- BAM plot locations

0 1 km

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Legend
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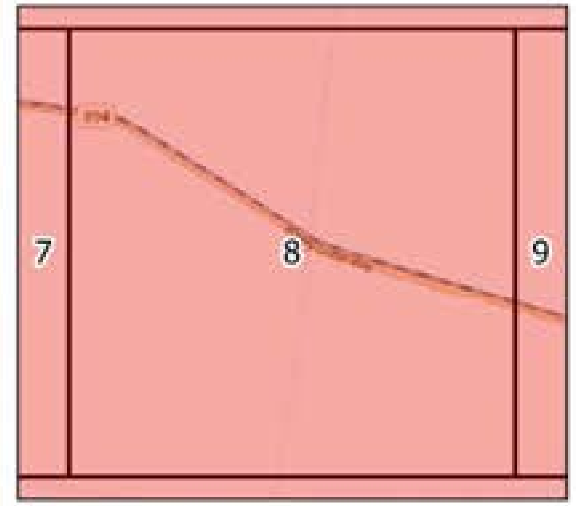
BAM plot locations



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Legend
Proposal area
BAM plot locations

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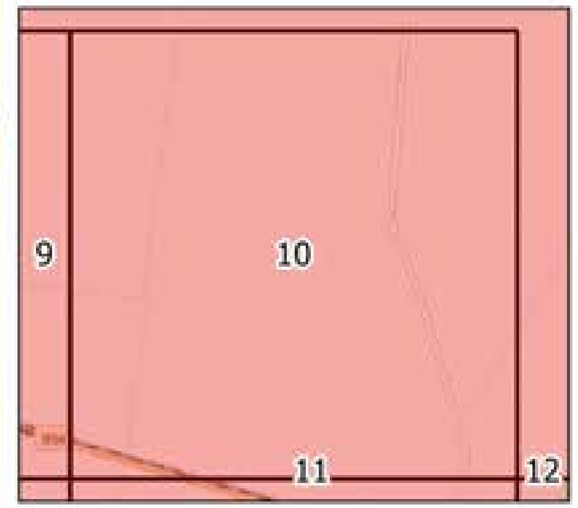
Survey Effort

Legend

Proposal area

BAM plot locations



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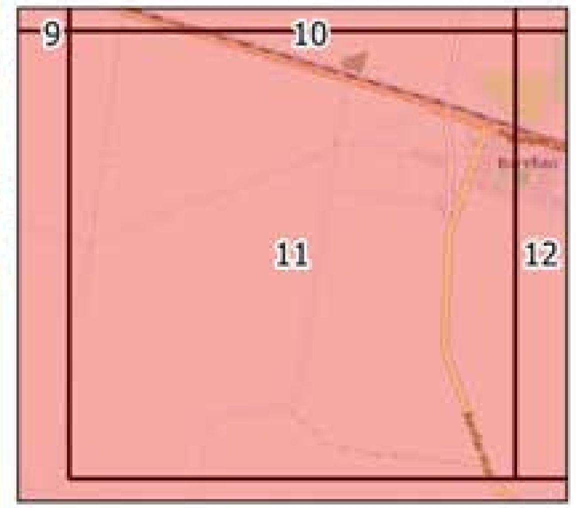

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Legend

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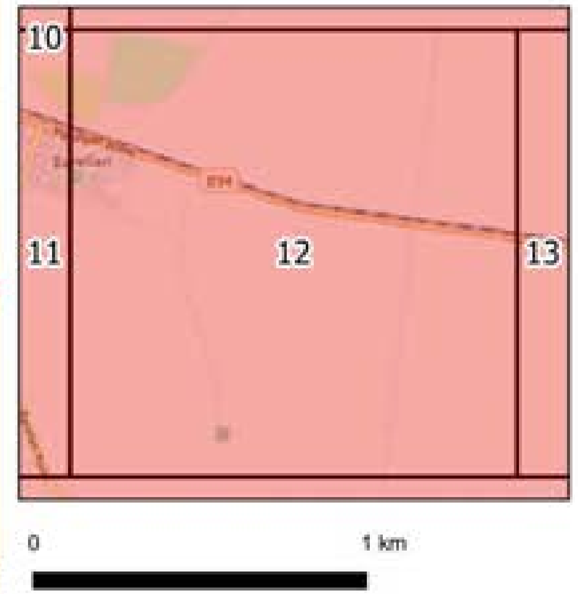
BAM plot locations



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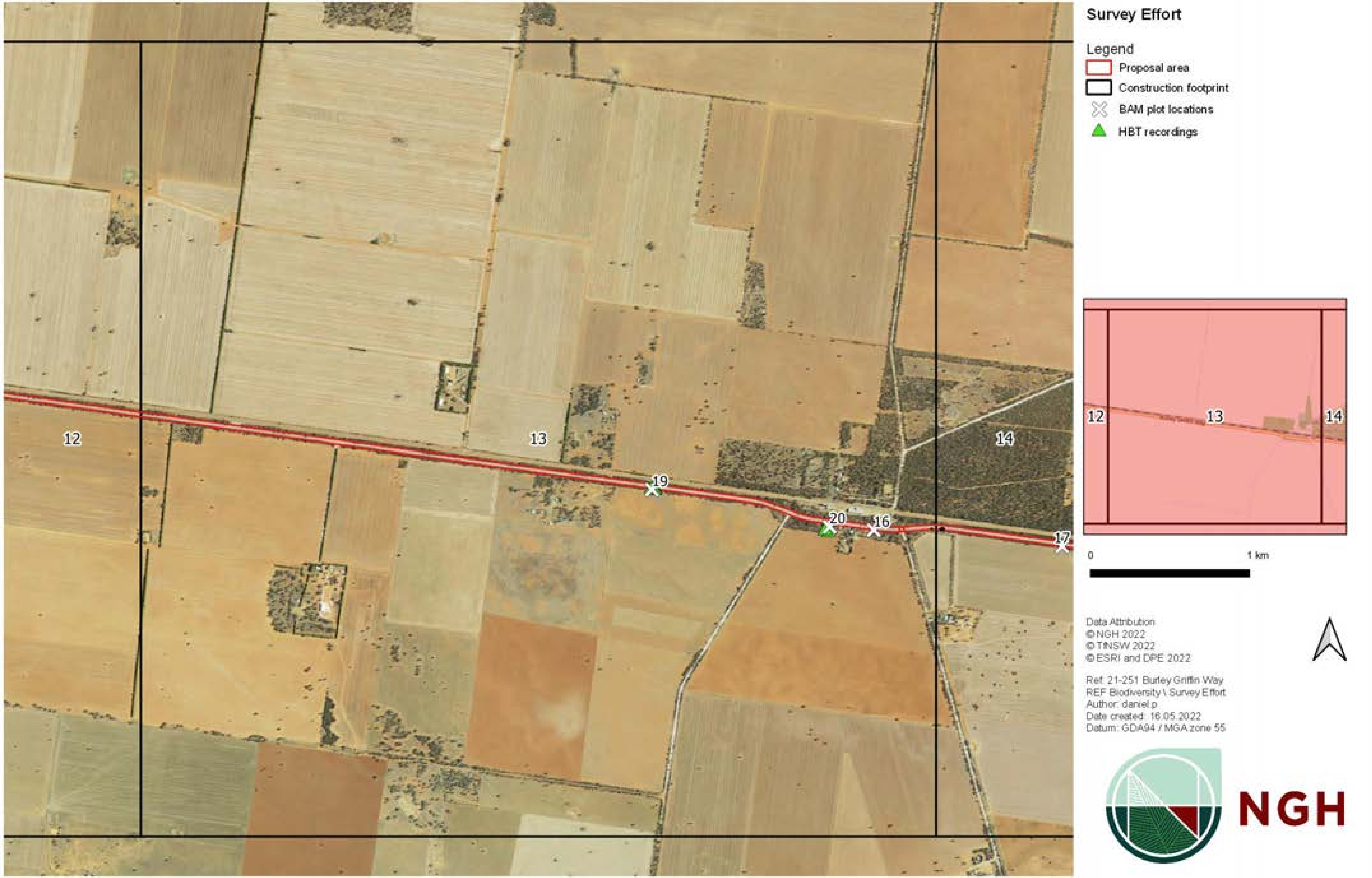

Survey Effort

Legend
- Proposal area
- Construction footprint
- BAM plot locations
- HBT recordings

0 1 km

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Legend
- Proposal area
- Construction footprint
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Legend

Proposal area

Threatened fauna

0 1 km

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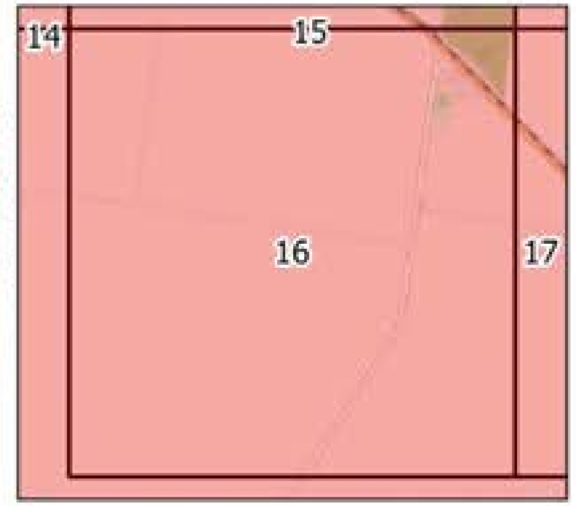
Survey Effort

Legend

Proposal area

BAM plot locations



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Survey Effort

Legend

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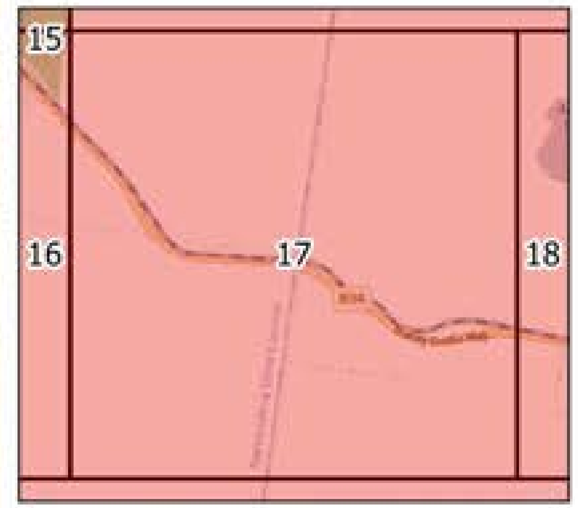
- Construction footprint
- BAM plot locations



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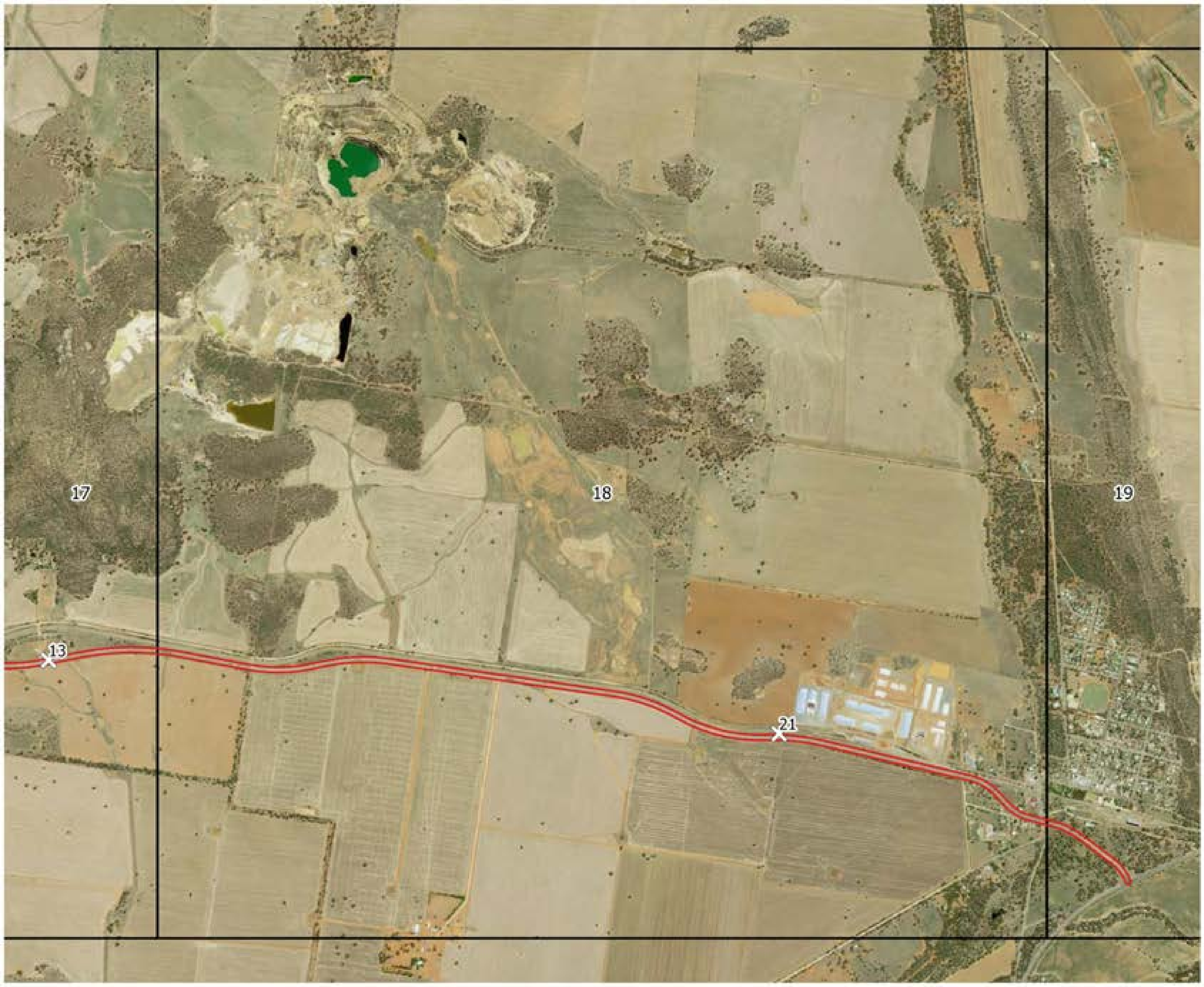

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Proposal area

BAM plot locations

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Proposal area

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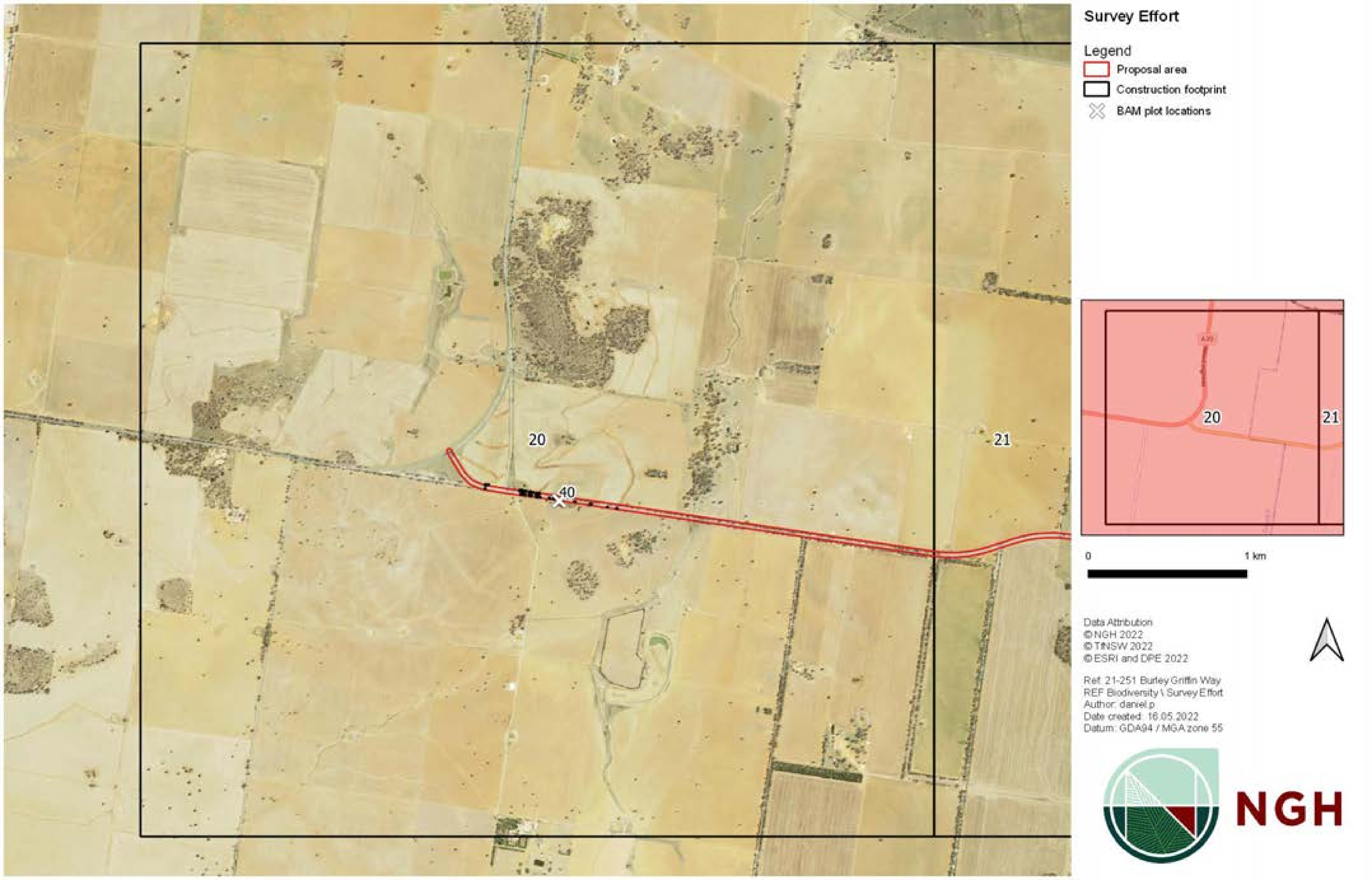
Survey Effort
Legend
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Construction footprint
BAM plot locations
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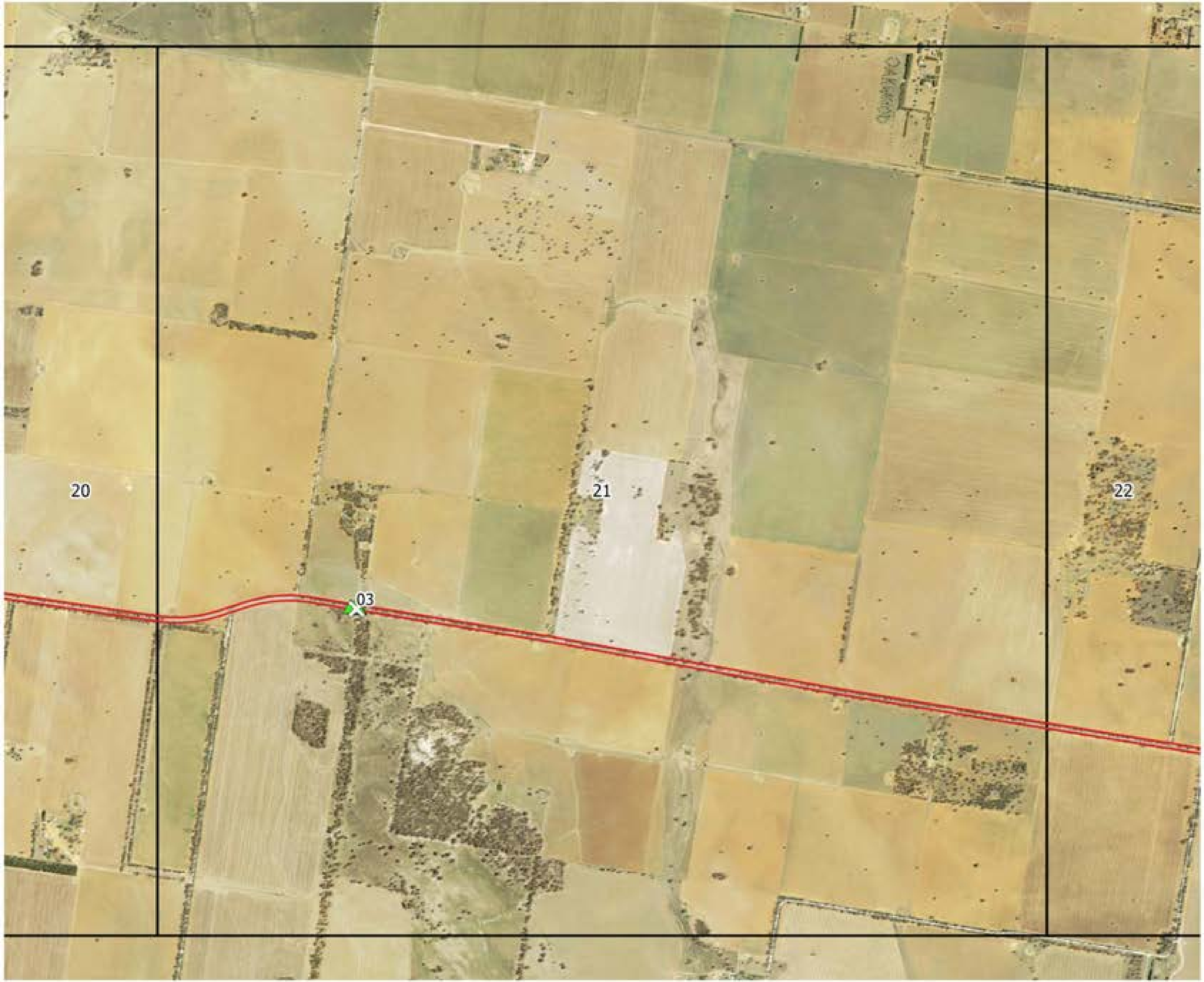

Legend
- Proposal area
- BAM plot locations
- HBT recordings

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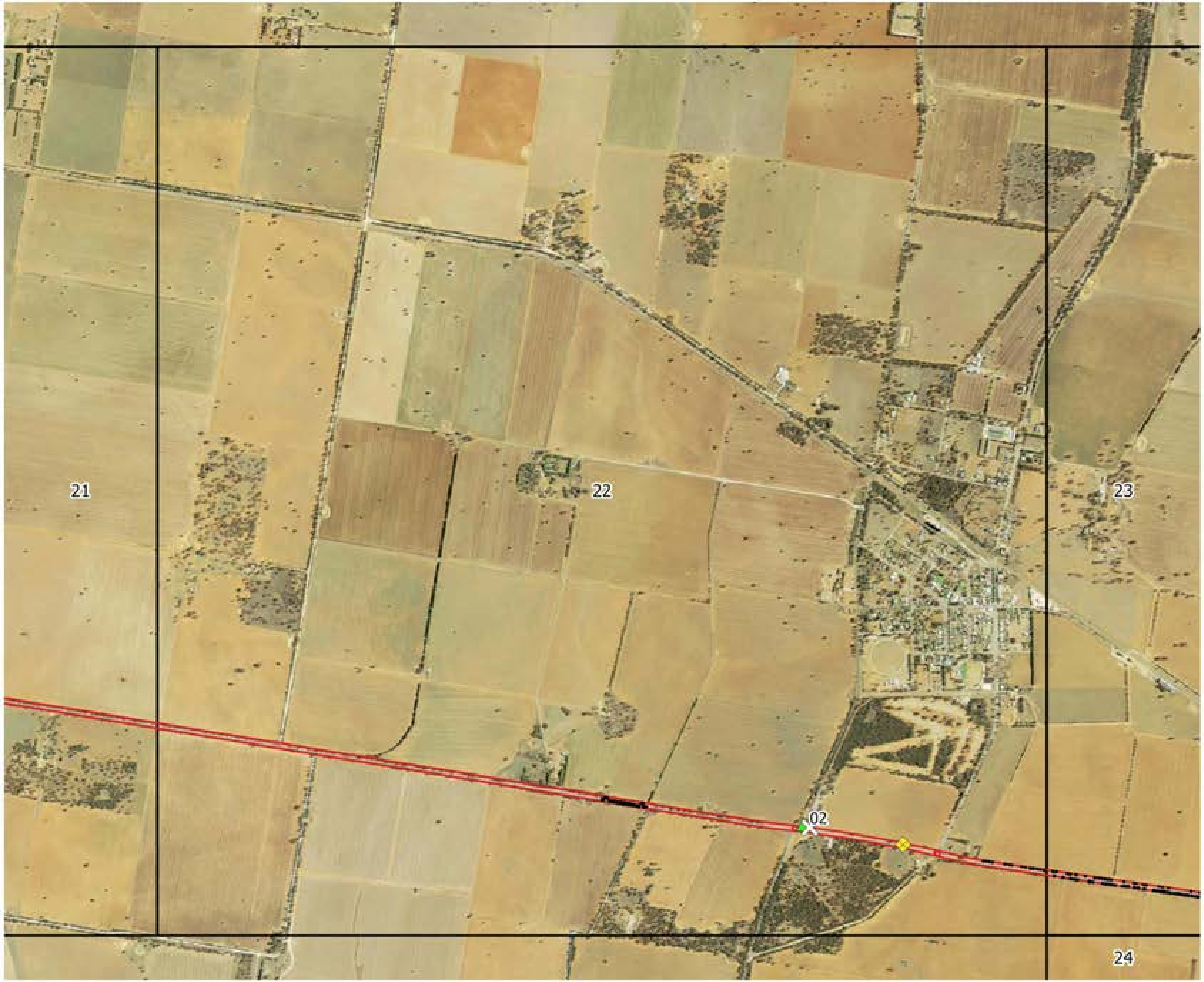

Survey Effort

Legend
- Proposal area
- Construction footprint
- BAM plot locations
- HBT recordings
- Threatened fauna

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Legend
Proposal area
Construction footprint

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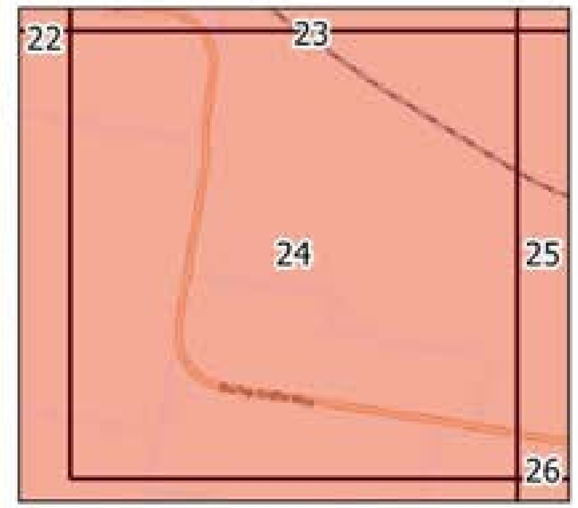

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Legend

Proposal area

Construction footprint

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Survey Effort

Legend

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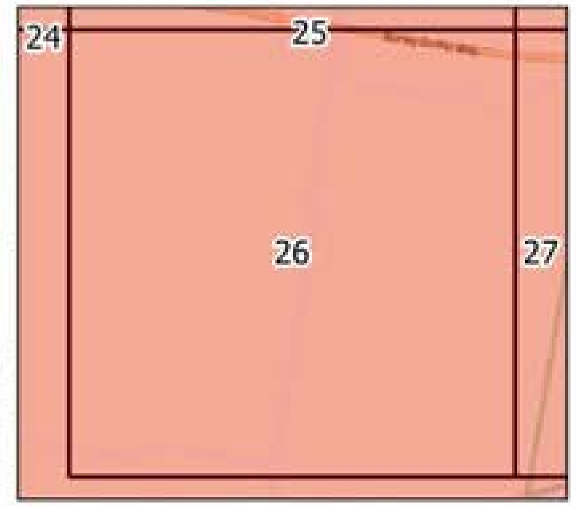
- BAM plot locations
- HBT recordings



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Survey Effort

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- HBT recordings

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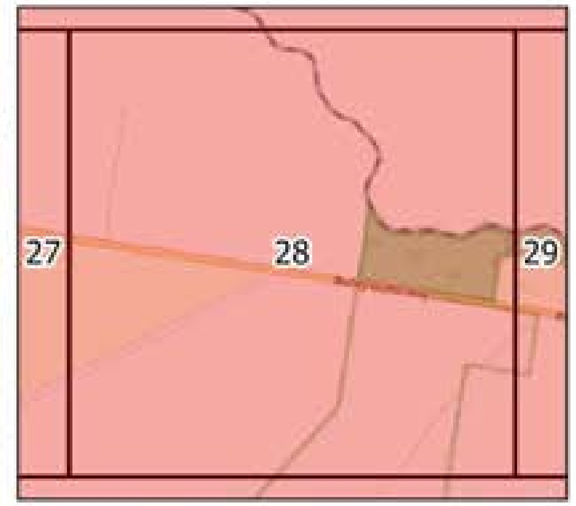

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Legend
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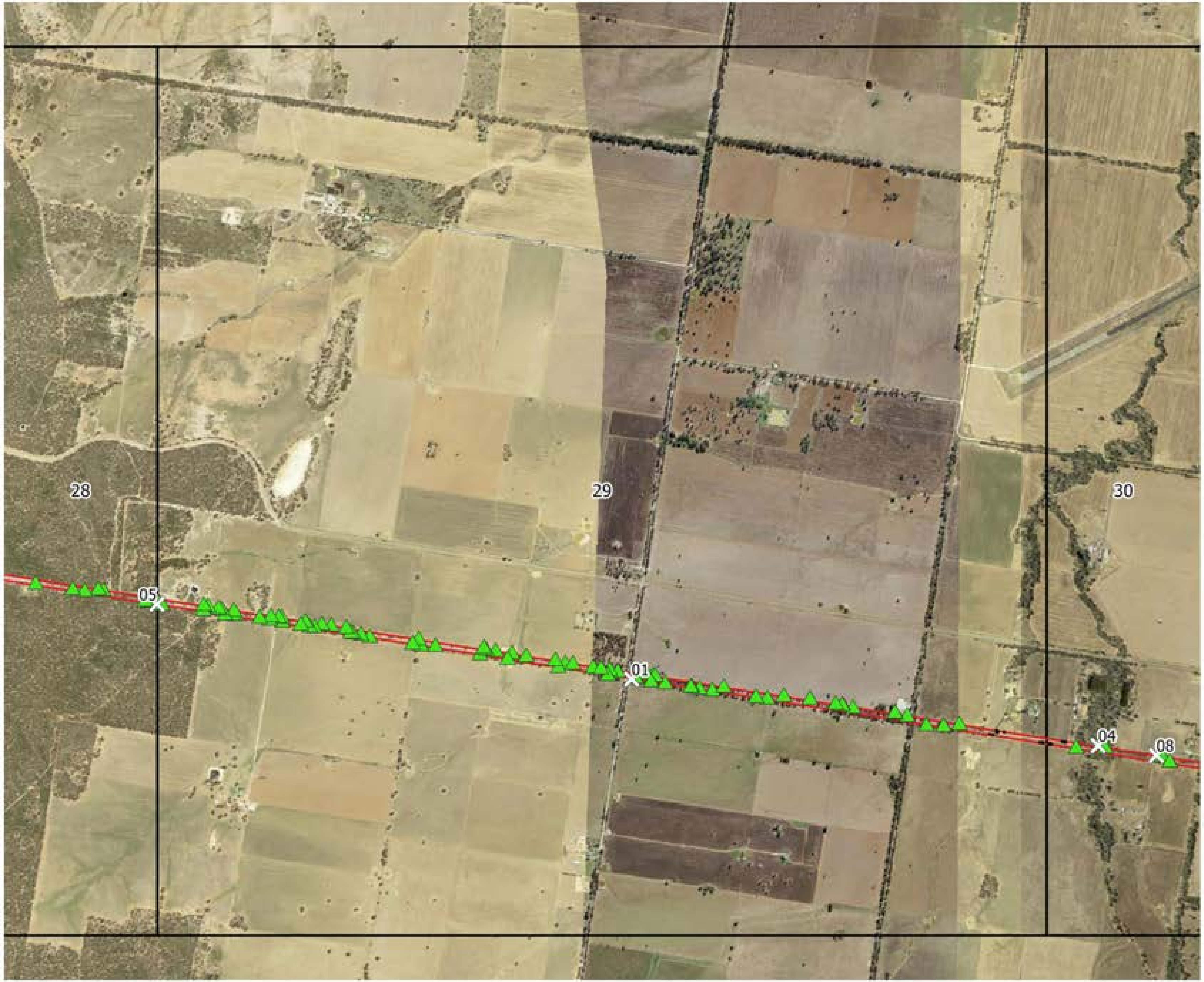

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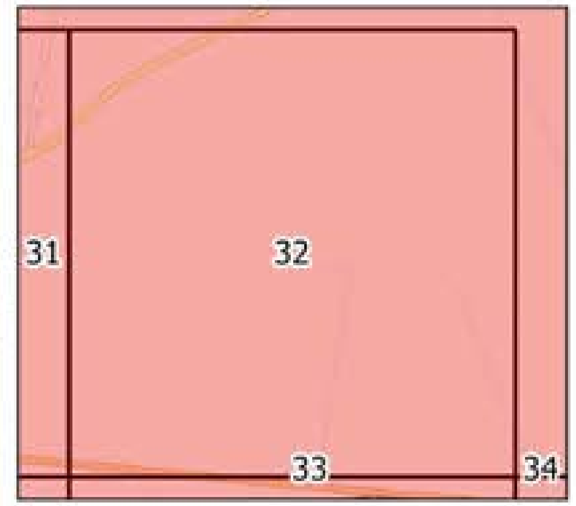

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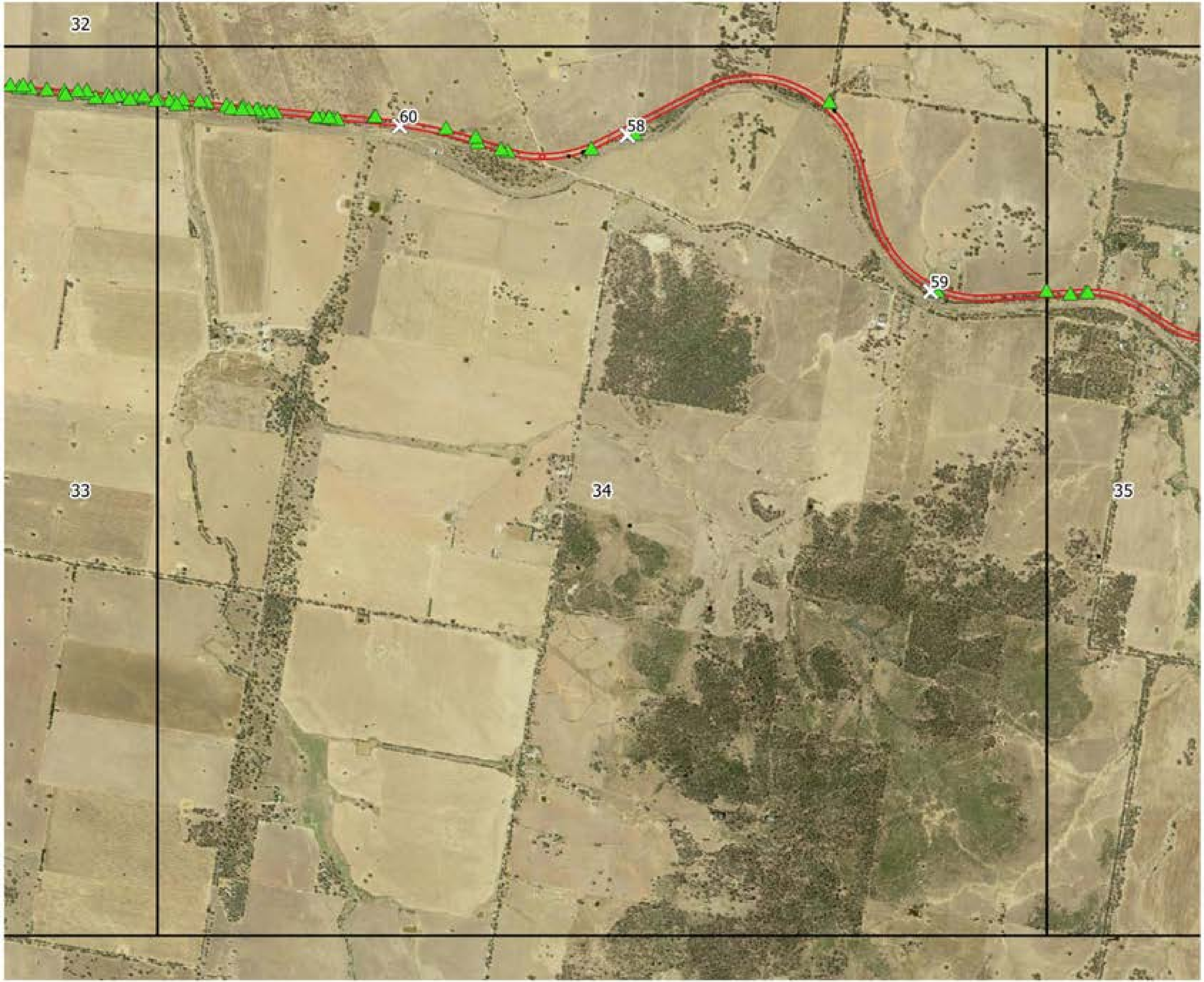

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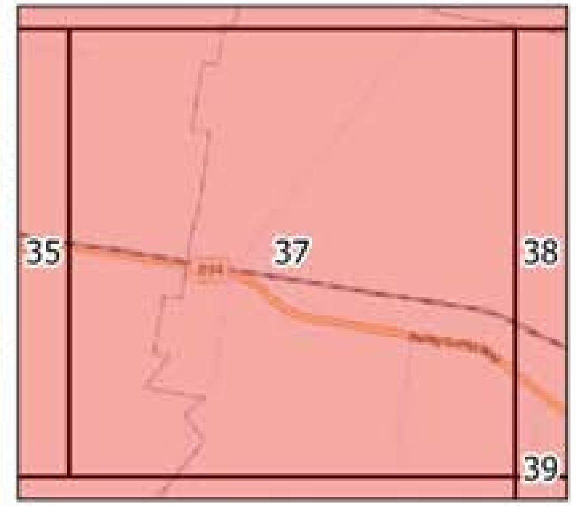

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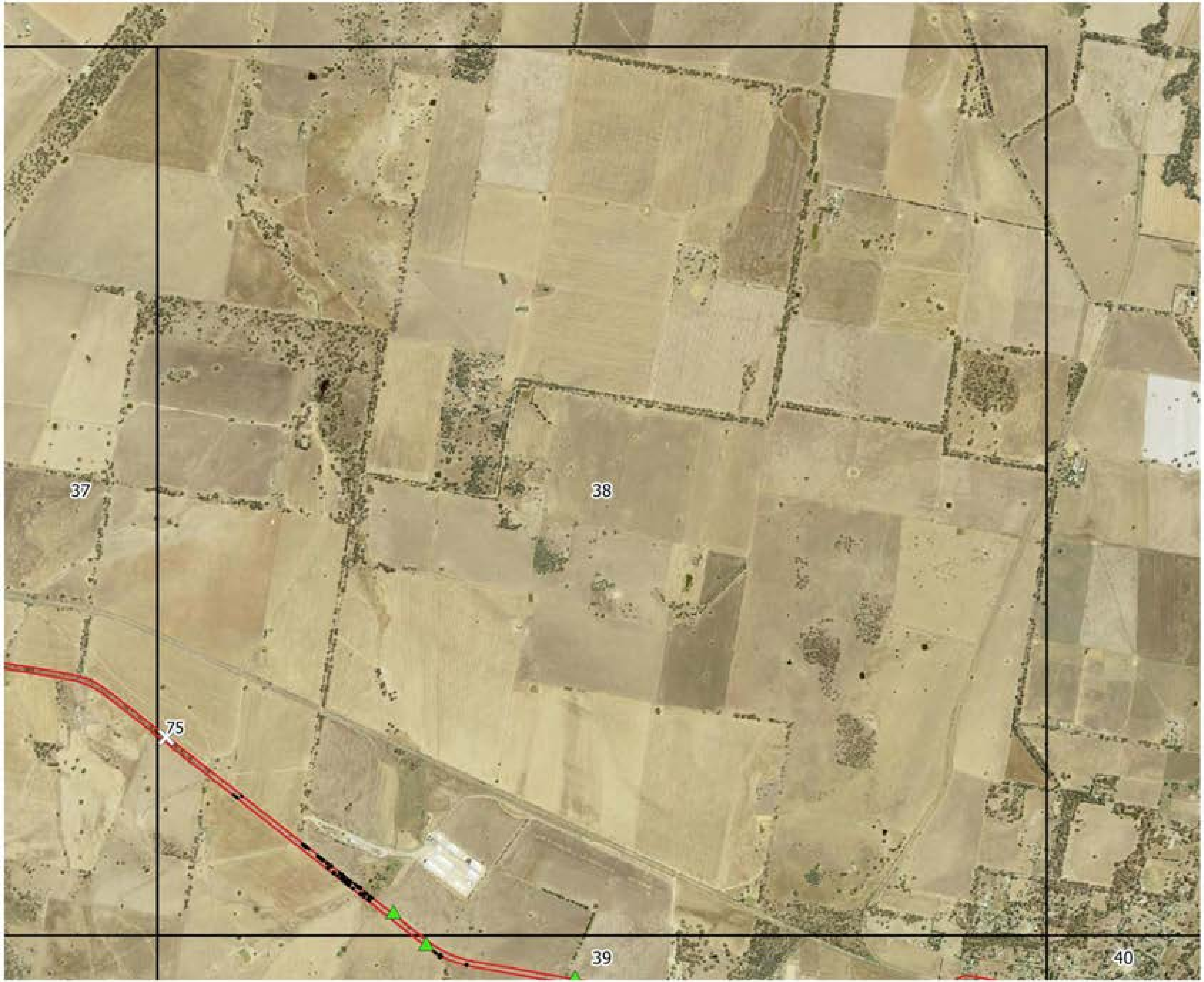

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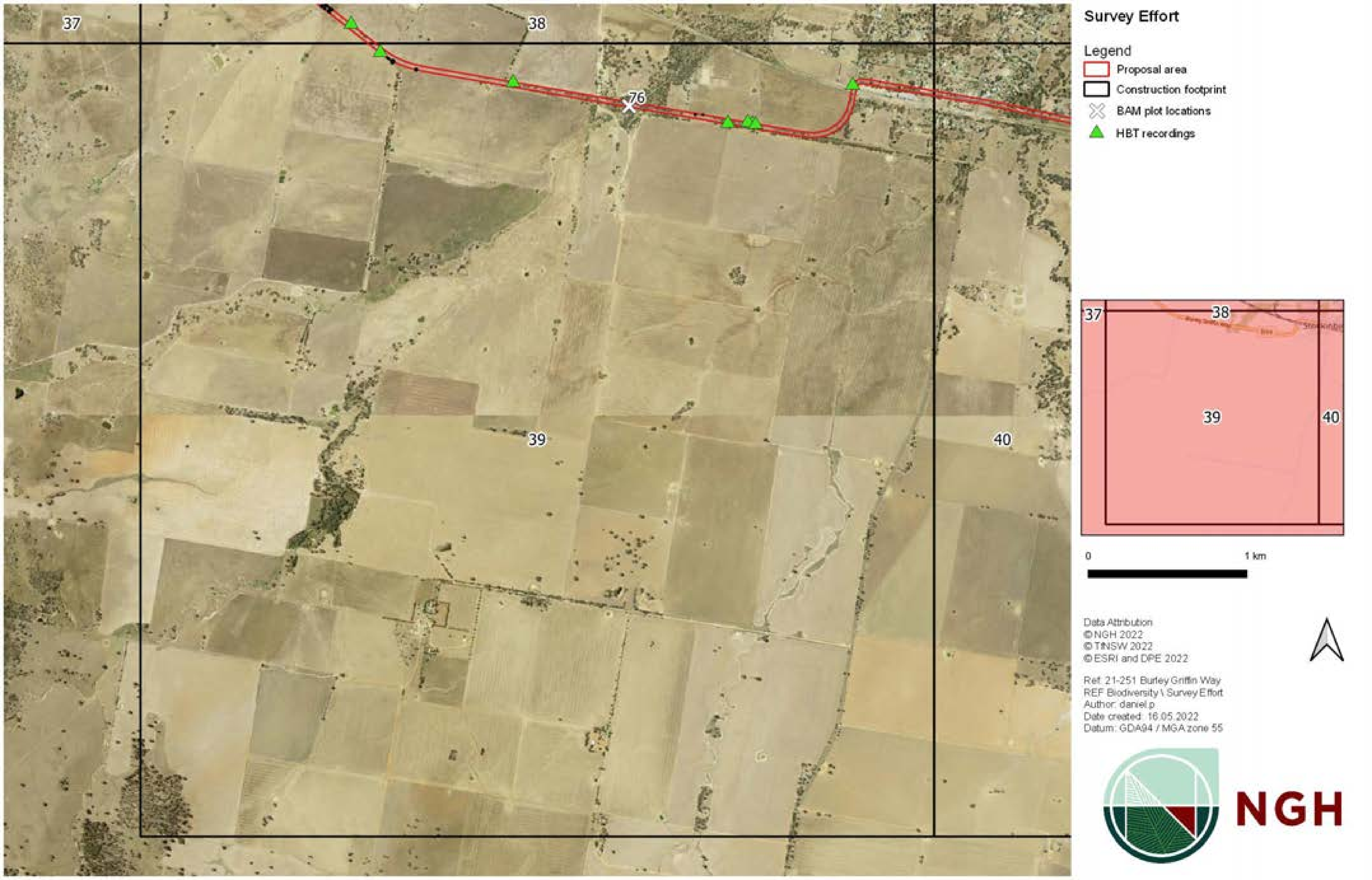
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Construction footprint
BAM plot locations
HBT recordings
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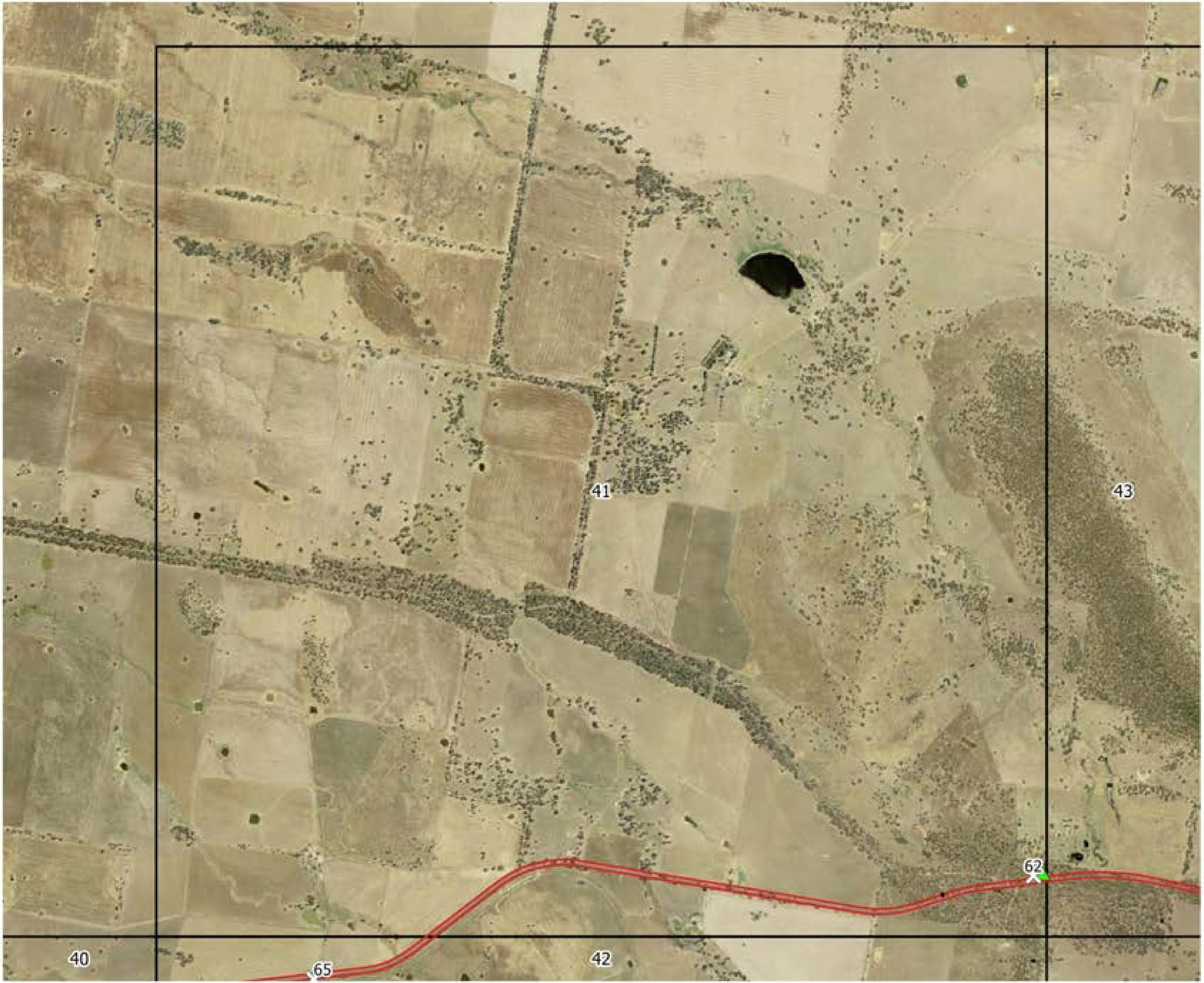

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Legend
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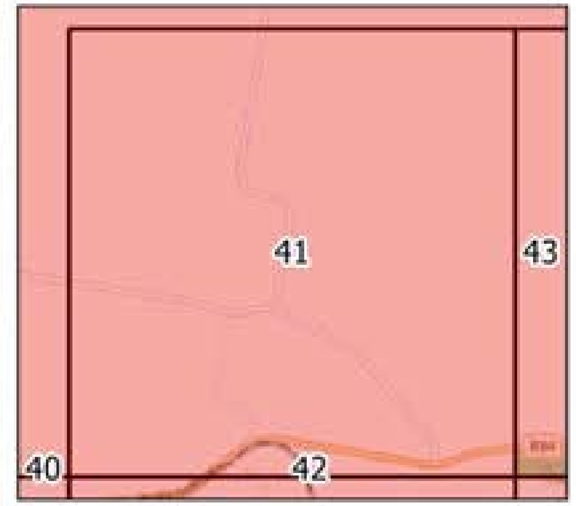

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BAM plot locations
HBT recordings

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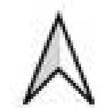

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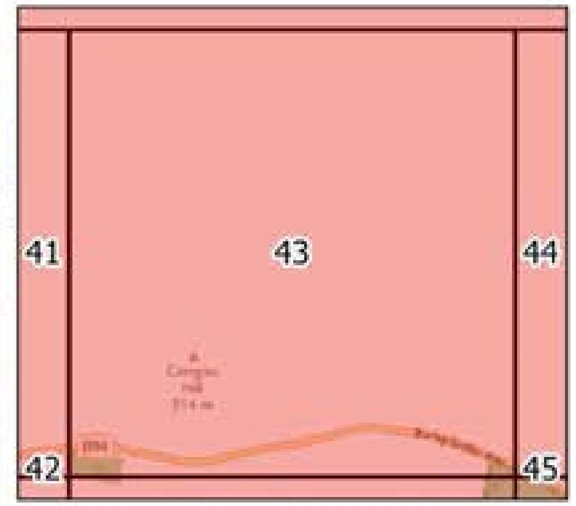

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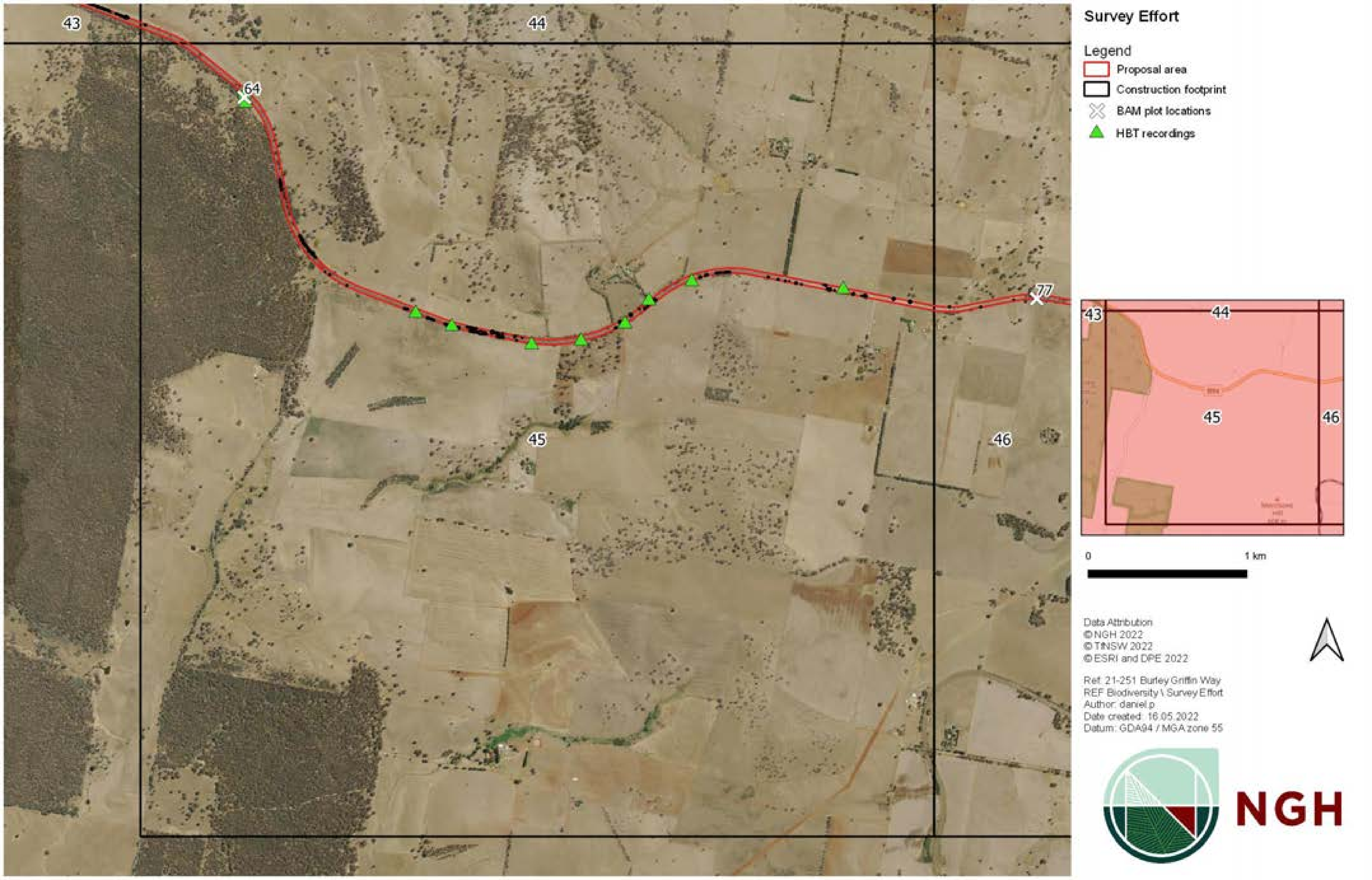

43
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Survey Effort
Legend
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Construction footprint
BAM plot locations
HBT recordings
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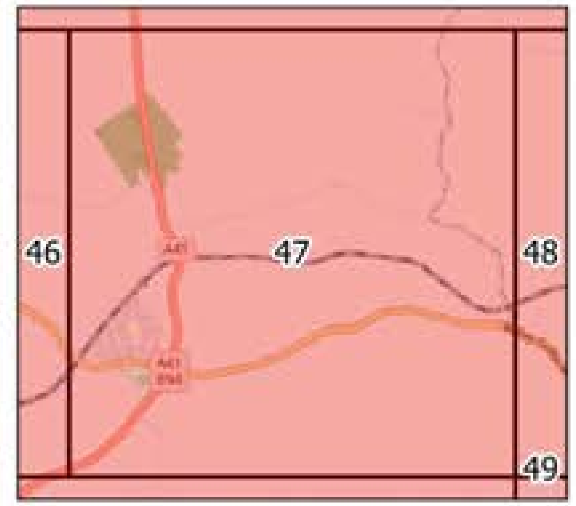

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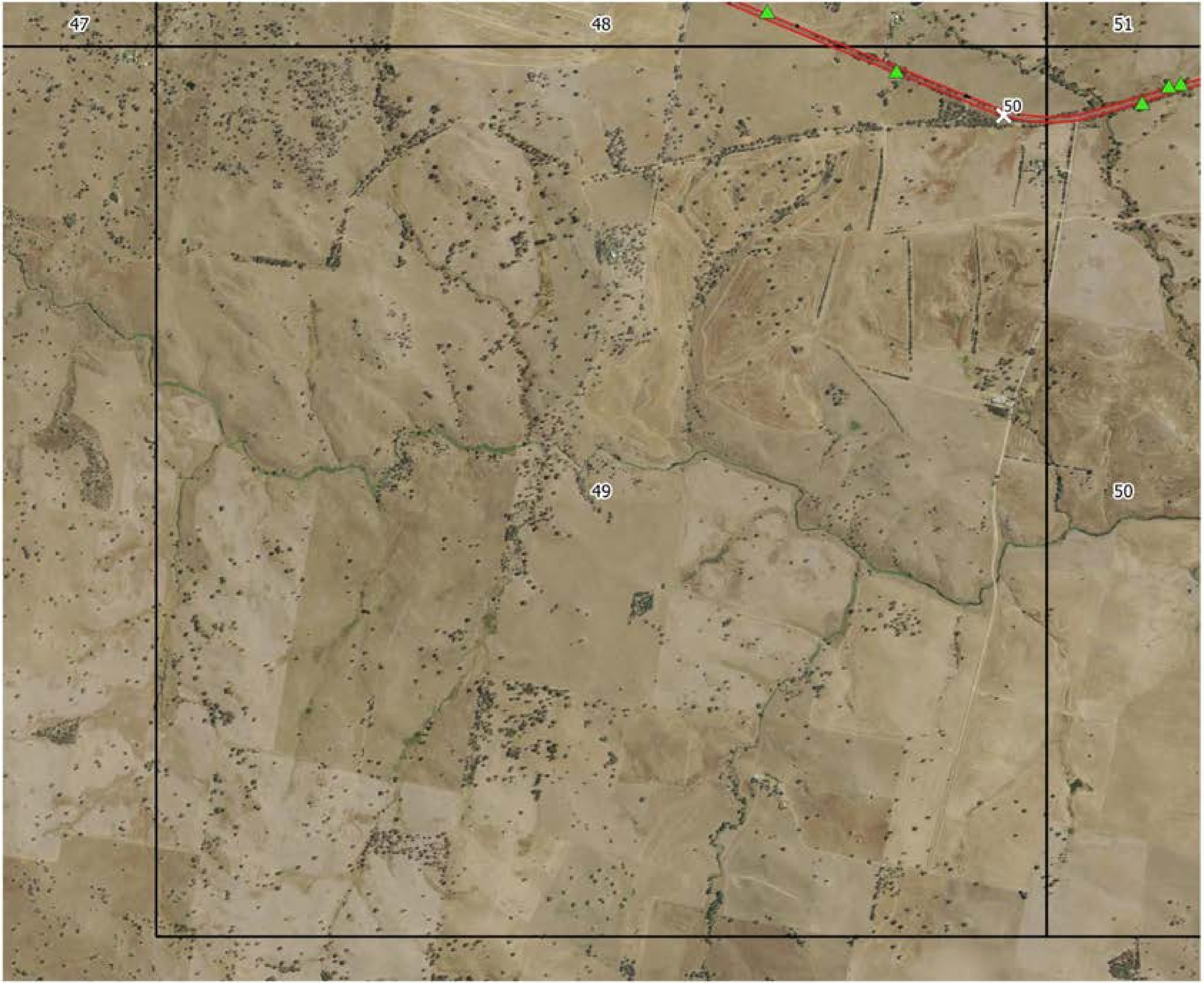

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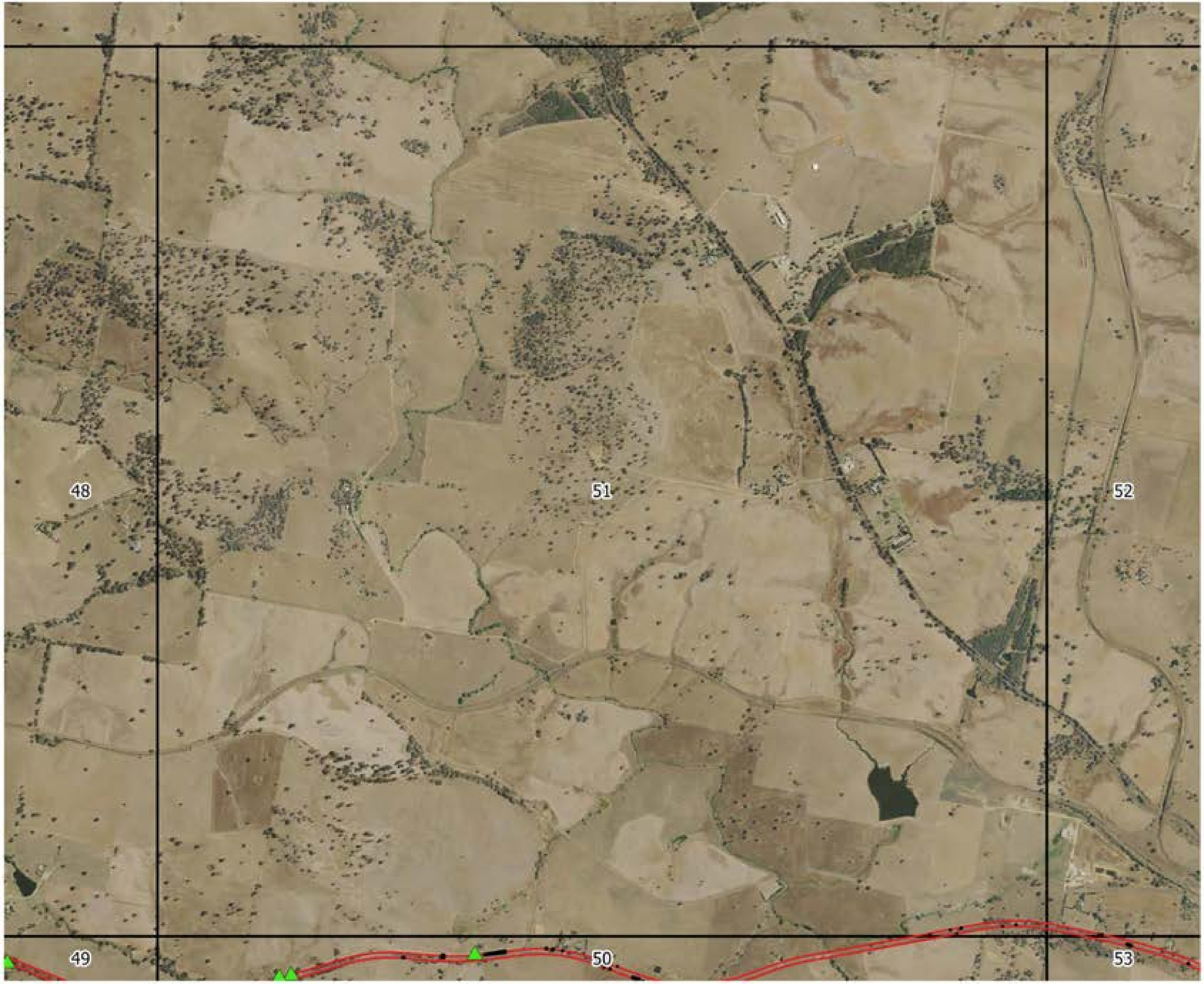

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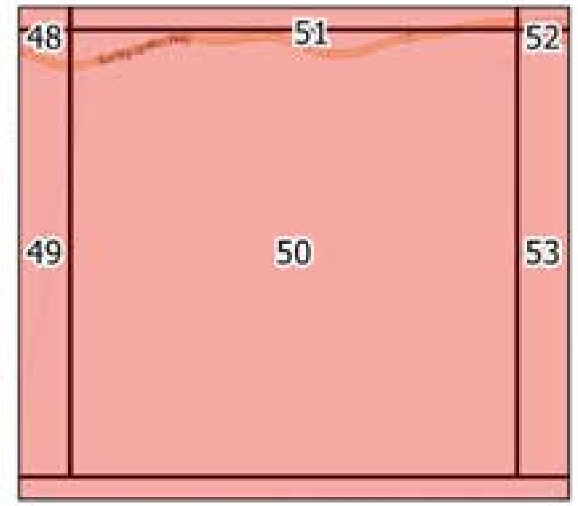
Construction footprint

HBT recordings



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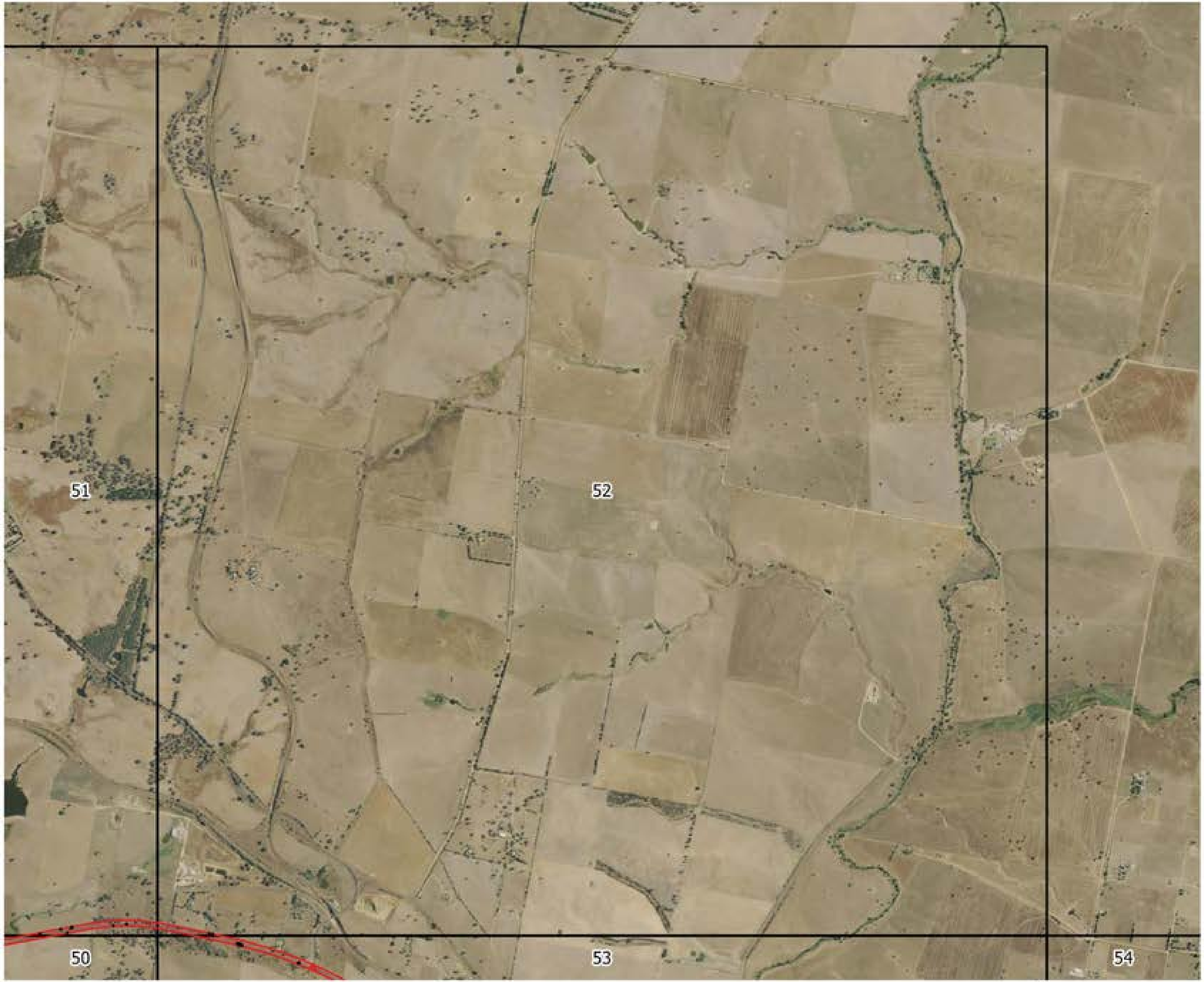

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Proposal area

Construction footprint

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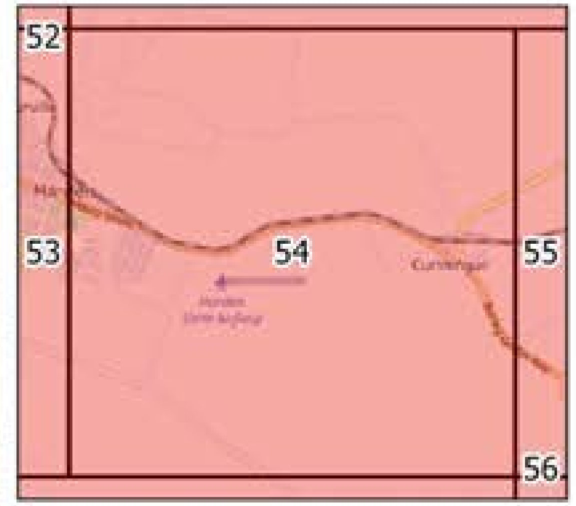

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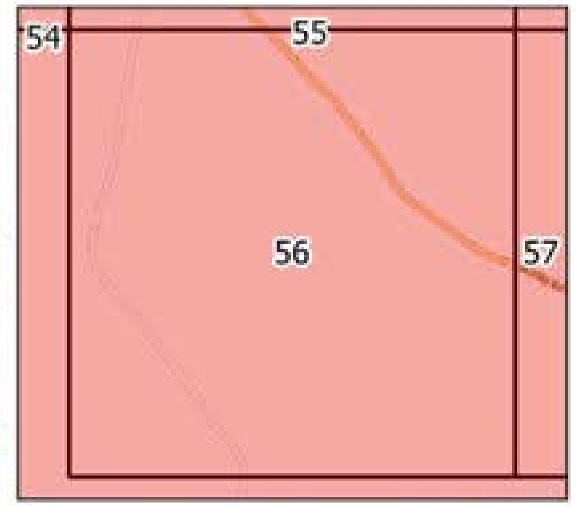
HBT recordings



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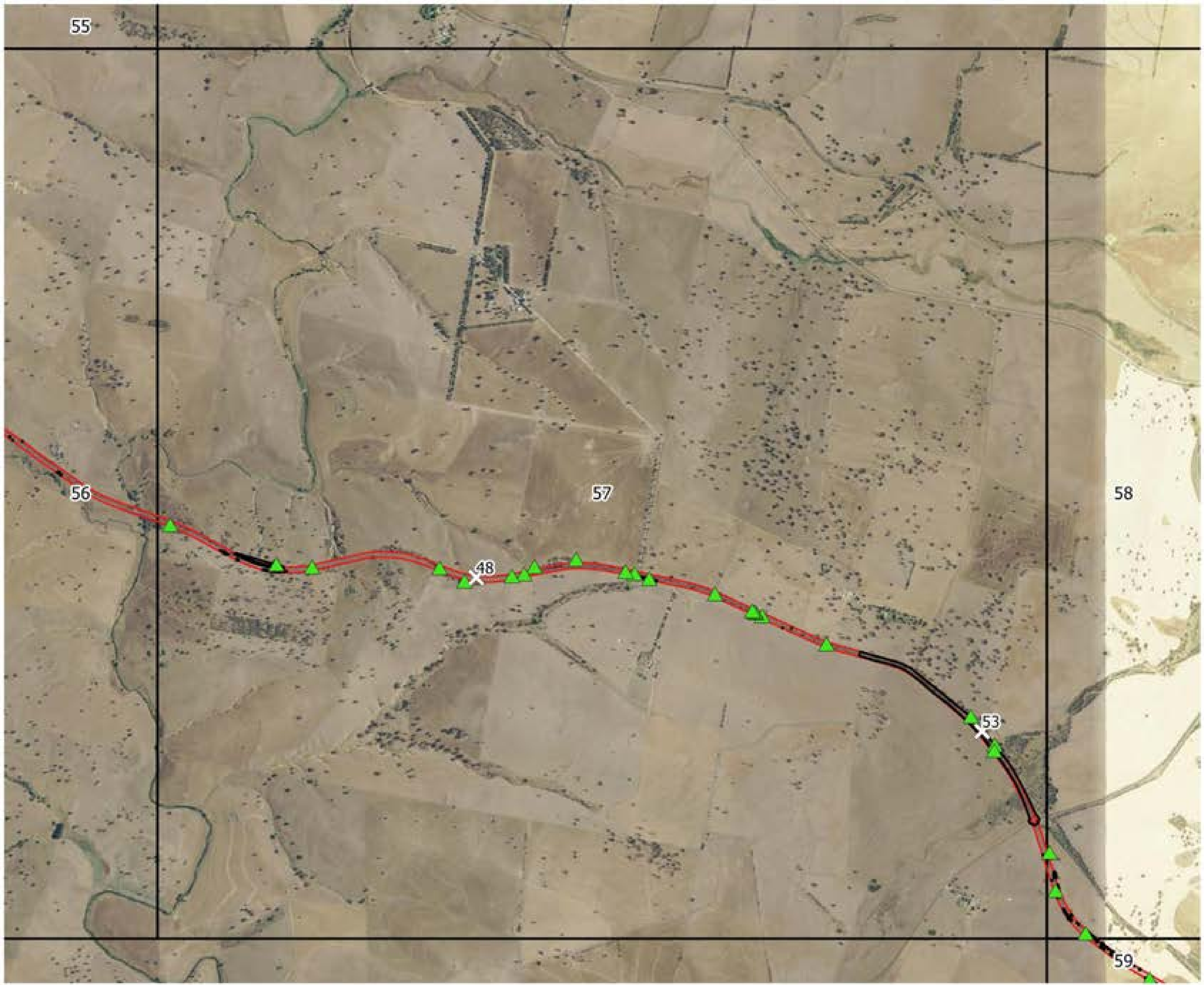

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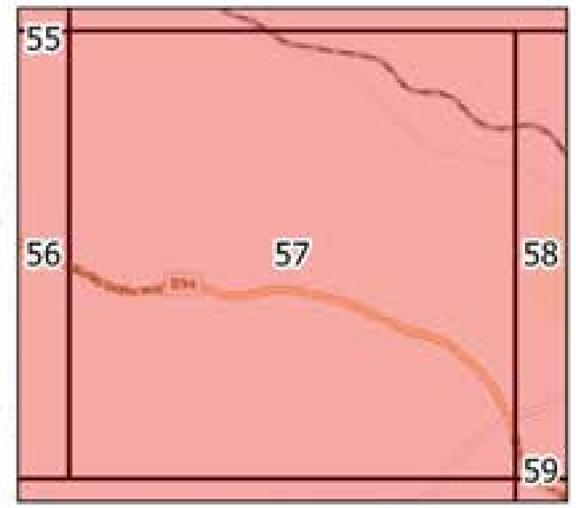
- HBT recordings



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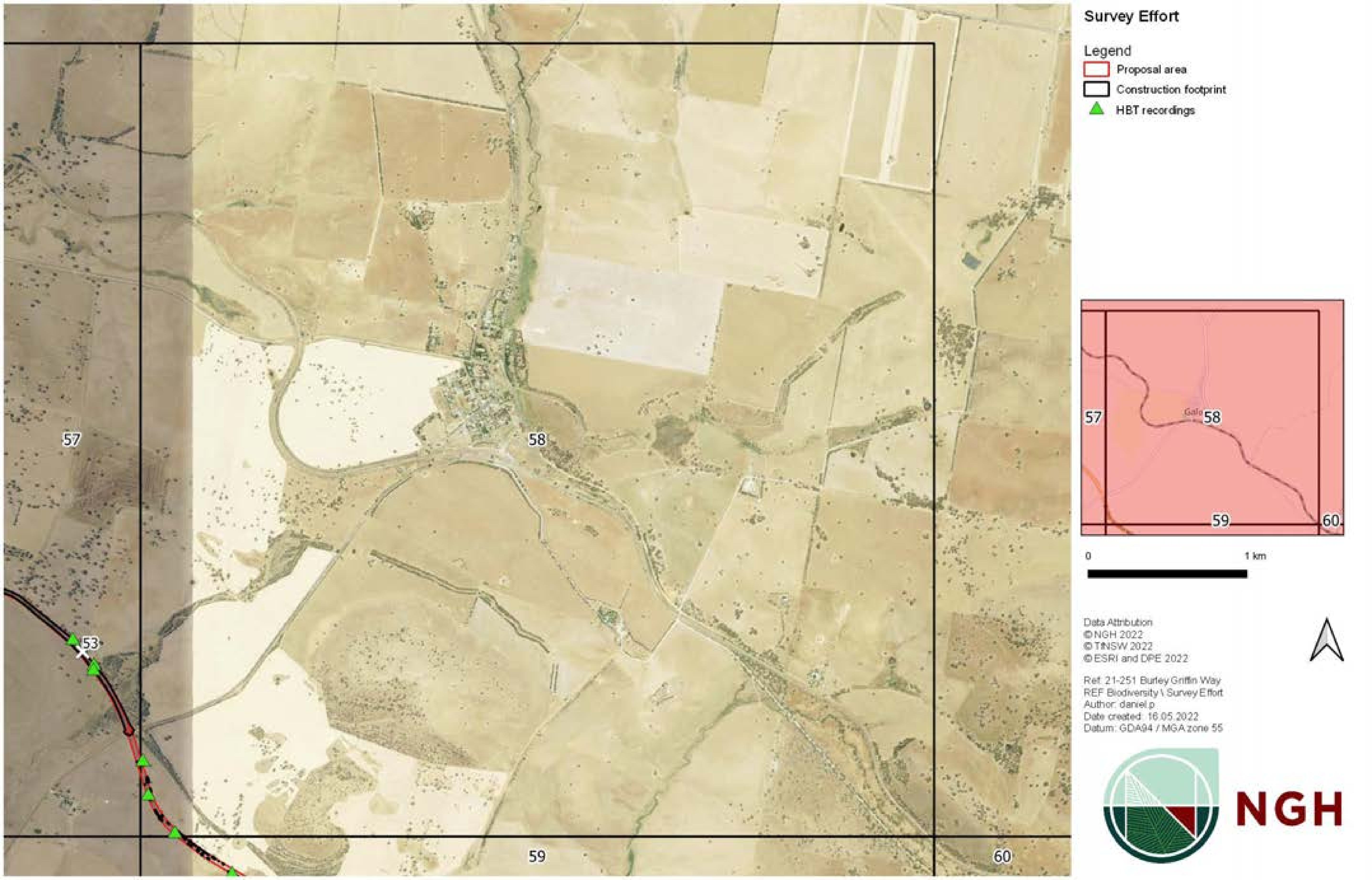

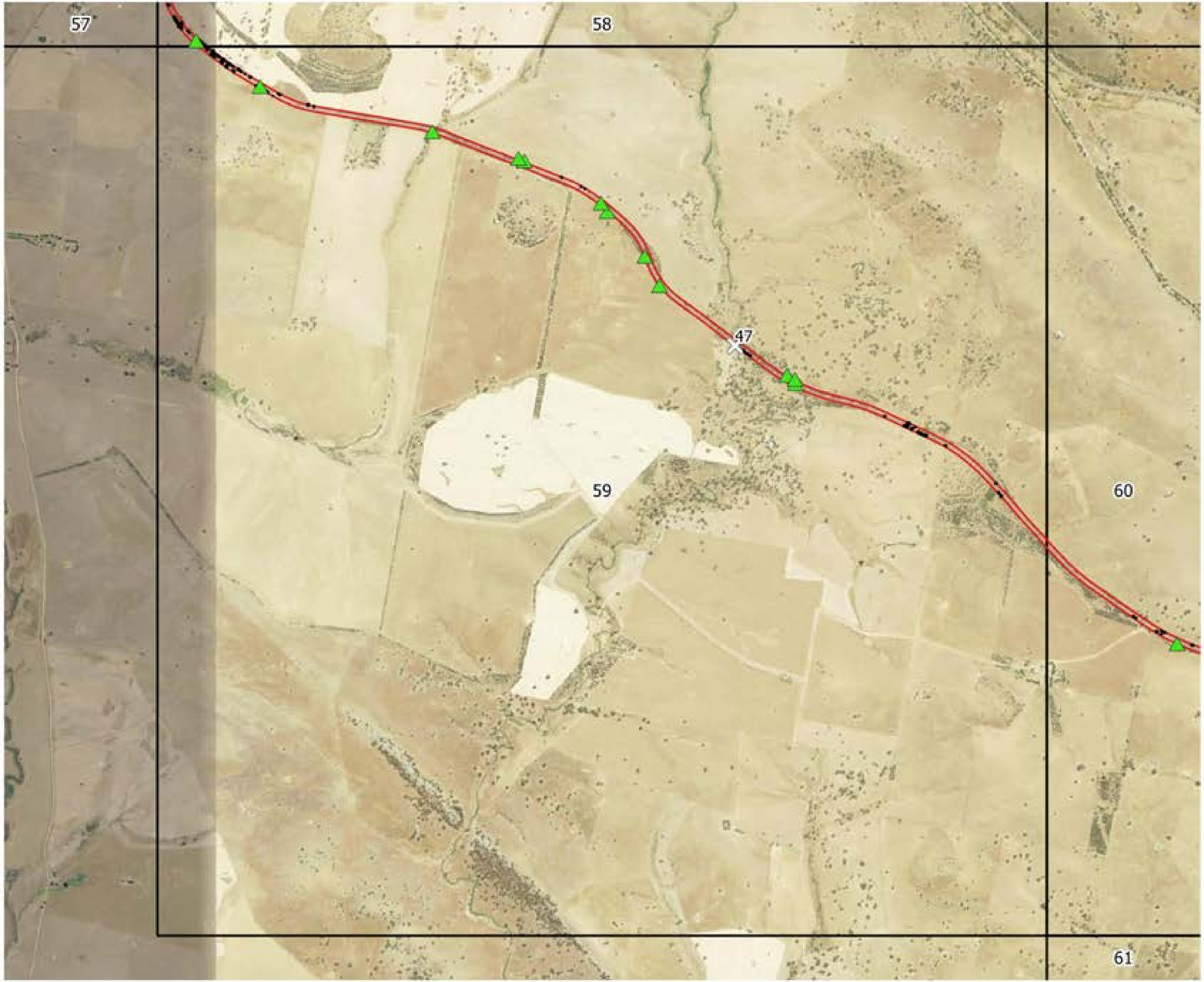

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Legend
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- Construction footprint
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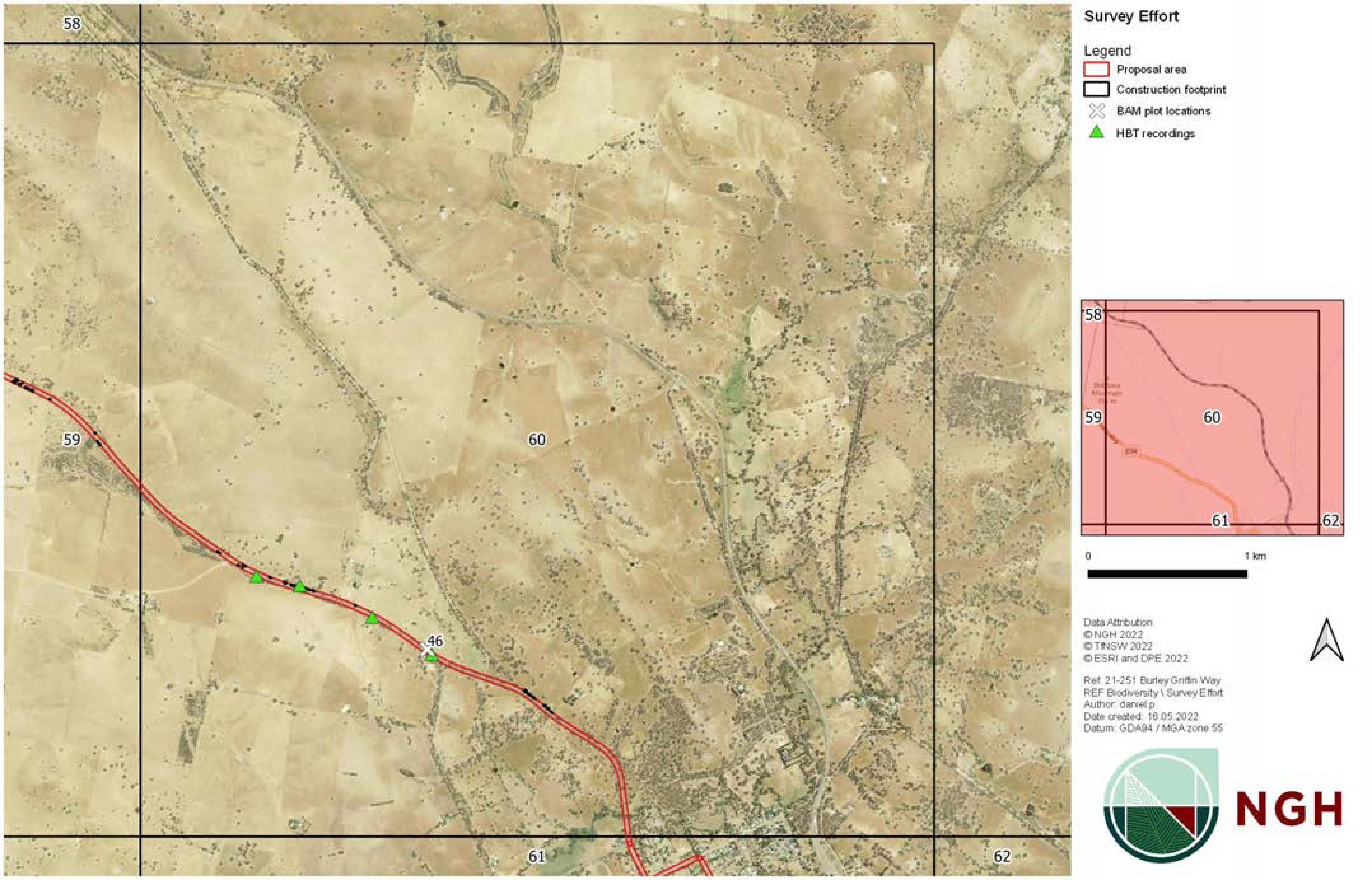
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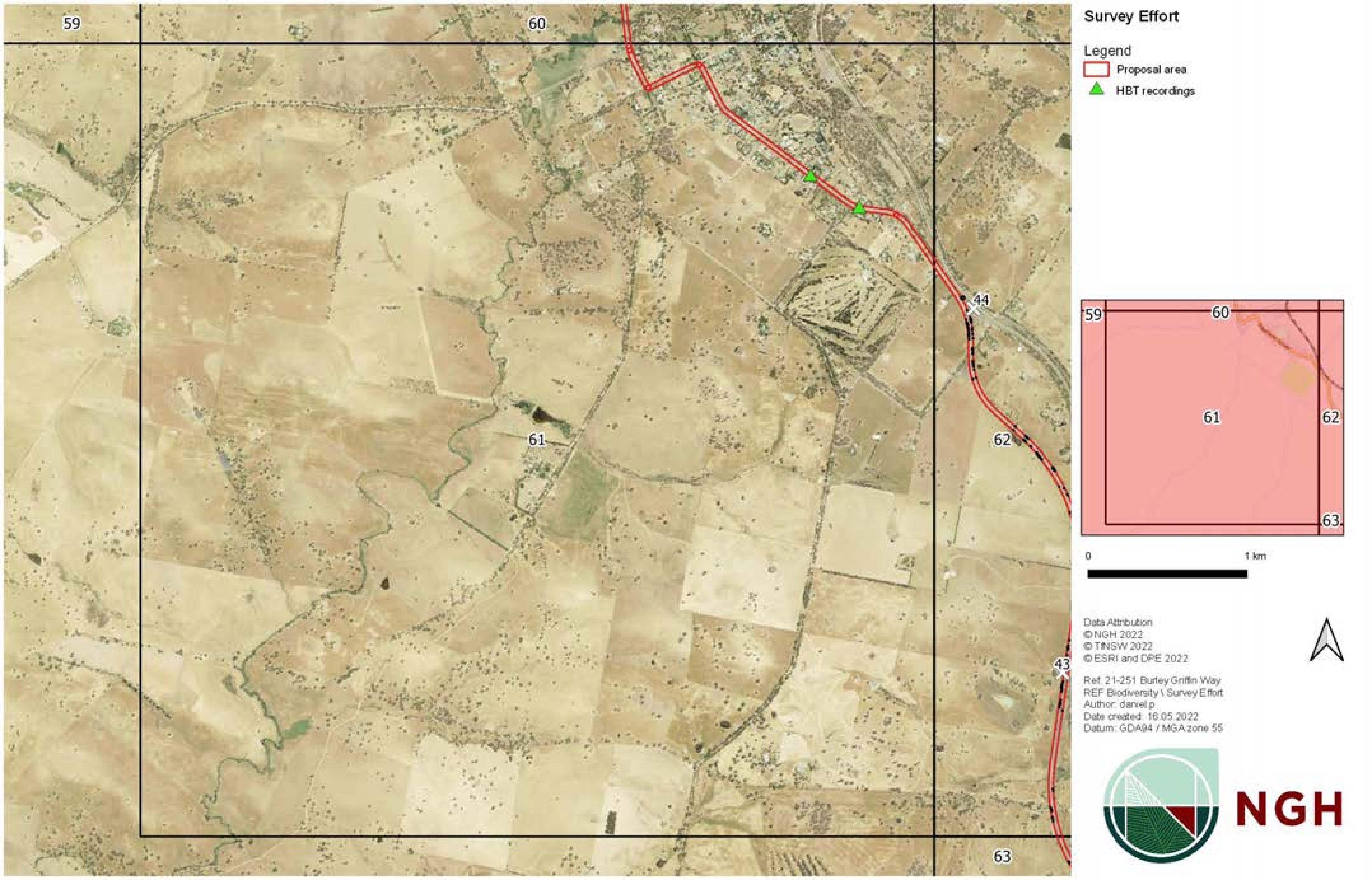

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Proposal area
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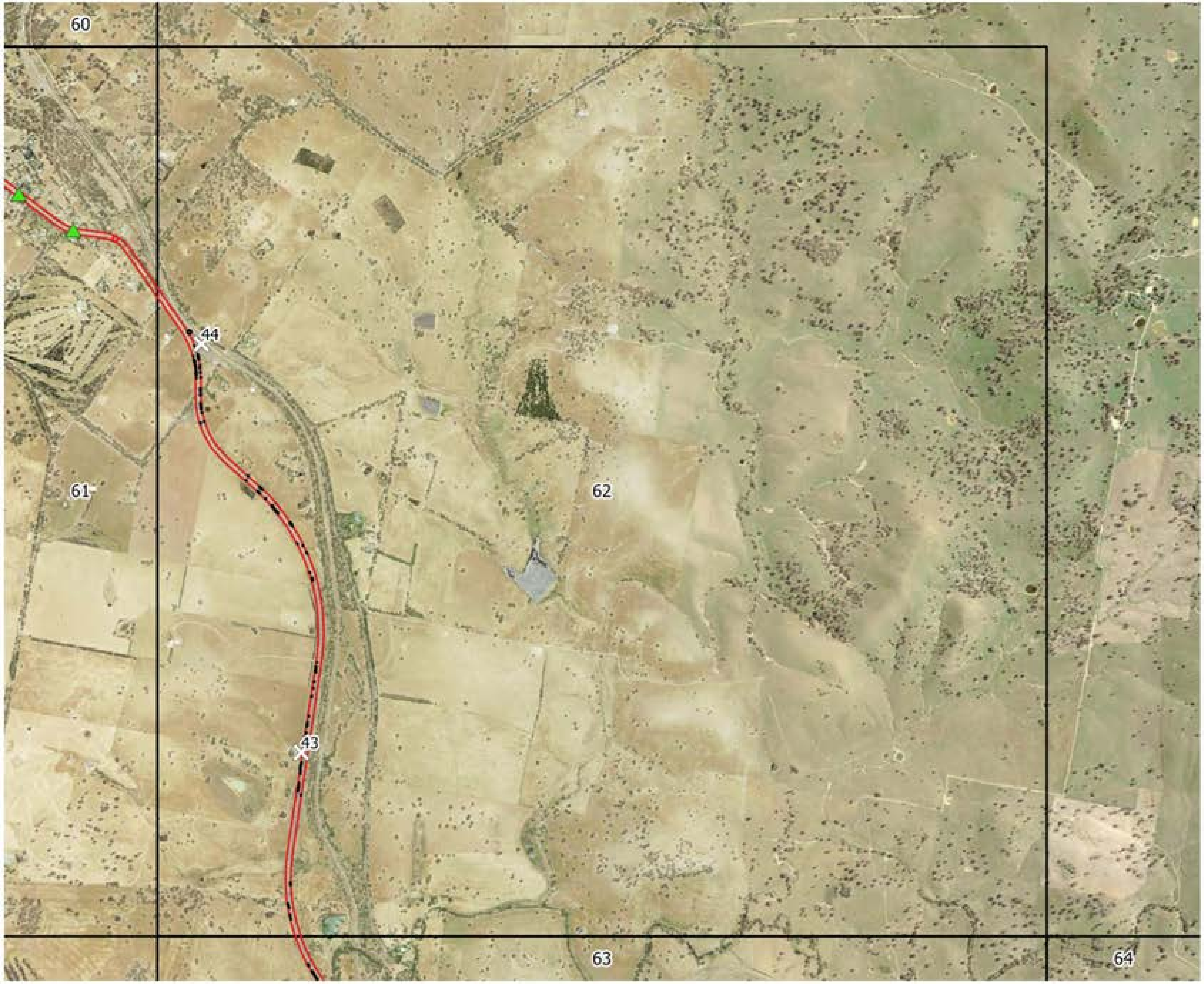

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Legend

Proposal area

Construction footprint

BAM plot locations

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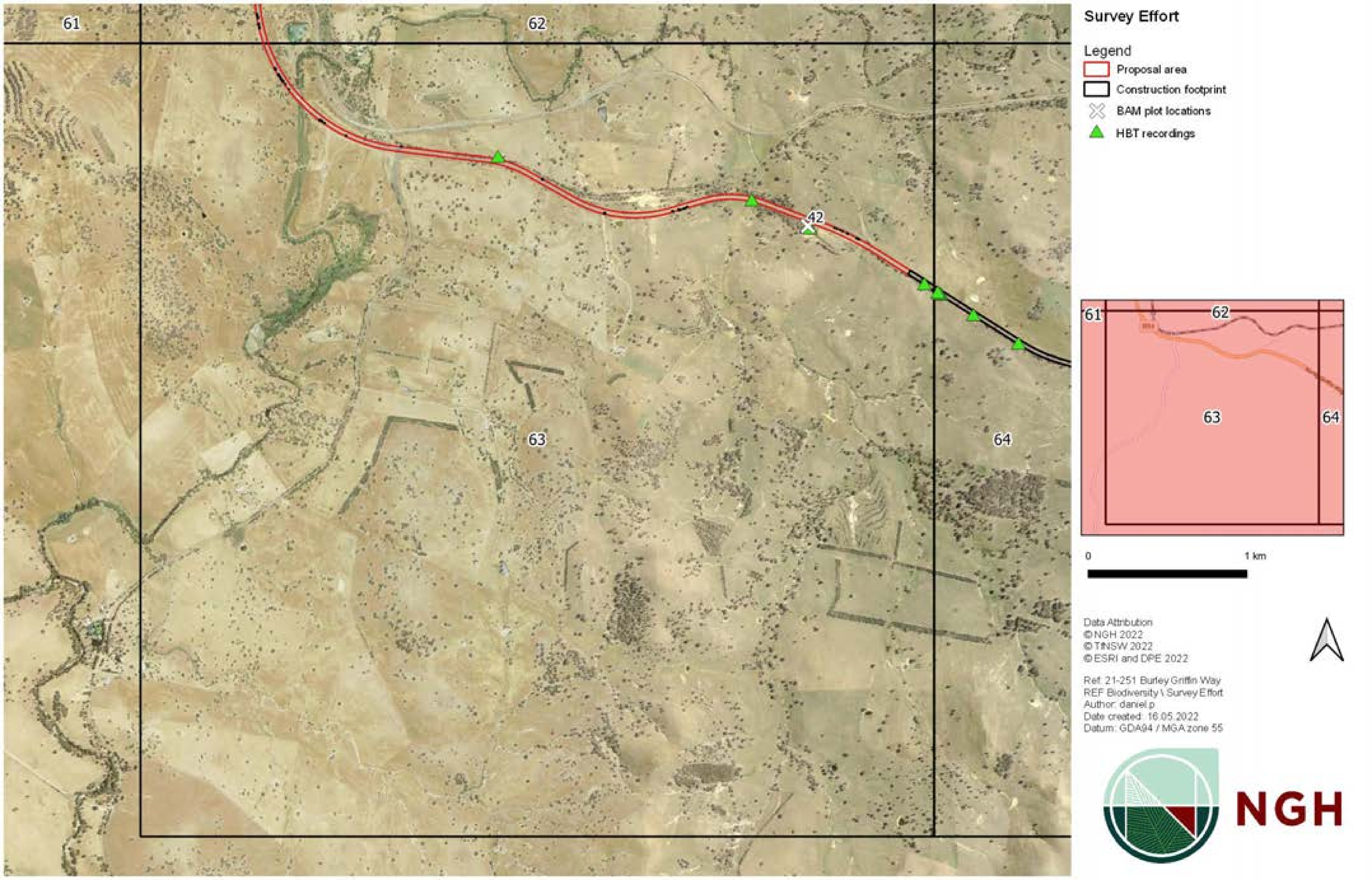
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Proposal area
Construction footprint
BAM plot locations
HBT recordings
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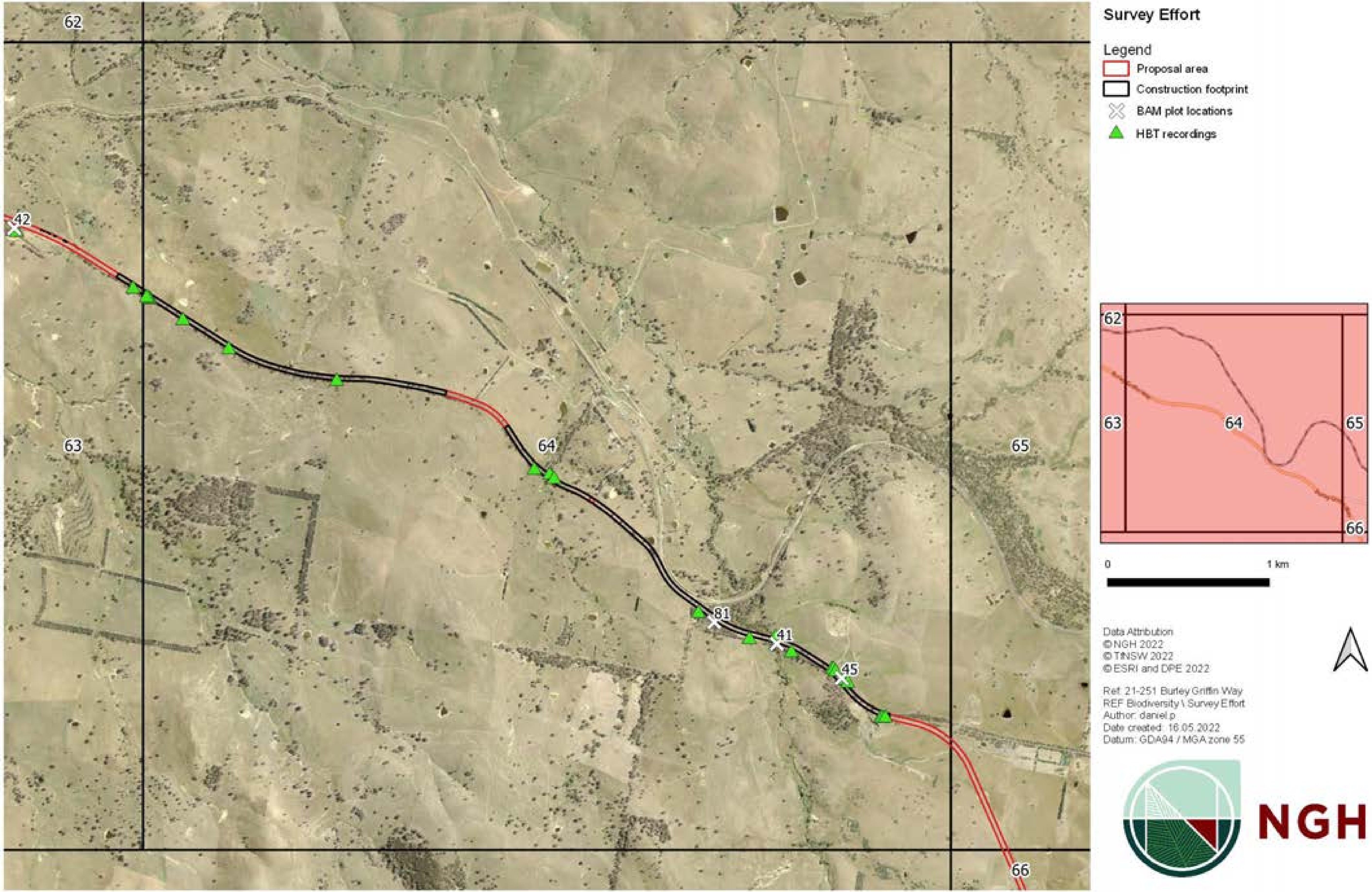

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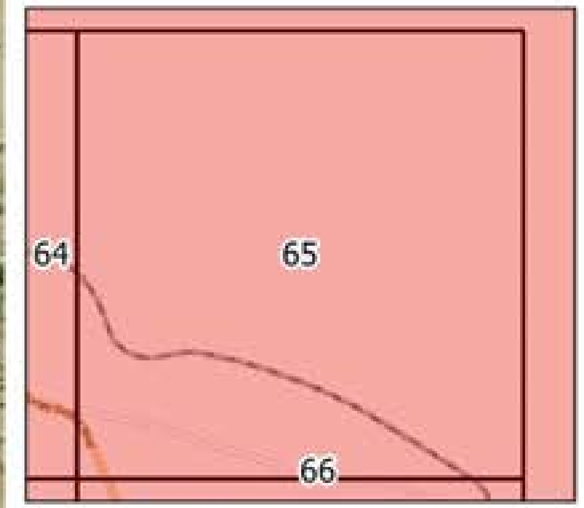
Legend

Proposal area



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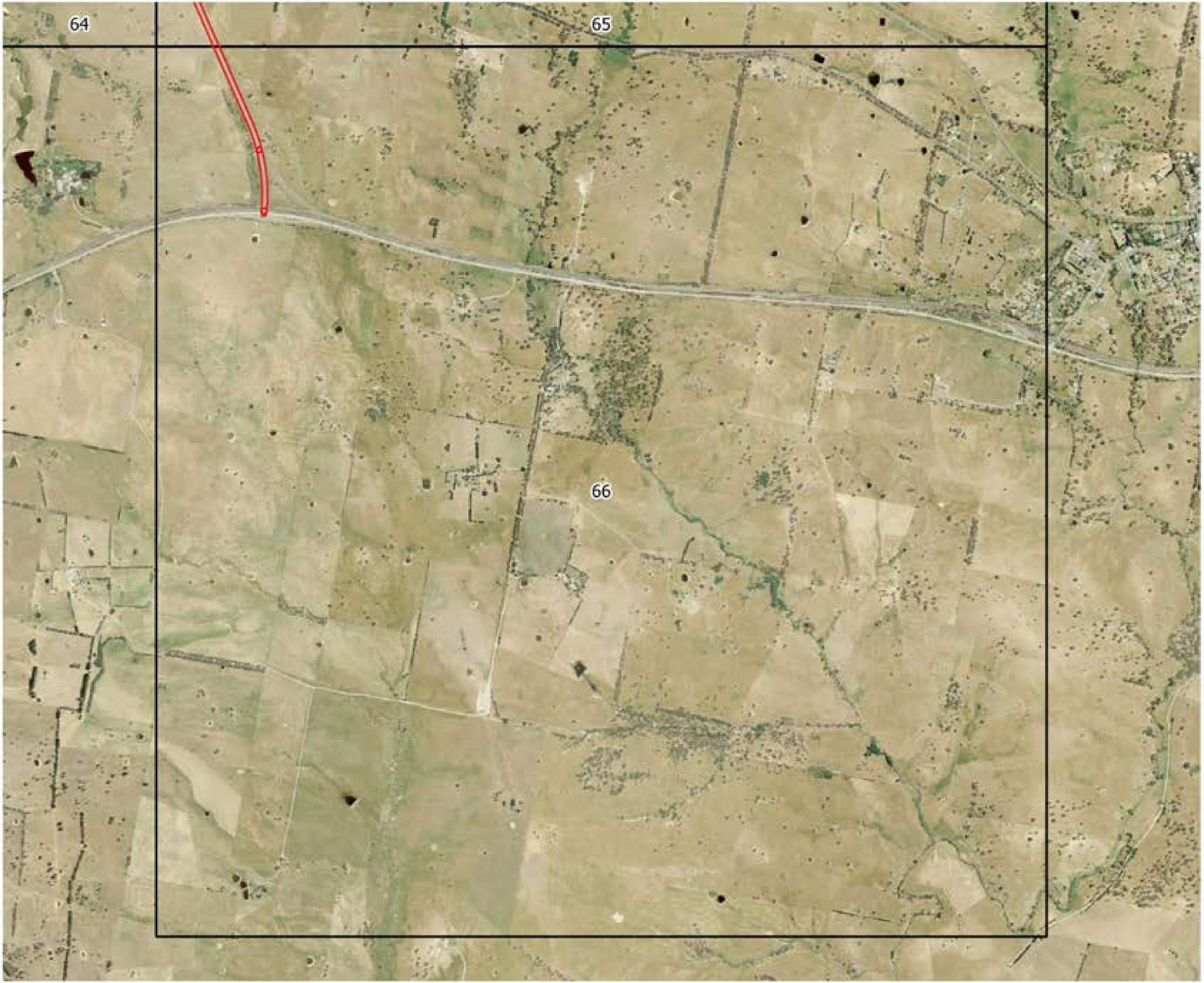

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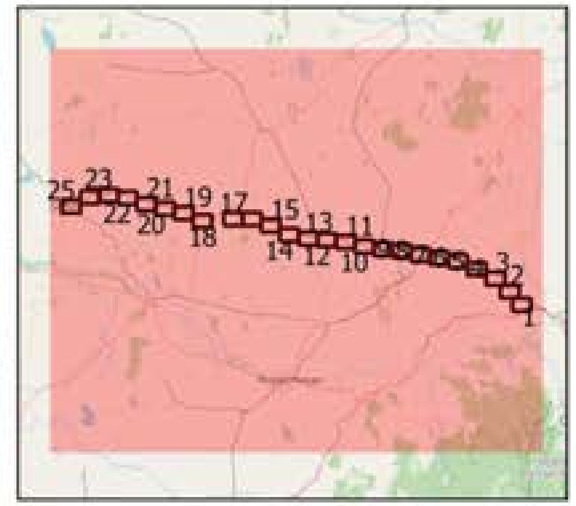
F.3 PCTs within the proposal area

Maps follow overleaf (67-map set)..

PCTs within the Proposal Area

Legend
Proposal area
Construction footprint



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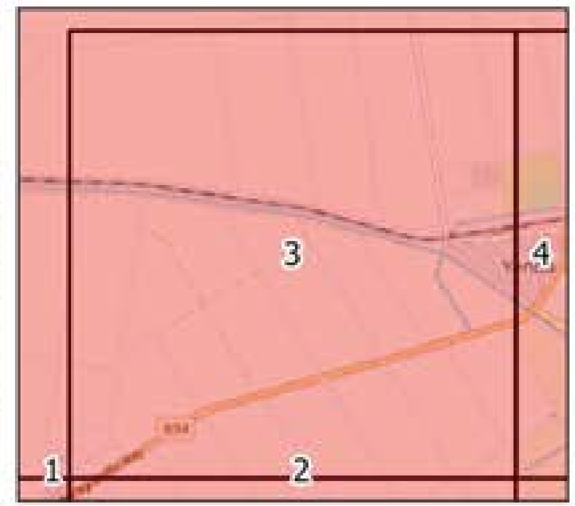
PCTs within the Proposal Area

Legend

Proposal area



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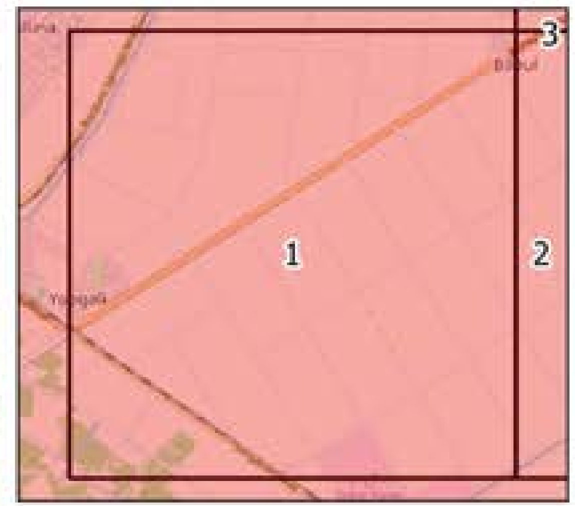
PCTs within the Proposal Area

Legend

Proposal area



0 0.75 1.5 km

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Date created: 16.05.2022
Datum: GDA94 / MGA zone 55

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PCTs within the Proposal Area

Legend

Proposal area

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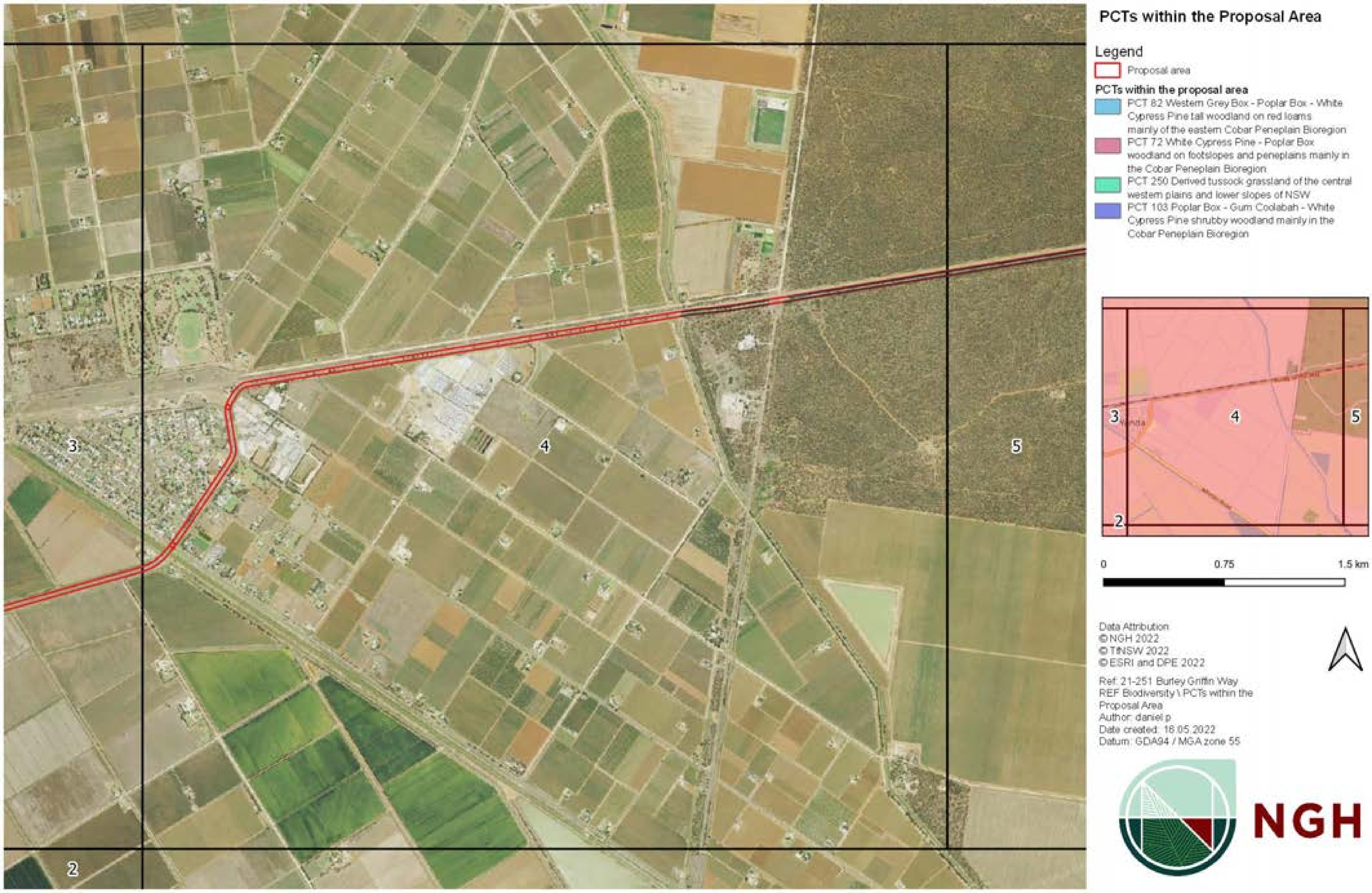

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PCTs within the Proposal Area

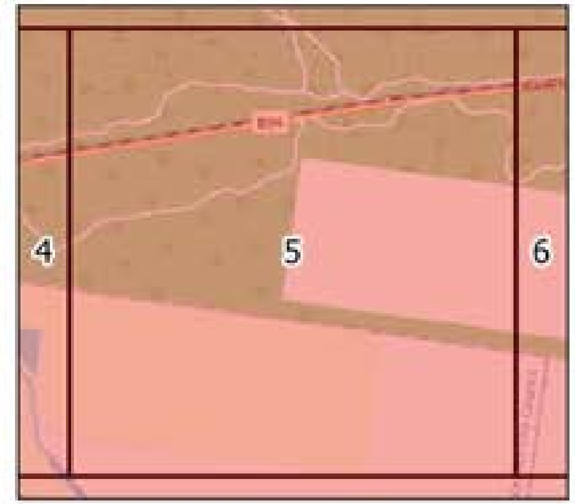
Legend

Proposal area

PCTs within the proposal area

PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

PCT 103 Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion



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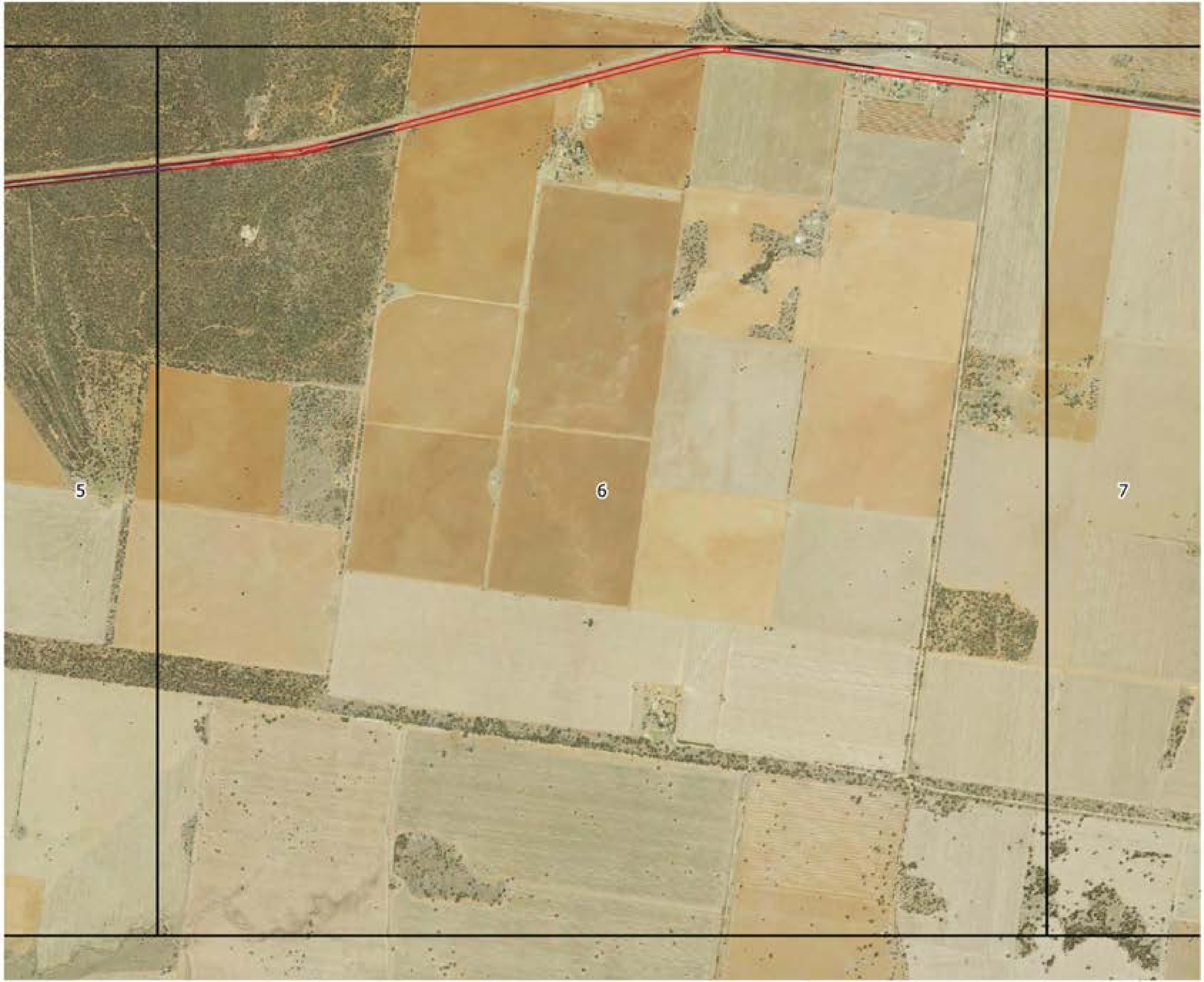
PCTs within the Proposal Area



Legend

Proposal area

PCTs within the proposal area

PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion

PCT 103 Poplar Box - Gum Coolabah - White Cypress Pine shrubby woodland mainly in the Cobar Peneplain Bioregion

Planted vegetation

0 0.75 1.5 km

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PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
- PCT 54 Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion
- PCT 229 Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion

0 0.75 1.5 km

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- PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
- PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion
- PCT 54 Buloke - White Cypress Pine woodland in the NSW South Western Slopes Bioregion
- PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW
- PCT 229 Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion

0 0.75 1.5 km

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PCTs within the proposal area

PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW

PCT 229 Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion

0 0.75 1.5 km

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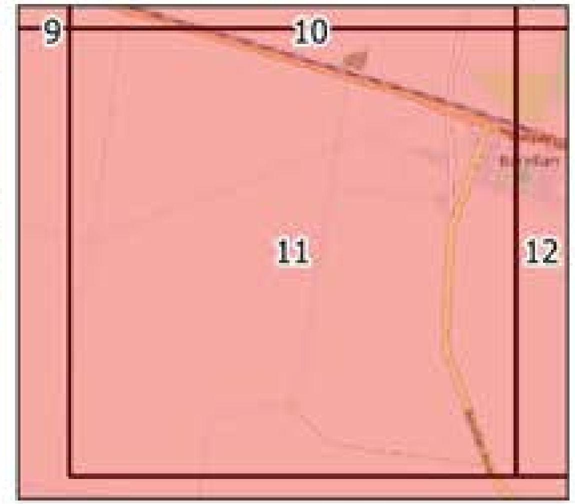
PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW

PCT 229 Derived mixed shrubland on loamy-clay soils in the Cobar Peneplain Bioregion



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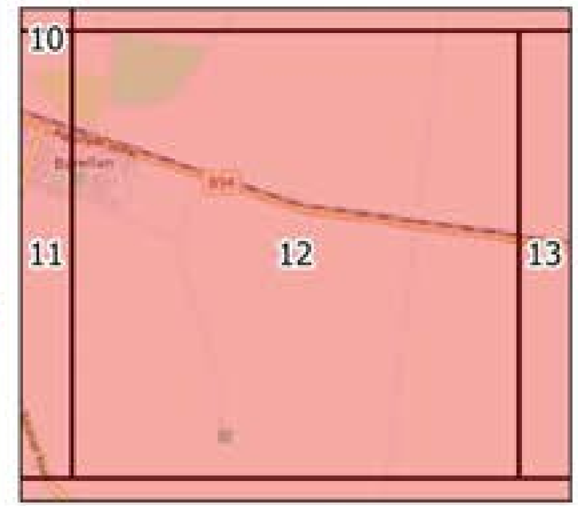

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Proposal area

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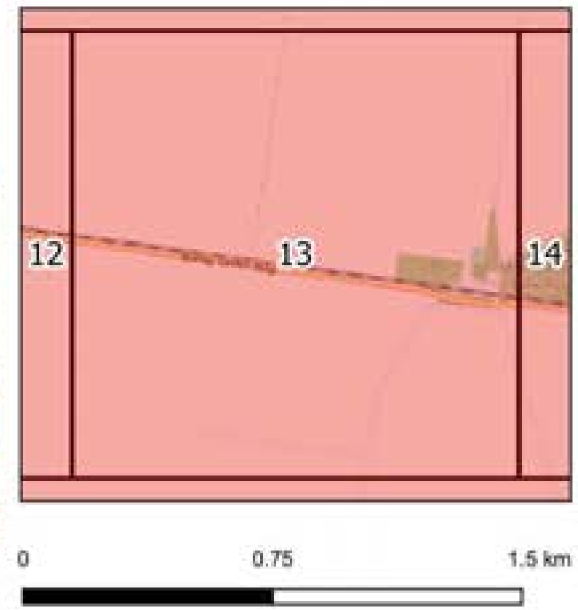
PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt



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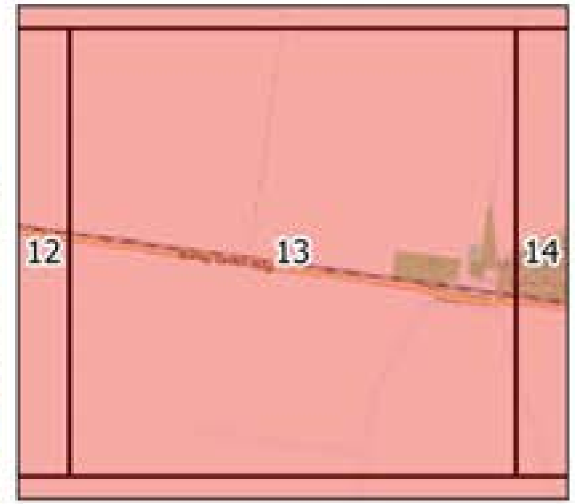
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt



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Proposal area

PCTs within the proposal area

PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion

PCT 70 White Cypress Pine woodland on sandy loams in central NSW wheatbelt

PCT 174 Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion

Previously Cleared

0 0.75 1.5 km

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PCTs within the proposal area

PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 174 Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion

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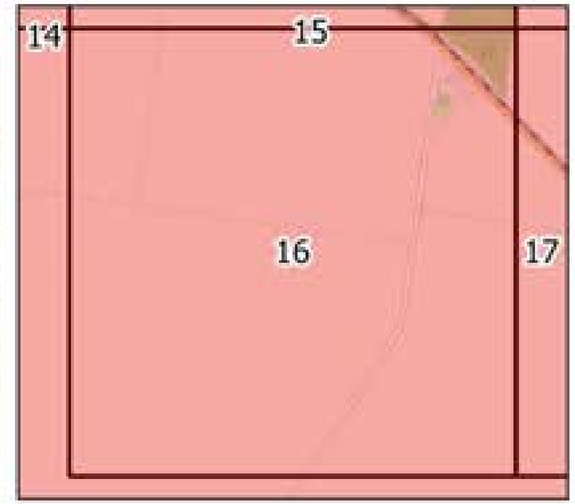
PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
- PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion
- PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW
- PCT 174 Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion
- Non Native



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Proposal area

PCTs within the proposal area

PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW

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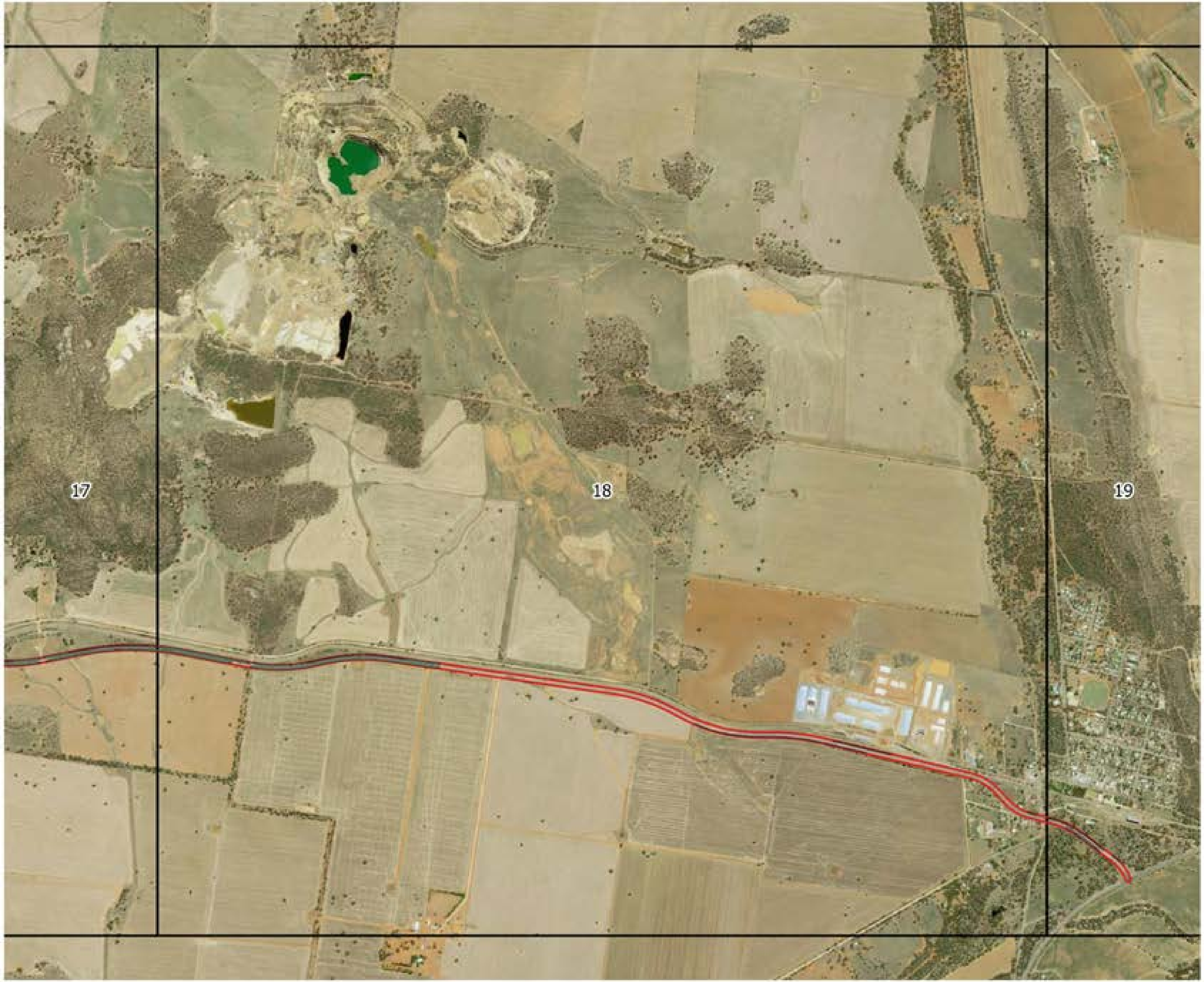

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- Proposal area

PCTs within the proposal area

- PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
- PCT 250 Derived tussock grassland of the central western plains and lower slopes of NSW
- PCT 174 Mallee - Gum Coolabah woodland on red earth flats of the eastern Cobar Peneplain Bioregion

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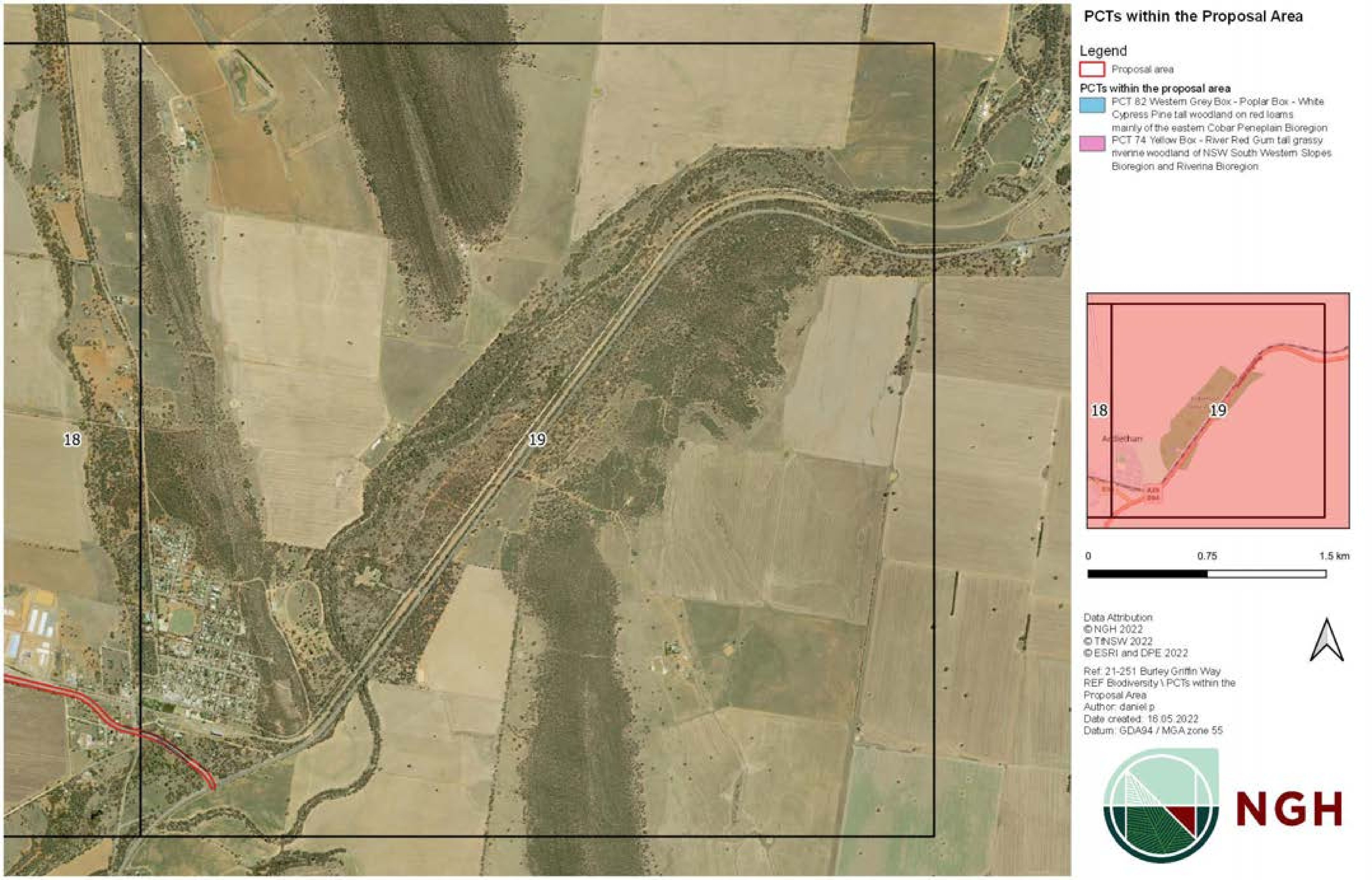
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PCTs within the Proposal Area
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Proposal area
PCTs within the proposal area
PCT 82 Western Grey Box - Poplar Box - White Cypress Pine tall woodland on red loams mainly of the eastern Cobar Peneplain Bioregion
PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
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PCTs within the Proposal Area

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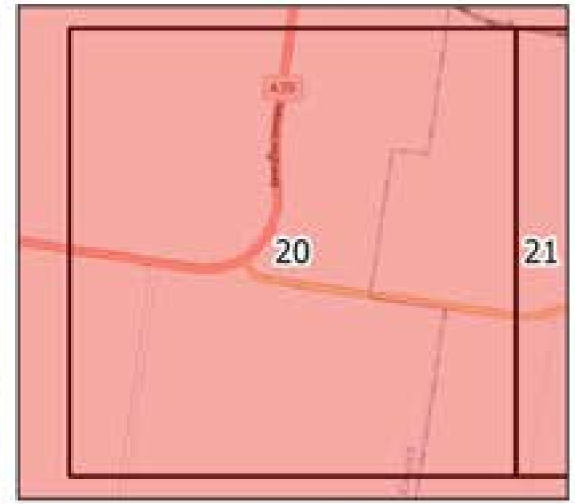
Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 342 Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion



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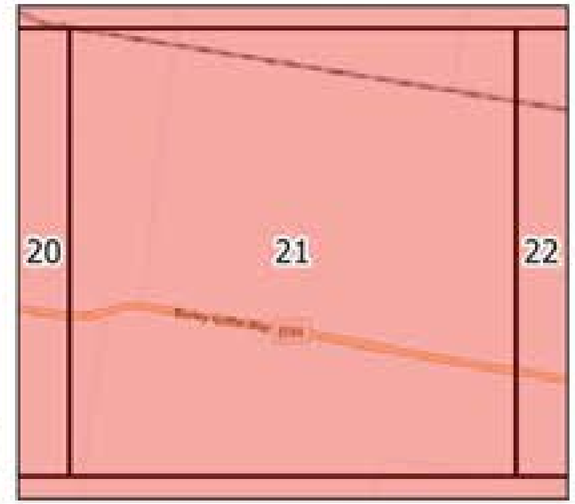
Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion



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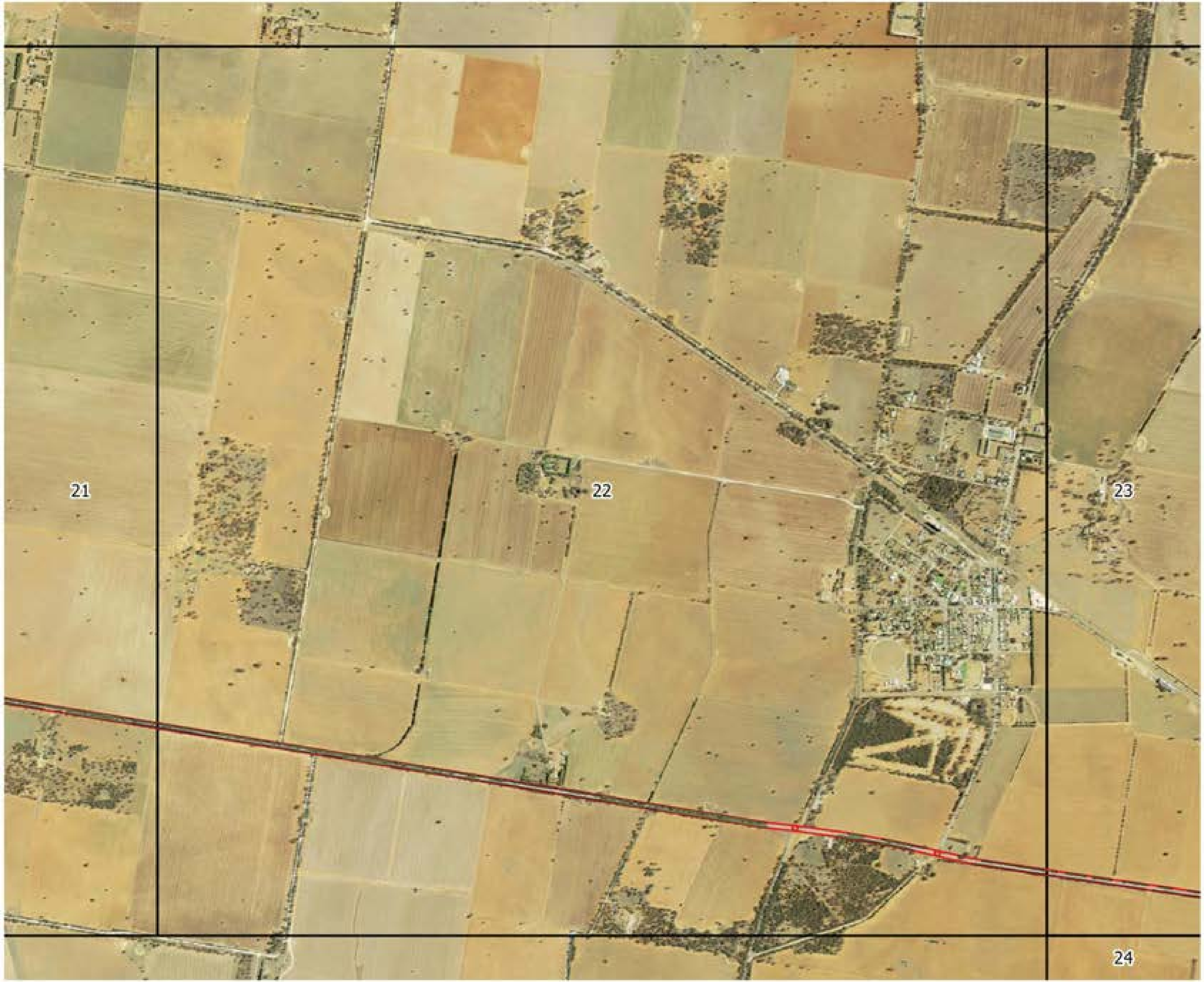

PCTs within the Proposal Area

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Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

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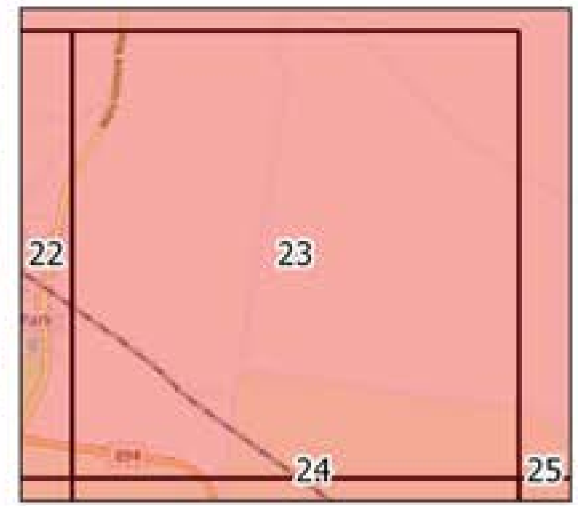
Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion



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PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 72 White Cypress Pine - Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
- PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

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Proposal area

PCTs within the proposal area

PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

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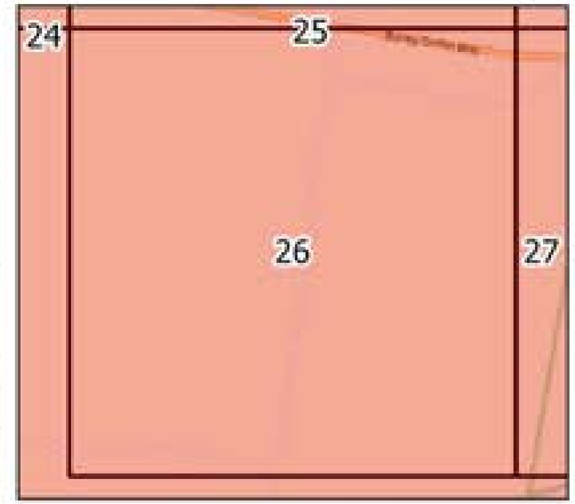
Proposal area

PCTs within the proposal area

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion



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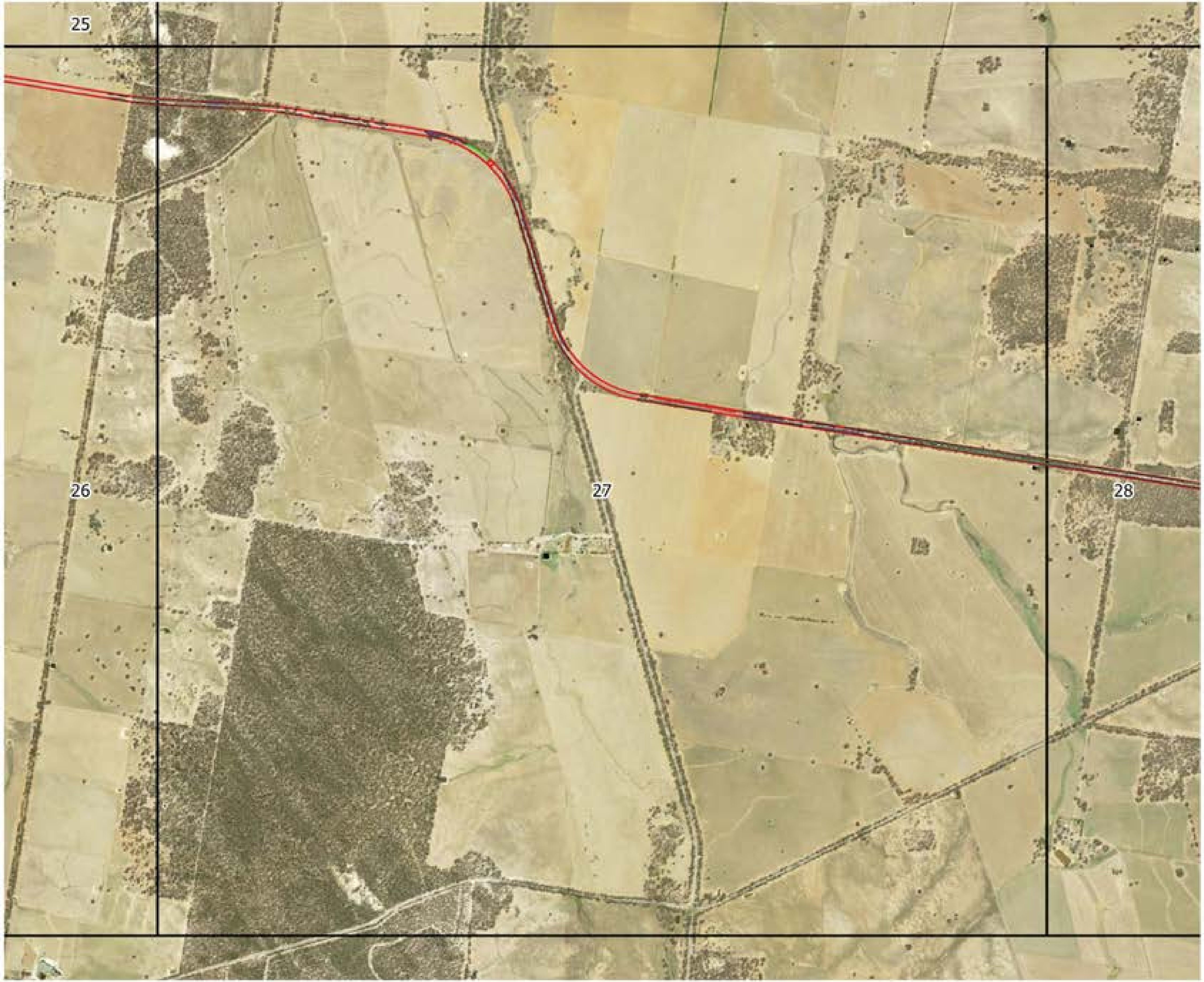

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- Proposal area

PCTs within the proposal area

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
- PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion
- PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion

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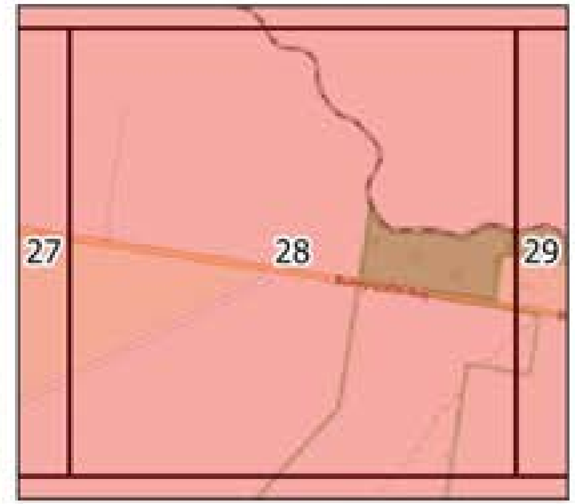
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion



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Proposal area

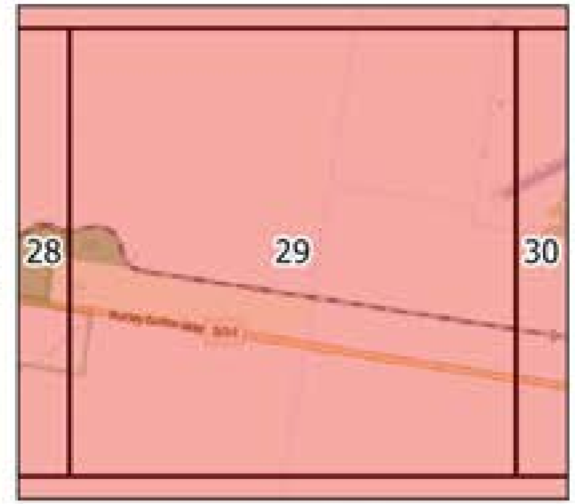
PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

Previously Cleared



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Author: daniel p
Date created: 16.05.2022
Datum: GDA94 / MGA zone 55

NGH

PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion
- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 74 Yellow Box - River Red Gum tall grassy riverine woodland of NSW South Western Slopes Bioregion and Riverina Bioregion
- Previously Cleared

0 0.75 1.5 km

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NGH

PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

0 0.75 1.5 km

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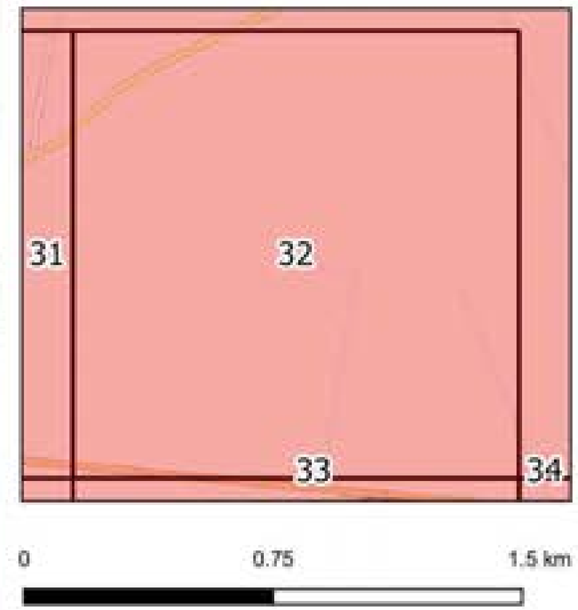
Proposal area

PCTs within the proposal area

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions



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PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

0 0.75 1.5 km

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PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
- PCT 276 Yellow Box grassy tall woodland on alluvium or parna loams and clays on flats in NSW South Western Slopes Bioregion
- PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion
- Previously Cleared

0 0.75 1.5 km

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PCTs within the proposal area

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

Previously Cleared

0 0.75 1.5 km

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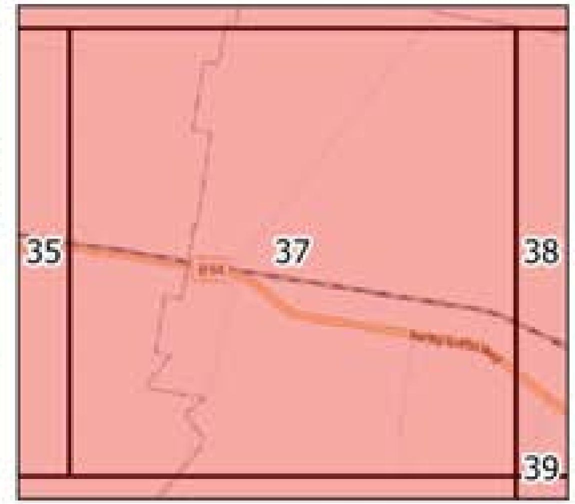
Proposal area

PCTs within the proposal area

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion

Previously Cleared



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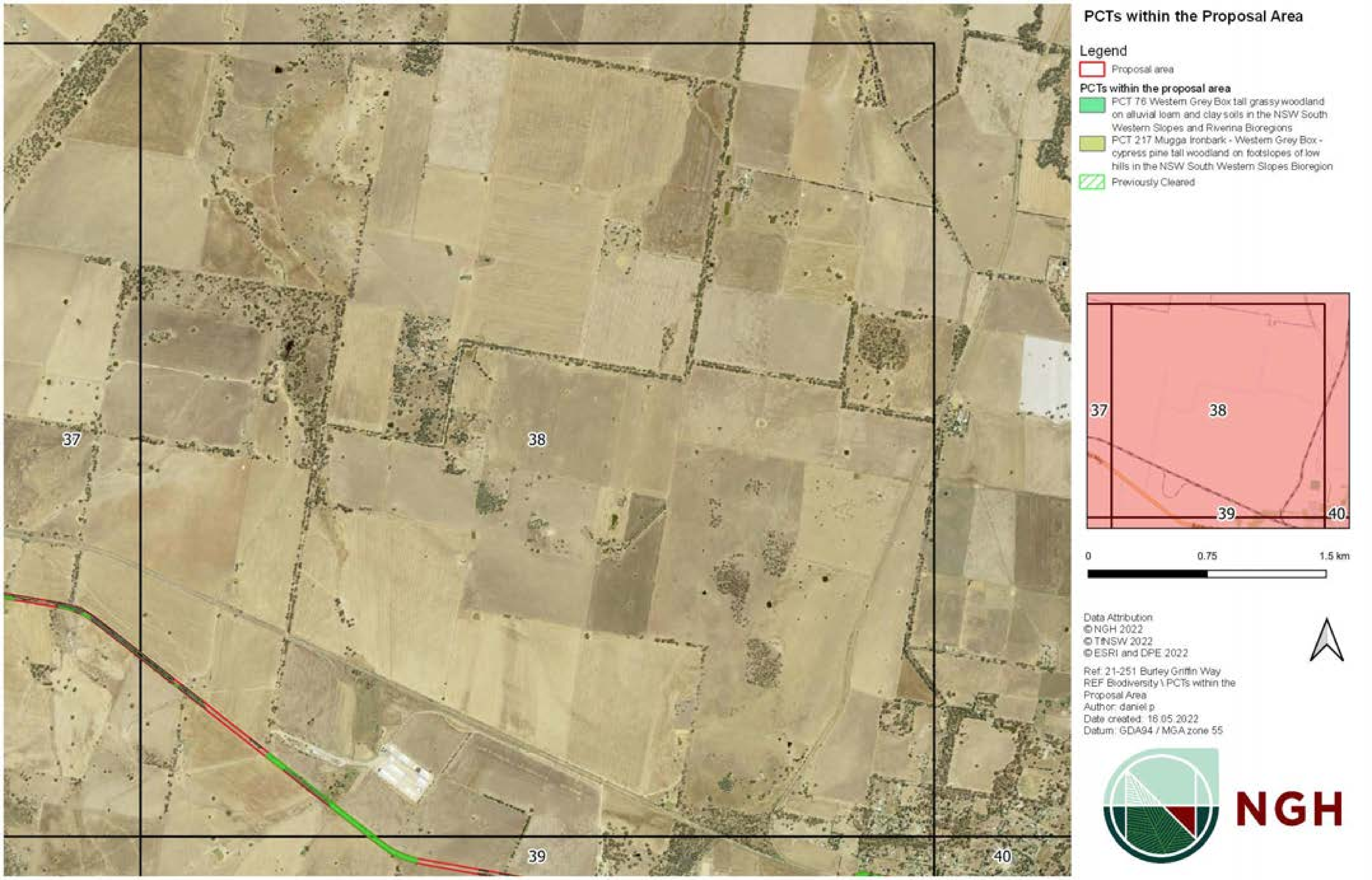

PCTs within the Proposal Area
Legend
Proposal area
PCTs within the proposal area
PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions
PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion
Previously Cleared
37
38
39
40
0
0.75
1.5 km
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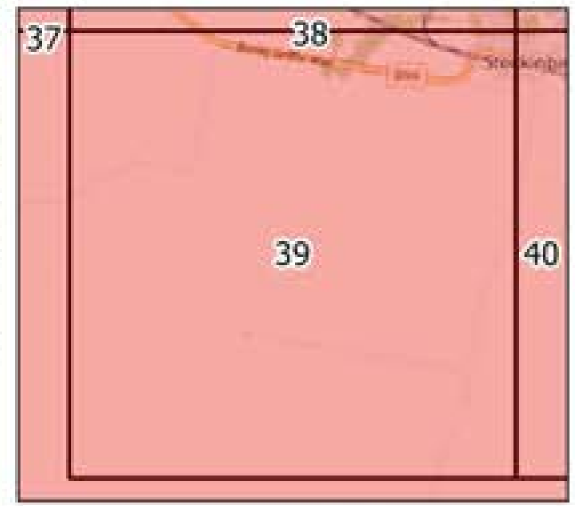
Proposal area

PCTs within the proposal area

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

Previously Cleared



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PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 79 River Red Gum shrub/grass riparian tall woodland or open forest wetland mainly in the upper slopes sub-region of the NSW South Western Slopes bioregion and western South East Highlands Bioregion

PCT 76 Western Grey Box tall grassy woodland on alluvial loam and clay soils in the NSW South Western Slopes and Riverina Bioregions

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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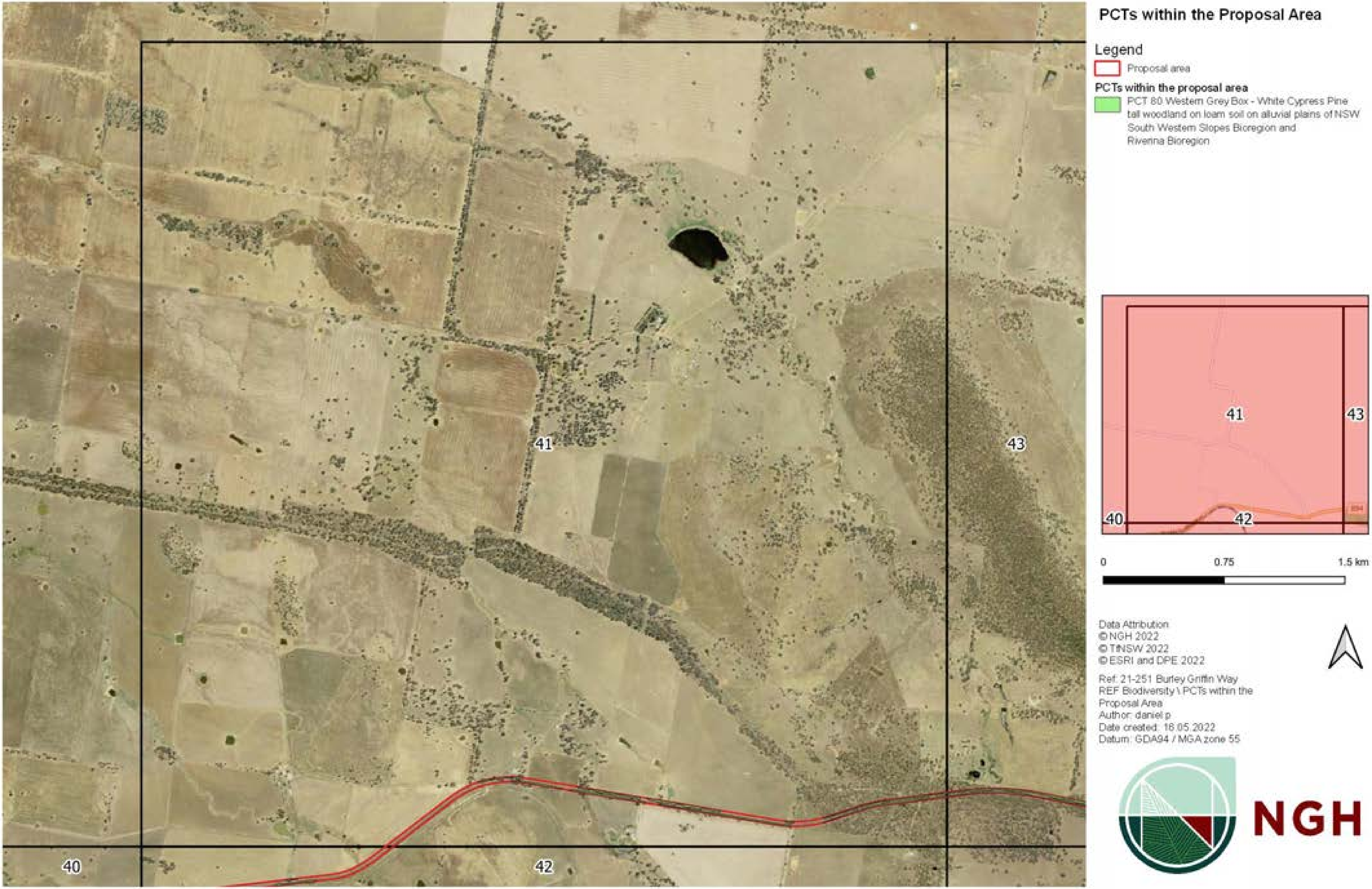

PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

0 0.75 1.5 km

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Proposal area

PCTs within the proposal area

PCT 80 Western Grey Box - White Cypress Pine tall woodland on loam soil on alluvial plains of NSW South Western Slopes Bioregion and Riverina Bioregion

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion

0 0.75 1.5 km

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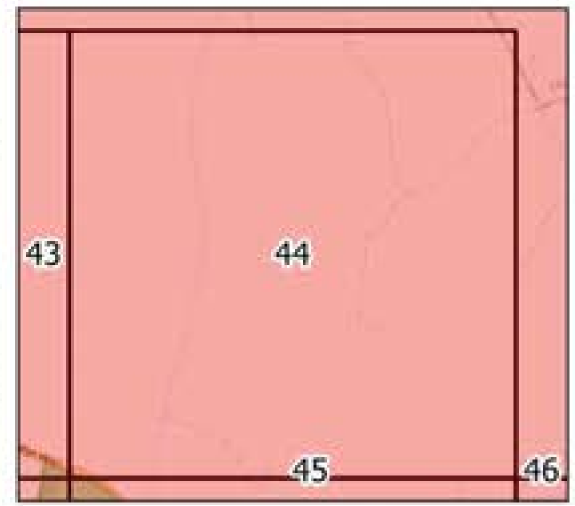
Proposal area

PCTs within the proposal area

PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion



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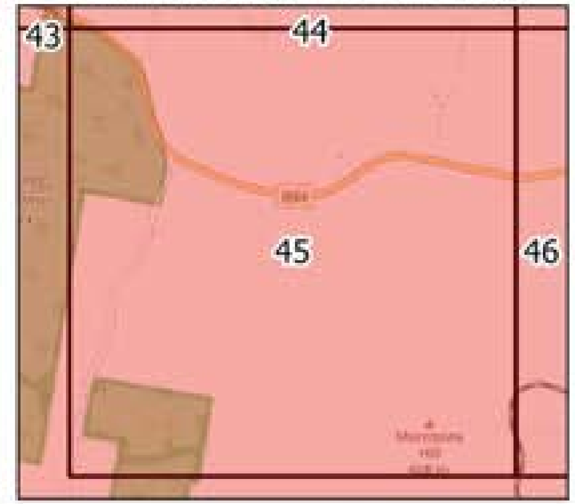
PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

- PCT 342 Mugga Ironbark - mixed box woodland on hills in the Cowra - Boorowa - Young region of the NSW South Western Slopes Bioregion
- PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion
- PCT 217 Mugga Ironbark - Western Grey Box - cypress pine tall woodland on footslopes of low hills in the NSW South Western Slopes Bioregion
- PCT 110 Western Grey Box - Cypress Pine shrubby woodland on stony footslopes in the NSW South Western Slopes Bioregion and Riverina Bioregion



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PCTs within the Proposal Area

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Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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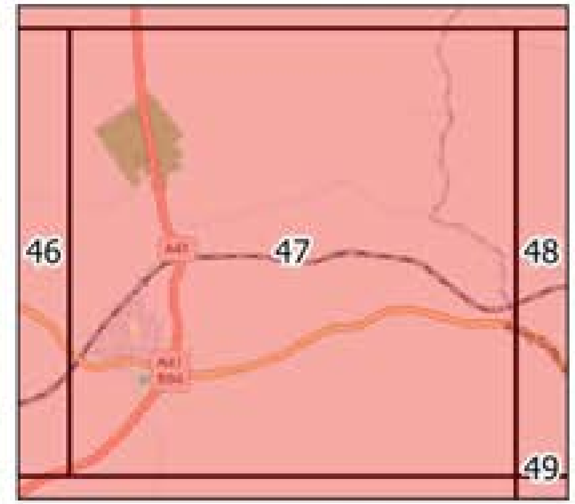
PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion



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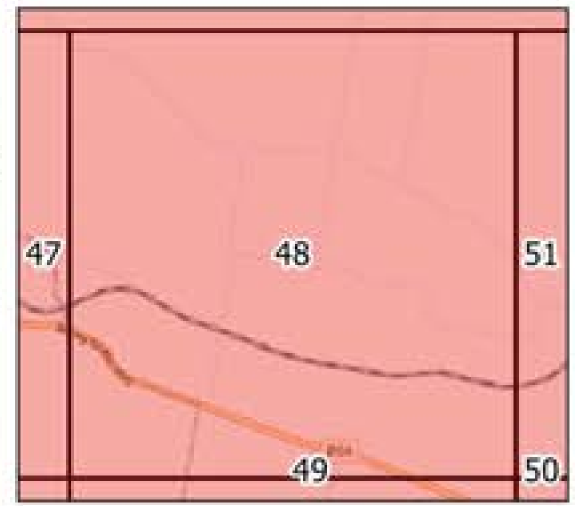
Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion



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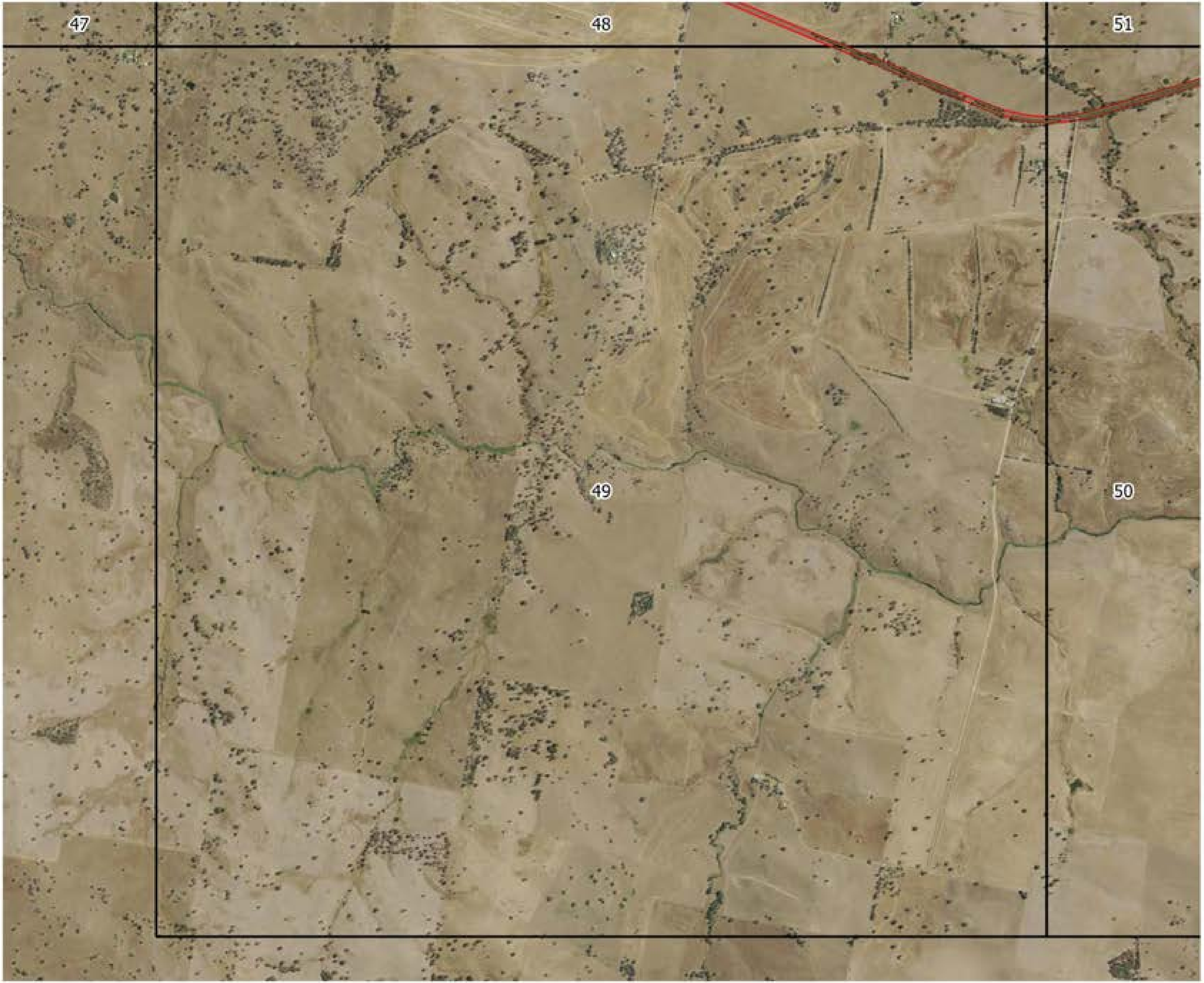

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Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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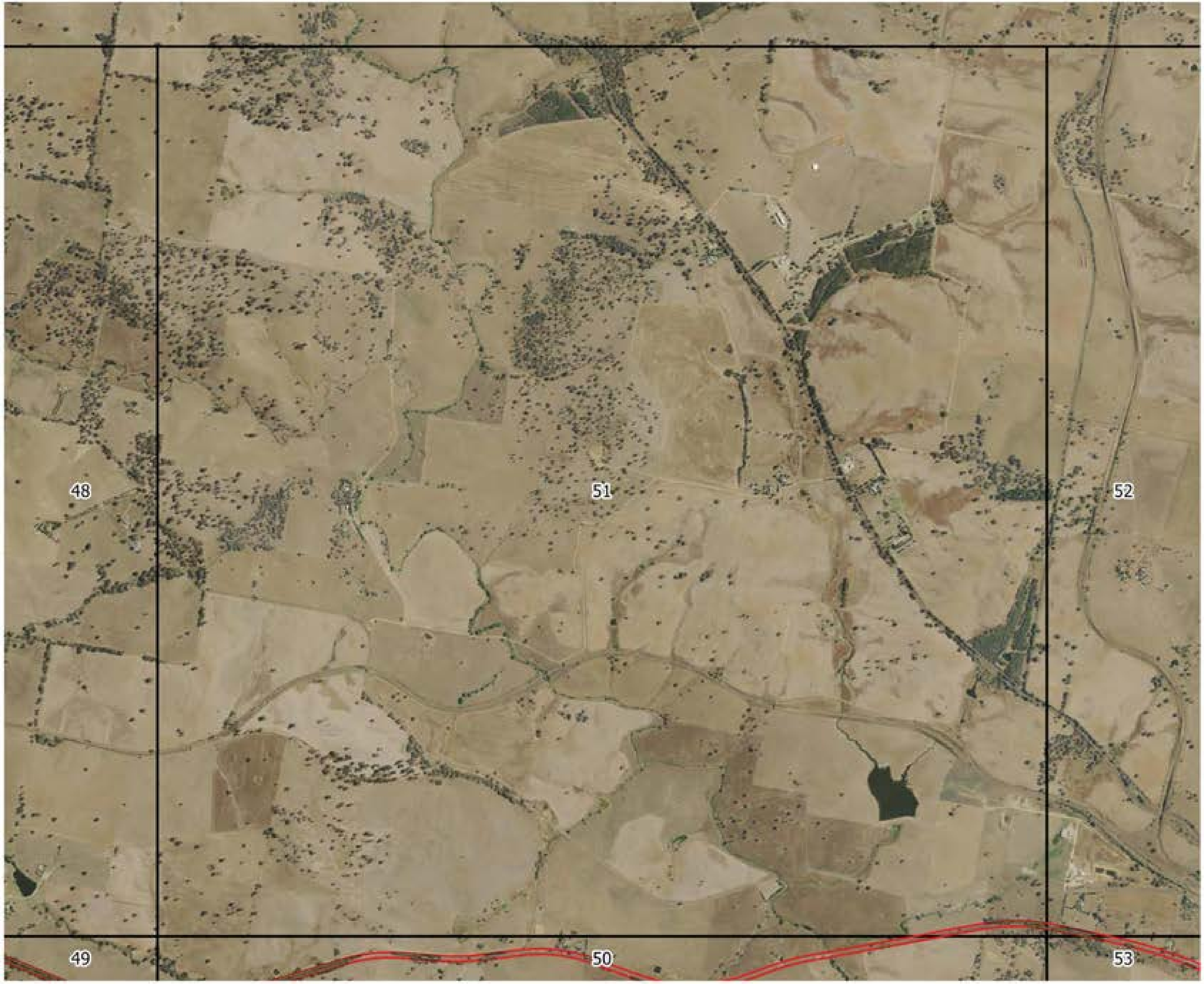

Legend

Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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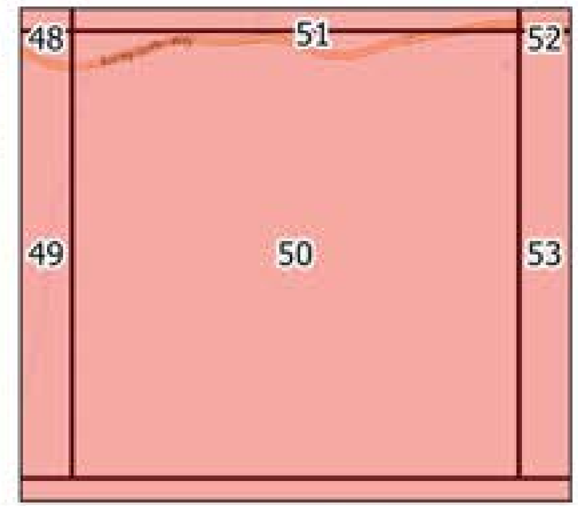
PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion



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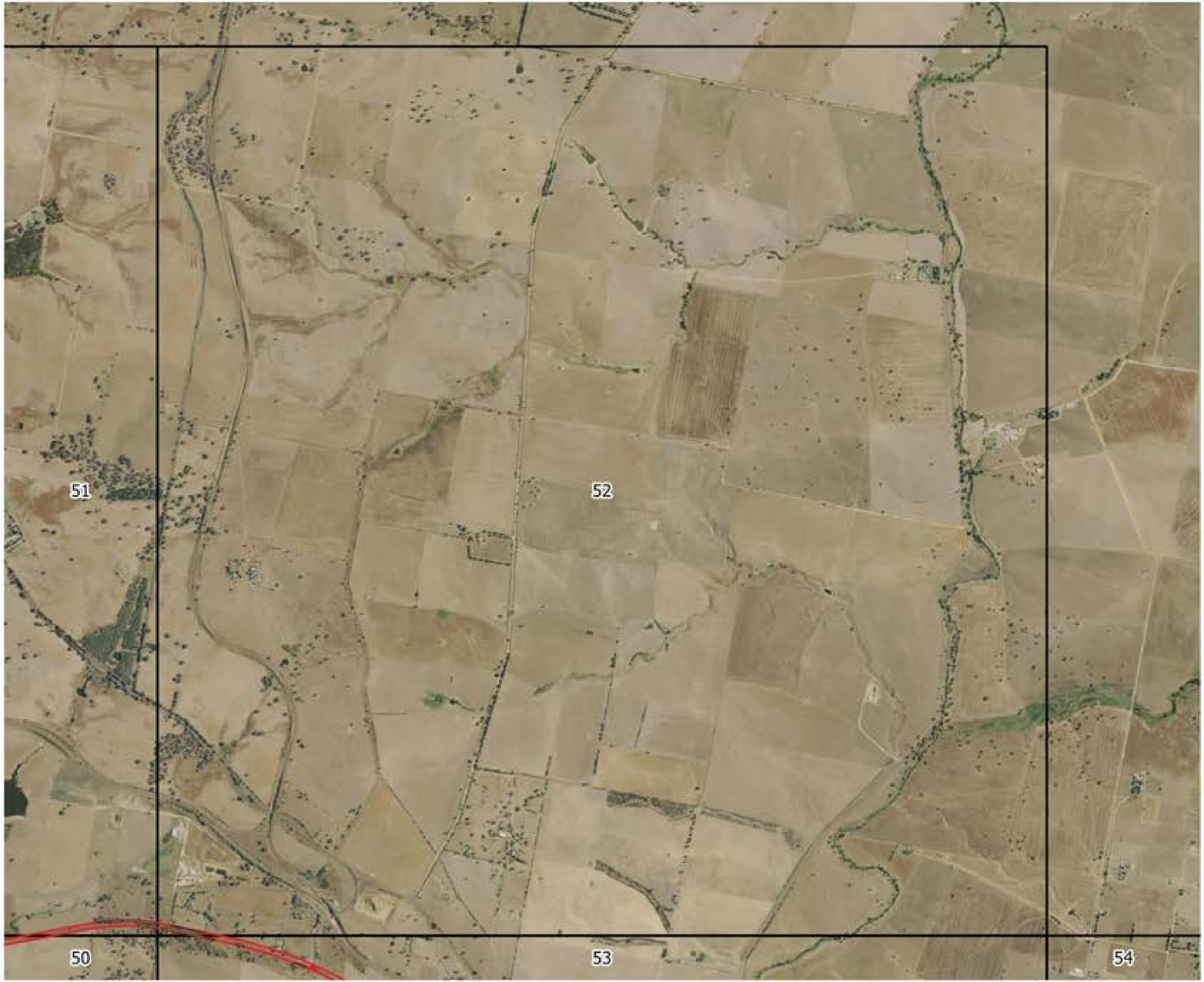

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Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- Planted vegetation

0 0.75 1.5 km

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PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 796 Derived grassland of the NSW South Western Slopes

Planted vegetation

0 0.75 1.5 km

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PCTs within the Proposal Area

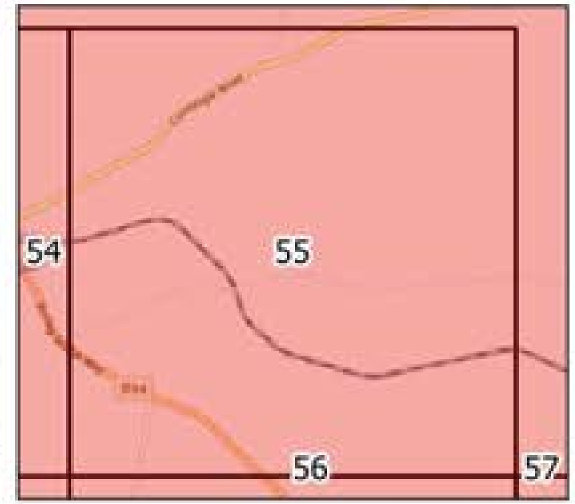
Legend

Proposal area

PCTs within the proposal area

PCT 796 Derived grassland of the NSW South Western Slopes

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion



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PCTs within the Proposal Area

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Proposal area

PCTs within the proposal area

PCT 796 Derived grassland of the NSW South Western Slopes

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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PCTs within the Proposal Area

Legend

- Proposal area

PCTs within the proposal area

- PCT 796 Derived grassland of the NSW South Western Slopes
- PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion
- PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

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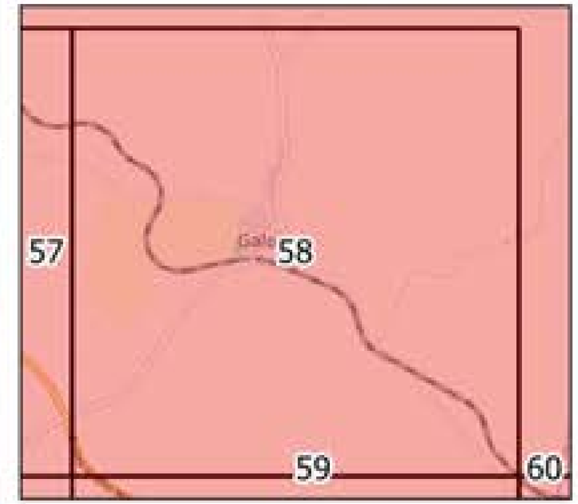
Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion



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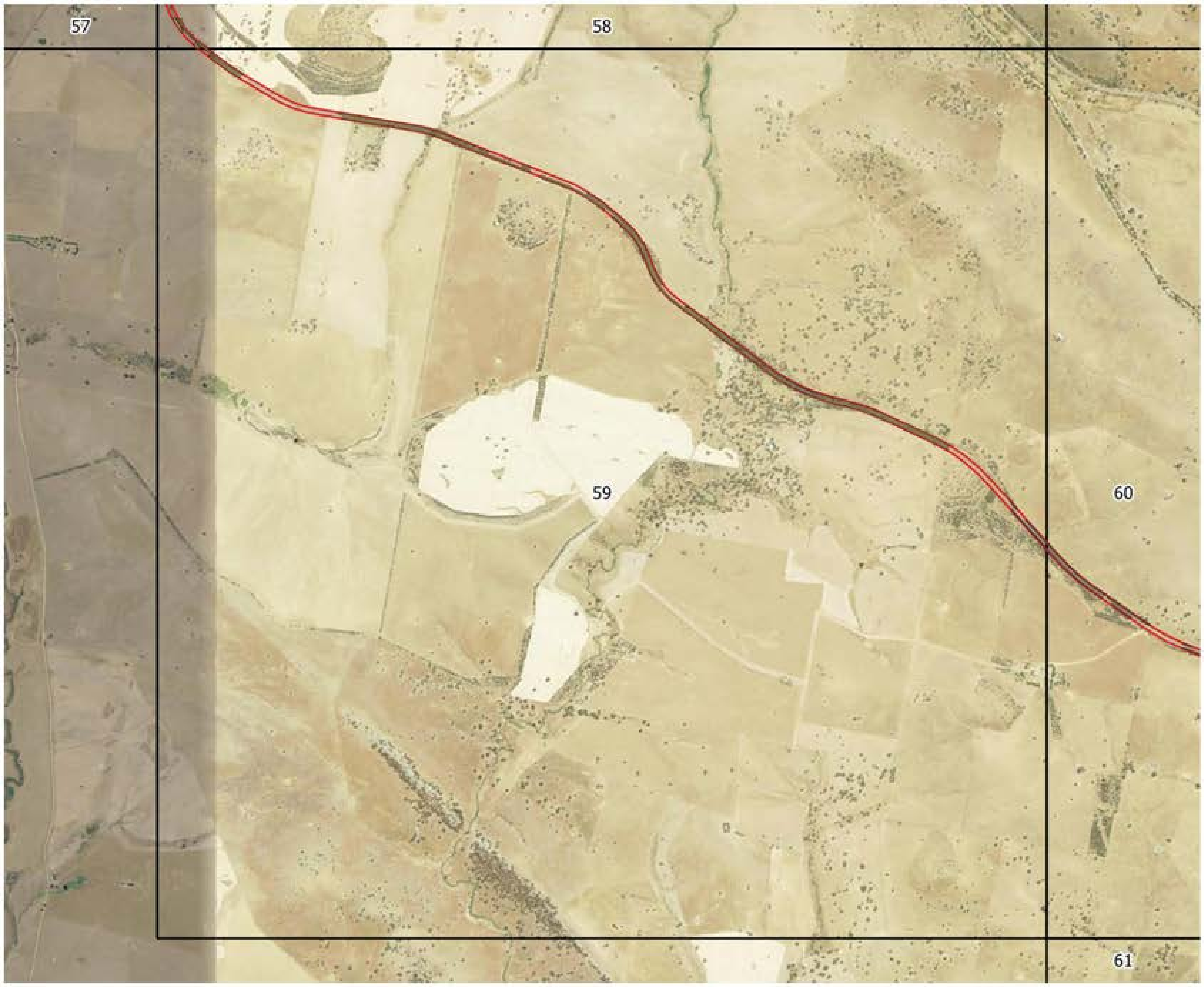

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Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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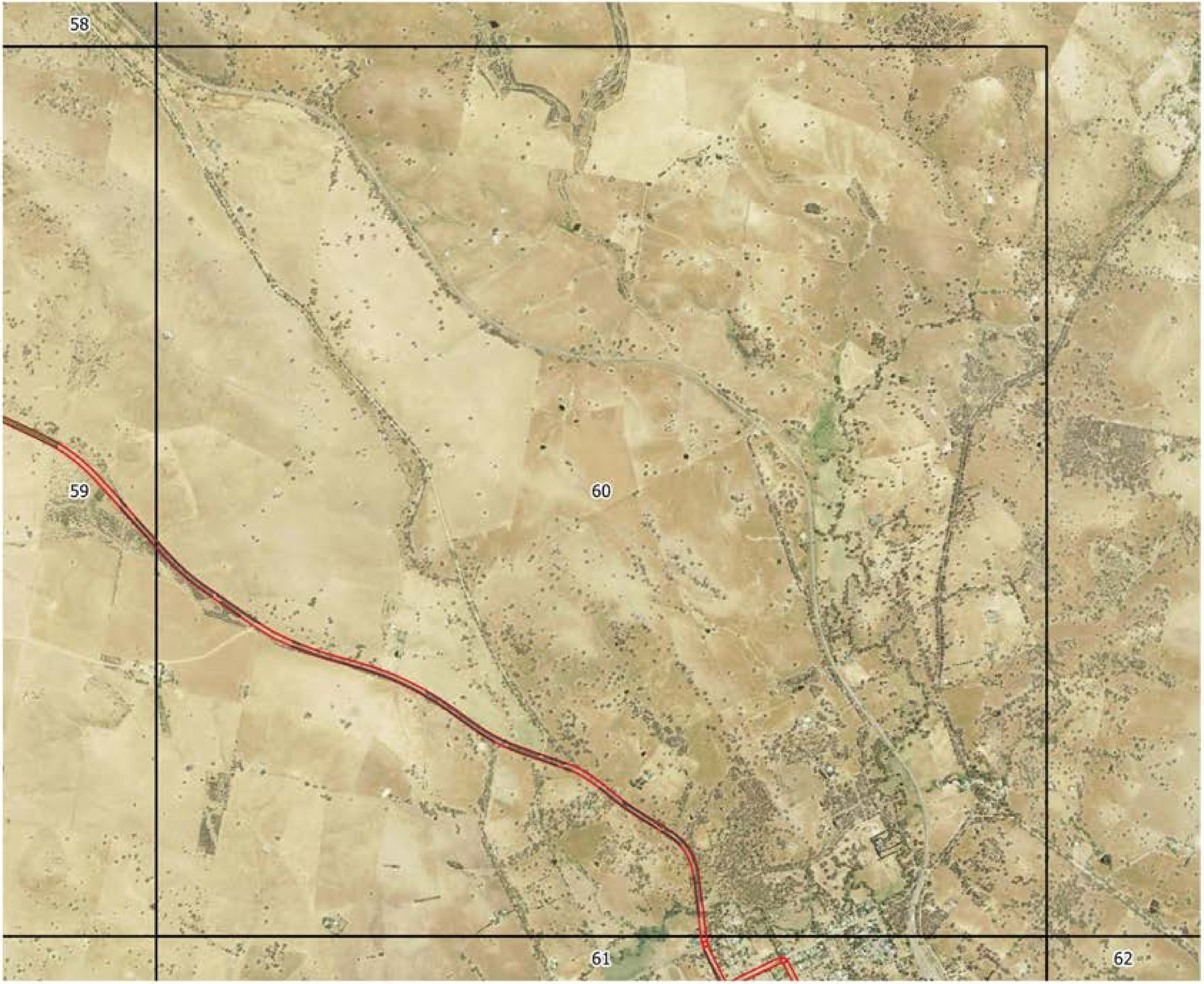
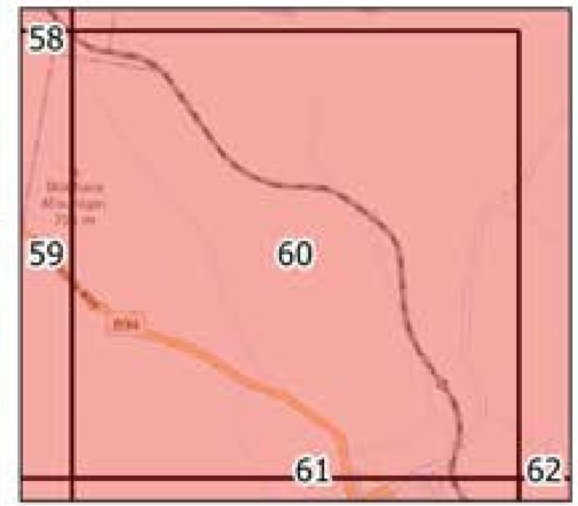


Legend

Proposal area

PCTs within the proposal area

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion



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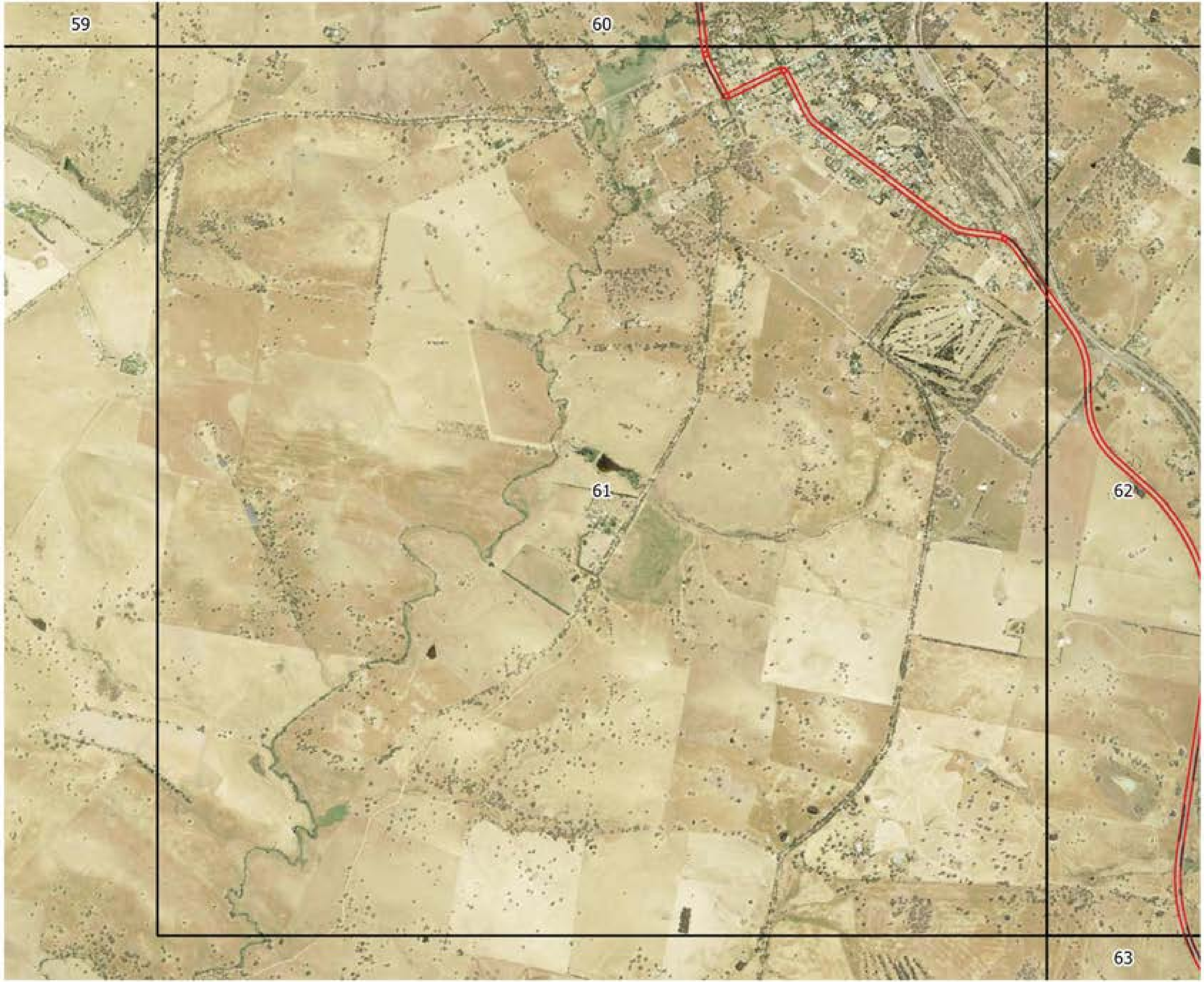

Legend

Proposal area

PCTs within the proposal area

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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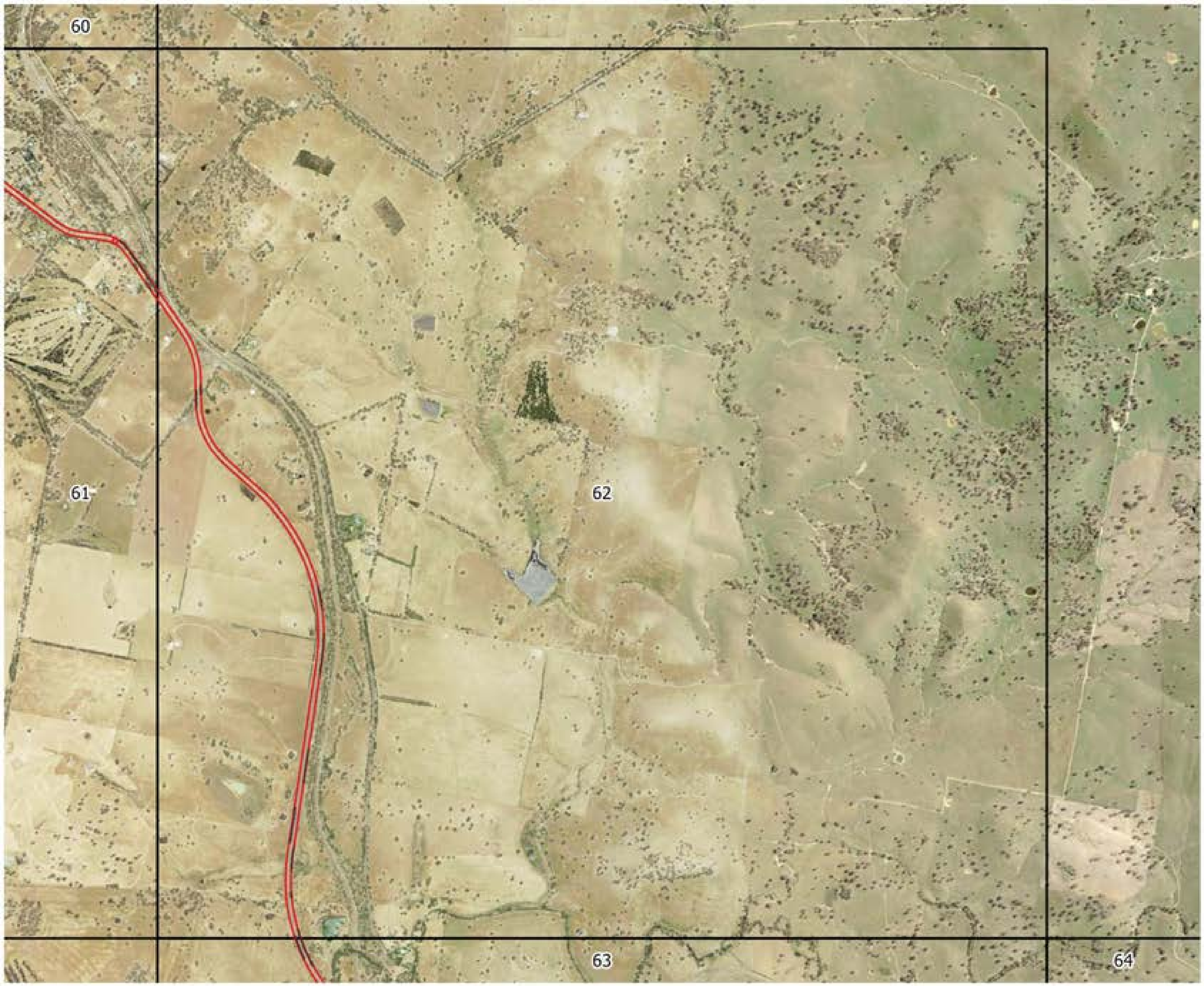


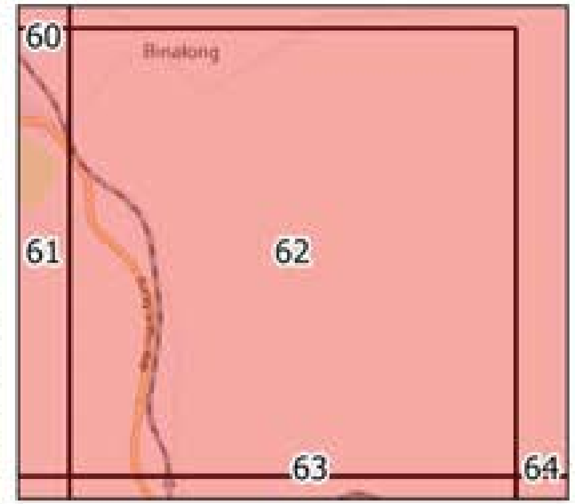
PCTs within the Proposal Area

Legend

Proposal area

PCTs within the proposal area

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion



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Author: daniel p
Date created: 16.05.2022
Datum: GDA94 / MGA zone 55

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PCTs within the Proposal Area

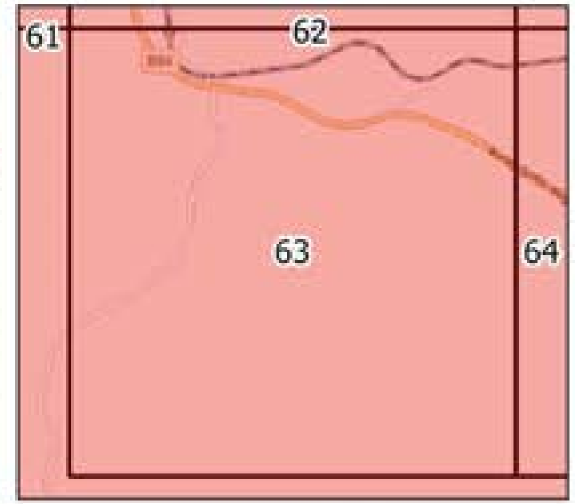
Legend

Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion



0 0.75 1.5 km

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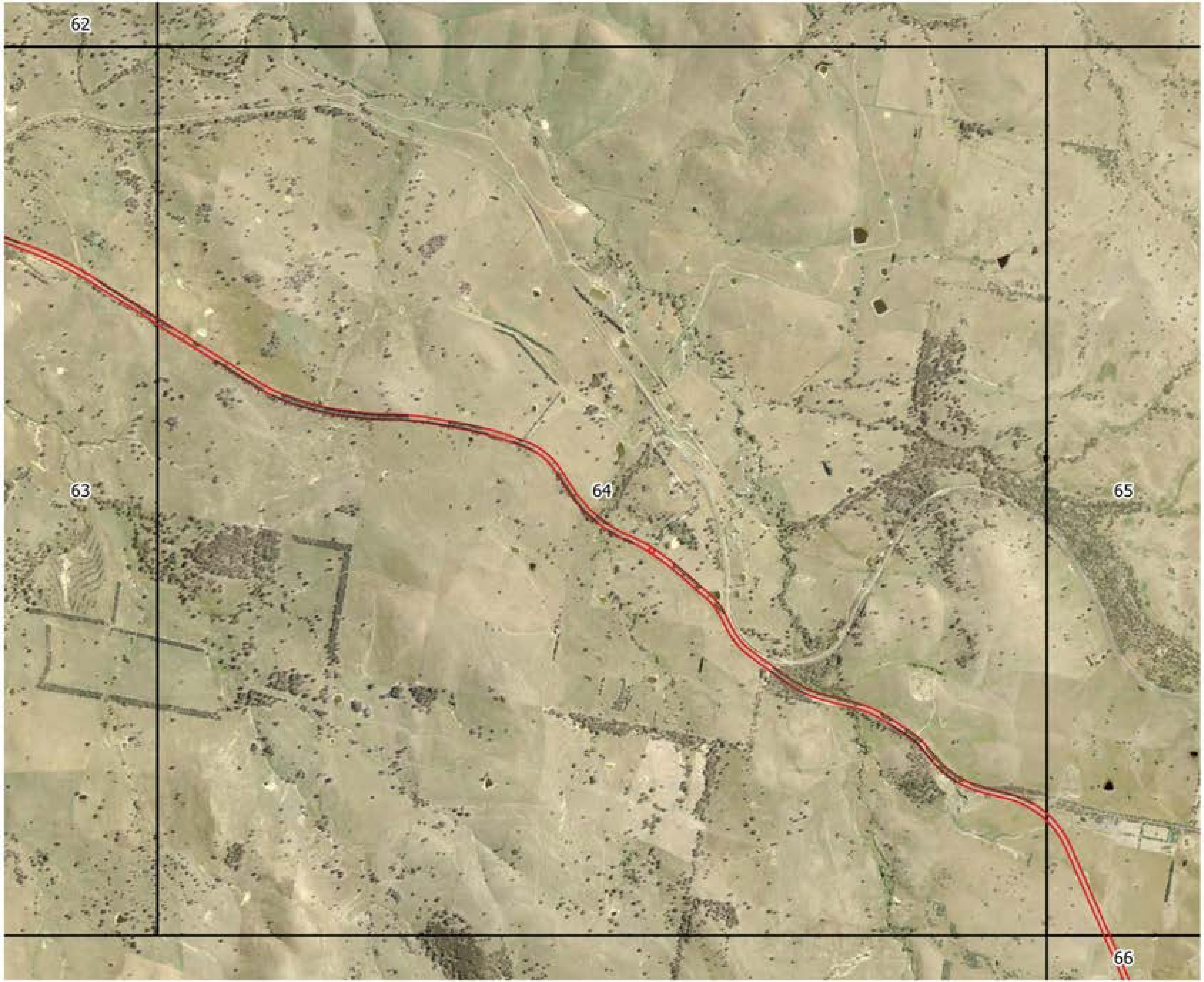
PCTs within the Proposal Area



Legend

Proposal area

PCTs within the proposal area

PCT 277 Blakelys Red Gum - Yellow Box grassy tall woodland of the NSW South Western Slopes Bioregion

PCT 266 White Box grassy woodland in the upper slopes sub-region of the NSW South Western Slopes Bioregion

0 0.75 1.5 km

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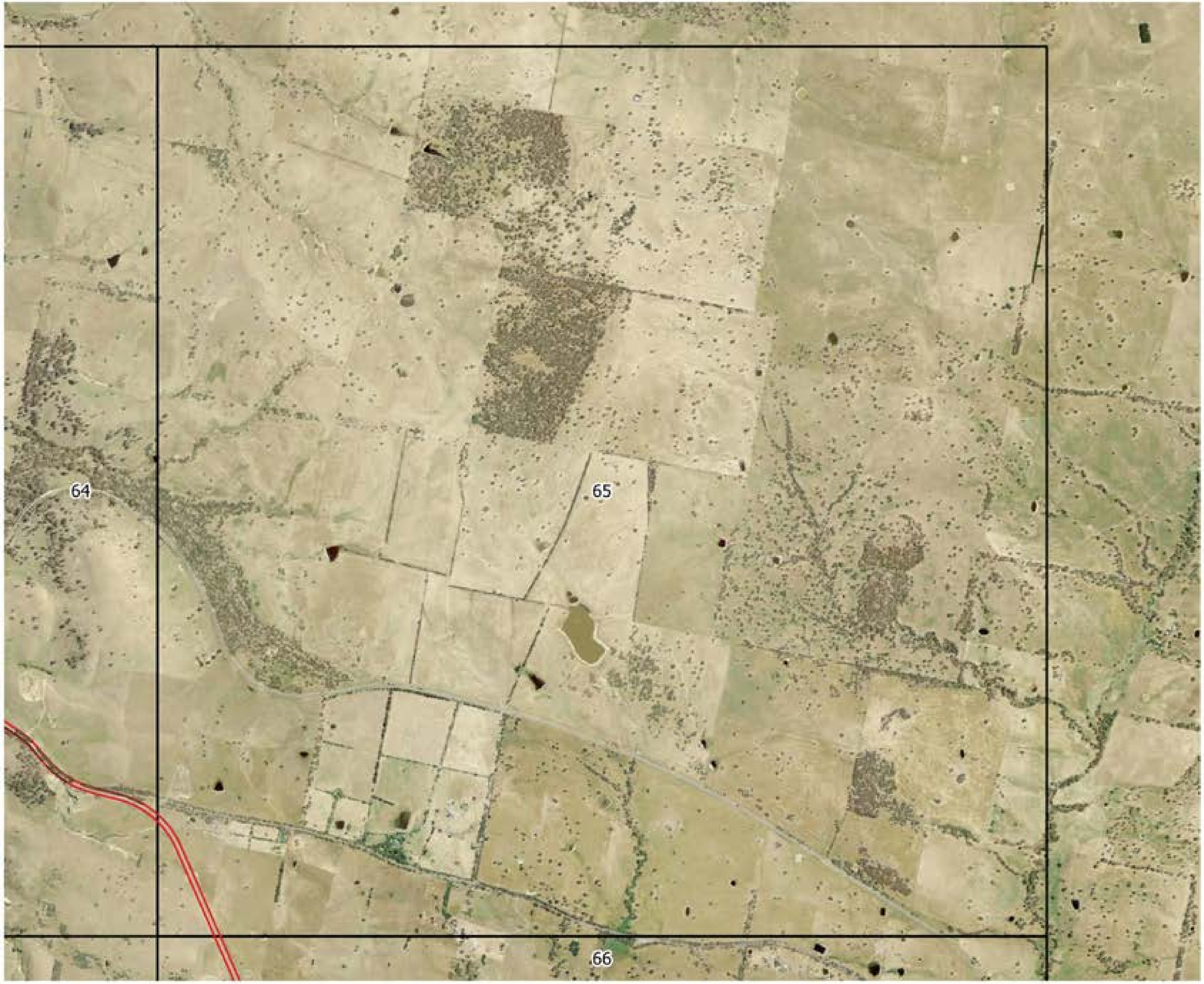
PCTs within the Proposal Area



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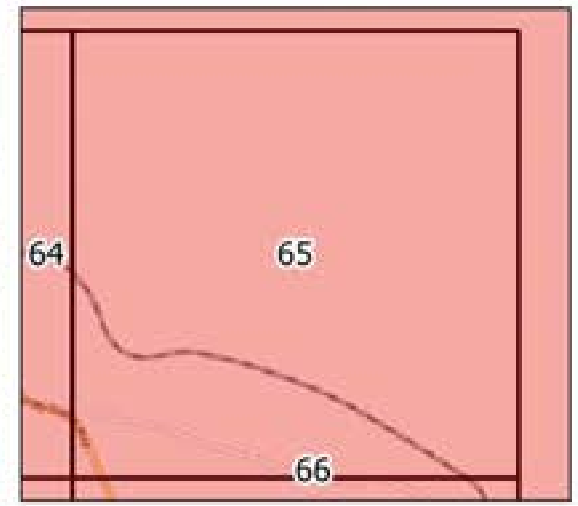
Proposal area



0 0.75 1.5 km

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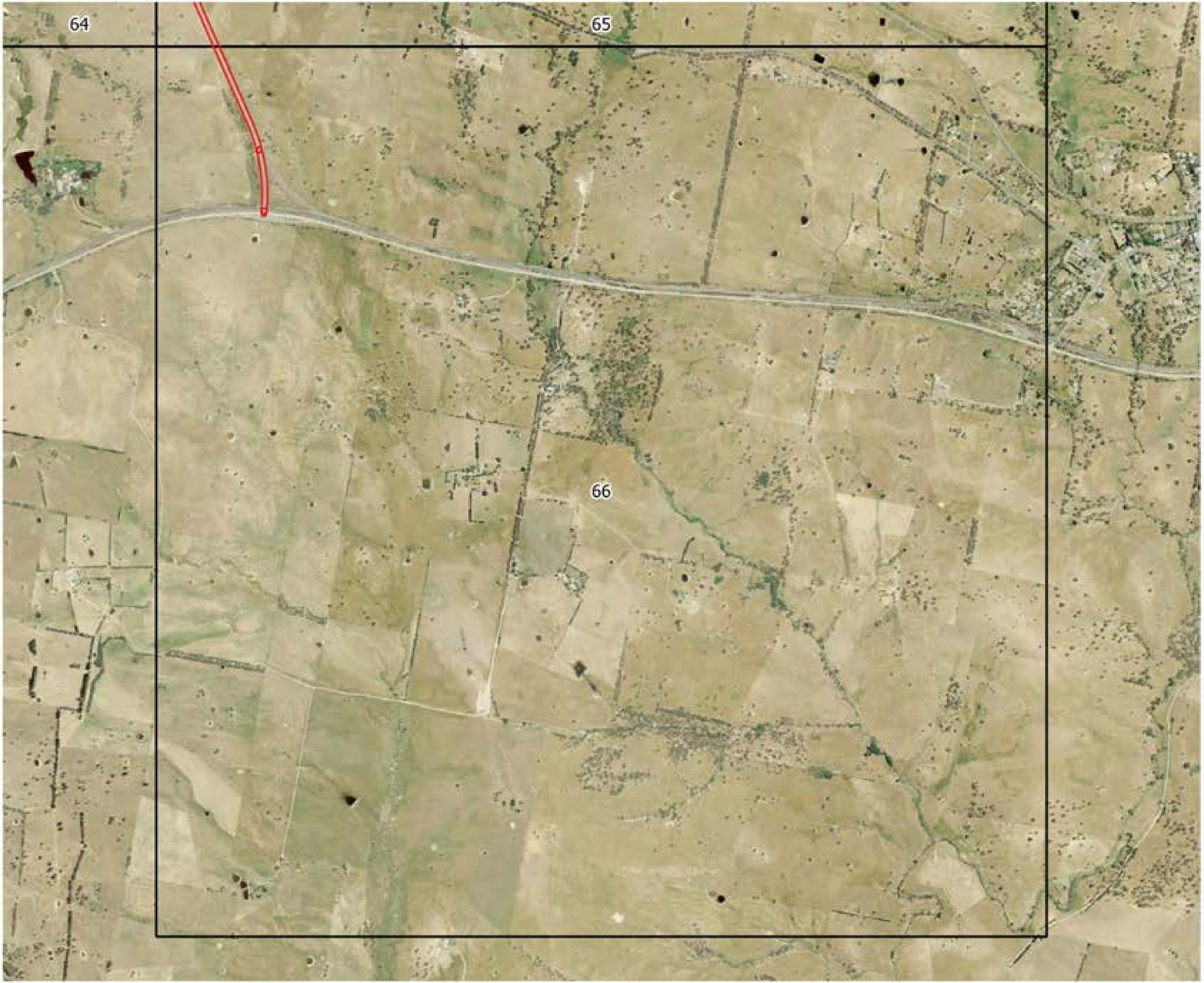
PCTs within the Proposal Area



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Proposal area

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F.4 TECS within the proposal area

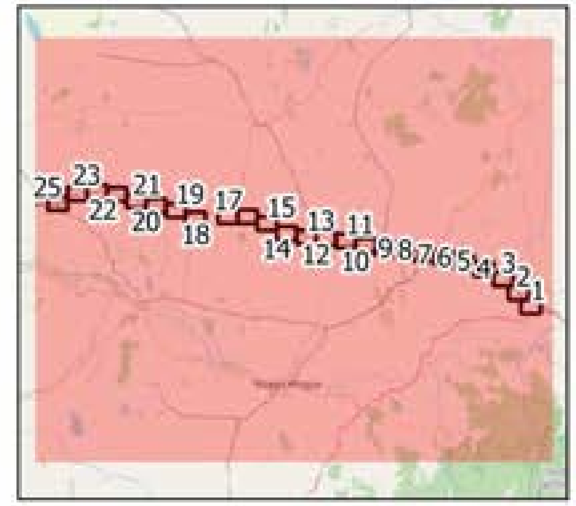
Maps follow overleaf (67-map set).

Threatened Ecological Communities (TECs) cover

Legend

Proposal area

Construction footprint



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Ref: 21-251 Burley Griffin Way REF Biodiversity \ Threatened Ecological Communities (TECs) cover
Author: daniel.p
Date created: 28.04.2022

Threatened Ecological Communities (TECs)

Legend

Proposal area

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

Proposal area

0 0.5 1 km

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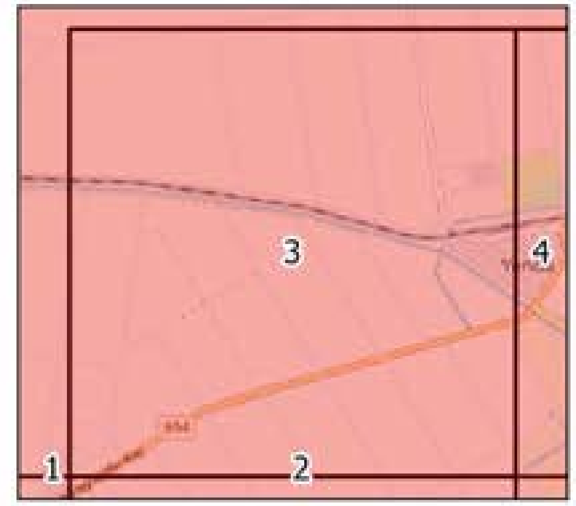
Threatened Ecological Communities (TECs)

Legend

Proposal area



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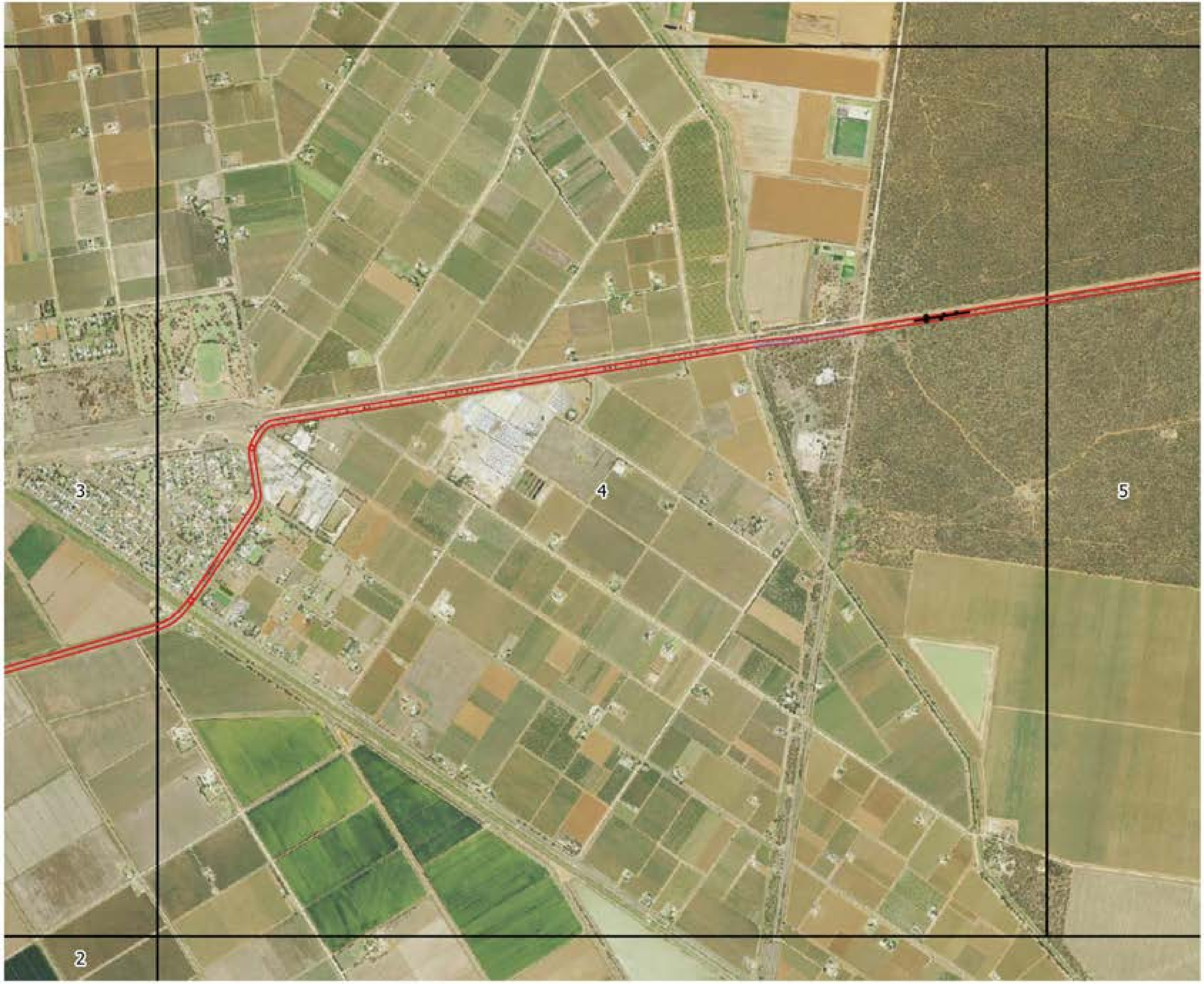

Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act & EPBC Act listed TEC

0 0.5 1 km

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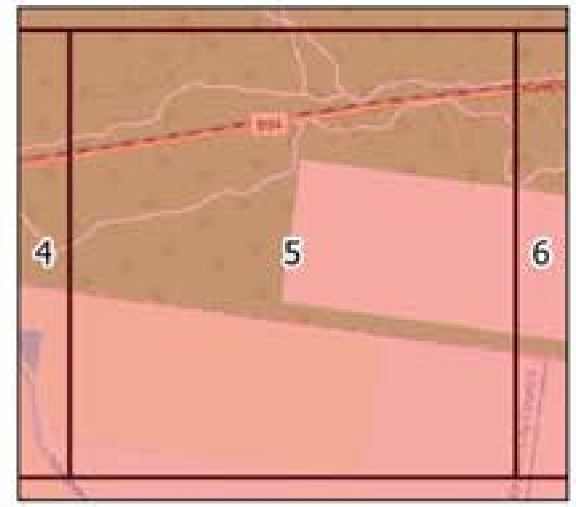
Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint



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Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

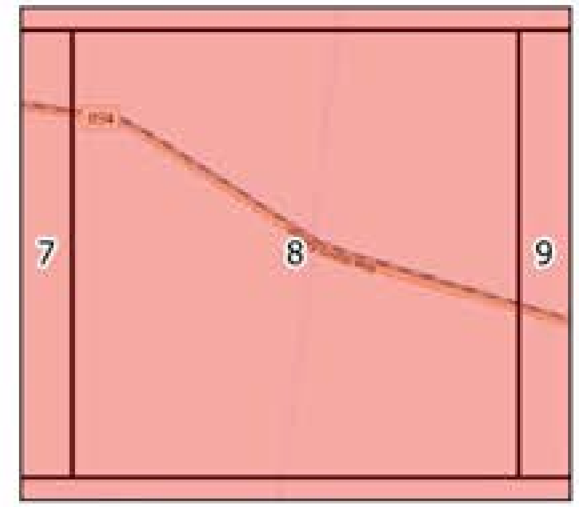
Proposal area

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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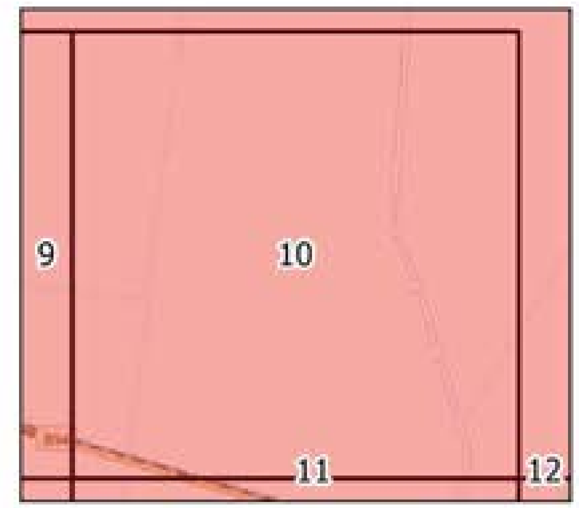
Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

EPBC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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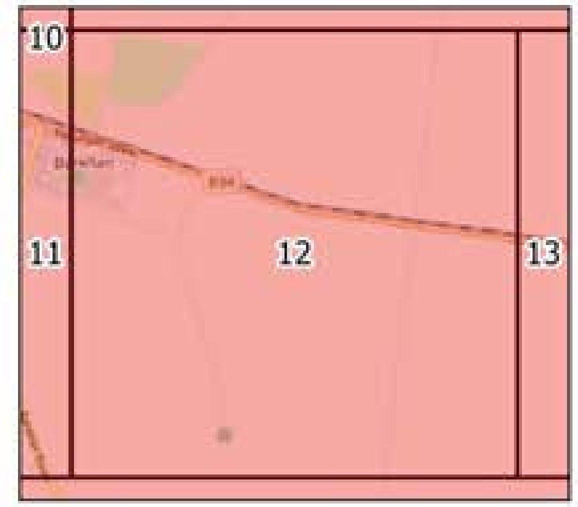
Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act listed TEC
- BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act listed TEC
- BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act listed TEC
- BC Act & EPBC Act listed TEC

0 0.5 1 km

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13
14
15
16
Threatened Ecological Communities (TECs)
Legend
Proposal area
Construction footprint
Threatened Ecological Community
BC Act listed TEC
BC Act & EPBC Act listed TEC
13
14
15
16
0
0.5
1 km
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Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

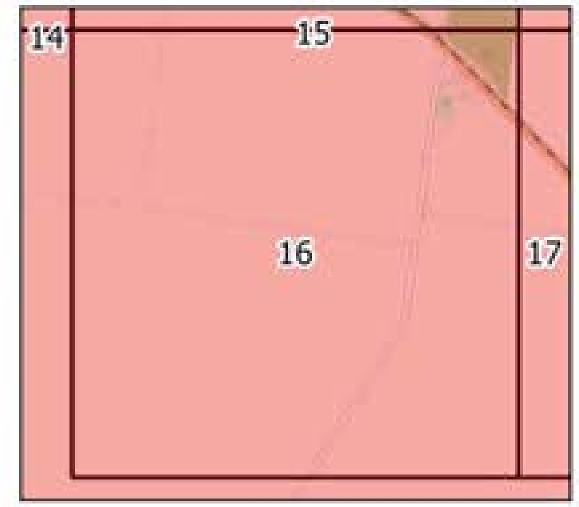
Proposal area

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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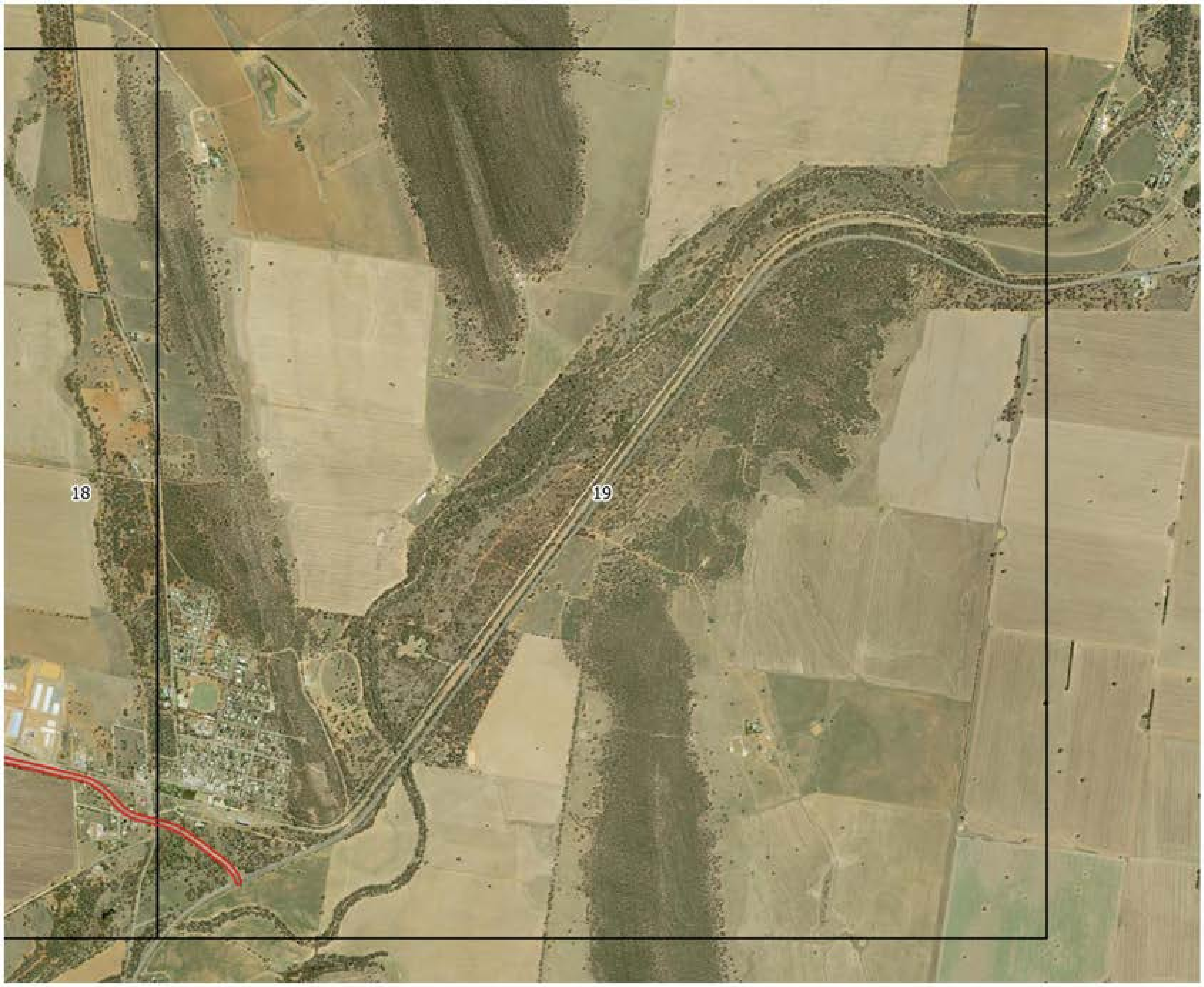

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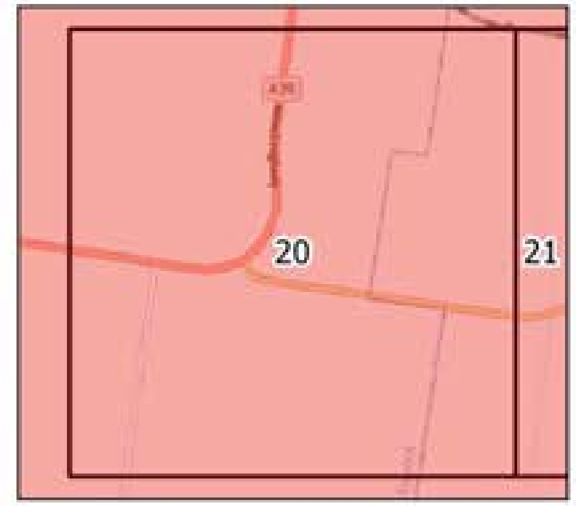
Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act listed TEC
- EPBC Act listed TEC
- BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

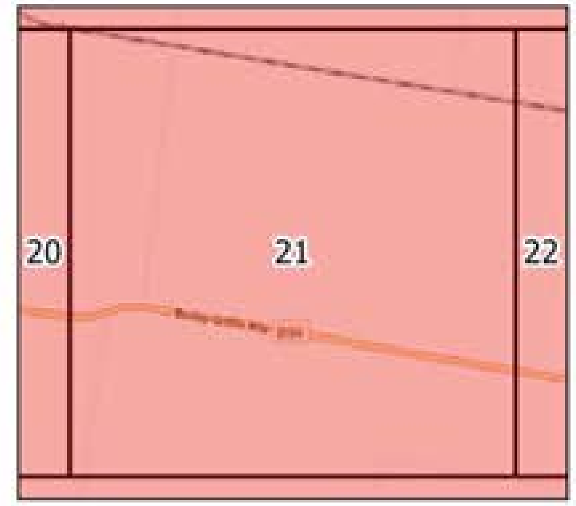
Proposal area

Threatened Ecological Community

BC Act listed TEC

EPBC Act listed TEC

BC Act & EPBC Act listed TEC



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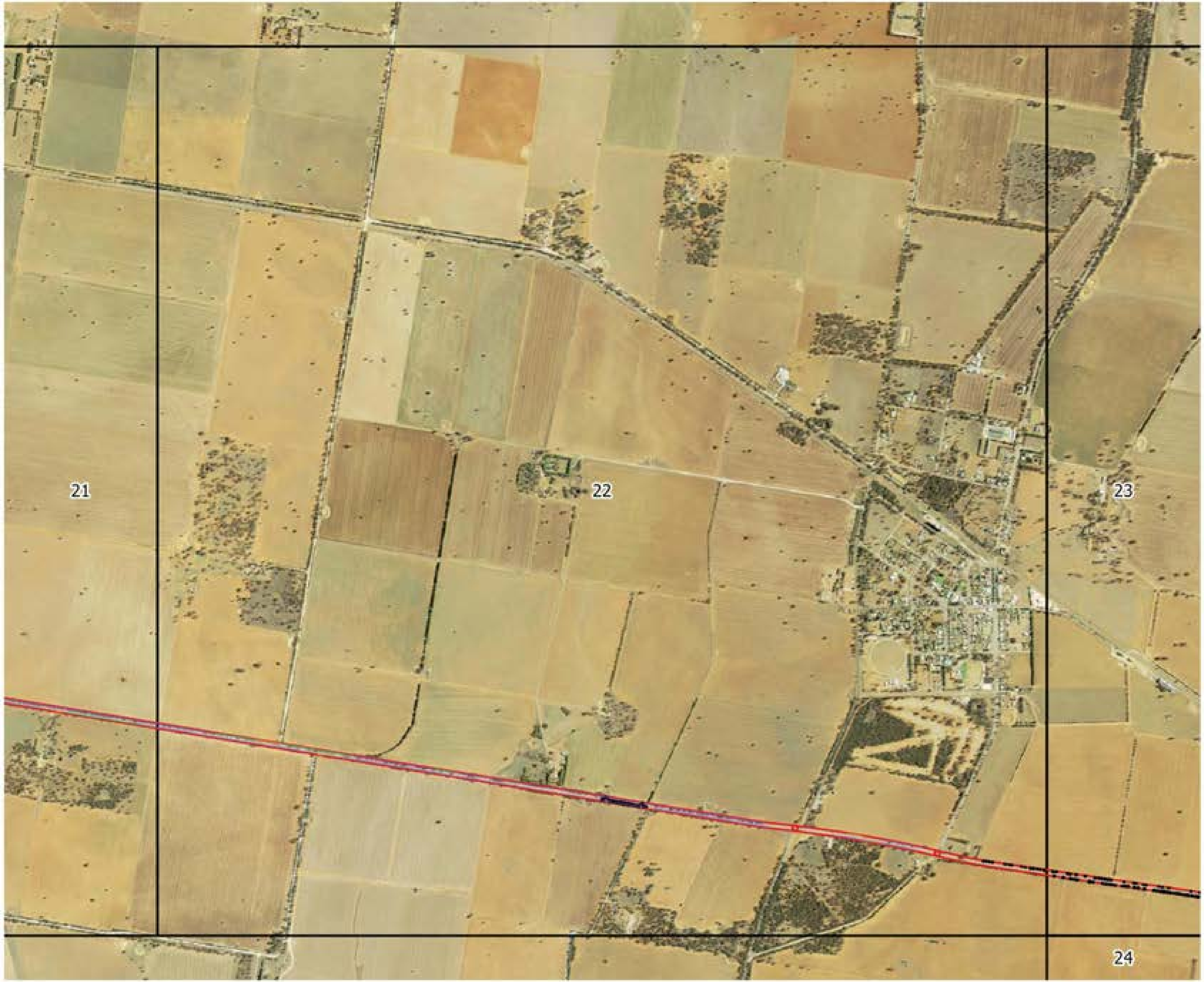

Threatened Ecological Communities (TECs)

Legend
- Proposal area
- Construction footprint

Threatened Ecological Community
- BC Act listed TEC
- EPBC Act listed TEC
- BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

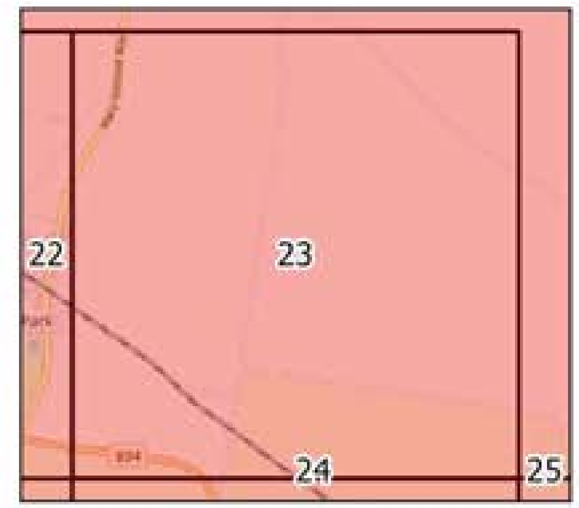
Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC



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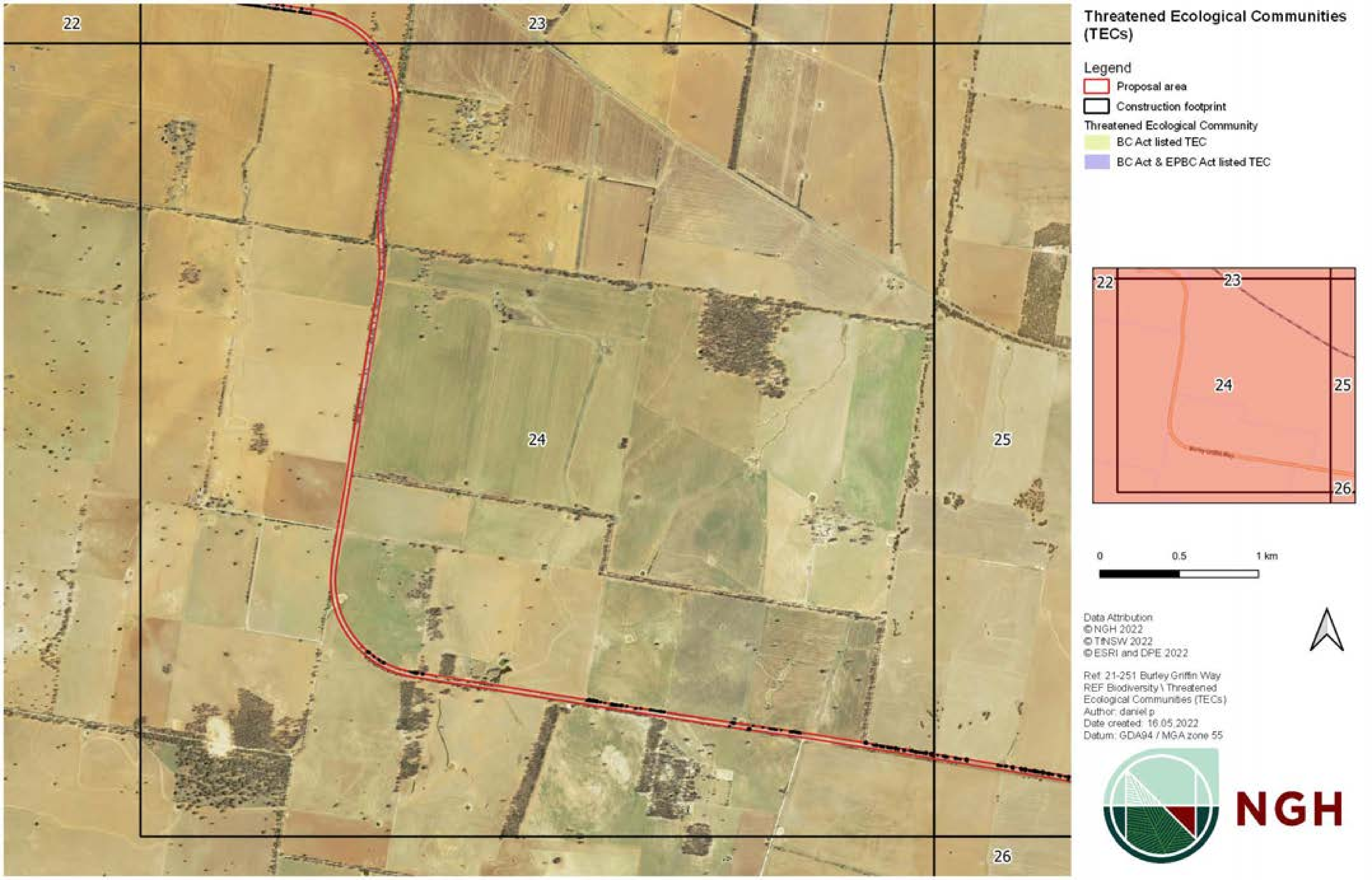

22
23
24
25
26
Threatened Ecological Communities (TECs)
Legend
Proposal area
Construction footprint
Threatened Ecological Community
BC Act listed TEC
BC Act & EPBC Act listed TEC
0
0.5
1 km
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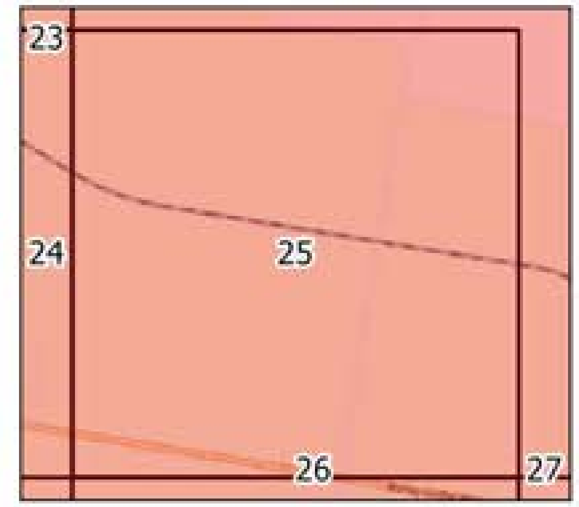
Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint



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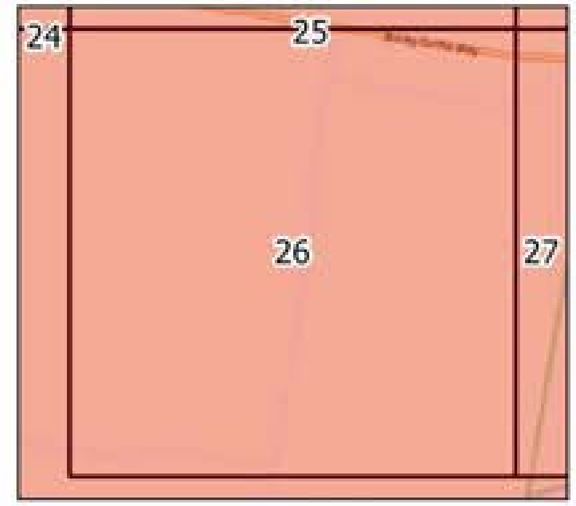
Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC



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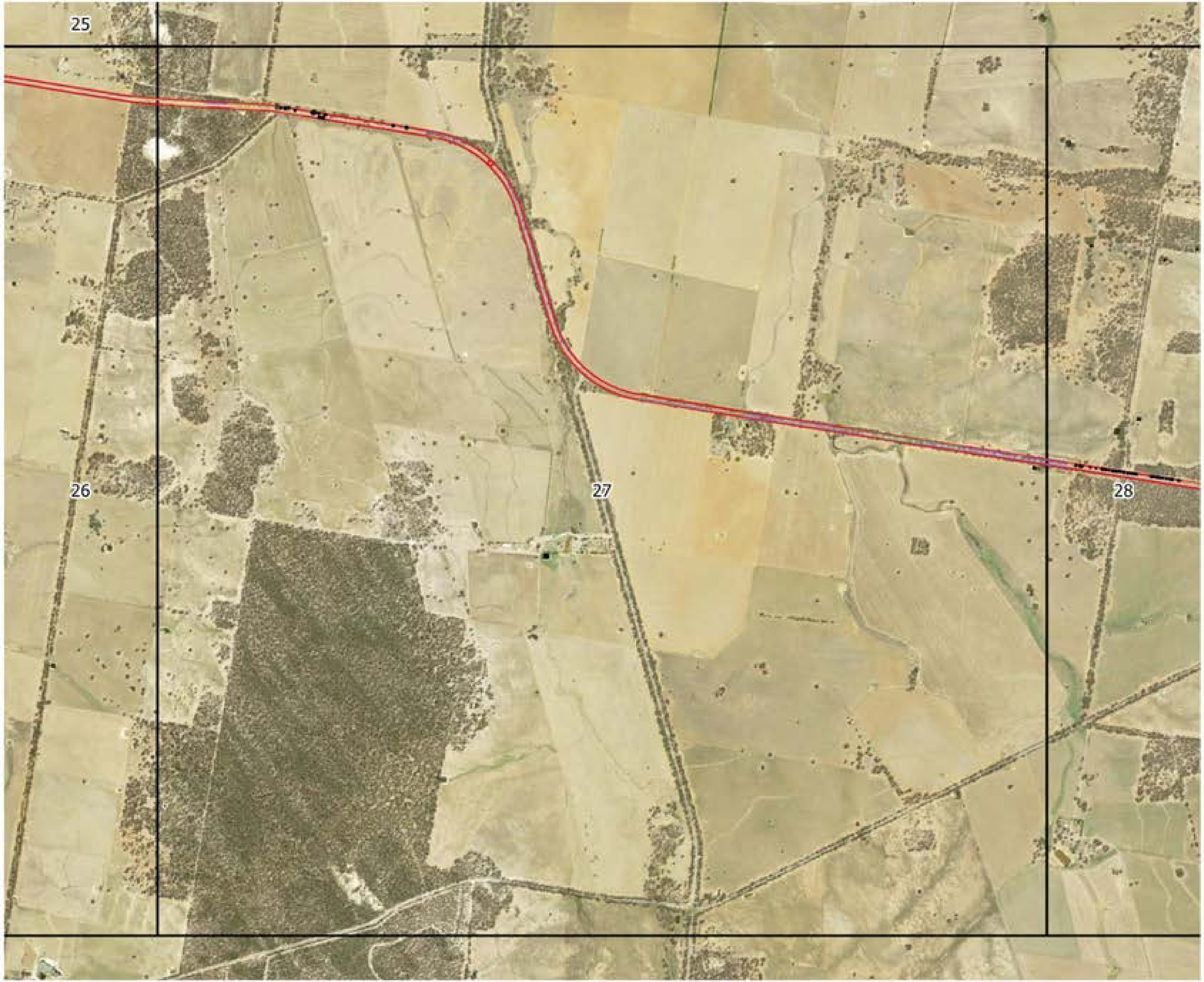

Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act listed TEC
- EPBC Act listed TEC
- BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

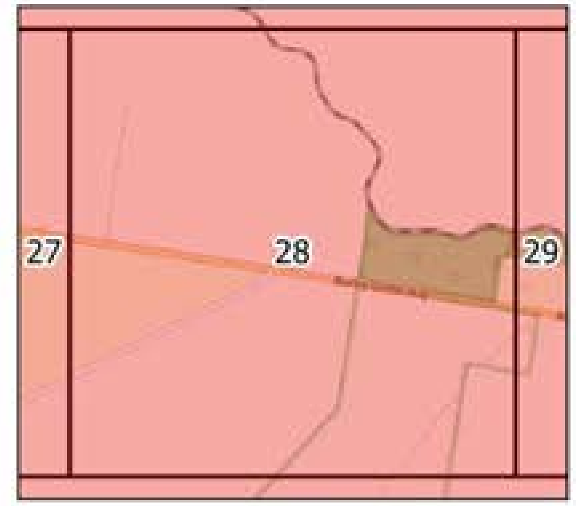
Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC



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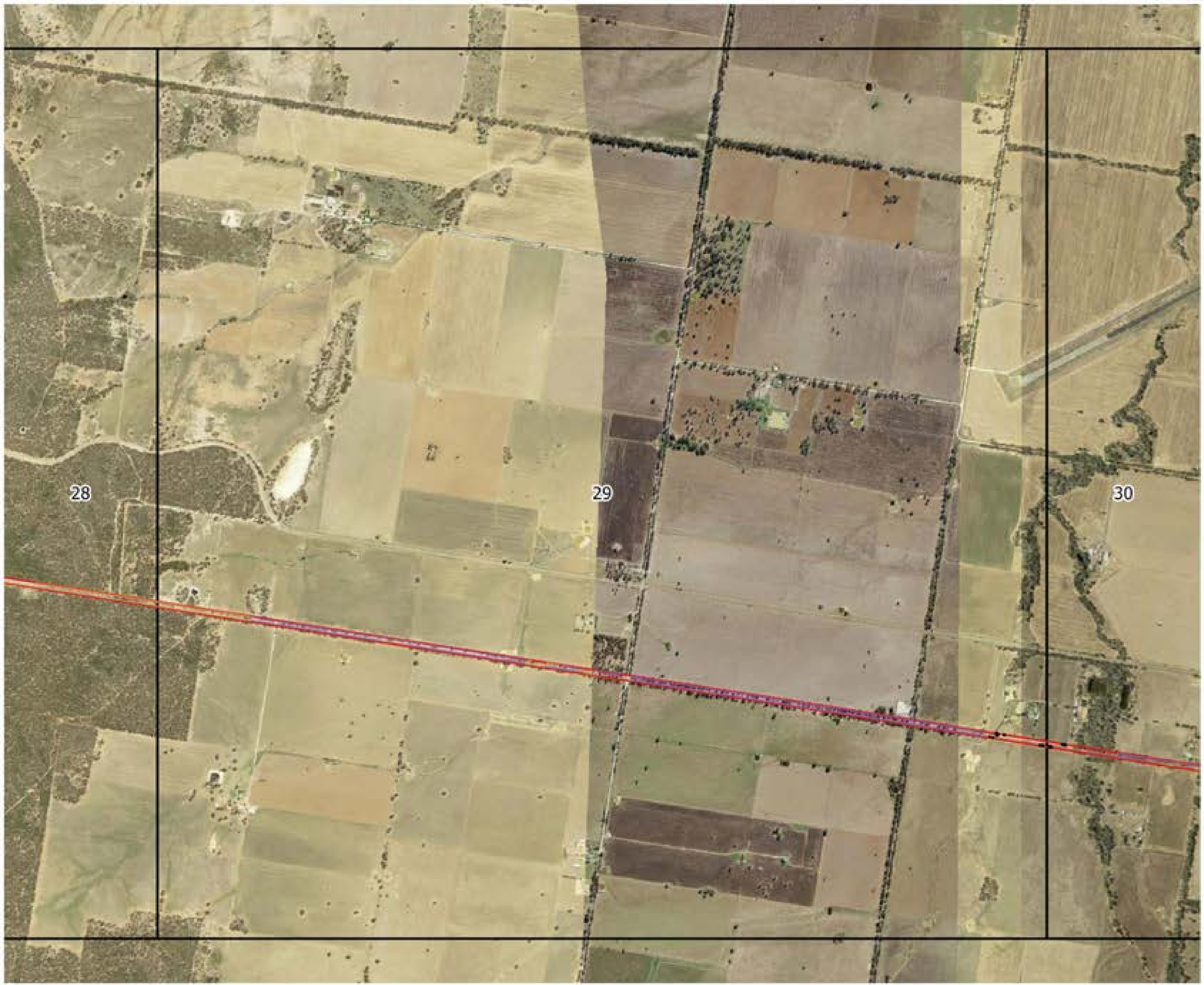
Threatened Ecological Communities (TECs)



Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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Threatened Ecological Communities (TECs)

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

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Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

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Legend

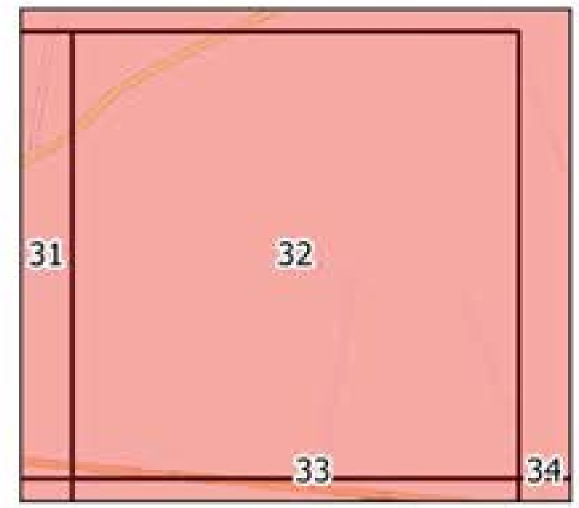
Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC



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Threatened Ecological Communities (TECs)

Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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0 0.5 1 km

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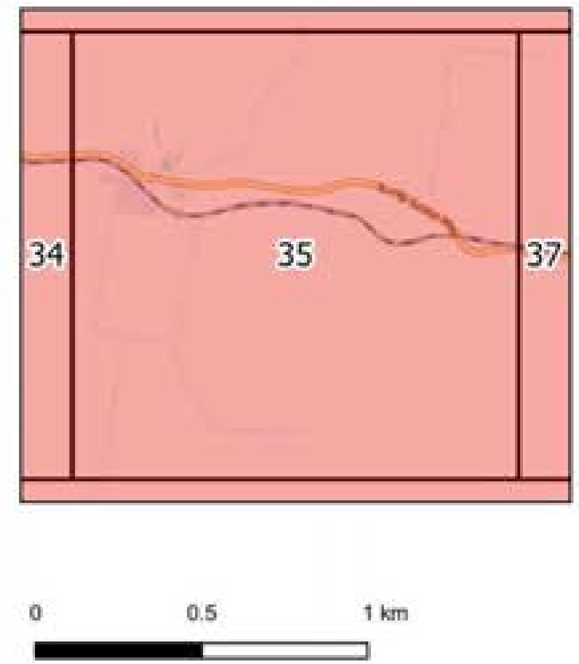

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EPBC Act listed TEC

BC Act & EPBC Act listed TEC

0 0.5 1 km

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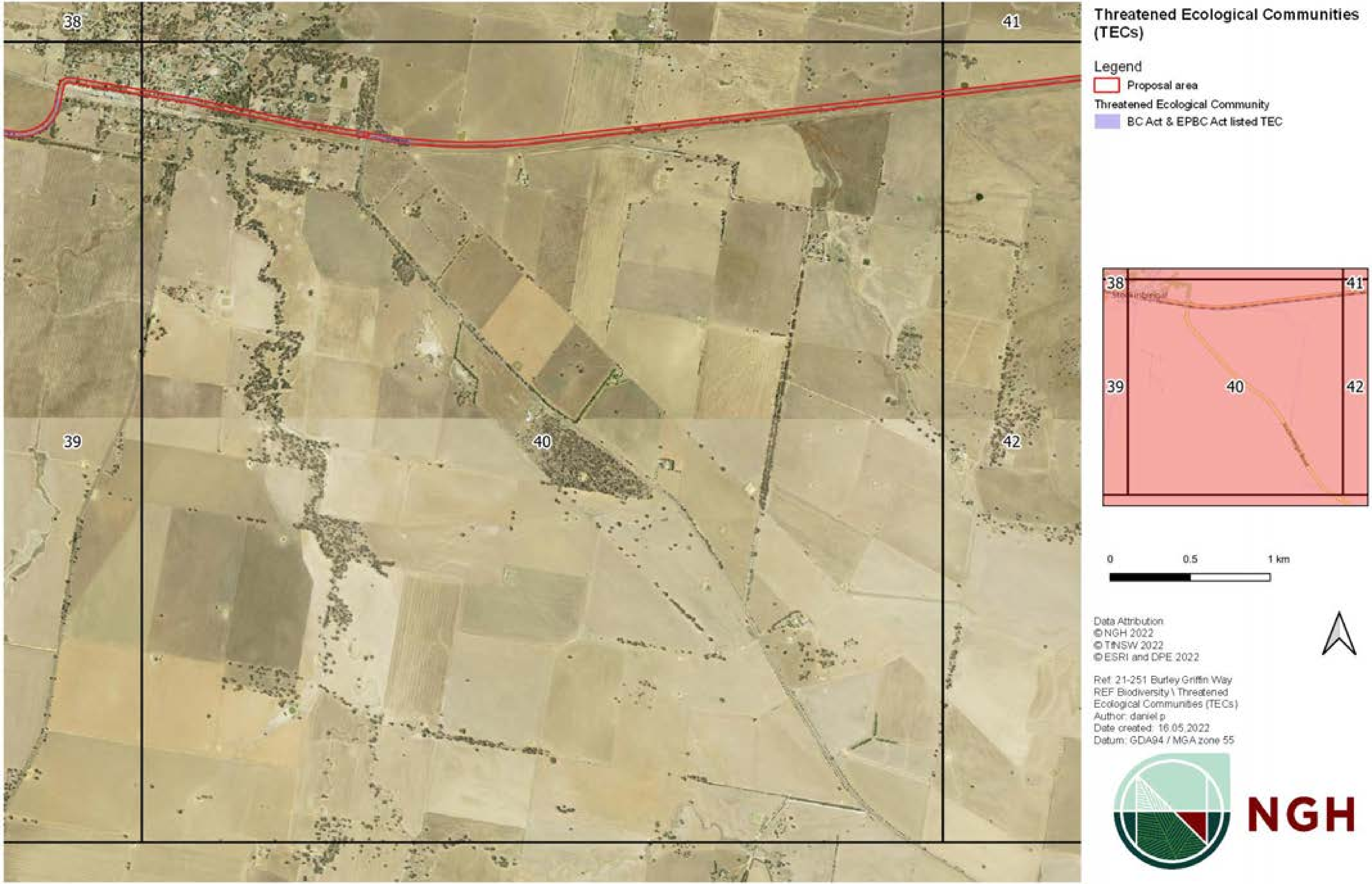

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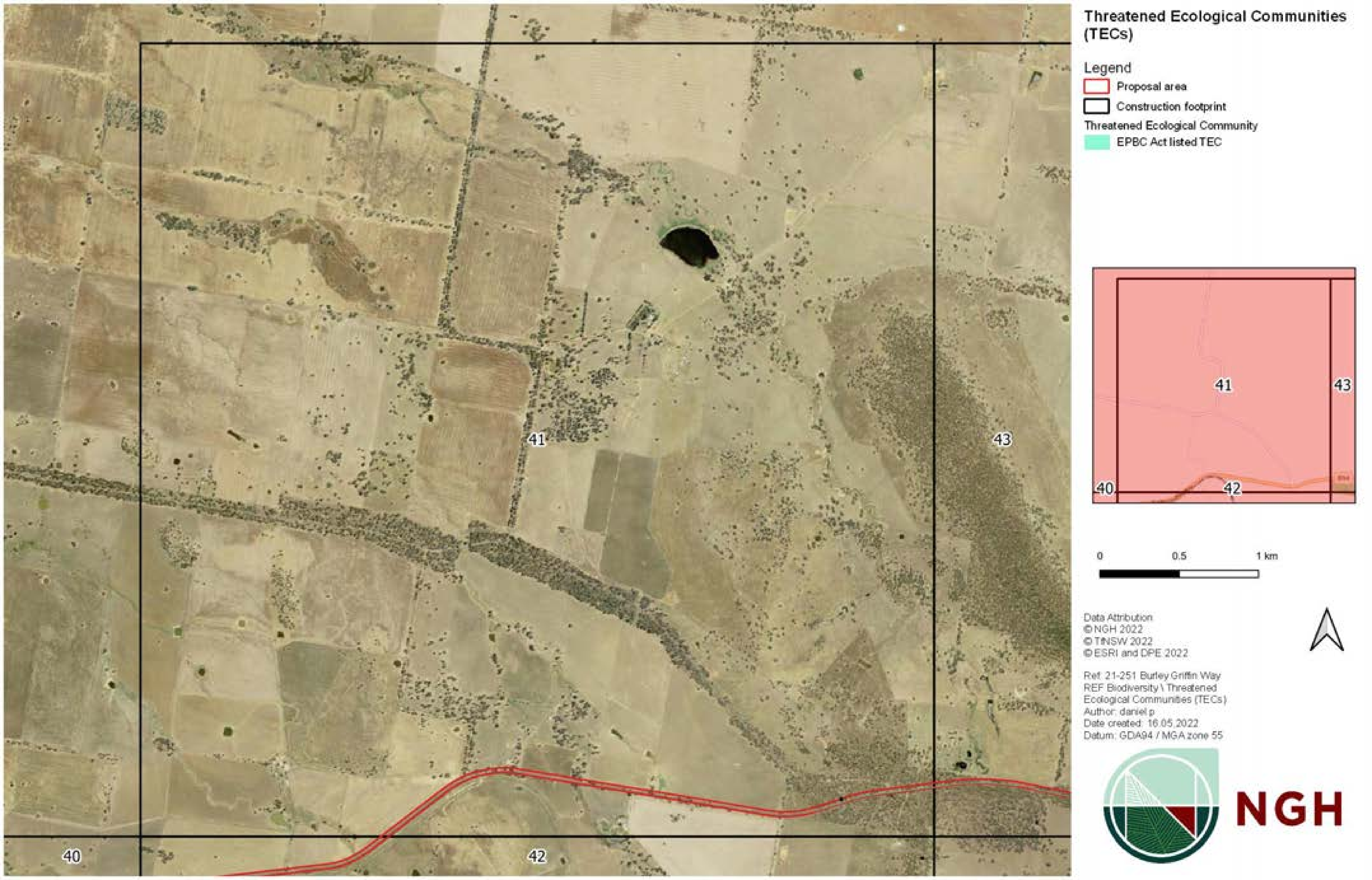
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Legend
Proposal area
Construction footprint
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EPBC Act listed TEC
41
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40
42
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1 km
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Legend

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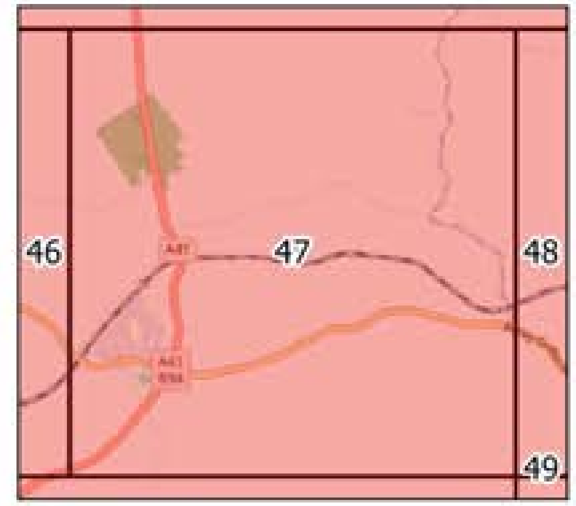

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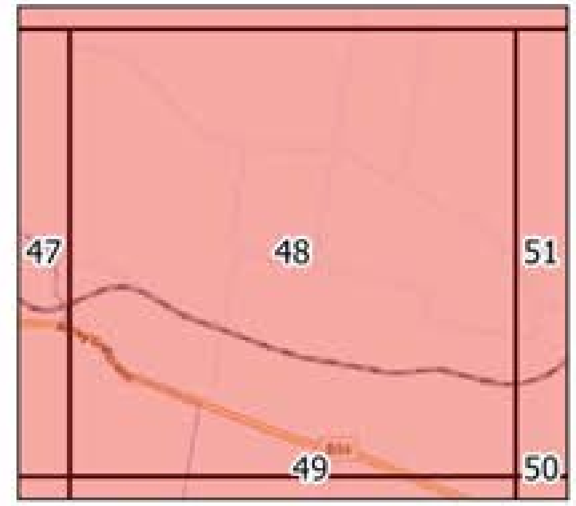

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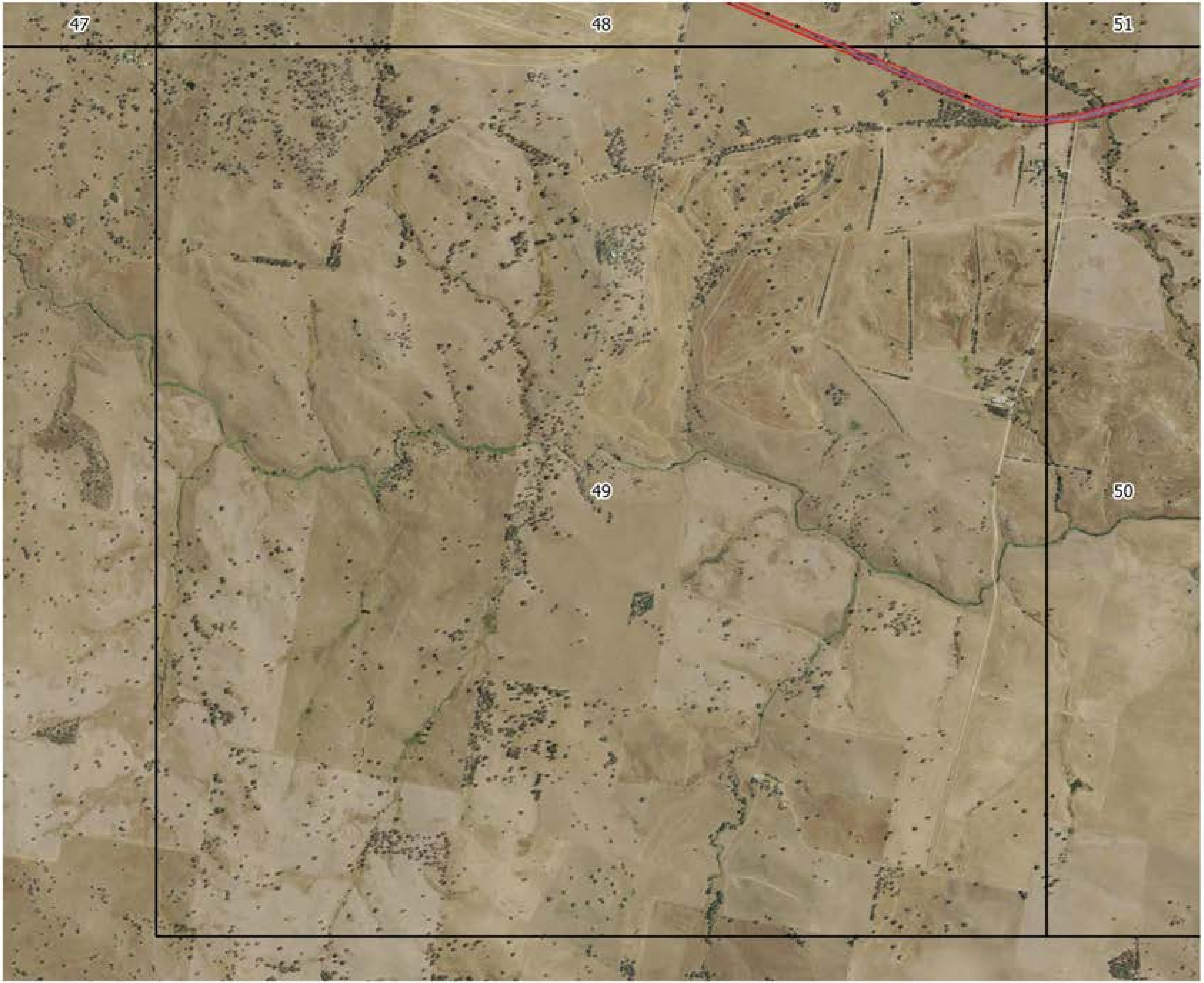

Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC

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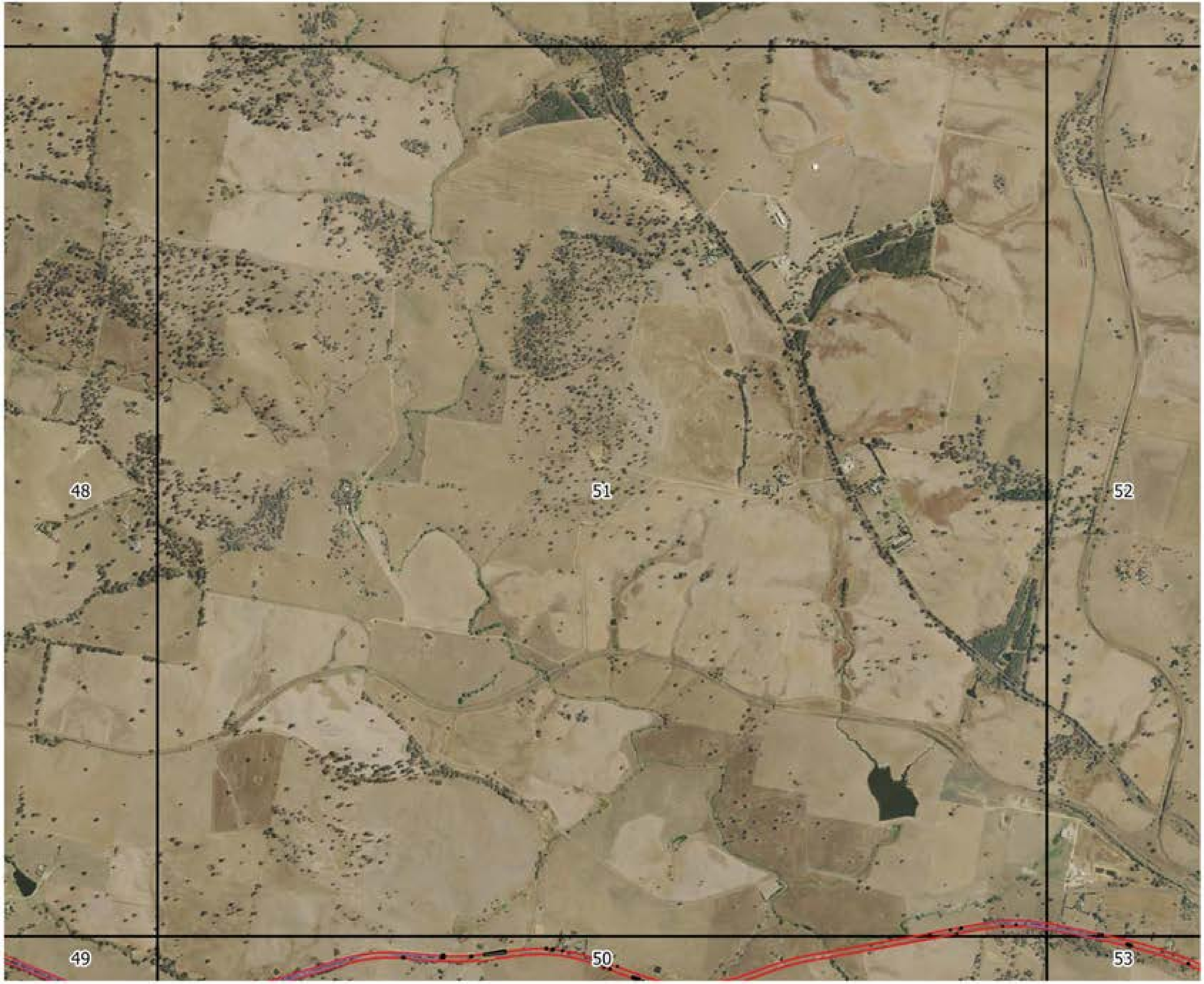

Threatened Ecological Communities (TECs)

Legend

Proposal area

Construction footprint

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Legend

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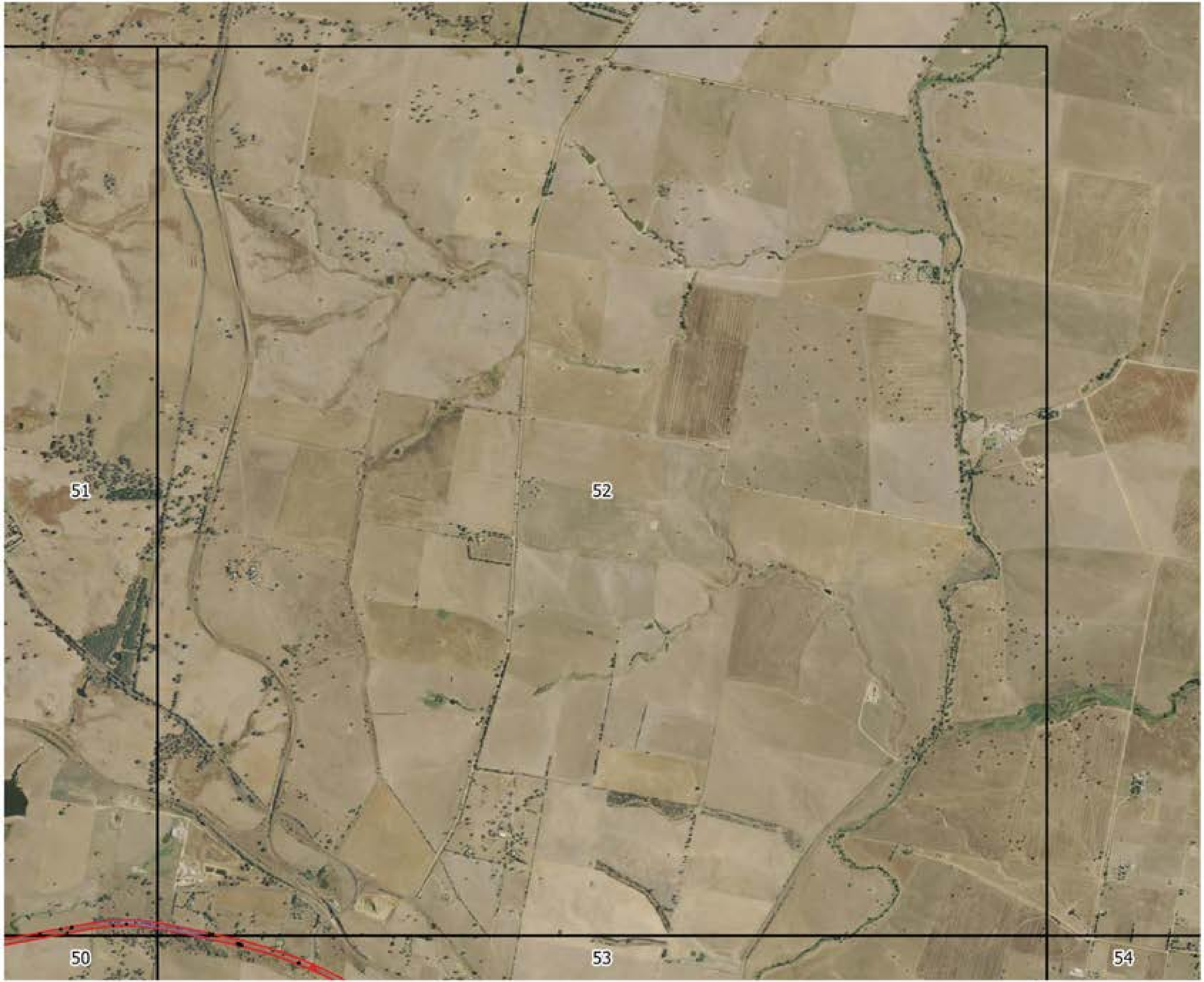

Legend

- Proposal area
- Construction footprint

Threatened Ecological Community

- BC Act & EPBC Act listed TEC

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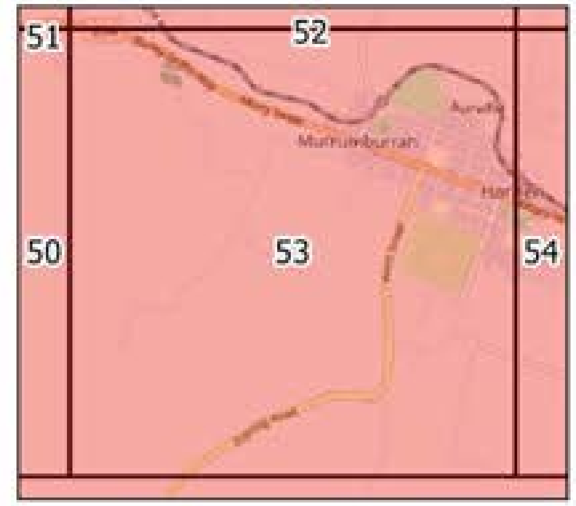

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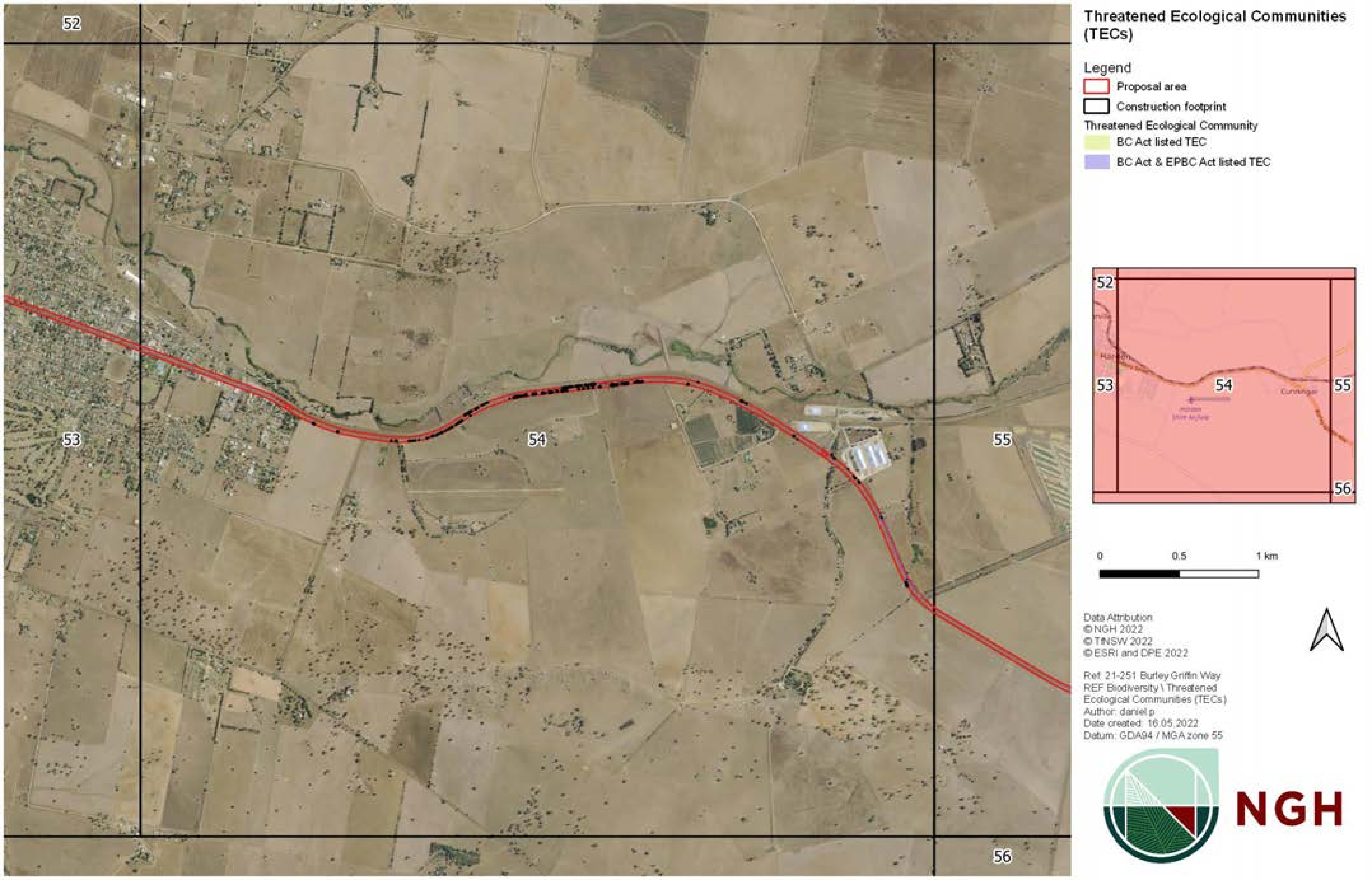
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Threatened Ecological Communities (TECs)
Legend
Proposal area
Construction footprint
Threatened Ecological Community
BC Act listed TEC
BC Act & EPBC Act listed TEC
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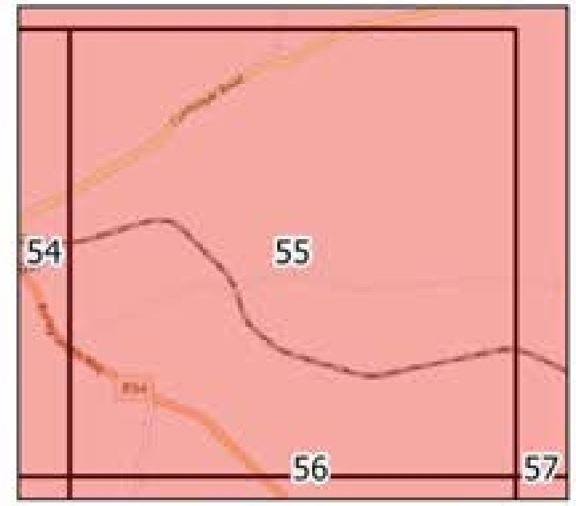
BC Act & EPBC Act listed TEC



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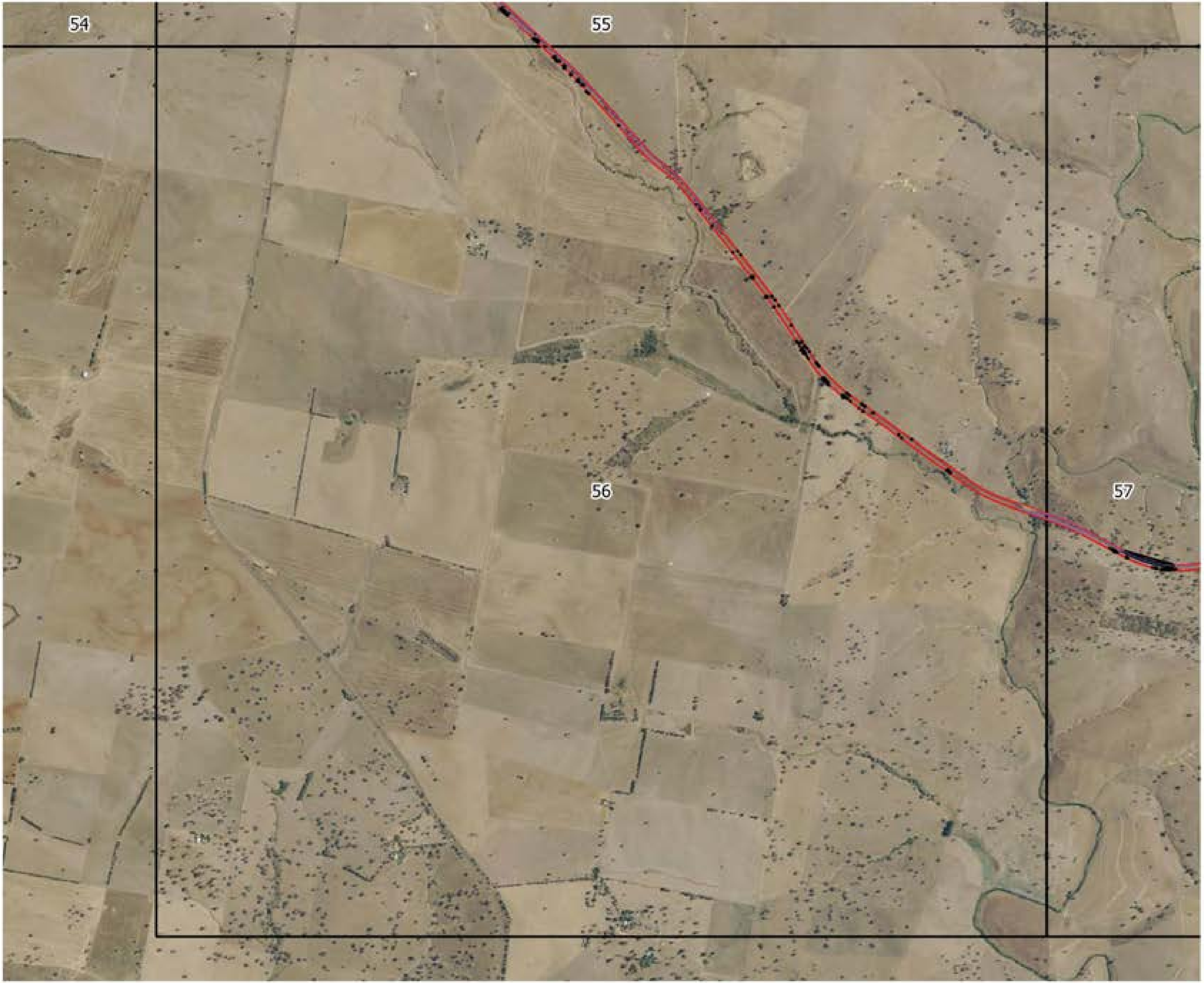


Legend

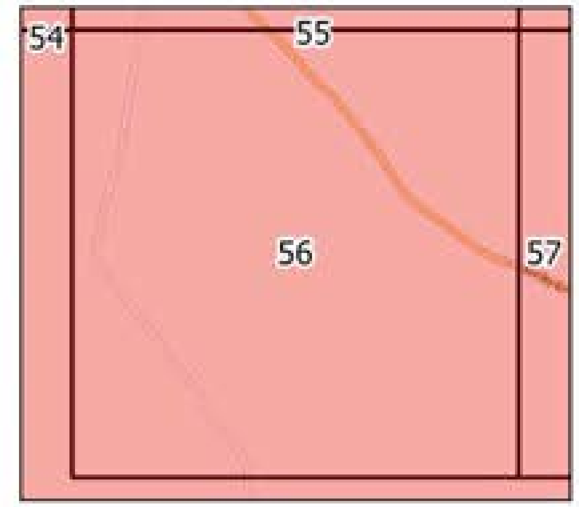
Proposal area

Construction footprint

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC



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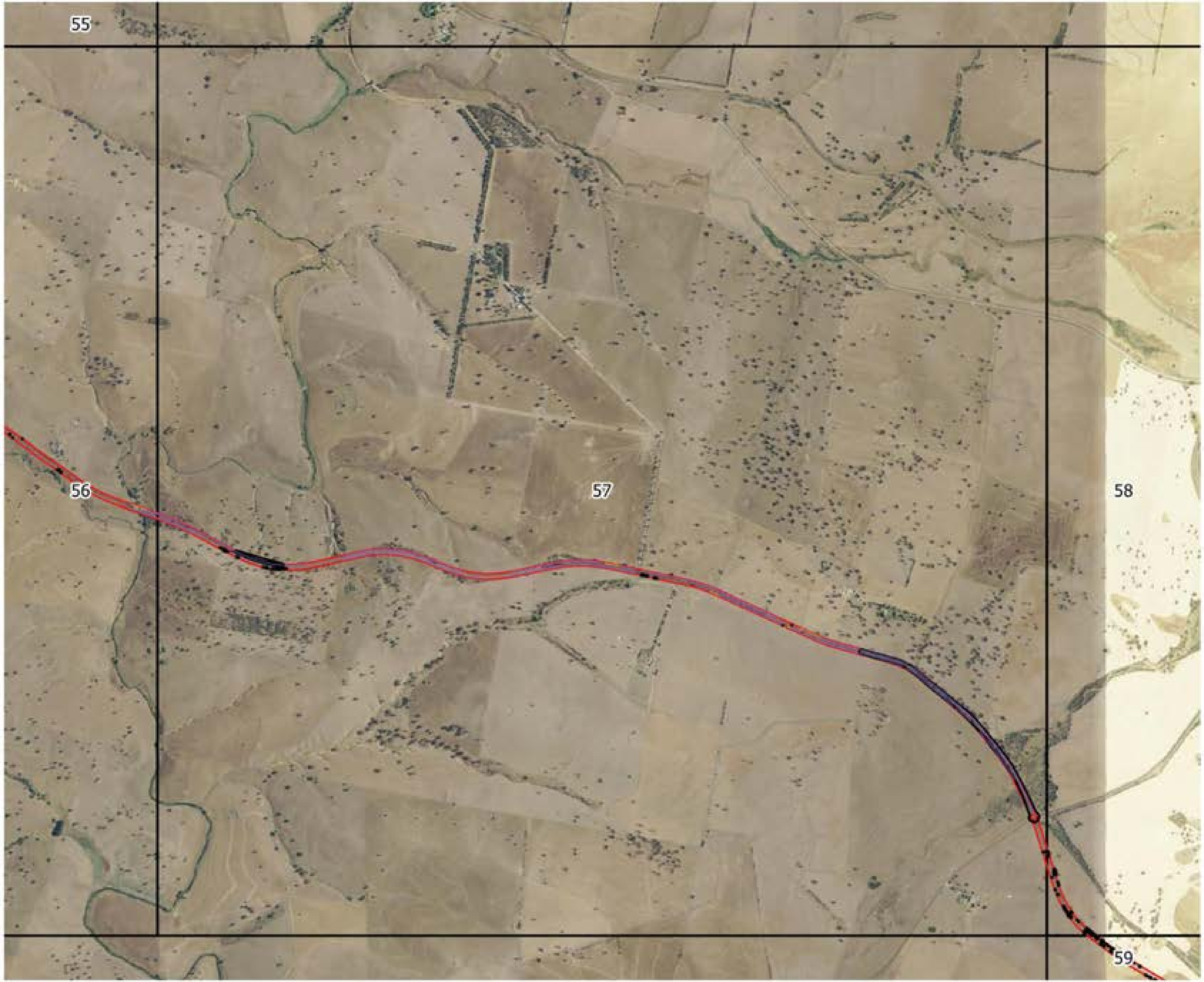

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Proposal area

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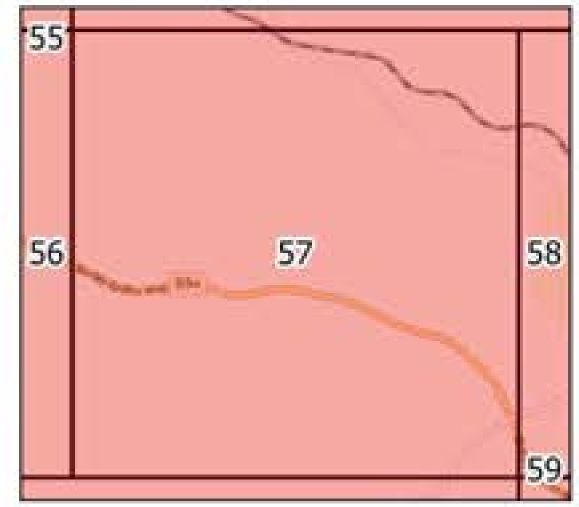
BC Act listed TEC

BC Act & EPBC Act listed TEC



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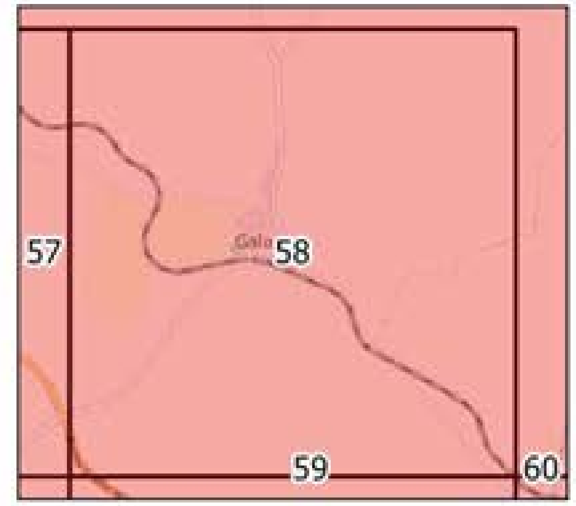

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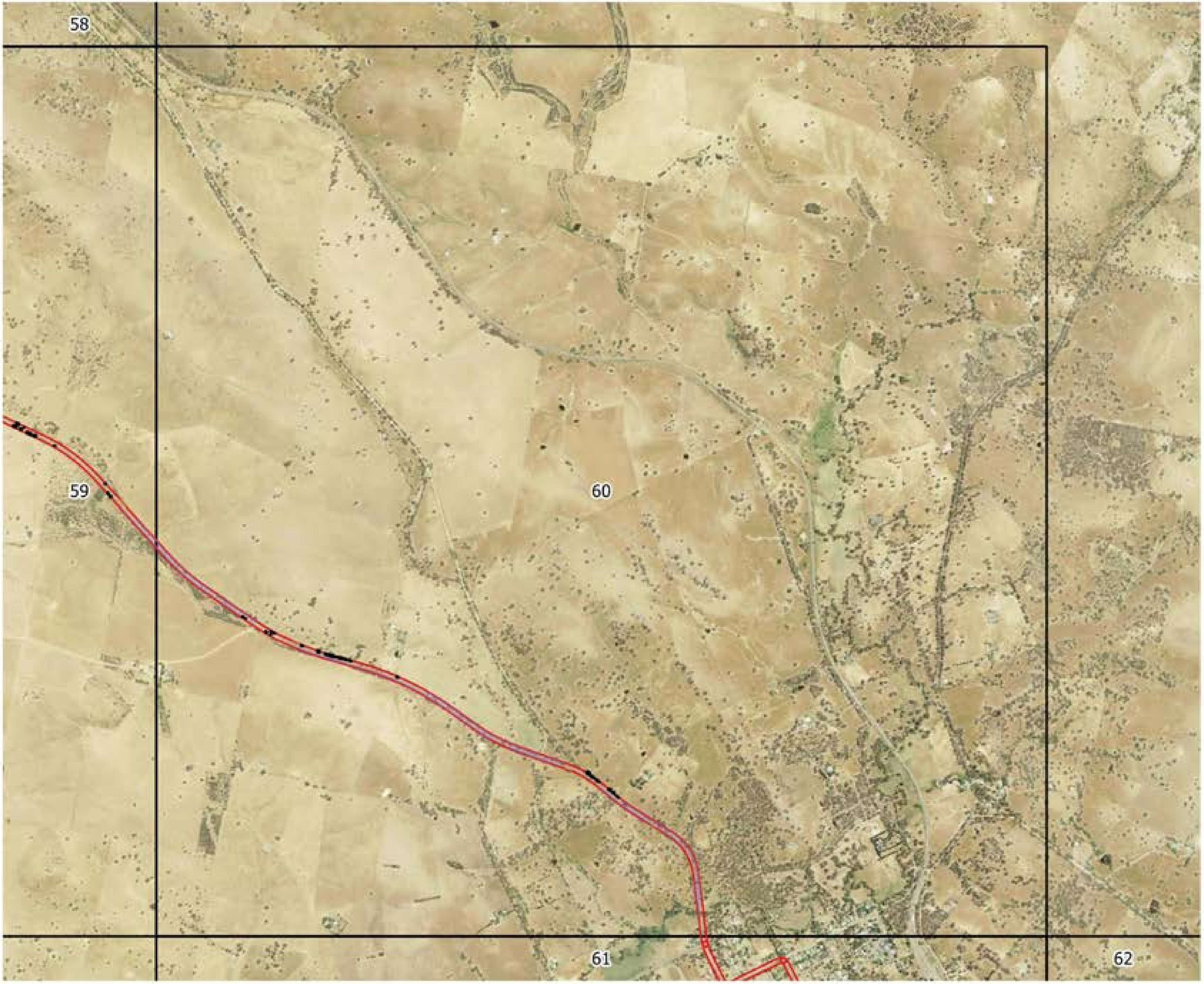

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Legend

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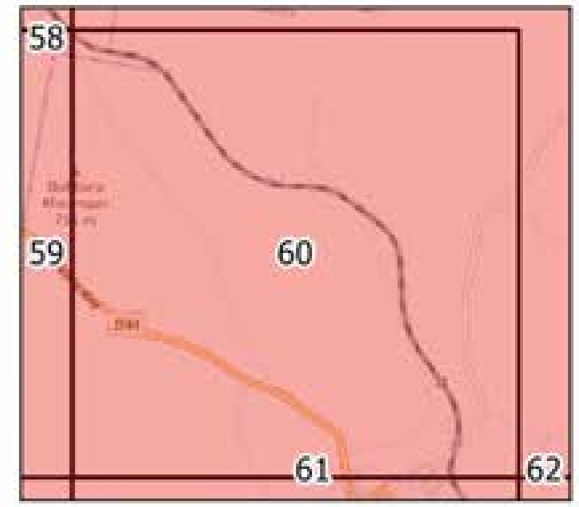
BC Act & EPBC Act listed TEC



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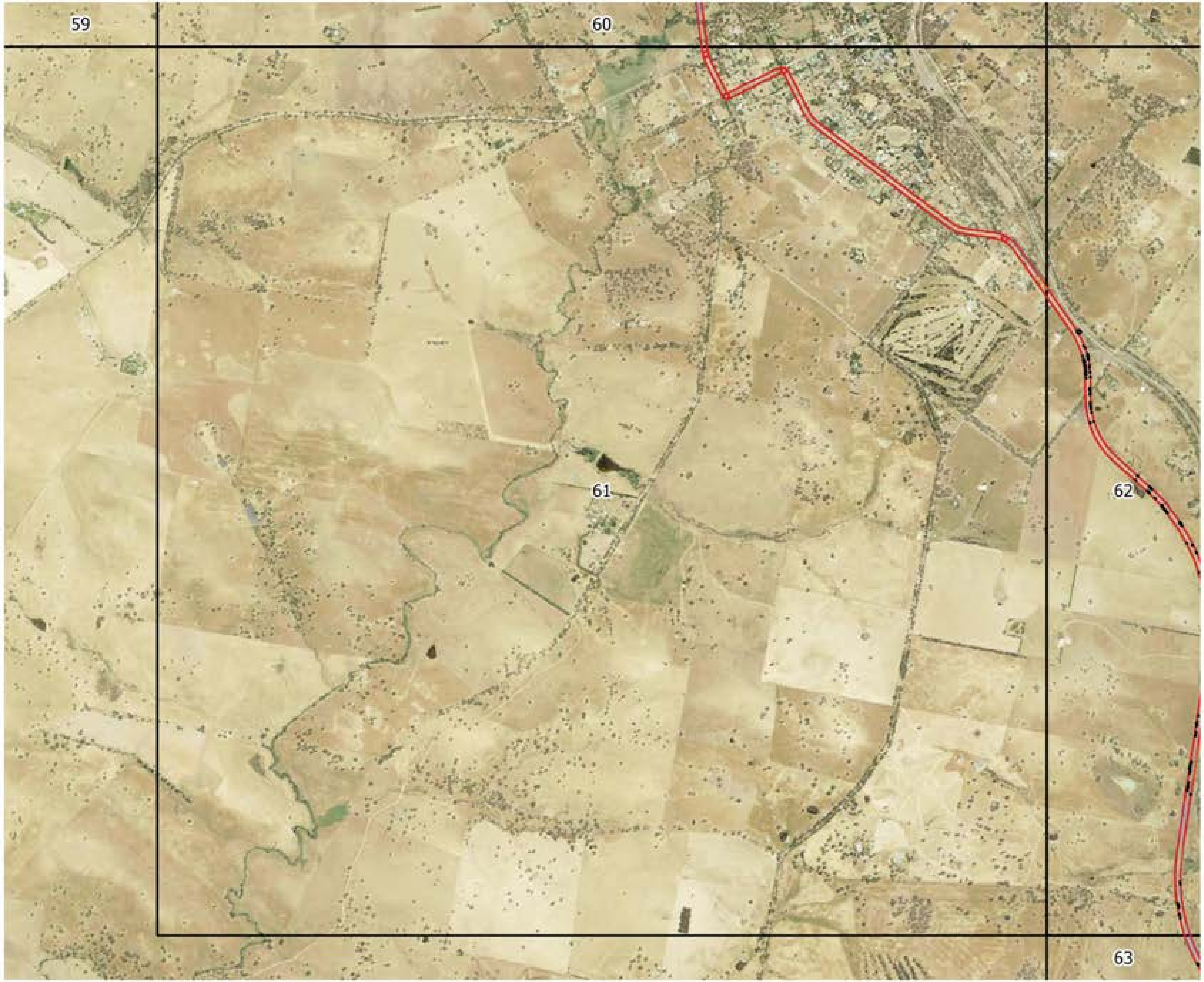

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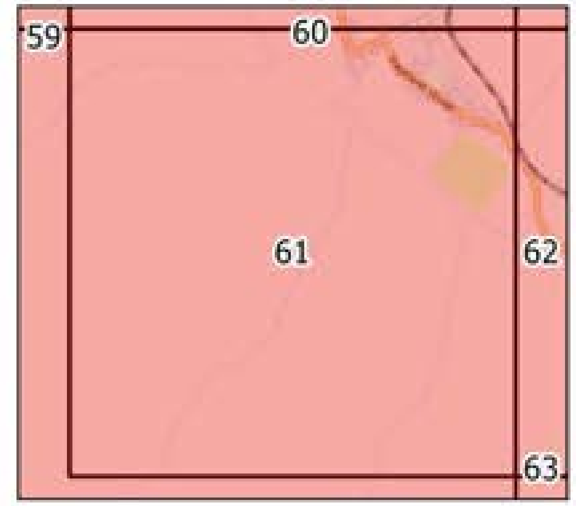
Legend

Proposal area

Threatened Ecological Community

BC Act listed TEC

BC Act & EPBC Act listed TEC



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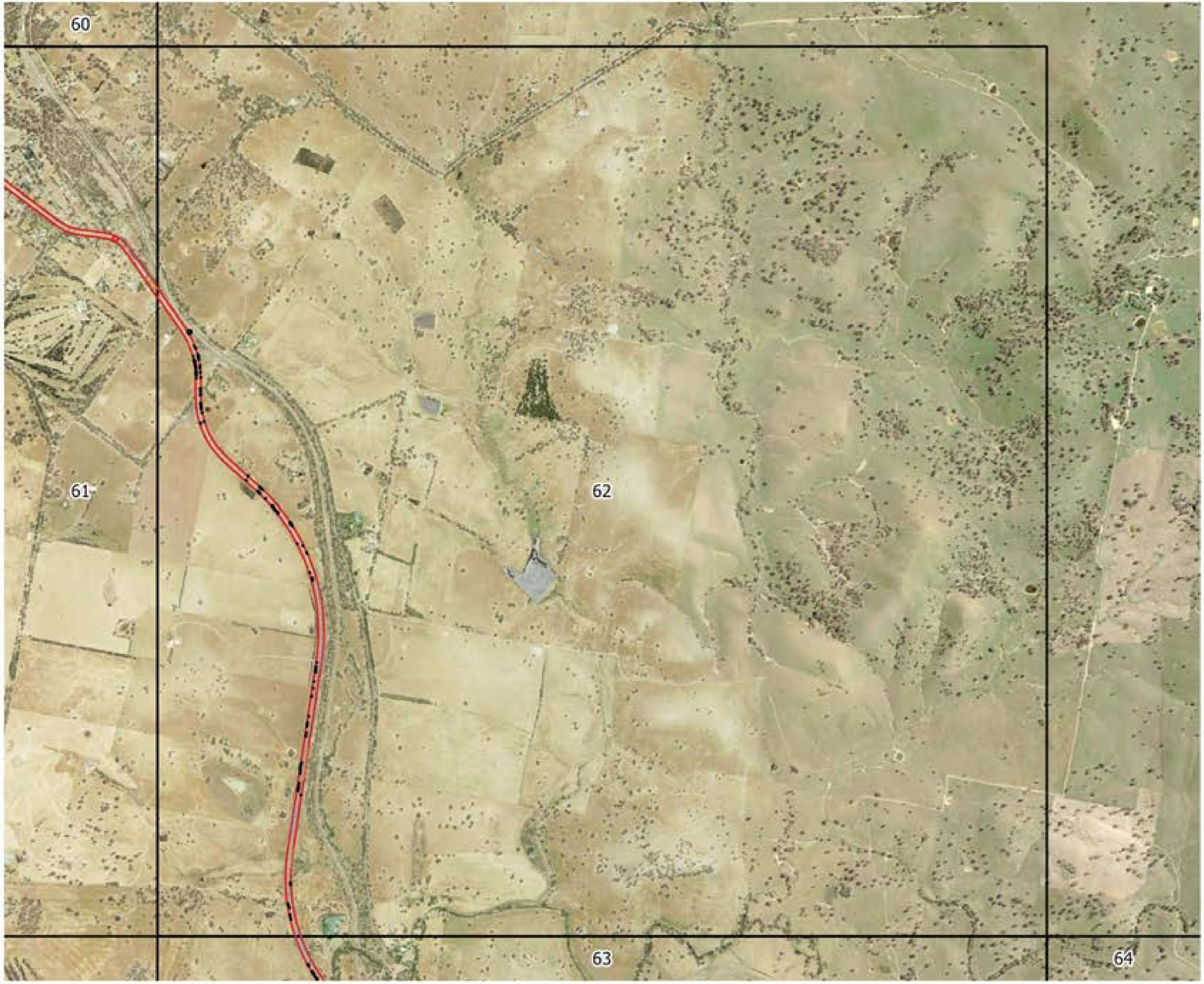

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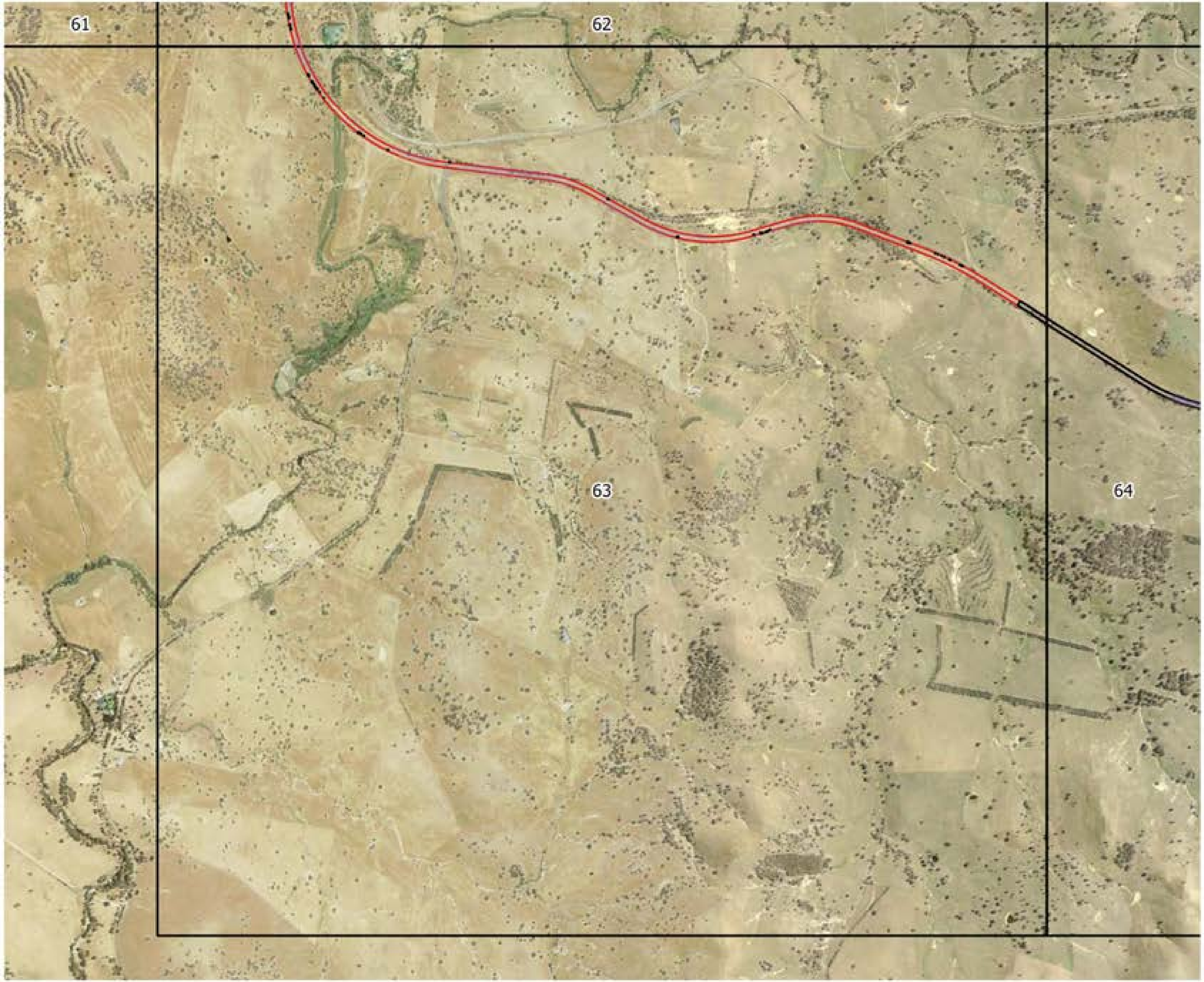

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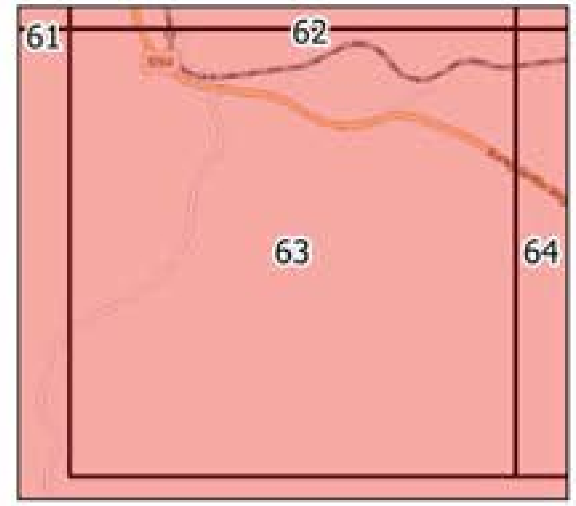

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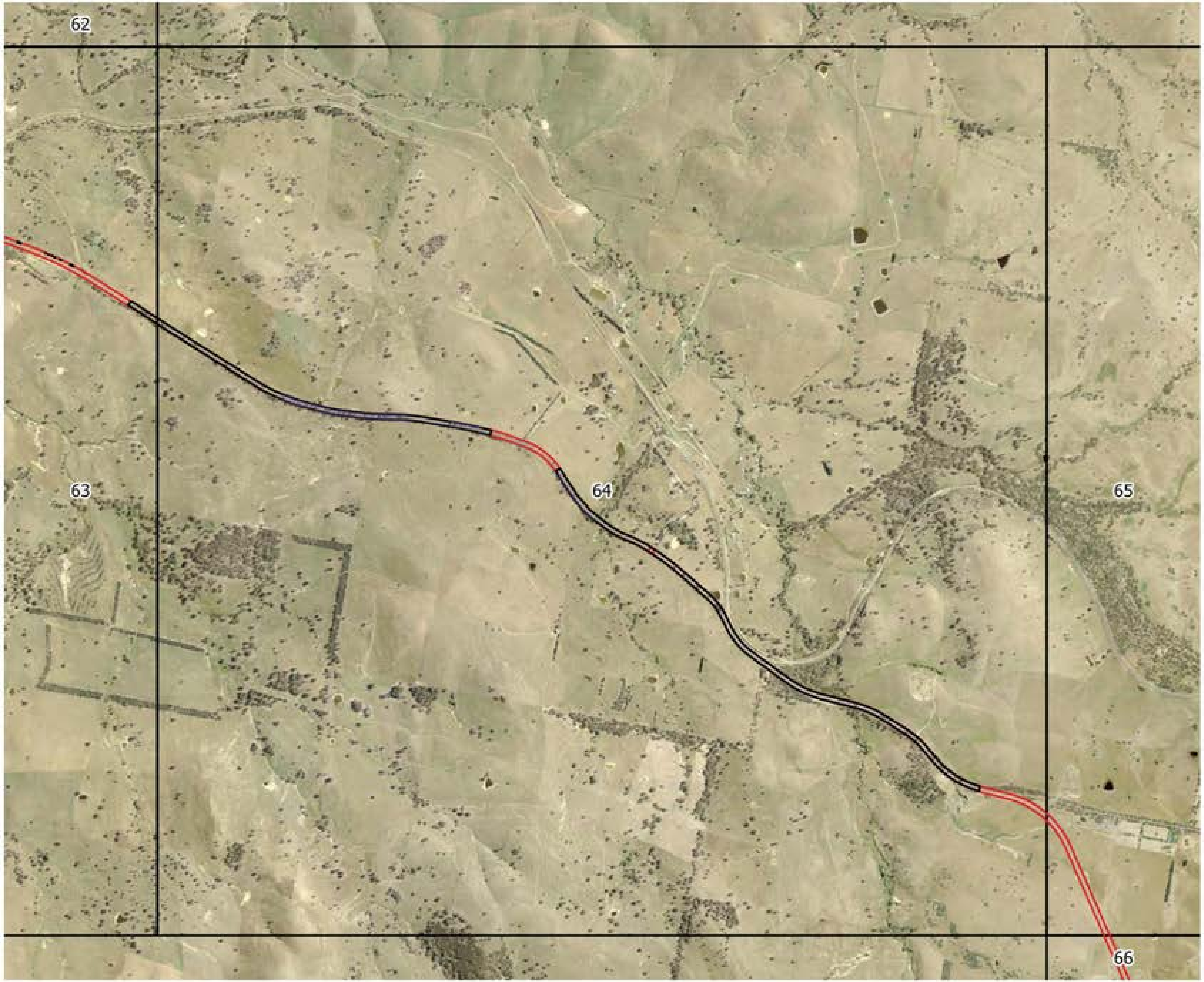

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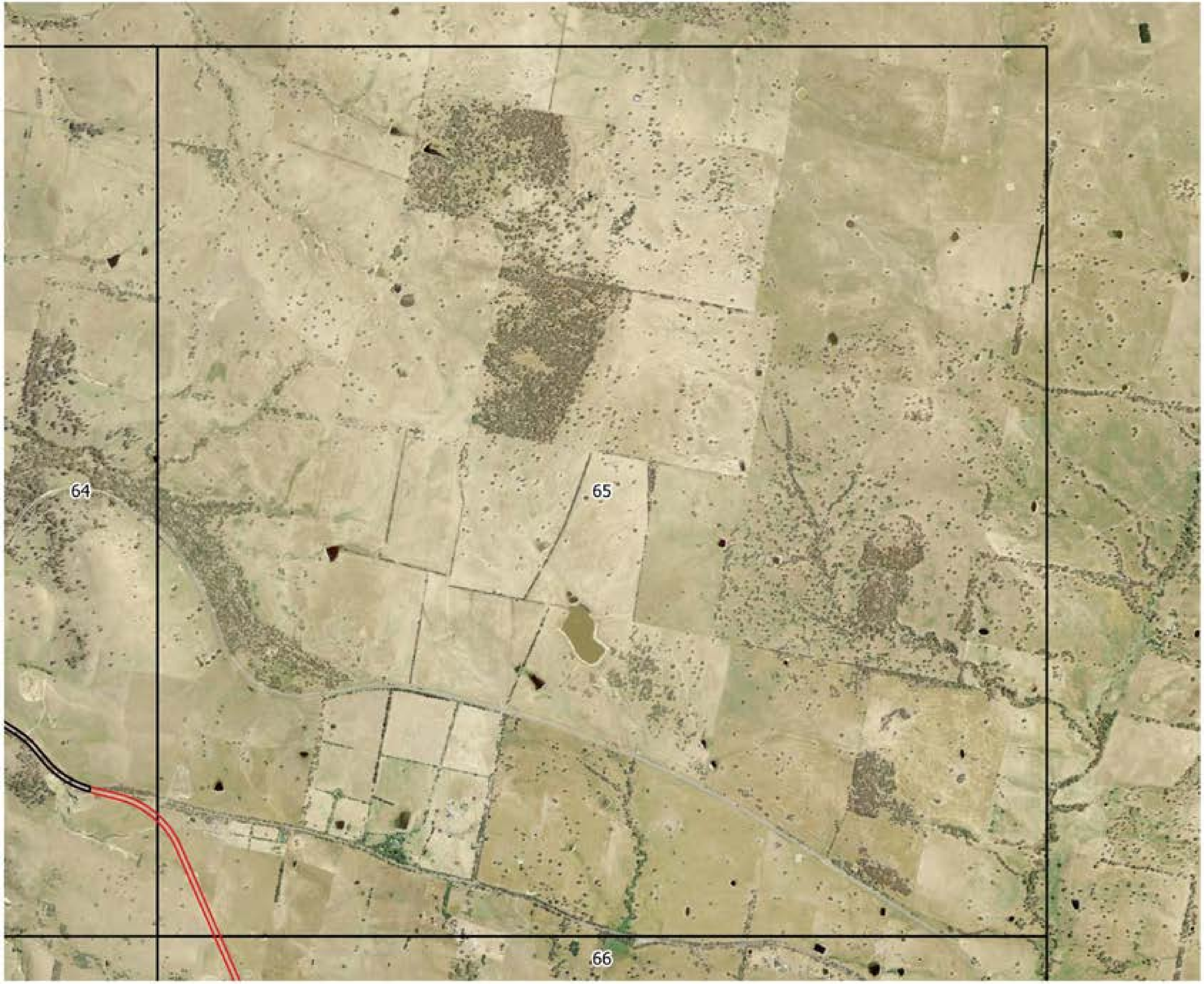

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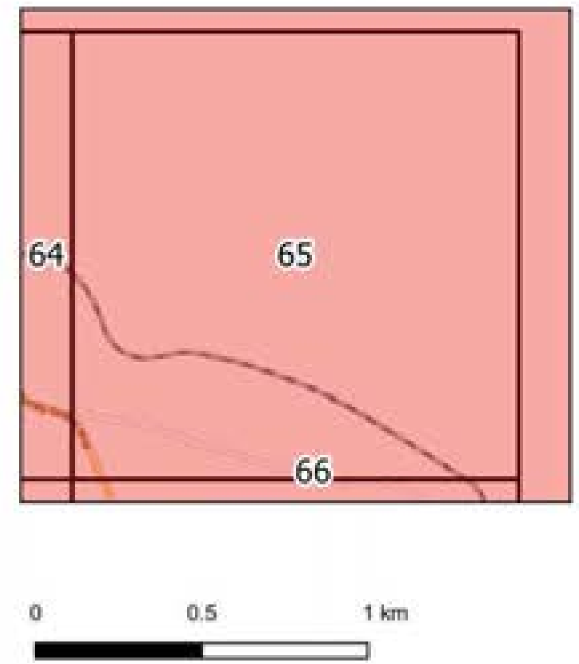
Proposal area



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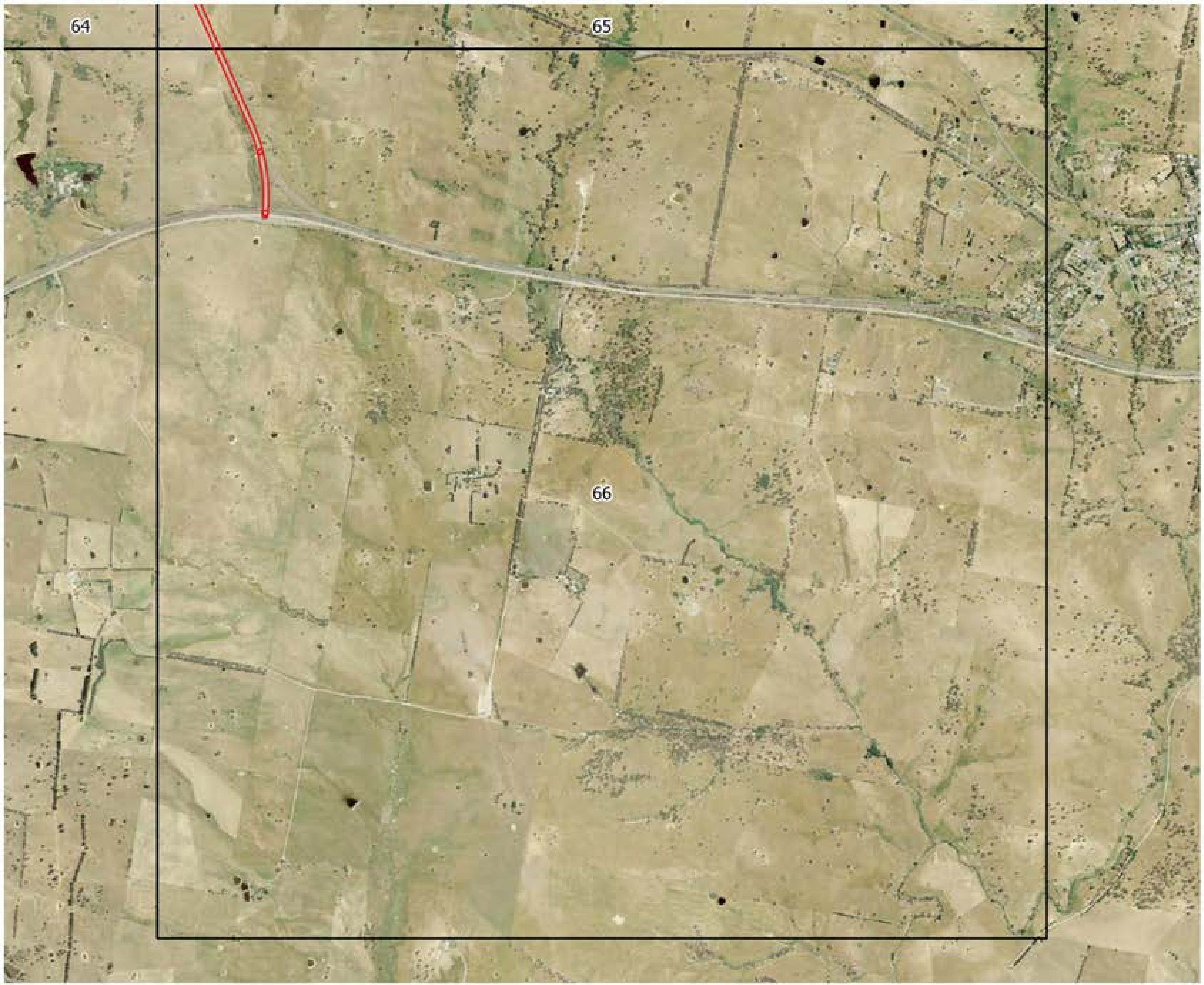

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Annexure G Hollow Bearing Trees Impacted

The 64 Hollow-bearing trees (HBT) to be removed are listed in the table overleaf. Hollows were recorded as occurring on the trunk, limb, or as a fissure. Hollows were classified into three size classes based on an estimation of entrance diameter: small (<10 cm entrance diameter), medium (>10<20 cm), and large (>20 cm). Along the proposal area, hollows may be utilised by:

- Small hollows: White-browed Treecreeper
- Medium hollows: Superb Parrot, Glossy Black-Cockatoo
- Large Hollows: Pink Cockatoo, Glossy Black-Cockatoo

Note: HBT data was collected opportunistically rather than via a targeted survey. Therefore, quantitative data such as tree details (height, diameter-at-breast-height DBH) and hollow information (entrance diameter, location) was not collected for every HBT recorded. Blank cells in the table below indicate the records for which quantitative data was not collected.

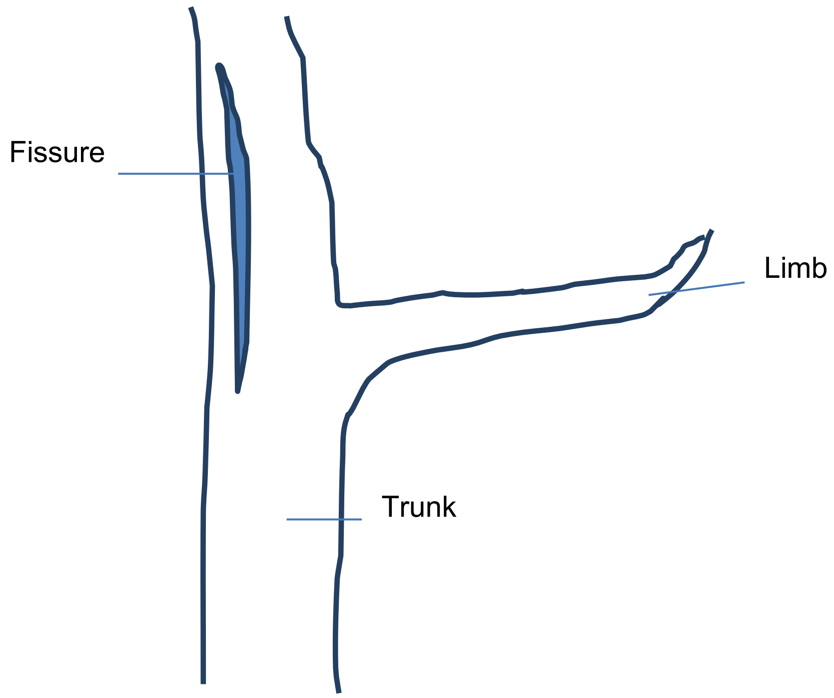

Figure 9-9-80 Locations of hollows on tree

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow			Limb Hollow			Fissure			Location Description
						S	M	L	S	M	L	S	M	L	
32	*Eucalyptus microcarpa*	545066.84	6188552.09												Approx 5 km West of Temora. East of Glynburn Rd.
36	*Eucalyptus microcarpa*	544558.28	6188655.47												Approx 5 km West of Temora. East of Glynburn Rd.
42	*Eucalyptus microcarpa*	544077.20	6188707.77												Approx 5 km West of Temora. East of Glynburn Rd.
155	*Eucalyptus microcarpa*	536265.41	6189952.18												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
160	*Eucalyptus microcarpa*	535829.50	6190017.81												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
161	*Eucalyptus microcarpa*	535789.45	6190025.73												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
165	*Eucalyptus microcarpa*	535655.80	6190044.35												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
168	*Eucalyptus microcarpa*	535576.64	6190056.46												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
174	*Eucalyptus microcarpa*	535435.20	6190080.96												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
175	*Eucalyptus microcarpa*	535418.38	6190081.95												Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow	Limb Hollow	Fissure		Location Description
176	*Eucalyptus microcarpa*	535399.25	6190083.27							Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
207	*Eucalyptus microcarpa*	534011.29	6190303.84							Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
208	*Eucalyptus microcarpa*	533997.78	6190309.21							Approx 14km West of Temora. Between Old Wagga South Rd and Tara-Bectric Rd turnoffs.
244	*Eucalyptus microcarpa*	532186.21	6191873.11							Approx 18km west of Temora. Near Olivers Road.
245	*Eucalyptus microcarpa*	532046.62	6191916.69							Approx 18km west of Temora. Near Olivers Road.
255	*Eucalyptus microcarpa*	531421.30	6191999.66							Approx 18km west of Temora. Near Olivers Road.
256	*Eucalyptus microcarpa*	531381.21	6192002.70							Approx 18km west of Temora. Near Olivers Road.
257	*Eucalyptus microcarpa*	531367.24	6192031.85							Approx 18km west of Temora. Near Olivers Road.
269	*Eucalyptus melliodora*	555186.25	6187587.38	22	60	1	2			Approx 6 km East of Temora. Within 1 km East of Bakers Rd.
270	*Eucalyptus melliodora*	555203.34	6187586.98	25	80		3			Approx 6 km East of Temora. Within 1 km East of Bakers Rd.
348	*Eucalyptus melliodora*	554693.28	6187606.16							Approx 6 km East of Temora. Within 1 km East of Bakers Rd.
521	*Eucalyptus blakelyi*	658165.45	6154700.48	25	0.9	1				Approx 5 km NW of the Hume Highway turnoff.
523	Stag	659911.76	6153497.56	8	0.3			1	1	Approx 2.5 km NW of the Hume Highway turnoff.

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow	Limb Hollow	Fissure	Location Description
530	Stag	646652.20	6163947.90	12		1			Approx 7.5 km SE of Limestone Way, Galong turnoff.
542	*Eucalyptus albens*	642710.84	6166719.23	15			1		Approx 2.5 km SE of Limestone Way, Galong turnoff.
543	Stag	642677.68	6166734.16	8			1		Approx 2.5 km SE of Limestone Way, Galong turnoff.
546	*Eucalyptus albens*	640865.65	6167395.53			1			Approx 500 m SE of Limestone Way, Galong turnoff.
547	Stag	640696.84	6167634.74			1			Approx 500 m SE of Limestone Way, Galong turnoff.
549	*Eucalyptus albens*	639408.71	6169020.31				1		Approx 1.5 km NW of Limestone Way, Galong turnoff.
550	Stag	639047.56	6169178.61			3			Approx 2 km NW of Limestone Way, Galong turnoff.
551	*Eucalyptus albens*	639012.94	6169196.45			1			Approx 2 km NW of Limestone Way, Galong turnoff.
552	Stag	639004.43	6169201.21			3			Approx 2 km NW of Limestone Way, Galong turnoff.
553	Stag	638991.80	6169207.13			1			Approx 2 km NW of Limestone Way, Galong turnoff.
554	Unknown Species	638782.75	6169303.04				1		Approx 2.5 km NW of Limestone Way, Galong turnoff.
556	*Eucalyptus albens*	638330.39	6169416.89				1		Approx 3 km NW of Limestone Way, Galong turnoff.
557	*Eucalyptus albens*	638279.43	6169427.91				1		Approx 3 km NW of Limestone Way, Galong turnoff.
563	*Eucalyptus albens*	637234.46	6169449.05			1			Approx 3.5 km NW of Limestone Way, Galong turnoff.

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow	Limb Hollow	Fissure	Location Description
565	*Eucalyptus blakelyi*	636317.26	6169468.35				1		Approx 4.5 km NW of Limestone Way, Galong turnoff.
567	*Eucalyptus blakelyi*	634512.68	6170405.31			1			Approx 4 km East of McMahons Reed Rd, Cunningar turnoff.
569	*Eucalyptus blakelyi*	633676.33	6171520.06				1		Approx 3 km East of McMahons Reed Rd, Cunningar turnoff.
574	Unknown Species	633017.20	6172189.95				2		Approx 2 km East of McMahons Reed Rd, Cunningar turnoff.
582	Unknown Species	616400.07	6177156.18				3		Approx 8 km West of Murrumburrah. 600 m East of Newington Rd
583	Stag	616333.59	6177141.86				2		Approx 8 km West of Murrumburrah. 600 m East of Newington Rd
587	Stag	613686.25	6177703.73			1			Approx 8 km East of Wallendbeen. Opposite Strathdoon Rd.
589	Stag	613118.71	6177841.18				2		Approx 7 km East of Wallendbeen. 500 m West of Strathdoon Rd.
590	*Eucalyptus melliodora*	612007.71	6178251.91			1			Approx 5 km East of Wallendbeen. Within 1 km East of Nubba South Rd.
591	*Eucalyptus blakelyi*	611969.45	6178264.74			1			Approx 5 km East of Wallendbeen. Within 1 km East of Nubba South Rd.
592	*Eucalyptus melliodora*	611445.78	6178461.97				1		Approx 5 km East of Wallendbeen. Within 1 km East of Nubba South Rd.

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow	Limb Hollow	Fissure	Location Description
593	Stag	611163.74	6178632.90				1		Approx 5 km East of Wallendbeen. Within 1 km East of Nubba South Rd.
596	*Eucalyptus albens*	608445.91	6178954.55			1			Approx 2 km East of Wallendbeen.
603	*Eucalyptus albens*	640221.30	6168614.27	15			1		Approx 500 m NW of Limestone Way, Galong turnoff.
608	*Eucalyptus microcarpa*	553398.08	6187754.55				2		Approx 5 km East of Temora. West of Bakers Rd.
612	*Eucalyptus microcarpa*	553853.95	6187707.76			1			Approx 5 km East of Temora. West of Bakers Rd.
613	*Eucalyptus microcarpa*	553877.07	6187703.83				1		Approx 5 km East of Temora. West of Bakers Rd.
614	Stag	553956.91	6187702.06					2	Approx 5 km East of Temora. West of Bakers Rd.
616	*Eucalyptus microcarpa*	554133.10	6187680.69			1			Approx 5 km East of Temora. West of Bakers Rd.
620	*Eucalyptus microcarpa*	554298.31	6187646.10			1			Approx 5 km East of Temora. West of Bakers Rd.
625	*Eucalyptus microcarpa*	553535.49	6187737.42	20	0.6	1			Approx 5 km East of Temora. West of Bakers Rd.
653	*Eucalyptus albens*	600075.09	6180824.75			1			Approx 3 km East of Berthong Rd, Jindalee National Park.
659	Stag	597609.27	6180590.96			1			Approx 1 km East of Berthong Rd, Jindalee National Park.
660	*Eucalyptus albens*	597381.98	6180673.66				1		Approx 1 km East of Berthong Rd, Jindalee National Park.

HBT ID	Species	Easting	Northing	Height	DBH	Trunk Hollow	Limb Hollow	Fissure	Location Description
678	Stag	577158.66	6182319.81			1			Approx 3.5 km West of Stockinbingal. Directly West of Cliffords Lane.
754	*Eucalyptus microcarpa*	558682.35	6187231.41				2-3		Approx 9 km East of Temora. Directly East of Fishers Rd.
7	*Eucalyptus microcarpa*	543336.91	6188824.44	20	15	1			Approx 5 km West of Temora. East of Glynburn Rd.

Appendix E Aboriginal Archaeological Baseline Report (AABR)

Aboriginal Archaeological Baseline Report

Burley Griffin Way Road (MR84) Safety Improvements

May 2023

Project Number: 21-251

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Document verification

Project Title:	Burley Griffin Way Road (MR84) Safety Improvements
Project Number:	21-251
Project File Name:	21-251 PACHCI Stage 1 – Aboriginal Archaeological Baseline Report – Burley Griffin Way Road Safety Improvements_Final v1.0

Revision	Date	Prepared by	Reviewed by	Approved by
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Final v 1.0	8/05/2023	Jorge Fuenzalida Miralles	Minor comment TfNSW and Kirsten Bradley	Kirsten Bradley

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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 466 Tugun QLD 4224)
T. (07) 3129 7633

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

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

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

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

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Acronyms and Abbreviations

AABR	Aboriginal Archaeological Baseline Assessment
ACT	Australian Capital Territory
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
DEM	Digital Elevation Model
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
Ha	Hectare
Heritage Act	*Heritage Act 1977* (NSW)
HW2	Hume Highway
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometres
LGA	Local Government Area
m	metres
MR84	Burley Griffin Way
NGH	NGH Pty Ltd
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
PACHCI	Procedure for Aboriginal Cultural Heritage Consultation and Investigation
PAD	Potential Archaeological Deposit
PCT	Plant Community Type
RAP	Registered Aboriginal Party
SHI	State Heritage Inventory
SHR	State Heritage Register
TfNSW	Transport for New South Wales
Type 1 works	Type 1 works refer to those works which are expected to have an overall low impact to Aboriginal heritage due to their taking place within the already heavily modified/disturbed road corridor. Type 1 works are routine maintenance activities for which there are approvals under the T&ISEPP. These works are exempt activities in line with Clause 2.113 of the T&ISEPP.
Type 2 works	Type 2 works may require ground disturbance, including the use of heavy machinery, removal of existing native vegetation, and earth works, associated with the existing roadway.

Executive Summary

Introduction

NGH Pty Ltd has been contracted by Transport for New South Wales (TfNSW) to undertake an Aboriginal Archaeological Baseline Report as part of Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) to investigate the Aboriginal heritage constraints associated with the proposed Burley Griffin Way Road Safety Review Safety Improvements Project. The project area is located across eight Local Government Areas (LGAs) in New South Wales (NSW). These are – from east to west – the Yass Valley, Hilltops, Cootamundra-Gundagai, Temora, Coolamon, Narrandera, Carrathool, and Griffith LGAs.

Burley Griffin Way is a two-lane flexible pavement that provides an important link for the Northern and Western Riverina connecting Griffith to Yass via the Hume Highway. The corridor is 258 km long and extends from the Hume Highway south of Bowning, via Binalong, Harden, Wallendbeen, Temora and Ariah Park to the Newell Highway near Mirrool. Then from the Newell Highway near Ardlethan via Barellan and Yenda to Irrigation Way at Yoogali, east of Griffith.

A 2019 route safety review of Burley Griffin Way by TfNSW and the Centre for Road Safety identified a number of opportunities to improve safety for road users. The route safety review identified road safety projects for funding between 2018 and 2023 as part of the Saving Lives on Country Roads program. This program funds safety improvements to standardised road cross-section along routes. The program will improve road safety along routes through mass-action upgrades such as audio tactile line marking, safety barrier installation, shoulder widening and median separation.

Project Proposal

TfNSW proposes to undertake safety upgrades along 258 km of the Burley Griffin Way as identified by a TfNSW Routine Safety Review. Key feature of the project include:

- Road edge repair (Type PV1) at various locations
- Road widening (Type PV2) at various locations up to 10 m from the existing carriageway edge line
- Road signage upgrade
- Install new audio tactile line-marking
- Reinstate line marking and raised pavement markers on completion
- Reinstatement of a hazard free roadside where possible by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of safety barrier where hazard free clear zones cannot be achieved provided (wire ropes and guardrails)
- Relocate utilities, if required
- Provide a 10 mm primer seal followed by a 7 mm final seal at the road widenings
- Establish 5 m clear zones where possible
- Tree removal and vegetation maintenance
- Beneficial re-use of surplus material from other road projects located nearby
- All works are to be undertaken in accordance with the relevant TfNSW specifications.

Aboriginal Community Consultation

In line with the *Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)* guidelines the Local Aboriginal Land Councils (LALC) who represent the areas in which the project area passes through were contacted for consultation. The project area passes through five LALCs which include Onerwal, Young, Narrandera, Leeton & District, and Griffith. All five LALCs were contacted during this assessment. Onerwal, Young, Leeton & District, and Griffith provided responses.

After the initial background research and sensitivity mapping was completed, NGH provided each of the four LALCs who engaged in consultation for this project with copies of the sensitivity mapping within their areas for their review. Digital meetings were organised between TfNSW, NGH, and each of the LALCs to discuss the proposed works for the project, the sensitivity mapping and provided an opportunity to raise any further concerns.

Summary of the Cultural Heritage Constraints Mapping

The desktop level assessment of the proposed works to the Burley Griffin Way road corridor clearly show that there are areas present that contain high sensitivity for Aboriginal sites and/or archaeological deposits. This has been determined based on the assessment of the general environmental context of the project area as well as its ethnographic and archaeological record. The criteria used for disturbed, low, moderate, and high sensitivity landforms is as follows:

- **High** – an area that is highly likely to contain Aboriginal objects and subsurface deposits due to the landforms present within the area, its position within the landscape, and proximity to resource areas such as waterways.
- **Medium** – an area that has a moderate potential to contain Aboriginal objects and subsurface deposits due to the landforms present within the area.
- **Low** – an area that has a low potential to contain Aboriginal objects and subsurface deposits. These areas are usually comprised of vast flats and floodplains, or areas with significant slopes. While they are less likely to contain Aboriginal objects, it is still possible for them to be encountered in these areas, albeit in reduced densities or as isolated finds.
- **Disturbed** – a separate category was added to reflect the nature of areas where disturbance has taken place. While the activities that caused this disturbance may have reduced the archaeological sensitivity of the area, it is still possible to find durable Aboriginal objects, such as stone artefacts, in these areas. However, any Aboriginal objects found in disturbed areas is unlikely to retain any significant scientific value.

While the cultural heritage constraints mapping developed for the purposes of this assessment is an indicative, desktop based view of the archaeological sensitivity of the project area, it does permit some general observations to be made about the potential for Aboriginal objects to occur along the corridor for Burley Griffin Way. In general, the entire road corridor (10 m each side from the centreline of the road) and any portions of the project area within towns are considered to be disturbed and therefore present a negligible potential for Aboriginal objects to be present. The project area east of Temora is considered to be of a higher sensitivity than those to the west due to the presence of multiple definable archaeologically sensitive landforms (i.e., waterways, spurs, elevated flats) in comparison to the expansive relatively flat plains in the west (which have far fewer definable archaeologically sensitive topographical features). It should however be noted that the western section of the project area is considered to have a higher potential for the presence of modified trees as a site type due to the presence of native vegetation that hugs the road corridor.

This modelling was used to identify disturbed areas and areas of low sensitivity that limit the need for further investigation. However, further assessment for the Burley Griffin Way Safety Improvements project is required where it cannot be determined that the proposed works will not impact on Aboriginal heritage.

The cultural heritage constraints mapping developed by NGH for this project should be used by TfNSW in conjunction with the finalised designs for the proposed works to determine where further assessment is required in line with the PACHCI procedure.

Recommendations

In line with the PACHCI guidelines, a Stage 2 assessment for the Burley Griffin Way Safety Improvements project is required where it cannot be determined that the proposed works will not impact on Aboriginal heritage.

Due to the nature and variety of the works proposed as a part of this project, and due to the fact that the design had not been finalised, the recommendations are split between the works described as Type 1 and Type 2 works.

The recommendations are as follows:

1. Where any known AHIMS sites will be impacted by either Type 1 or Type 2 works, further assessment to determine the need for an Aboriginal Heritage Impact Permit (AHIP) is required.
2. The removal of any old growth native trees requires further assessment in line with the PACHCI.
3. Type 1 works may proceed with caution (assuming there is no conflict with the above two recommendations).
4. Where Type 2 works are required, further assessment in line with the PACHCI guidelines is necessary to assess the potential for the proposed works to impact on both recorded and un-recorded Aboriginal heritage within the project area.
    a. The cultural heritage constraints mapping prepared for this assessment should be used by TfNSW to inform where further assessment may be required considering the finalised design plans for the proposed works.
5. Members of the Aboriginal community should continue to be engaged and consulted about the project and the potential for Aboriginal heritage impacts. They should also be provided an opportunity to assist in a formal survey of the project area as part of any Stage 2 assessment.

1. Introduction

NGH Pty Ltd (NGH) has been contracted by Transport for New South Wales (TfNSW) to undertake an Aboriginal Archaeological Baseline Report (AABR) as part of Stage 1 of the Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) to investigate and examine the presence, extent and nature of any Aboriginal heritage sites within the proposed Burley Griffin Way (MR84) Road Safety Review Safety Improvements Project (see Figure 1-1). The project area is located across a total of eight Local Government Areas (LGAs) across central New South Wales (NSW). These are, from east to west, the Yass Valley, Hilltops, Cootamundra-Gundagai, Temora, Coolamon, Narrandera, Carrathool, and Griffith LGAs.

Burley Griffin Way is a two-lane flexible pavement that provides an important link for Northern and Western Riverina connecting Griffith to Yass and Sydney via the Hume Highway. The corridor is 258 km long and extends from the Hume Highway (HW2) south of Bowning, via Binalong, Harden, Wallendbeen, Temora and Ariah Park to the Newell Highway near Mirrool, then from the Newell Highway near Ardlethan via Barellan and Yenda to Irrigation Way at Yoogali, east of Griffith.

A 2019 route safety review of Burley Griffin Way by TfNSW and the Centre for Road Safety identified a number of opportunities to improve safety for road users. The route safety review identified road safety projects for road safety funding between 2018 and 2023 as part of the Saving Lives on Country Roads program. This program funds safety improvements to standardised road cross-section along routes. The program will improve road safety along routes through mass-action upgrades such as audio tactile line marking, safety barrier installation, shoulder widening and median separation.

1.1 Statutory context

In NSW, Aboriginal heritage is principally protected by two legislative acts:

- *The National* Parks and Wildlife Act 1974 (NPW Act); and
- The Environme*ntal Planning and Assessment Act 1979* (EP&A Act).

The aim of the NPW Act includes:

> *The conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to places, objects and features of significance to Aboriginal people.*

An Aboriginal object is defined as:

> *Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with the occupation of that area by persons on non-Aboriginal extraction and includes Aboriginal remains.*

Part 6 of the NPW Act concerns Aboriginal objects and places and various sections describe the offences, defences and requirements to harm an Aboriginal object or place. All Aboriginal material receives blanket protection under the NPW Act of NSW. The main offences under section 86 of the NPW Act are:

- A person must not harm or desecrate an object that the person knows is an Aboriginal object.
- A person must not harm an Aboriginal object.

- For the purposes of this section, "circumstances of aggravation" are:
  - that the offence was committed in the course of carrying out a commercial activity, or
  - that the offence was the second or subsequent occasion on which the offender was convicted of an offence under this section.
- A person must not harm or desecrate an Aboriginal place.

Under section 87 of the NPW Act, there are specified defences to prosecution including authorisation to harm in accordance with an Aboriginal Heritage Impact Permit (AHIP) or through exercising due diligence or compliance through the regulation.

Section 89A of the Act also requires that a person who is aware of an Aboriginal object must notify the Director-General in a prescribed manner. In effect this section requires the completion of an AHIMS site card for all sites located during heritage surveys.

Section 90 of the NPW Act deals with the issuing of an AHIP, including that the permit may be subject to certain conditions.

The strict liability offence of harming Aboriginal objects has a number of defences and include the statutory defence of due diligence through complying with an adopted industry code of practise, or compliance with the conditions of an AHIP.

The EP&A Act is legislation for the management of development in NSW. It sets up a planning structure that requires developers (individuals or companies) to consider the environmental impacts of new proposals. Under this Act, cultural heritage is a part of the environment. It provides for the identification, protection, and management of heritage items through the inclusion of these items into schedules of planning instruments, such as Local Environmental Plans (LEPs) or Regional Environmental Plans. This Act requires that Aboriginal cultural heritage and the possible impacts to Aboriginal heritage that development may have formally considered in land-use planning and development approval processes.

1.2 Objectives of assessment

This assessment has been undertaken as part of Stage 1 of the PACHCI. The PACHCI outlines four stages for the assessment of Aboriginal cultural heritage. The different stages of the PACHCI assessment determine if the next stage of assessment is required. As the proposed Burley Griffin Way safety improvements would involve ground disturbance there is potential to impact on Aboriginal heritage sites and objects, which are protected under the NPW Act.

The purpose of this AABR is to provide a general desktop overview of known and potential Aboriginal objects and places within the study area. It provides background information to determine if Aboriginal objects, sites and places could be avoided or affected by the project and to determine if further assessment is required under Stage 2 of the PACHCI.

The objectives of the assessment were to:

- Conduct consultation with the appropriate Aboriginal stakeholders identified by TfNSW for this project in accordance with the PACHCI guidelines and document the community consultation within the AABR;
- Undertake an AABR of the study area in accordance with requirements 1 to 4 of OEH's Code of practice for archaeological investigations in NSW incorporating the landscape context, historical research and previous archaeological work undertaken to summarise what is known about the local and regional character of Aboriginal land use and material

traces and to predict the nature and distribution of Aboriginal cultural heritage within the project area and map the Aboriginal cultural constraints within the project area.

- Map cultural constraints on a plan of the project corridor showing the location of known archaeological objects and places, and cultural values identified by Aboriginal stakeholders. The map should address areas of nil, low, moderate and high archaeological sensitivity based on an archaeological predictive model.

1.3 Report format

This AABR report was prepared in accordance with the following guidelines:

- *TfNSW Procedure for Aboriginal Cultural Heritage Consultation and Investigation* (Roads and Maritime Services 2011); and
- *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW* (OEH 2010a).

This report is structured in accordance with the outline provided under Requirement 11 in the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* as relevant to comply with Requirements 1 to 4. The report includes the following components:

Section 1 – Introduction, Legislation and contributors

Section 2 – Details of the project proposal

Section 3 – Landscape context

Section 4 – Details of previous archaeological studies and site models, Summary of contextual information and Site prediction model

Section 5 – Aboriginal community consultation

Section 6 – Recommendations

The report also contains three sets of detailed maps produced using the Atlas function in QGIS. Each set contains a total of 26 maps produced at a 10 km scale and each set provides a visual representation of their respective aspect of the assessment provided in this report. Due to the size of the three map sets, they are provided in the appendix as follows:

- Appendix A – Topographical Mapping
- Appendix B – Detailed AHIMS Sites within 1km
- Appendix C - Desktop Sensitivity Mapping

The locational context for the 26 grids used to produce each map set along the Burley Griffin Way corridor is provided in Figure 1-2 and Figure 1-3 below. The location of these grids is identical for each of the three map sets.

1.4 Investigation contributors

This report was completed by Jorge Fuenzalida Miralles (NGH Heritage Consultant - BA Hons Anthropology with 4 years' experience*)* who conducted research, GIS mapping, and report preparation. Doctor Giles Hamm (*NGH Aboriginal Heritage Technical Lead* – Doctor of Philosophy (Archaeology) with 30 years' experience) assisted with research, consultation, and report preparation, while Doctor Tessa Bryant (*NGH Senior Heritage Consultant* - Doctor of Philosophy (Archaeology) with 8 years' experience) and Kirsten Bradley *(NGH Principal Heritage Consultant -* BA Hons Archaeology with 15 years' experience) reviewed the report and Matthew Barber (NGH General Manager- Heritage with 30 years' experience reviewed the report for quality assurance purposes.

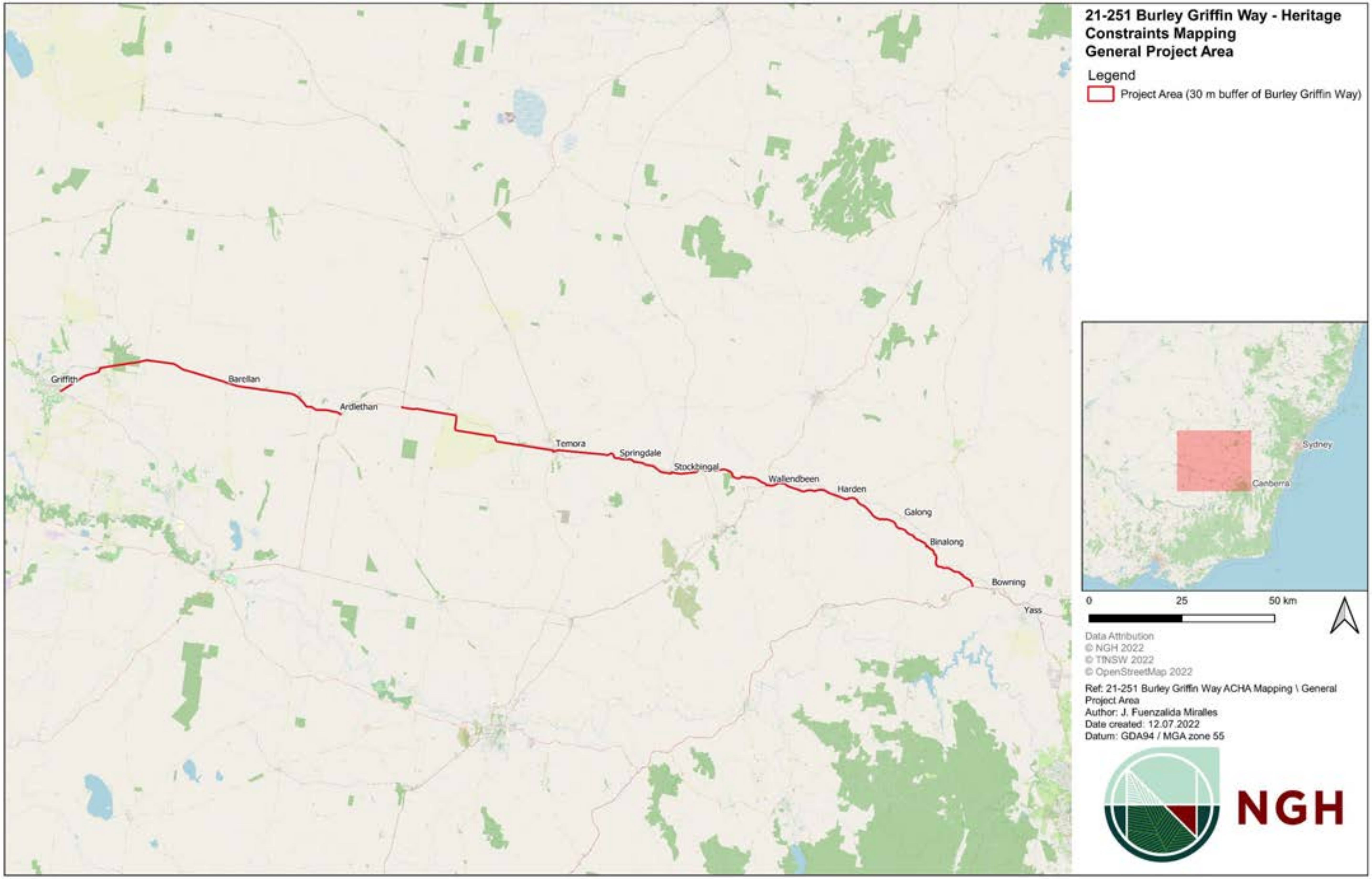

Figure 1-1 Location of the project area.

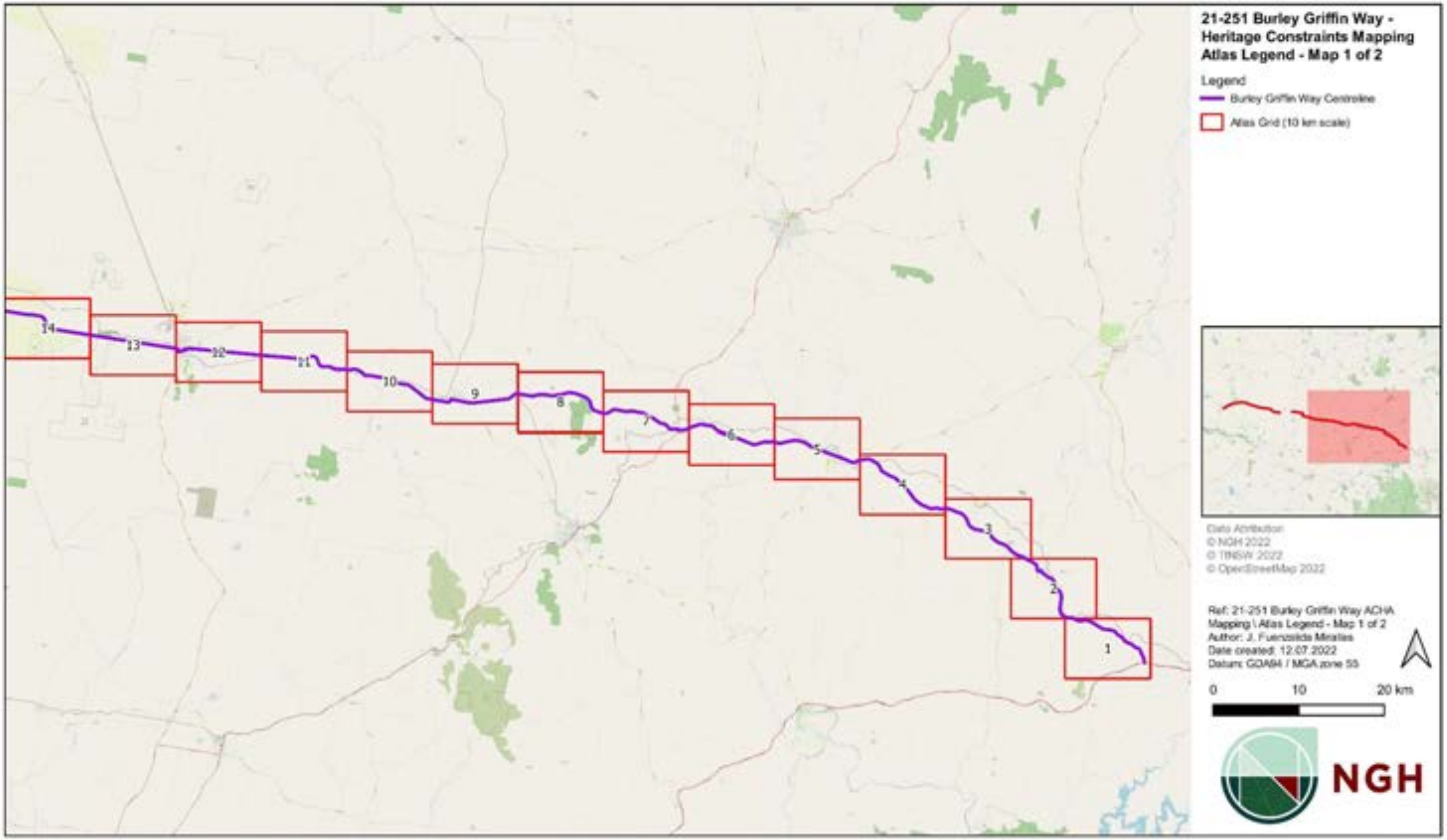

Figure 1-2 Key for maps produced using an Atlas. Map 1 of 2.

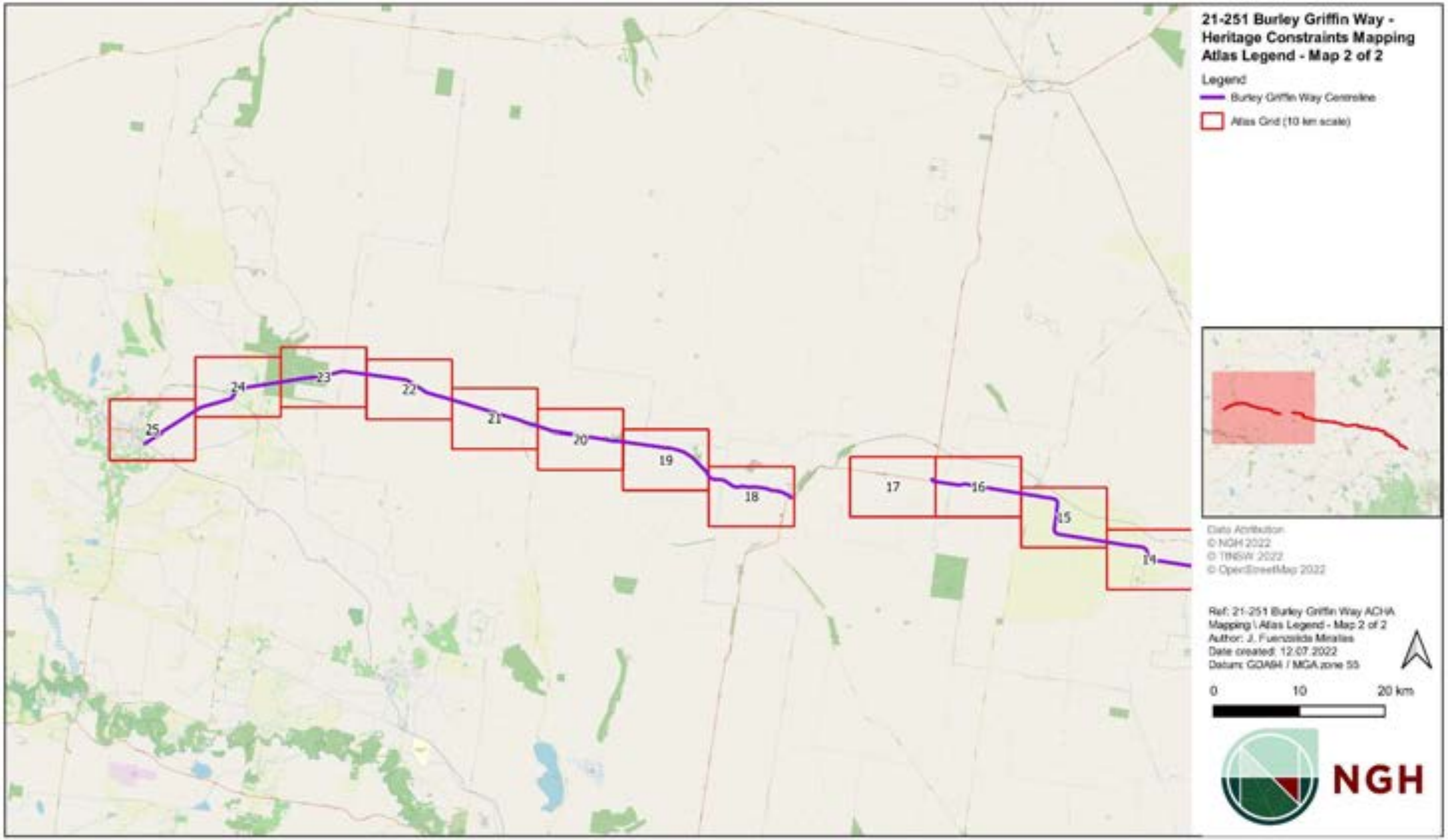

Figure 1-3 Key for maps produced using an Atlas. Map 2 of 2.

2. Description of the area

2.1 Project location and description of works

The project area is located across a total of eight LGAs across central NSW. These are, from east to west, the Yass Valley, Hilltops, Cootamundra-Gundagai, Temora, Coolamon, Narrandera, Carrathool, and Griffith LGAs. The project area LGAs are shown in Figure 2-1 to Figure 2-3 below.

Transport for NSW proposes to undertake road safety upgrades along sections of the Burley Griffin Way. Upgrades include key roadside infrastructure and line marking safety improvements to improve road user safety. This assessment is based on preliminary designs only, with an estimation of impacts based on the current estimated development footprint.

Key features of the assessed proposal include:

- Road edge repair (Type PV1) at various locations
- Road widening (Type PV2) at various locations up to 10m from existing carriageway edge line
- Road signage upgrade
- Install new audio tactile line-marking
- Reinstate line marking and raised pavement markers on completion
- Reinstatement of a hazard free roadside where possible by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of safety barrier where hazard free clear zones cannot be achieved provided (wire ropes and guardrails)
- Relocate utilities, if required
- Provide a 10mm primer seal followed by a 7mm final seal at the road widenings
- Establish 5m clear zones where possible
- Tree removal and vegetation maintenance
- Beneficial re-use of surplus material from other road projects located nearby
- All works are to be undertaken in accordance with the relevant TfNSW specifications.

The proposed work would be conducted along identified sections of Burley Griffin Way with town centres excluded from proposed work. Town centres are excluded from this assessment. As this AABR is based on a preliminary design, impacts on culverts are not yet known, however they are expected to be minimal with no work in waterways. For the purposes of this assessment, the proposed works have been categorised into Type 1 and Type 2 works in relation to their expected overall impact within the project area; Table 2-1 provides the breakdown of the proposed works into Type 1 and Type 2 works.

Type 1 works refer to those works which are expected to have an overall low impact to Aboriginal heritage due to their taking place within the already heavily modified/disturbed road corridor. Type 1 works are routine maintenance activities for which there are approvals under the T&ISEPP. These works are exempt activities in line with Clause 2.113 of the T&ISEPP. The Type 2 works may require ground disturbance, including the use of heavy machinery, removal of existing native vegetation, and earth works, associated with the existing roadway. Any Aboriginal sites, whether recorded or unrecorded, could therefore be subject to harm. The first stage of the PACHCI guidelines will be followed to assess any potential threats to Aboriginal sites within the project area.

Table 2-1 General classification of Type 1 and Type 2 works.

Type 1 Works	Type 2 Works
• Road edge repair • Road signage upgrades • Installation of new audio tactile line-marking • Reinstatement of line marking and raised pavement markers • Installation of safety barrier where hazard free clear zones cannot be achieved • Relocation of utilities, if required • Provision of a 10mm primer seal followed by a 7mm final seal at the road widenings	• Road widening • Reinstatement of a hazard free roadside where possible by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping • Establish 5m clear zones where possible • Tree removal and vegetation maintenance

.

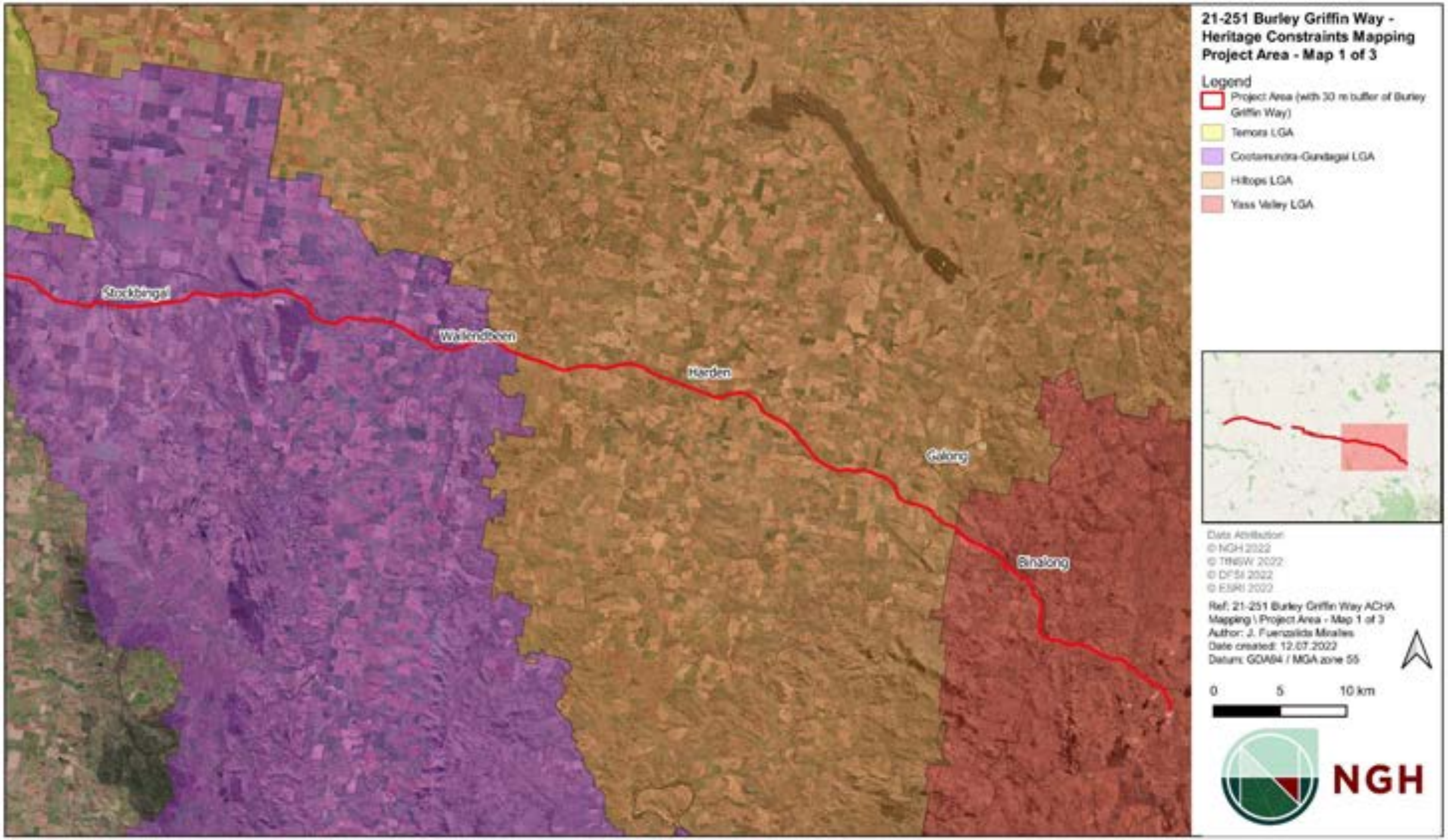

Figure 2-1 Project area with relevant LGAs within the project area. Map 1 of 3.

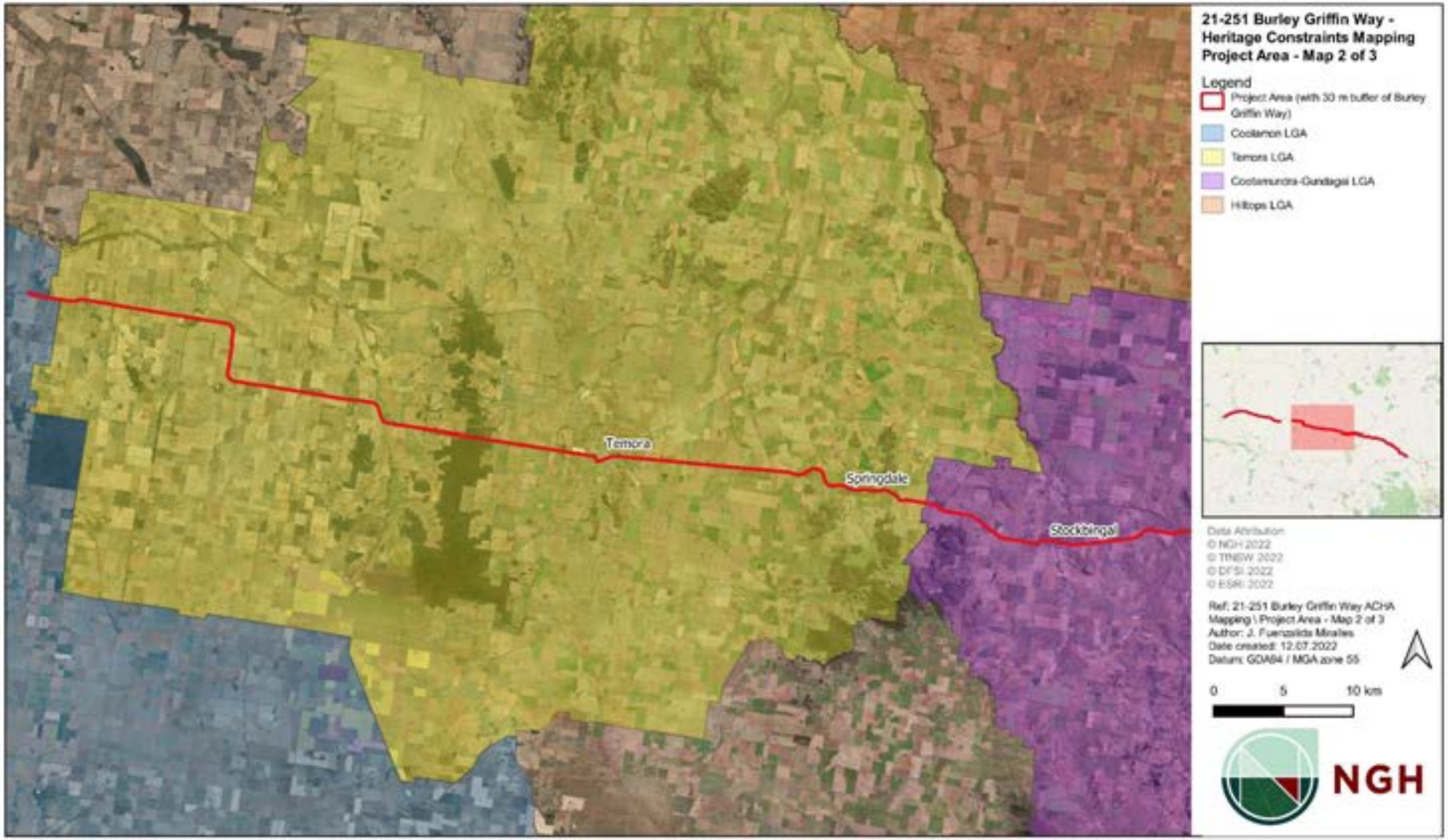

Figure 2-2 Project area with relevant LGAs within the project area. Map 2 of 3.

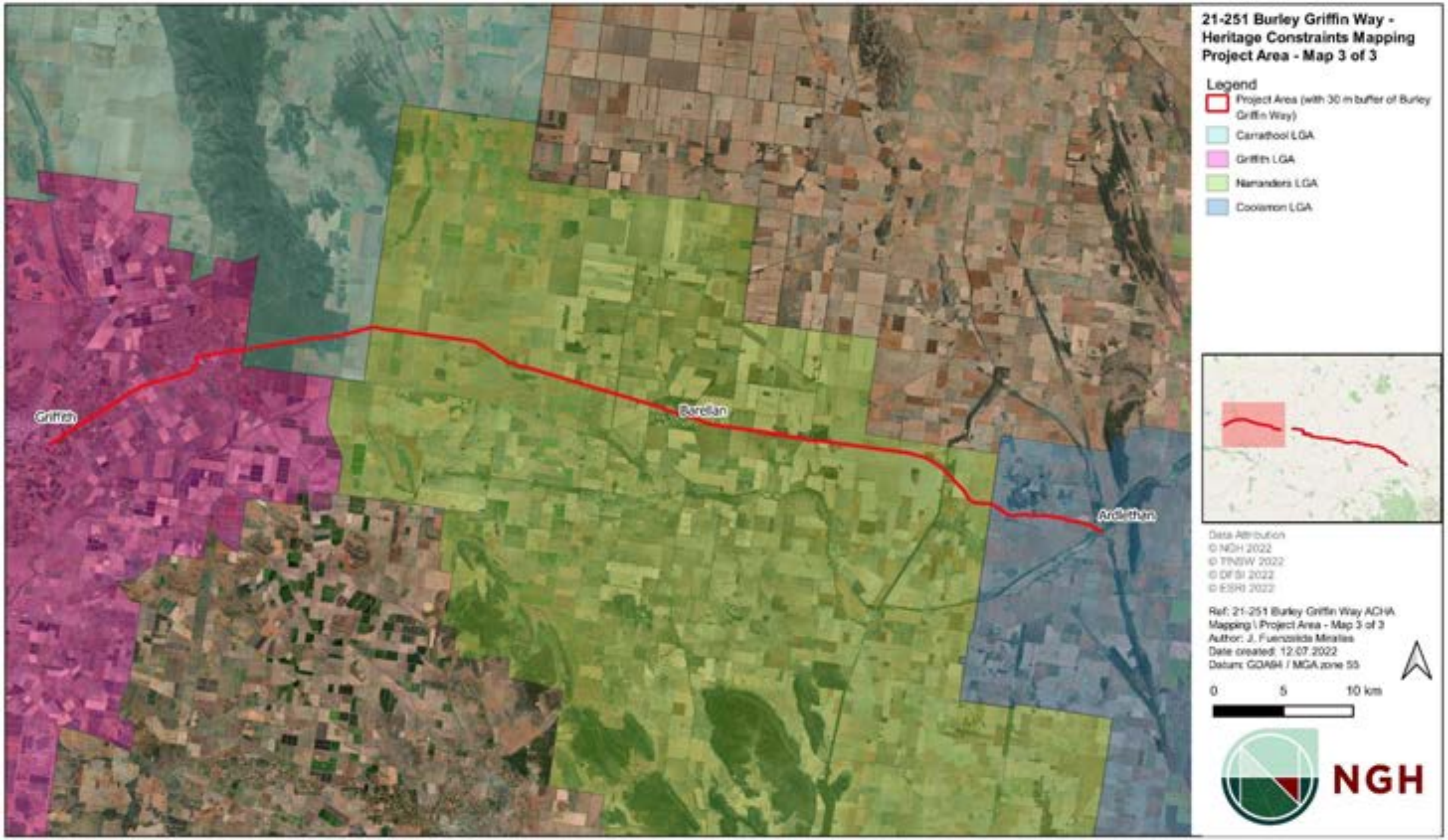

Figure 2-3 Project area with relevant LGAs within the project area. Map 3 of 3.

3. Environmental context

Understanding the landscape context of the project area assists to better understand the archaeological modelling of the area and in identifying local resources which may have been used by Aboriginal people in the past. This information can then potentially be used to predict the nature of Aboriginal occupation across the landscapes within the project area.

Factors that are typically used to inform the archaeological potential of landscapes include the presence or absence of resources that would have been used by Aboriginal people including; water, animal and plant foods, stone and other resources. The landscape context assessment for the project area is based on several classifications that have been made at national, regional, and local levels to help better understand the archaeological modelling of the area. Due to the length of the project area and scope of this assessment, only general environmental information is presented in this report. The environmental context of the project area is based on the Interim Biogeographic Regionalisation for Australia (IBRA) and Mitchell Landscape data. The combination of these differing resolutions of landform data provides a comprehensive and multi scaled understanding of the environmental context within the project area and its immediate surroundings. The project area is located within two main IBRA Bioregions and three separate IBRA Subregions shown in Table 3-1 as well as Figure 3-1 to Figure 3-2 below. The project area is located in 14 separate Mitchell Landscapes which are in

Table 3-2 as well as Figure 3-3 to Figure 3-5 below.

Table 3-1 IBRA Bioregions and Subregions within the project area.

IBRA Bioregion	IBRA Subregion
South Western Slopes	Upper Slopes
	Lower Slopes
Cobar Peneplain	Lachlan Plains

Table 3-2 Mitchell Landscapes present within the project area (DECC 2002).

Mitchell Landscape	Description
Ardlethan Hills	Rolling hills and rises on Ordovician quartzose sandstone, greywacke, chert, and phyllite, general elevation 200 to 412 m, local relief 50 to 60 m. Stony red and brown texture-contrast soils merging to calcareous red earth on valley floors. Woodlands of; bimble box (*Eucalyptus populnea*), currawang (*Acacia doratoxylon*), white cypress pine (*Callitris glaucophylla*) and red ironbark (*Eucalyptus sideroxylon*). Shrubs common including; western golden wattle (*Acacia decora*), yarran (*Acacia homalophylla*), wilga (*Geijera parviflora*) and needle wattle (*Acacia rigens*). Dense bimble box (*Eucalyptus populnea*) and black box (*Eucalyptus largiflorens*) in the valleys. Large areas white (*Eucalyptus dumosa*), green (*Eucalyptus viridis*) and red mallee (*Eucalyptus socialis*) with dwarf red ironbark, black cypress pine (*Callitris endlicheri*) and mallee

Mitchell Landscape	Description
	broombush (*Melaleuca uncinata*).
Bimbi Plains	Quaternary alluvial plains from bedrock hills and ridges of the *Gobondery/Gillenbine* and the *Belmont/Brooklyn* land systems. General elevation 200 to 250 m, local relief 30 m. Gravelly clay loams and red brown clays, red-brown texture-contrast soils on higher slopes grading to red-brown gradational and uniform profiles of clay loams and clays along creeks. Grey box (*Eucalyptus microcarpa*) and white cypress pine (*Callitris glaucophylla*) originally dominant, sparse bimble box (*Eucalyptus populnea*) along creek lines. Mostly cleared and cultivated.
Boorowa Volcanics	Undulating low hills and rocky rises on Silurian dacite, crystal tuff, andesite and minor sandstone, general elevation 550 to 650 m, with peaks to 780 m. Red and yellow gradational earths, and yellow structured loams, thin stony loams within rock outcrops. Grassy woodland of yellow box (*Eucalyptus melliodora*), grey box (*Eucalyptus microcarpa*), Blakely's red gum (*Eucalyptus blakelyii*), red stringy bark (*Eucalyptus macrorhyncha)* and occasional kurrajong (*Brachychiton populneus*).
Burgooney Plains	Burgooney Plains landscape is made up of part of the *Burgooney* land system. Extensive plains and low angle footslopes of Quaternary colluvium and alluvium, with low hills and rises of Devonian sandstones and siltstones, relief 5 to 15 m. Lithosols and calcareous red earths with moderate to dense bimble box *(Eucalyptus populnea*), currawang (*Acacia doratoxylon*), white cypress pine (*Callitris glaucophylla*), Dwyer's mallee gum *(Eucalyptus dwyeri*), red ironbark *(Eucalyptus sideroxylon*), pointed mallee *(Eucalyptus socialis*), red mallee *(Eucalyptus oleosa*), wilga (*Geijera parviflora*), sugarwood (*Myoporum platycarpum*) and grey box *(Eucalyptus microcarpa*). Dense patches of punty bush (*Senna eremophila*), wedge-leaf hopbush (*Dodonaea viscosa*) and Deane's wattle (*Acacia deanei*) with speargrass (*Austrostipa* sp.), wallaby grass (*Austrodanthonia* sp.) and annual grasses and forbs.
Cocoparra Ranges and Footslopes	Cocoparra Ranges and Footslopes landscape is made up of part of land systems: *Cocoparra* and *Naradhan.* Steep crested ranges, ridges, hills and associated footslopes of Quaternary colluvium with outcrops of upper Devonian sandstone, conglomerate and siltstones. Cliff faces to 30 m, bouldery hill slopes with overall relief to 260 m. Extensive rock outcrop, shallow sandy lithosols, acid, neutral and calcareous red earths on slopes and deep sandy alluvium in creek lines. On ranges; scattered white cypress pine (*Callitris glaucophylla*), currawang (*Acacia doratoxylon*), Dwyer's mallee gum *(Eucalyptus dwyeri*), and red ironbark *(Eucalyptus sideroxylon*); locally dense broombush (*Melaleuca uncinata*), hill tea-tree (*Leptospermum divaricatum*), urn heath (*Melichrus urceolatus*), wedge-leaf hopbush (*Dodonaea viscosa*), punty bush (*Senna eremophila*), cough bush (*Cassinia laevis*), sugarwood (*Myoporum platycarpum*), grey box *(Eucalyptus microcarpa*), wilga (*Geijera parviflora*), and Deane's wattle (*Acacia deanei*); rock fern (*Cheilanthes sieberi*), wire grass (*Aristida* sp.), mulga grass (*Thyridolepis mitchelliana*), short grasses and forbs. On lower slopes bimble box *(Eucalyptus populnea*), white cypress pine, mallees, yarran (*Acacia homalophylla*), wilga, emu bush (*Eremophila longifolia*) and various acacia with grasses and forbs.

Mitchell Landscape	Description
Frampton Hills	Rounded ranges and hills with moderate slopes on Silurian slate, jasper, chert, amphibolite, and Devonian dacite and mudstone, general elevation 400 to 720 m, local relief 100 m. Shallow stony red brown structured loam. Open forest of grey box (*Eucalyptus microcarpa*), red stringybark (*Eucalyptus macrorhyncha*), red ironbark (*Eucalyptus sideroxylon*), Blakely's red gum (*Eucalyptus blakelyii*) and black cypress pine (*Callitris endlicheri*).
Junee Hills and Slopes	Rolling hills, low ranges and undulating plain on Silurian-Devonian massive granite and granodiorite, general elevation 300 to 450 m, local relief 60 m. Coarse siliceous sands amongst rock outcrop and tors, thin gritty red and yellow texture-contrast soils on slopes with harsh blocky subsoil. Woodland of Dwyer's red gum (*Eucalyptus dwyeri*) and red ironbark (*Eucalyptus sideroxylon*) on high rocky areas. On slopes open forest of; grey box (*Eucalyptus microcarpa*), red stringybark (*Eucalyptus macrorhyncha*) with patches of black cypress pine (*Callitris endlicheri*) in rocky outcrops. River red gum (*Eucalyptus camaldulensis*) and river oak (*Casuarina cunninghamiana*) along streams.
Manitoba Hills and Footslopes	Manitoba Hills and Footslopes landscape includes parts of two land systems: *Manitoba* and *Warrowie*. Low ridges with outcrops and tors of granite with narrow, incised drainage contributing to major creeks. General elevation 200 to 310 m, local relief to 30 m. Calcareous and neutral red earths with hills of shallow loamy and sandy lithosols with abundant surface grit grading into red earths down slope. Moderate to open Dwyer's mallee gum (*Eucalyptus dwyeri*), tumbledown gum (*Eucalyptus dealbata*), white cypress pine (*Callitris glaucophylla*), red box (*Eucalyptus polyanthemos*), kurrajongs (*Brachychiton populneus*), bimble box (*Eucalyptus populnea*), scattered western golden wattle (*Acacia decora*), variable spear grass (*Stipa* spp.), and wire grass (*Aristida* spp). River red gum (*Eucalyptus camaldulensis*) and bimble box along major creeks. Also mallee (*Eucalyptus* spp.), sugarwood (*Myaporum platycarpum*), grey box (*Eucalyptus microcarpa*), yarran (*Acacia homalophylla*), Dean's wattle (*Acacia deanei*), grasses and forbs.
Marilba Range	Steep strike ridges on steep dipping Devonian rhyolite, dacite, andesite, tuff and shale, general elevation 550 to 840 m, local relief 150 m. Thin brown loams in rock outcrop grading to red-yellow harsh texture-contrast soil on the slopes. Open grey box (*Eucalyptus microcarpa*), red stringybark (*Eucalyptus macrorhyncha*), red ironbark (*Eucalyptus sideroxylon*), black cypress pine (*Callitris endlicheri*) and tumbledown gum (*Eucalyptus dealbata*). Yellow box (*Eucalyptus melliodora*) and limited river red gum (*Eucalyptus camaldulensis*) along streams.
Murrumbidgee - Tarcutta Channels and Floodplains	Channels, floodplain and terraces of Murrumbidgee tributaries on Quaternary alluvium, general elevation 200 to 400 m, local relief 25 m. Undifferentiated organic sand and loam on the floodplain, brown gradational loam and yellow texture-contrast soils on higher terraces. River red gum (*Eucalyptus camaldulensis*) gallery woodland on banks, yellow box (*Eucalyptus melliodora*) and grey box (*Eucalyptus microcarpa*) open woodland on floodplain and

Mitchell Landscape	Description
	terraces.
Murrumbidgee Depression Plains	Quaternary alluvial plains with numerous circular depressions interpreted as high floodplains or low terraces beyond the reach of average floodwaters, relief to 10 m. Grey to brown clays and clay loams with linear patterns of sandy prior streams. Now extensive grasslands of white-top, windmill grass, sand broom, and spear grasses, heavily grazed and invaded by exotic species. Reported to have originally been myall (*Acacia pendula*), old man saltbush (*Atriplex nummularia*) and bladder saltbush (*Atriplex vesicaria*). Sandy ridges of prior streams support patches of white cypress pine (*Callitris glaucophylla*), with needlewood (*Hakea leucoptera*), western pittosporum (*Pittosporum phylliraeoides*) and spear grasses (*Austrostipa* sp.).
Springdale Hills	Rounded ridges and a few peaks on Silurian sandstone, shale and acid volcanics, general elevation 300 to 530 m, local relief 150 m. Gravelly uniform clay loams and red-brown texture-contrast soils. Grey box (*Eucalyptus microcarpa*), red ironbark (*Eucalyptus sideroxylon*), white cypress pine (*Callitris glaucophylla*) and patches of mallee. Bimble box (*Eucalyptus populnea*) along creek lines.
Weddin Range and Slopes	Prominent strike ridges, cliffs, peaks and benched slopes on moderately folded Devonian quartz sandstone, siltstone and conglomerate, general elevation 350 to 720 m, local relief 250 m. Thin stony uniform sands on crests and benches, deeper red brown loamy sand on slopes occasional red-brown texture-contrast soil. Crests with red ironbark (*Eucalyptus sideroxylon*), Blakely's red gum (*Eucalyptus blakelyii*), red stringybark (*Eucalyptus macrorhyncha*), white gum (Eucalyptus *rossii*), apple box (*Eucalyptus bridgesiana*), and tumble down red gum (*Eucalyptus dealbata*). Slopes with white box (*Eucalyptus albens*), yellow box (*Eucalyptus melliodora*), fuzzy box (*Eucalyptus conica*), and shrubby understorey of hopbush (*Dodonaea* spp.) and wattles (*Acacia* spp.). Foot slopes with white cypress pine (*Callitris glaucophylla*).
Young Hills and Slopes	Rounded hills and some steep slopes to tor covered ridges on massive and gneissic Silurian-Devonian granites and granodiorite, general elevation 400 to 730 m, local relief 100 to 250 m. Gradational red earths on upper slopes and red-yellow texture-contrast soils on lower slopes reflecting poorer drainage. Extensively cleared with patches of remaining woodland of white box (*Eucalyptus albens*), yellow box (*Eucalyptus melliodora*), broad-leaved peppermint (*Eucalyptus dives*), red stringybark (*Eucalyptus macrorhyncha*) and Blakely's red gum (*Eucalyptus blakelyii*).

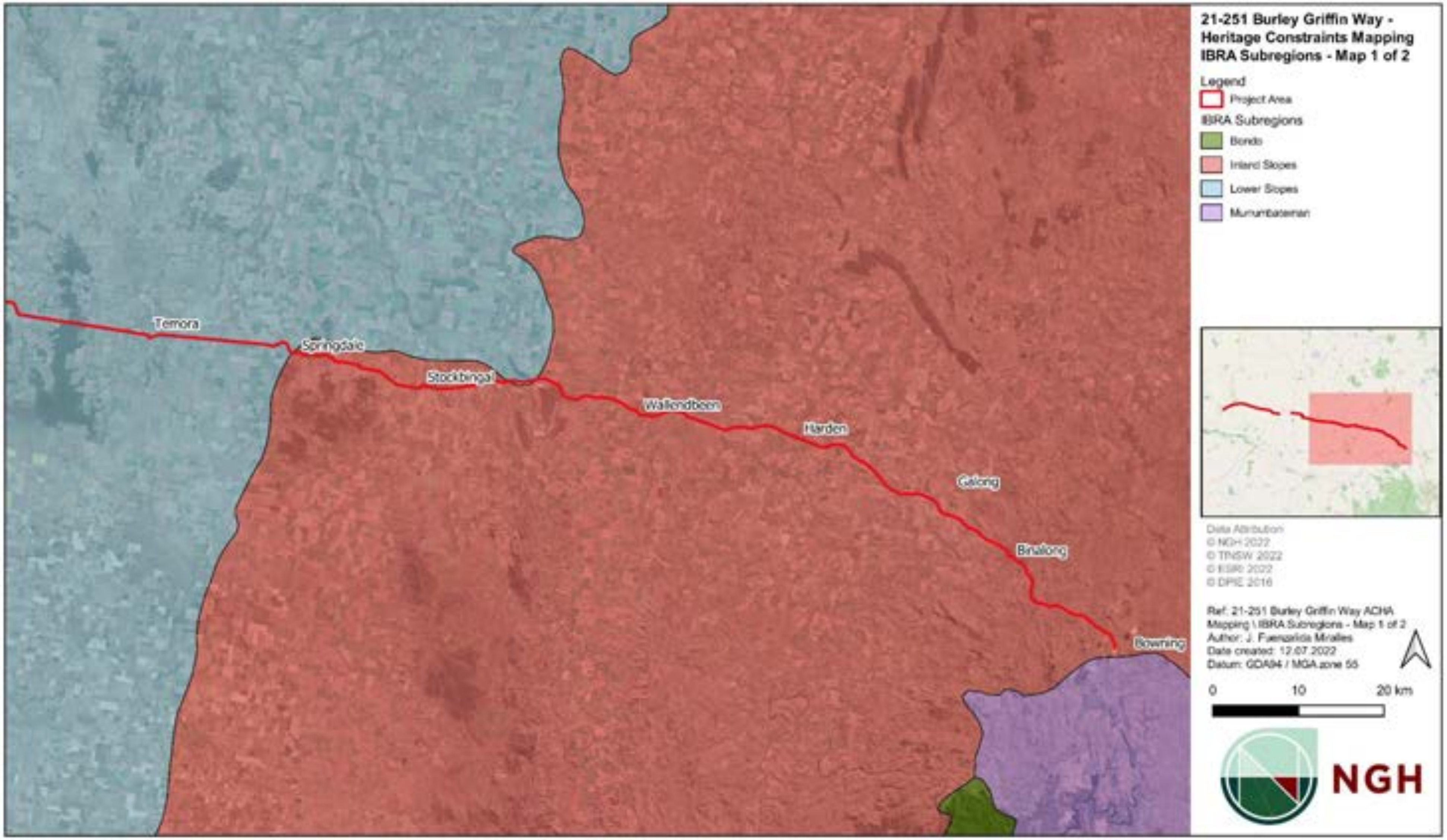

Figure 3-1 IBRA Subregions within – and in proximity to – the eastern section of the project area. Map 1 of 2.

Figure 3-2 IBRA Subregions within – and in proximity to – the western section of the project area. Map 2 of 2.

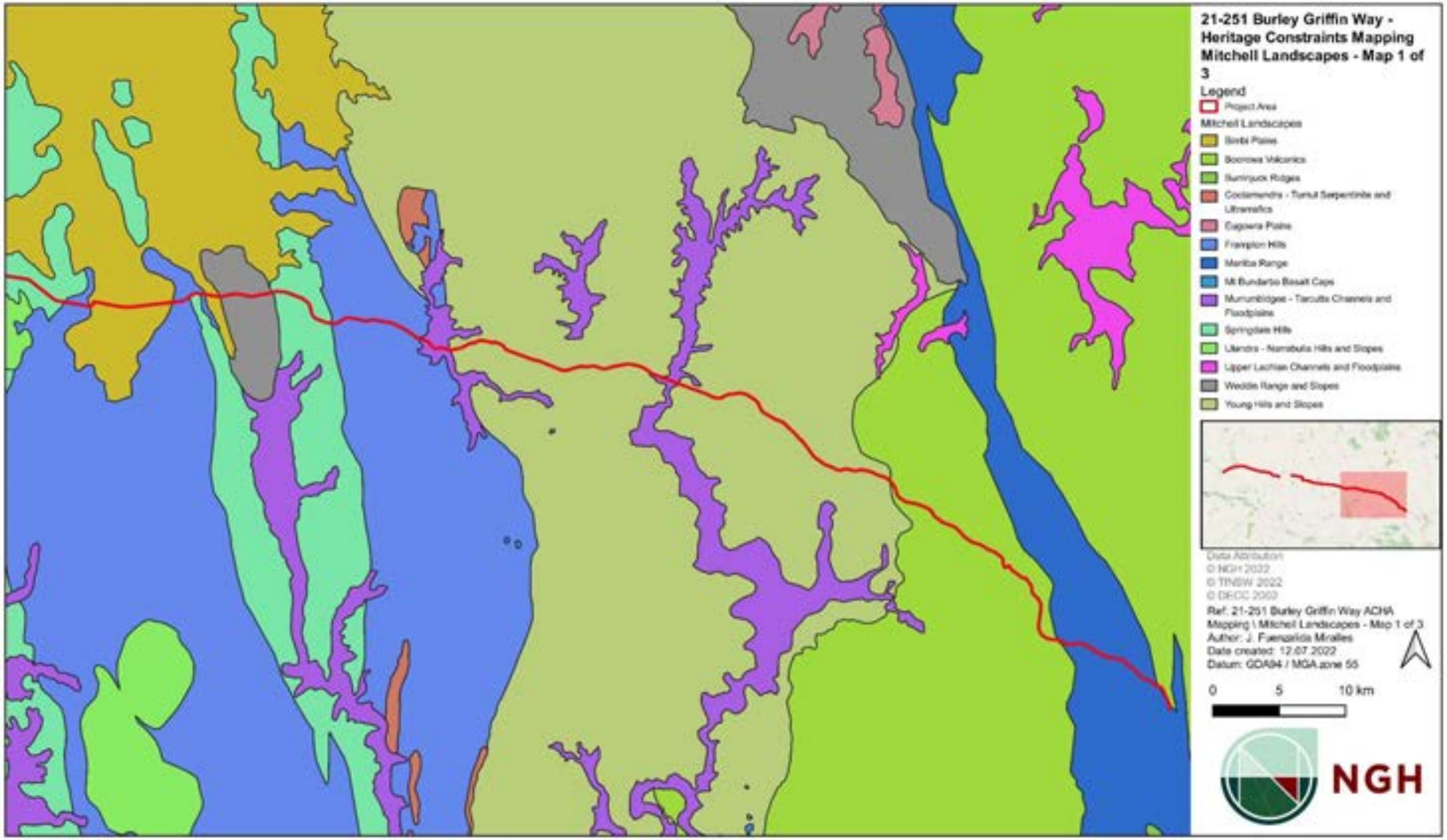

Figure 3-3 Mitchell Landscapes within – and in proximity to – the eastern section of the project area. Map 1 of 3.

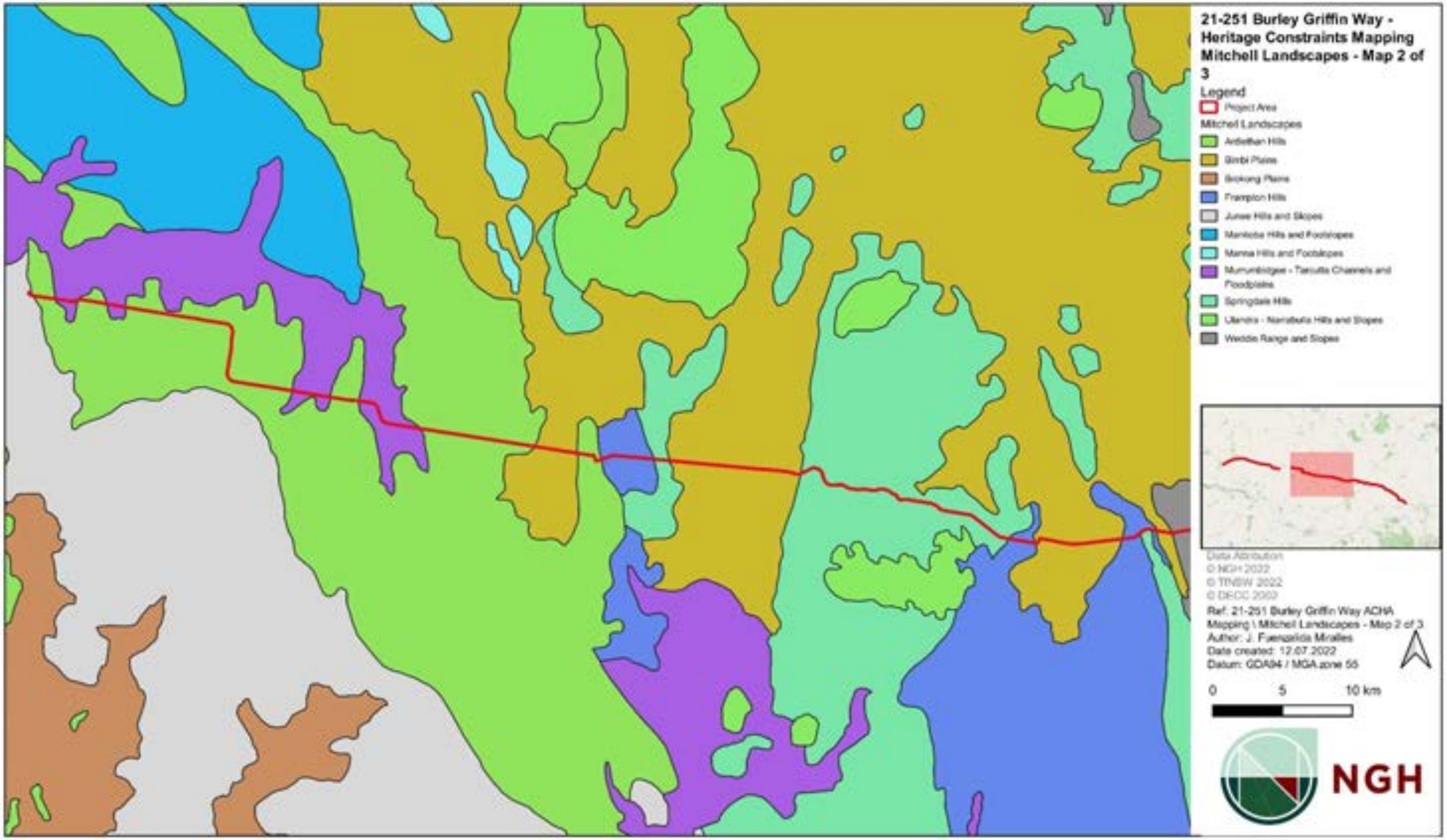

Figure 3-4 Mitchell Landscapes within – and in proximity to – the central section of the project area. Map 2 of 3.

Figure 3-5 Mitchell Landscapes within – and in proximity to – the western section of the project area. Map 3 of 3.

3.1 Geology

Geologically, the project area is located across a variety of formations along the 258km road corridor. These formations, based off the general IBRA Subregions and Mitchell Landscapes present within the project area, are comprised of a wide range of different lithic materials that would have been used by Aboriginal people in the past. These materials primarily include quartz, quartzite, silcrete, chert, mudstone, siltstone, basalt or other fine-grained volcanics, and sandstone. All of these are located in the various formations throughout the project area. The actual presence of these lithic materials in outcrops across the region is not possible to determine from a desktop level assessment. Where these lithic materials are present in outcrops, it is highly likely that an Aboriginal site is present in that area. The generalised geological descriptions for the IBRA Bioregions and Subregions within the project area are described in Table 3-3 below.

The geological formations present within any location can provide some insight into whether there is any potential for in-situ deposits of stone material traditionally used for the manufacture of stone tools. However, it should be noted that the absence of suitable geological formations does not necessarily reduce the potential for stone material as it may have been traded into the area through established trading networks.

Table 3-3 General geological descriptions for the IBRA Subregions within the project area (NPWS 2003:106, 120).

IBRA Bioregion	Geological Description	IBRA Subregion	Geology
South Western Slopes	The bioregion lies wholly in the eastern part of the Lachlan Fold Belt which consists of a complex series of north to northwesterly trending folded bodies of Cambrian to Early Carboniferous sedimentary and volcanic rocks. Granites are common and mostly located in large scale upfolded bodies of rock. Granite landscapes occur either as central basins surrounded by steep hills formed on contact metamorphic rocks, or as high blocky plateau features with rock outcrops and tors. Hilly landscapes developed on the sedimentary and volcanic rocks are controlled by structural features (bedding and faults) and typically form lines of hills extended along the strike of more resistant rocks such as quartzite. The valleys between ranges are either in granite or generally softer rocks such as shale, phyllite, or slate. Limited areas of Tertiary basalt with underlying river gravels and sands occur, and as the country becomes lower to the west and north, wide valleys filled with Quaternary alluvium and occasional lakes become the dominant landscape form. At the western edge of the bioregion the alluvial fans of the Riverine Plain have largely buried bedrock forms. Remnants of earlier gravel deposition on these fans, indicative of higher river discharges than today, are found as terrace features in the valleys and as gravel outwash plains. Some rock types and landscape features deserve special mention. Several limestone outcrops are known, all of which have developed karst topography and carry locally different vegetation. A narrow belt of serpentinite with chemically	**Upper Slopes**	Ordovician to Devonian folded and faulted sedimentary sequences with inter-bedded volcanic rocks and large areas of intrusive granites.
		Lower Slopes	Same as the Upper Slopes but with larger areas of Tertiary and Quaternary alluvium.

IBRA Bioregion	Geological Description	IBRA Subregion	Geology
	distinctive soil runs northwest from Tumut to Cootamundra. A very large number of mineral deposits have supported the mining industry over the past 150 years.		
Cobar Peneplain	The Cobar Peneplain bioregion is based on Palaeozoic rocks largely within the Lachlan Fold Belt. It is lapped by the Murray Basin and the Great Australian Basin and although it is described as a peneplain, the implications attached to this word concerning tectonic stability, landscape and soil genesis should not be uncritically accepted. The region contains a wide range of bedrock types that exert a strong influence on topography. Rock outcrops form low ranges or lines of residual hills controlled by structure (bedding, folds and faults). Rocks in the eastern half of the bioregion are older (Ordovician), more deformed and more highly mineralised than those in the west (Devonian), although the dominant structural trends in both are northwest. Quartz sandstones, conglomerates and siltstones with low angle folds are typical of the younger rocks, and these form prominent multiple ridges like the ranges at Mt Grenfell up to 300m high, or the more complex folds seen in the Cocoparra Ranges near Griffith. Topography on the older rocks around Cobar is more subdued as residual hills, low rounded ridges, and stony slopes formed on softer, more weathered shales, phyllites and cherts, with only occasional features such as Mt Boppy standing as much as 100m above the plain. Igneous rocks are more common in the southern part of the region and granites north of Nymagee make attractive landscapes of rugged peaks and tors. Very small areas of basalt lava are found from Griffith to north of Cobar, with the most interesting being the rare example of 10-16 million year old leucitite lava capping the tabletop peak of El' Capitan. During the Tertiary and possibly as recently as 5 million years ago, marine sediments were deposited in the Murray Basin with the coastline being the southwestern edge of the Cobar Peneplain. In the Quaternary, after these shallow seas receded, sands were mobilised by wind to form dunes and sandplains that advanced onto the peneplain. A drainage system of wide shallow valleys with a few lakes also developed despite the low rainfall and low gradients. Today the creeks respond to local rainfall but only occasionally deliver water to the Bogan or Darling Rivers.	**Lachlan Plains**	Devonian quartz sandstone and conglomerate, small areas of granite, and Quaternary colluvial slope mantles and alluvium.

3.2 Topography

Due to the length of the project area the precise topography will not be discussed in detail for the entire corridor. Instead, this assessment relies of the general landforms described in IBRA Bioregions and Subregions as well as the Mitchell Landscape systems. The topographical descriptions of the landscapes within the project area, as defined by IBRA, are provided in Table 3-4 below. Beginning in the east, the road corridor is located within undulating hilly terrain, passing through a variety of landforms such as spurs, saddles, crests, slopes of varying degree, creeks, and terraces over roughly 105 km until the town of Springdale. Continuing west after the town of Springdale the topography transitions to a more gently undulating landscape for roughly 76 km until approximately 15 km west of the town of Ardlethan. At this point the landscape transitions to a very gently undulating plain landform across the remaining 61 km of Burley Griffin Way, with a small section of the corridor passing through the relatively flat sections of the landscape in between two hills at Binya State Forest. These three general ‘Topographical Zones’ roughly correspond to the IBRA Subregions present within the project area (see Figure 3-6 and Figure 3-7 below), and are as follows:

- Topographical Zone 1 (from the intersection of Burley Griffin Way and the Hume Highway to Springdale): corresponds to the Upper Slopes Subregion of the South Western Slopes Bioregion.
- Topographical Zone 2 (from Springdale to approximately 15km west of Ardlethan): corresponds to the Lower Slopes Subregion of the South Western Slopes Bioregion.
- Topographical Zone 3 (from approximately 15km west of Ardlethan to the end of Burley Griffin Way): corresponds to the Lower Slopes Subregion of the South Western Slopes Bioregion and the Lachlan Plains Subregion of the Cobar Peneplain Bioregion.

A detailed topographical view of the entire project area is also provided in Appendix A.

Along the project area Aboriginal objects are likely to occur on landforms which are not disturbed and is:

- Within 200 m of waters;
- Located on a ridge top or ridge line; and/or
- Within 20 m of, or in a cave, rock shelter or a cave mouth.

Topographically, it is important to consider the landforms that are present within the project area as certain landforms such as spurs, ridgelines, hill crests, saddles, elevated terraces and flats are known to contain higher levels of archaeological sensitivity due to their ease of access and suitability for occupation (i.e., level ground, proximity to fresh water and floral/faunal resources). These landforms are generally considered to contain higher levels of archaeological sensitivity in comparison to other landforms, such as steep slopes, especially when in proximity to waterways.

Table 3-4 IBRA Bioregion and Subregion topographical descriptions within the project area (NPWS 2003:106, 120).

IBRA Bioregion	Topographical Description	IBRA Subregion	Characteristic Landforms
South Western Slopes	Characterised by a large area of foothills and ranges comprising the western fall of the Great Dividing Range to the edge of the Riverina Bioregion. A very wide range of rock types is found across the bioregion, which is also affected by topographic and rainfall gradients that decrease toward the west. These physical differences have an impact on the nature of the soils and vegetation found across the bioregion. Inland streams pass across the slopes in confined valleys with terraces and local areas of sedimentation. Geology, soils and vegetation are complex and diverse but typified by granites and meta-sediments, texture contrast soils and a variety of eucalypt woodlands, making this bioregion the southern equivalent of the Nandewar Bioregion.	**Upper Slopes**	Steep, hilly, and undulating ranges and granite basins. Occasional basalt caps, confined river valleys with terrace remnants.
		Lower Slopes	Undulating and hilly ranges with isolated peaks set in wide valleys at the apices of the Riverina alluvial fans.
Cobar Peneplain	Characterised by a subdued bedrock-controlled landscape in the centre of semi-arid NSW. Described as a low undulating plain, the Cobar Peneplain is easily distinguished from most of the surrounding bioregions which are relatively flatter landscapes of floodplains (Riverina and Darling Riverine Plains bioregions) and sandplains and dunefields (Murray Darling Depression Bioregion). The Cobar Peneplain is a prominent topographical landscape of rolling downs and flat plains punctuated by stony ridges and ranges and is formed on the northwesterly extension of the Lachlan Fold Belt. The more elevated areas of the Cobar Peneplain are characterised by shallow, red soils and aeolian sands associated with the Darling River and the Murray Basin mantle in the lower areas in the west and south, while alluvial deposits from the Bogan River fringe the Peneplain in the east.	**Lachlan Plains**	Strike ridges of resistant rocks often following fold patterns. Low rounded hills of granite with sparse outcrop. Wide short valleys connecting to Lachlan Floodplains

Figure 3-6 Topographical Zones within the project area. Map 1 of 2.

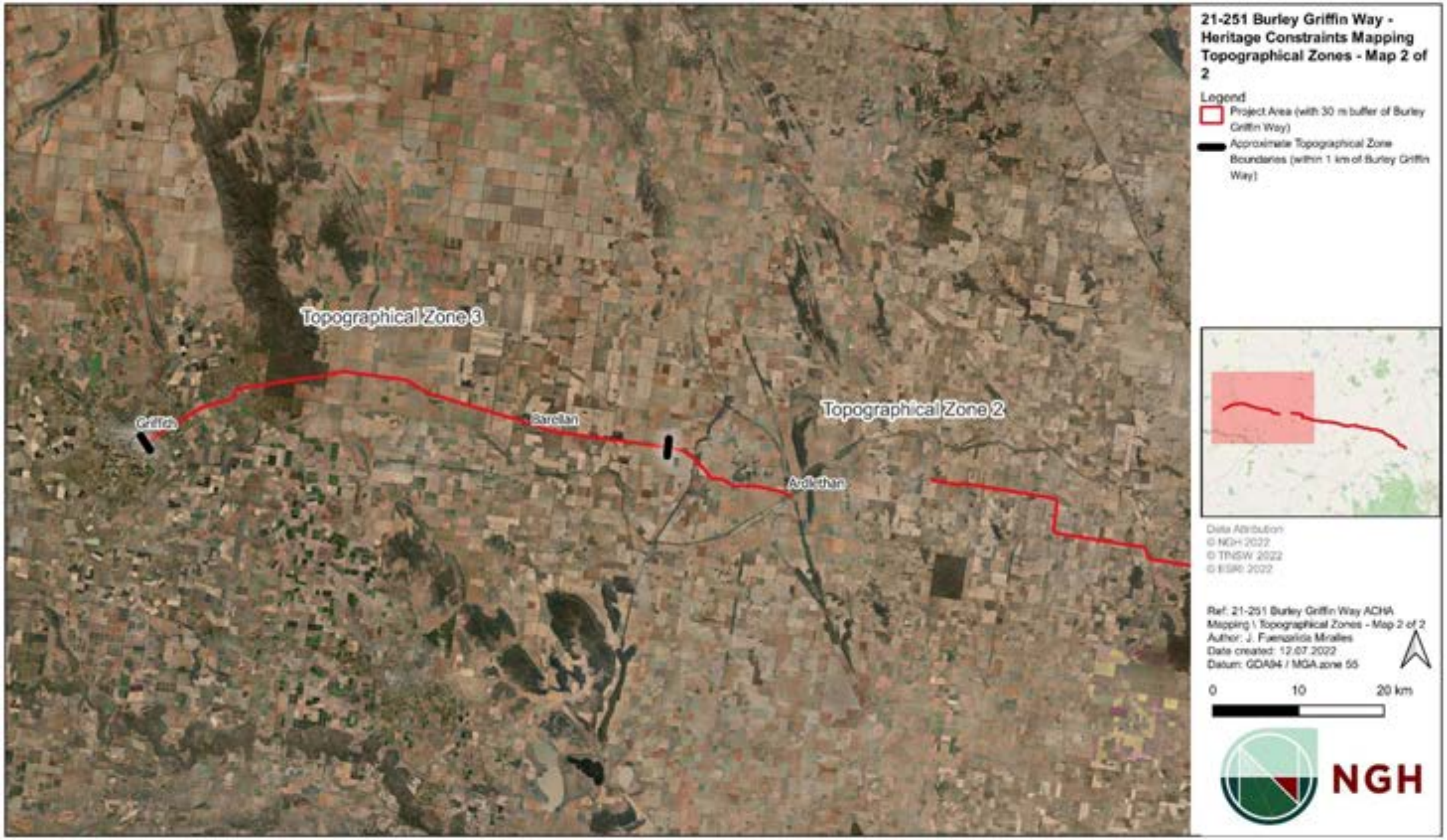

Figure 3-7 Topographical Zones within the project area. Map 2 of 2.

3.3 Soils

The IBRA Bioregion and Subregion describe a variety of soils depending on the landform that they are located within, ranging from stony shallow soils on slopes to deeper subsoils on crests and upper slopes to alluvial sands, loams, and clays closer to waterways. The full descriptions are available in Table 3-5 below. The description of soils within the Mitchell Landscapes across the project area (see

Table 3-2 above) are also consistent with the descriptions provided in the IBRA Bioregions and Subregions. Archaeologically, the nature of the soil deposits within the project area is important to consider due to the potential for subsurface archaeological deposits. These will mostly occur in areas containing deep loamy, sandy, or silty soils but may also be present in some clays (depending on the permeability of the clays). Any intact soils of sufficient depth within the project area have the potential to retain subsurface archaeological materials particularly in slightly elevated landforms in close proximity to water.

Table 3-5 IBRA Bioregion and Subregion soil descriptions within the project area (NPWS 2003:106, 120).

IBRA Bioregion	Soil Descriptions	IBRA Subregion	Soil Descriptions
South Western Slopes	The overall pattern of soils in these landscapes is one where shallow, stony soils are found on the tops of ridges and hills. Moving downslope, texture contrast soils are the norm with subsoils derived from the underlying weathered rock and the topsoils being an homogenised surface mantle of coarser material derived from all parts of the slope. On valley floors subsoils have drabber colours indicative of poor drainage and they may accumulate soluble salts. Dryland salinity is widespread. Alluvial sands and loams are more common than clays in most parts of the landscape but alluvial clays become more important nearer to the Riverine Plain. Over the Quaternary, soils in these landscapes have accumulated a considerable quantity of windblown silt and clay from western NSW.	**Upper Slopes**	Shallow stony soils on steep slopes, texture contrast soils grading from red subsoils on upper slopes to yellow subsoils on lower slopes. Alluvial sands, loams and clays.
		Lower Slopes	Similar to the Upper Slopes but with more extensive red-brown earths on undulating plains and more extensive grey clays on alluvium.
Cobar Peneplain	Soils across the bioregion are reasonably uniform and relate closely to topographic position and local geology. On ridge crests they are thin, stony, well-drained red loams. Downslope the soil thickens as a colluvial mantle, usually with a large proportion of stones and with an increasing texture contrast between topsoil and subsoil. On lower slopes the stoniness decreases, red subsoils give way to yellow subsoils, carbonate levels increase and soil drainage is more impeded. Brown clays are more common than grey clays in drainage lines, red sands and earthy sands are widespread but there are only a few areas of sandplain and dunefield.	**Lachlan Plains**	Shallow stony or gritty red earths on crests and slopes, thickening downslope as rubbly mantles often with a texture contrast. Deep sandy alluvial soils in valleys with small areas of grey clay in swamps.

3.4 Hydrology

The Strahler Stream ordering system is a classification system that gives a waterway an order. The order is determined by the number of tributaries associated with the waterway (Strahler 1952). The Strahler Stream ordering system is illustrated in Figure 3-8 below.

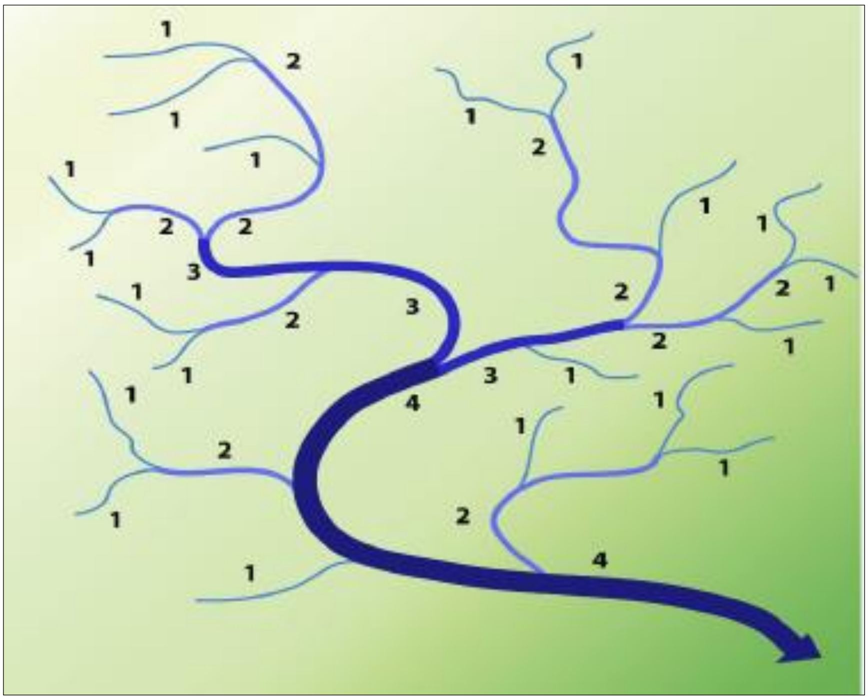

Figure 3-8 The Strahler Stream ordering system illustrated (DPIE 2020:79).

The project area is traversed by several waterways varying from 1st order ephemeral tributaries to major >5th order waterways and generally flow along a rough north south axis (see Appendix A). Such water sources and adjacent landforms (i.e., relatively flat ground, elevated terraces) would have provided attractive terrain and ideal conditions for Aboriginal people living in the area. These waterways would also have attracted local fauna to the area as well, providing a food resource for Aboriginal people.

Availability of water would not have hindered Aboriginal occupation across the region, with most areas having access to some form of permanent water. The major waterways (>5th order) are generally expected to have been used as traveling routes and the adjacent land would have attracted a higher degree of use and Aboriginal occupation due to the presence of a permanent source of water. Despite this Aboriginal people moved away from these recourses and also utilised lower order tributaries and ephemeral water sources. As a result, the landforms located within proximity to waterways in the project area will have a higher sensitivity due to the focus of Aboriginal occupation and land use on landforms associated with waterways. The major waterways (>5th order) located within the project area are as follows:

- Illalong Creek (6th order waterway within the project area)
- Demondrille Creek (5th order waterway within the project area)
- Trigalong Creek (5th order waterway within the project area)
- Bland Creek (5th order waterway within the project area)
- Rocky Ponds Creek (5th order waterway within the project area)
- Currawong Creek (5th order waterway within the project area)

3.5 Flora and fauna

The project area contain a variety of different species such as White Cypress Pine, River Red Gum, Poplar Box, Mugga Ironbark, Western Grey Box, Yellow Box, Blakely's Red Gum, as well as various grasses and tussock grasslands. Prior to land clearing for the existing road corridor, the project area would originally have contained vegetation and plant communities which would have provided habitat to a wide variety of arboreal and terrestrial mammals, birds, reptiles, and other animals. These would have been sources of food, clothing, implements, and ornamentation for the Aboriginal occupants of the land. Terrestrial and aquatic faunal resources would have contributed towards a mixed subsistence diet including birds, fish, frogs, snakes, ants, echidnas, kangaroos, wombats, wallabies, and emus. Vegetation such as tubers, berries, wattle seeds, and grass seeds contributed to diet and a variety of plants would have been used for medicine.

The project area, as a whole, may have been used for a number of resources by Aboriginal people. Consequently, there is potential for Aboriginal sites, particularly surface artefact scatters and scarred trees, across the project area. Especially in areas which have more favourable floral and faunal resources.

Any areas where mature native trees are present within the project area, especially river red gum trees, has potential for modified trees to occur as an Aboriginal site type.

3.6 Historic land use and land disturbance

Land disturbances within and around the project area are largely associated with the construction and continued operation of Burley Griffin Way and the trails and roads that preceded it. While Burley Griffin Way was commissioned as State Route 94 in 1974 and as B94 in 2013, historical imagery from the 1960s at various points along the route show that roads were present along the corridor prior to 1974. The majority of these roads would have served as country roads for locals and are unlikely to have seen the same heavy traffic that would be seen after 1974.

The initial construction of roads along the existing corridor is likely to have caused significant ground disturbance. These ground disturbing activities would have involved removal of topsoils, cutting into rock, vegetation clearance, construction of associated bridges, overpasses, culverts, grading, laying road base, and sealing with bitumen. These are likely to have destroyed and/or removed a significant portion of Aboriginal objects or archaeological sites such as subsurface deposits or scarred trees within the existing sealed road corridor. While other sites, such as artefact scatters or isolated finds, are expected to have been displaced from their original depositional locations during the construction process or via erosion, there is still a low potential for them to be present within or adjacent to the road corridor, albeit in a disturbed context. As a result, it can be expected that the sealed roads and adjacent shoulder within the project area have a negligible potential for Aboriginal objects or archaeological sites. The effects of the historical land use and associated land disturbances on the areas within the project area that are not part of the sealed road and its immediate disturbed road shoulder or clearly disturbed areas are more difficult to quantify along the entire project area from a large scale desktop level assessment.

While very little specific information is available for the historical land use of the project area prior to the establishment of the existing road corridor, it can be assumed that it was subjected to a similar style of agricultural and pastoral use as the privately owned land adjacent to it. This style of land use, while destructive to vegetation, often causes only superficial disturbances to the upper layers of soil deposits. The result of this is that Aboriginal sites such as artefact scatters, isolated finds, hearths, and quarries as well as subsurface archaeological deposits are often found in areas that had been farmed for over 100 years. Regional roads and major highways tend to follow trails and stock reserve routes which were initially forged during European settlement into areas by following Aboriginal pathways. It is possible that portions of the Burley Griffin Way were built directly over Aboriginal pathways that were used to traverse the landscape.

The existing road corridor route and any previous alignments, cut and fill earthworks, building and dam construction, and the installation of underground and overhead services within the project area are determined to be highly disturbed. Meanwhile areas of minimal (low/moderate) disturbance are defined as those that, while cleared historically and used for cropping and/or grazing, have not been subject to significant ground disturbances. These varying degrees of land disturbances are relevant to the survival, integrity, and identification of Aboriginal archaeological evidence within the project area with the main implications for the varying degrees of land disturbances on the archaeological record within the project area listed below.

- In highly disturbed areas any pre-existing archaeological deposits and sites are likely to have been destroyed.
- There is a reduced likelihood for the presence of culturally modified trees in cleared areas.
- While farming practices, fencing and low impact road maintenance works may have disturbed stone artefacts and affect the integrity of the objects, they are likely to still be present.

3.7 Landscape context summary

Most archaeological assessments are conducted in a situation where topographic variation can lead to differences in the assessment of archaeological potential and site modelling for the location of Aboriginal objects. The project area is situated within an area of varying topography that can grouped into three general ‘topographical zones’ that roughly correspond to the IBRA Subregions that are present. In general, beginning in the east the project area crosses through undulating hills before transitioning to a more gently undulating landscape with intermittent flats before transitioning again to a very gently undulating to relativity flat plain. It should be noted that the topography determined routes of travel and particular landforms were imbued with spiritual meanings and associations (NPWS 2006).

Several dozen waterways, ranging from 1st order ephemeral tributaries to >5th order major waterways, flow through the project area at various points. It is expected that Aboriginal activity would have been focussed on the more permanent water courses. As the region is well watered, Aboriginal use of the landscape would not have been restricted to the main water courses.

The rock types and landforms within the project area would have influenced human habitation and movement throughout the landscape. Aboriginal people used certain rocks to manufacture tools and others for ceremonial purposes. A large variety of geological formations are present within the project area which many have been suitable to produce stone tools. Artefacts made from quartz, quartzite, silcrete, chert, mudstone, siltstone, basalt, other fine-grained volcanics, and sandstone are located within the project area and are considered to be common material used for the manufacture of stone tools in the wider region. These could be in surface or subsurface contexts.

The steeper slopes within the project area, primarily in the east, are generally not considered to be conducive for camping. There are however sections that contain elevated, level terrain that may have been a focus for Aboriginal camping, particularly when in proximity to major waterways. These level areas have a higher archaeological potential. Additionally, any old growth mature native trees within the project area have the potential to have been culturally modified. It is known that prior to European land modifications, this area provided resources, shelter, water and food for Aboriginal people during all four seasons of the year.

4. Cultural and archaeological context

4.1 Ethnographic setting

There are several ethnographic recordings of Aboriginal life in the region from the 1800s that notably focus on the prevalence of Aboriginal people around waterways. It is important to consider that the Aboriginal people alive at the time of such observations were survivors of serious epidemics of infectious disease such as smallpox, brought by Europeans, that greatly affected the population sizes and distribution of people within the landscape. Consequently, European records may not necessarily reflect pre-contact population distributions and traditional ways of life (Dowling 1997; Littleton and Allen 2007).

The dispossession from traditional lands and acts of violence against the Aboriginal people caused great social upheaval meaning that access to traditional resource gathering and hunting areas, religious life, marriage links and sacred ceremonial sites was disrupted or prevented. Despite this, Aboriginal people continued to maintain their connections to sites and the landscape in a variety of ways. Aboriginal people today continue to have a strong connection to their land, the region, and across the entirety of the project area.

4.1.1 Tribal Boundaries and Social Structure

Cultural areas are difficult to define and “must encompass an area in which the inhabitants have cultural ties, that is, closely related ways of life as reflected in shared meanings, social practices and interactions” (Egloff et al. 2005:8,16). Depending on the culture defining criteria chosen – i.e., which cultural traits and the temporal context (historical or contemporary) – the definition of the spatial boundary may vary. In Australia, Aboriginal “marriage networks, ceremonial interaction and language have been central to the constitution of regional cultural groupings” with the distribution of language speakers being the main determinant of groupings larger than a foraging band (Egloff et al. 2005:8,16).

Cultural mapping along the proposed Burley Griffin Way shows that a majority of the project area falls within the Wiradjuri cultural grouping and a small part of the Ngunawal cultural grouping located in the south-east portion of the project area (see Figure 4-1 below) (Tindale 1974; White 1986; Horton 1994; Kabaila 1998, 2010; Jackson-Nakano 2002). Within these groups there were other smaller bands however historically the exact boundary of these local groups is uncertain. It is however important to remember that mapped tribal boundaries were partially the product of a European system of determining landownership, a system that did not reflect Aboriginal social constructs or their relationship with country. Tindale’s maps imply that the language groups identified, and their defined borders/boundaries should be considered as territorial units. It is important to remember that the boundaries between all the language groups mapped by Tindale are suggestive only and would most likely have changed through time due to changing availability and distribution of food and raw material resources. It should also be noted that today not all Aboriginal groups agree with the mapped boundaries presented in Tindale and other publications. These borders were not static, they were most likely fluid, expanding and contracting over time to the movements of smaller family or clan groups. These boundaries ebbed and flowed through contact with neighbours, the seasons and periods of drought and abundance. The proximity to each other also meant that people likely spoke multiple languages and dialects. Today the project area is regarded as being located across Ngunnawal and Wiradjuri Country.

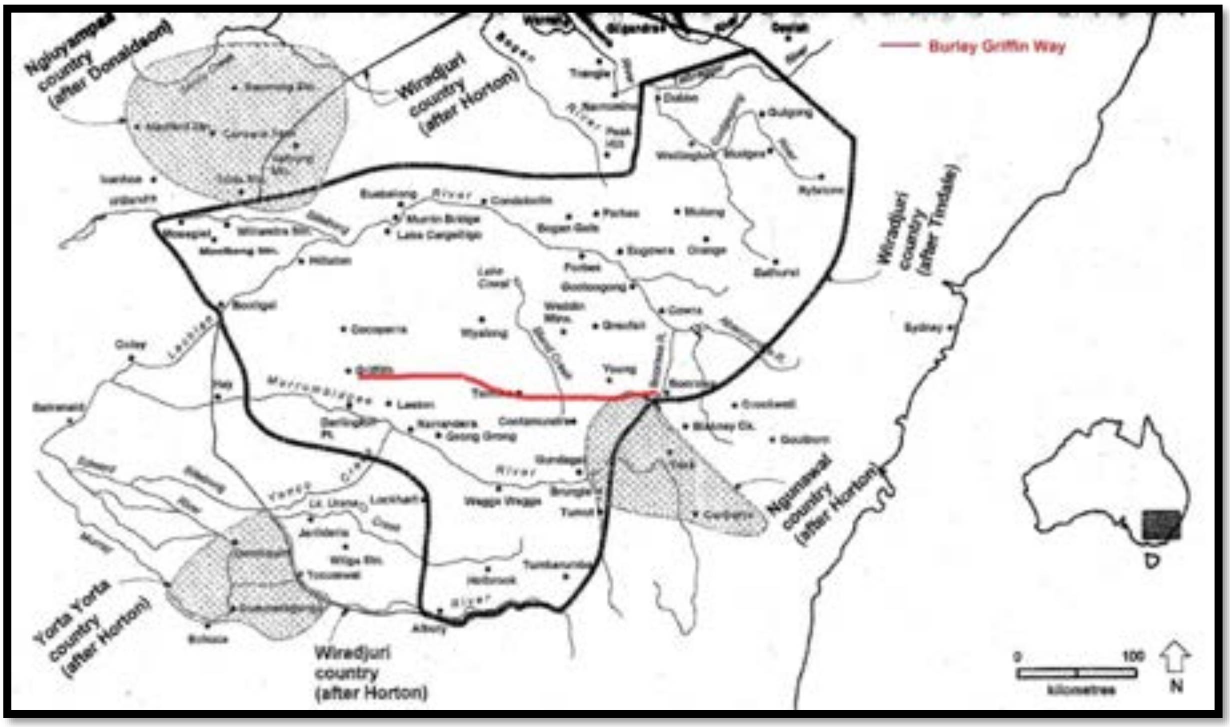

Figure 4-1 Map showing Wiradjuri and Ngunawal territories and where they overlap (Kabalia 2010). The approximate project area is shown in red.

The Wiradjuri people generally occupied a large part of central NSW principally based on three main river catchments. Their southern border was the Murray River from Albury upstream towards Tumbarumba area. From this point they went north along the eastern edges of the Great Dividing Range, past Tumut and Gundagai to Lithgow. Their territory continued up to Dubbo, then west across the plains to the Willandra creek near Mossgiel. The Booligal swamps are near the western border and down to Hay. From Hay their territory extended across the Riverina plains passing the Jerilderie area to Albury (see Figure 4-1). Ethnographic accounts of Wiradjuri people are found in the historical writings of Dawson (1881), Mitchell (1864) and Lawson (1822).

Wiradjuri traditional lands were known as the land of three rivers being the:

- Murrumbidgee (known by its traditional Wiradjuri name);
- Lachlan (Gulari); and
- Macquarie (Womboy).

A small section of the project area is in Ngunawal country between Boorowa and Binalong. Places historically important to the Ngunawal such as Rye Park, Hollywood, Oak Hill, and Edgerton are located near Yass (Kabalia 2010). G.A. Robinson reported that the people of Yass area were called Onerwal [Ngunawal] (White and Cane 1986). Jackson-Nakano's (2002), research also suggests that the Aboriginal group who occupied the Yass and Boorowa districts in the early years of European settlement were called the Wallabalooa tribe. Jackson-Nakano (2002) also reports that, according to Bayley (who wrote a brief history of Yass), Warrambalulah was the Aboriginal name for the area on which the first township of Yass was settled in 1836.

4.1.2 Material culture, food, and resources

At the centre of the project area lies the main Wiradjuri traditional lands of occupation which is principally defined as the catchment of the Murrumbidgee River system (located to the south).

Before European settlement this land supported woodland and forest habitats for possums which provided ready meat and animal skins for fur cloaks (Pearson 1981; Kabaila 1998). The Wiradjuri also exploited vegetable foods. Some that are available on the south-western slopes are myrrnong tubers of lilies and orchids, bracken fern, and kurrajong roots (Gott 1982; White 1986; Kabalia 1998).

Within the broader riverine plains a corridor of grass and open forest/woodland follows the Murrumbidgee River and is dominated by River Red gums and Casuarina in its upper reaches. These areas provided habitat for kangaroo and emu which Wiradjuri people utilised on a regular basis (White 1986; Kabalia 1998). These animals were harder to catch and required patch work burning. Additionally grass seeds (kangaroo) herbs, orchids, lilies, yam daisies, and ground berries would have been exploited on a seasonal basis (Flood 1980; Gott 1982). Periodic flooding of the Murrumbidgee also provided important superabundance of wetland foods such as yabbies, mussels, fish, and waterfowl (Kabalia 1998).

Stone raw material for making stone tools was scarce on the plains and according to Witter (1982: 14-15) quartz was the dominant stone used for tool making with bipolar techniques being commonly used.

In an archaeological context, few of these items would survive, particularly in an open site context. Any item made from bark, timber and animal skins would decay quickly in an open environment. However, other items, in particular those made of stone would survive where they were made, placed or dropped. Shell material may also survive in an archaeological context. Sources of raw materials, such as the extraction of wood or bark from trees, would leave scars on the trees that are archaeologically visible. Outcropping stone sources also provide clues to their utilisation through flaking, although pebble beds may also provide sources of stone which leave no archaeological trace.

4.1.3 Impact of European Settlement

By the early 1830s European settler impacts were having a devastating impact on the Wiradjuri people of the Murrumbidgee river catchment and the south-western slopes. By 1849, large sheep runs were taking up the best country along the Murrumbidgee River floodplain. Aboriginal people were moved off their traditional country, living on the margins of towns like Hay, Griffith, Yass, Gundagai, Leeton, Grong Grong, Wagga Wagga, Darlington Point and Narrandera. Often they gained food by working for farmers as stockman or shepherds, otherwise they had to rely solely on government rations.

The British government introduced the reservation system to manage the Aboriginal people in the latter half of the 19th century. After federation, this system was transferred into the Aborigines Protection Board later called the Aborigines Welfare Board of NSW. A number of these reserves and missions were set up near parts of the project area and are listed below (Kabaila 2010):

- Yass: Oak Hill, Edgerton, and Hollywood
- Griffith: Town Camps, Frogs Hollow Marsh, and The Three Ways
- Darlington Point: Warangesda Mission, Riverside Camp, Police Reserve, and Household Camps
- Leeton: Wattle Hill and (9km north-west) Koonadan Historic Site-Aboriginal Place
- Narrandera: Narrandera Sand hills, Hill 60, and Wool scour

Many Wiradjuri and Ngunawal families and their descendants grew up on these reserves and missions. As a result, and although set up to control Aboriginal people, the reserves and missions are often regarded as important historical cultural places (Kabalia 2010).

The Griffith historic camp reserves are the closest to the project area (within 2 km). According to Kabalia (2010) Aboriginal people began moving into the town of Griffith around 1940 as fruit pickers. They created a camp at Frogs Hollow and later at The Three Ways. The earliest shanty town at Griffith was called Bagtown and was built by white construction workers in Hanwood in 1911 (Kabalia 2010:358). This housed Aboriginal people who worked as itinerant fruit pickers where they lived in a place called Condo Lane.

Within these Griffith town areas there were also nine temporary town camps that are listed below:

- The Pines: near Wickham's Hill at the rice mill
- Old Tip: present day suburb of Collina
- Golf Course: present day golf course and raceway
- Scenic Hill: footslopes between present day McNabb Crescent and Scenic Drive
- Wakaden Street: present day Catholic High School oval at Macarthur St
- Tharbogang: railway fettlers camp situated near Tharbogang railway siding
- Condo Lane: present day Leonards Road off Hanwood village
- Alongside an irrigation channel near the McWilliam vineyards
- The Willows: present day entrance to Greenacres property with extensive avenue of former willow trees alongside Mirrool Creek branch
- Mayfair area between the town and Frogs Hollow.

None of these Aboriginal historic places are currently affected by the proposed works along Burley Griffin Way.

4.2 AHIMS search

The Aboriginal Heritage Information Management System (AHIMS) is a database of previously recorded Aboriginal heritage sites in NSW. A search provides basic information about any sites previously identified within a search area. A register search is not conclusive evidence of the presence or absence of Aboriginal heritage sites, as it requires that an area has been inspected and details of any sites located have been added to the register. As a starting point, the search will indicate whether any sites are known within or adjacent to the investigation area.

A search of the AHIMS database was conducted on the 28th June 2022 over the entire 258 km corridor of the Burley Griffin Way with a 1 km buffer from the centreline of the road. The AHIMS Client Service ID was 696179. There were 54 Aboriginal sites and no declared Aboriginal Places recorded in the search area.

The results of the AHIMS search can be seen in Table 4-1 and are shown from Figure 4-2 to Figure 4-4 below.

Table 4-1 Breakdown of previously recorded Aboriginal sites in the region.

Site Type	Number
Modified Tree	30
Artefact (1 or more)	21
Potential Archaeological Deposit (PAD)	2
Aboriginal Resource and Gathering	1
TOTAL	**54**

The AHIMS search identified that there are four previously recorded valid sites with the recorded GPS site location within the project area. These are AHIMS# 50-2-0006, AHIMS# 50-2-0004, AHIMS# 50-3-0046, and AHIMS#50-3-0010. A further 28 previously recorded valid sites are located within 300 m of Burley Griffin Way at various points along the corridor. These sites are described in Table 4-2 below. A detailed series of 26 maps showing the AHIMS sites within 1 km of the project area is available in Appendix B. The four registered AHIMS sites within the project area are described in Section 4.5 below. Due to the limited nature of this desktop assessment any proposed works within close proximity (within 200m) to a known AHIMS sites must have the AHIMS site cards inspected by TfNSW to ensure the know boundary and/or extent of these sites does not extent into the proposed work area. It is also noted that extensive AHIMS searches are only valid for a 12 month period.

Table 4-2 AHIMS sites within and adjacent to the project area.

Site ID	Site Name	Site Type	Status on AHIMS	Location to Project area (m)
50-2-0006	WT/OC2	Artefact	Valid	Within the project area
50-2-0004	WT/H?1	Artefact	Valid	Within the project area
50-3-0046	Burley Griffin Way Scar Tree 1	Modified Tree	Valid	Within the project area
50-3-0010	WT/ST1	Modified Tree	Valid	Within the project area
51-1-0040	Site 1 in Nowra District	Artefact	Valid	Approximately 24 m from the project area
50-2-0005	W/0C3	Artefact	Valid	Approximately 25m from the project area
50-5-0026	Spring Creek	Artefact	Valid	Approximately 28m from the project area

Site ID	Site Name	Site Type	Status on AHIMS	Location to Project area (m)
50-1-0031	Ingalba NR Scar Tree 7	Modified Tree	Valid	Approximately 29m from the project area
51-4-0056	C-0S-1/Chris P	Artefact	Valid	Approximately 33m from the project area
50-6-0107	Jindalee NP Tree 10	Modified Tree	Valid	Approximately 35m from the project area
50-6-0062	WT/OC1	Artefact	Valid	Approximately 38m from the project area
50-5-0291	8 Mile TSR Young	Modified Tree	Valid	Approximately 50m from the project area
50-6-0102	Jindalee NP Tree 5	Modified Tree	Valid	Approximately 59m from the project area
50-6-0103	Jindalee Np Tree 6	Modified Tree	Valid	Approximately 63m from the project area
51-1-0041	Isolated Artefact - Pebble Axe	Artefact	Valid	Approximately 65m from the project area
50-6-0101	Jindalee NP Tree 4	Modified Tree	Valid	Approximately 66m from the project area
50-5-0020	Beechwood 1	Artefact	Valid	Approximately 66m from the project area
50-6-0108	Jindalee NP Tree 11	Modified Tree	Valid	Approximately 66m from the project area
50-6-0168	Harden Cumbamurra 1	Modified Tree	Valid	Approximately 74m from the project area
50-6-0098	Jindalee NP Tree 1	Modified Tree	Valid	Approximately 75m from the project area
50-6-0099	Jindalee NP Tree 2	Modified Tree	Valid	Approximately 78m from the project area
50-6-0100	Jindalee NP Tree 3	Modified Tree	Valid	Approximately 79m from the project area
50-6-0109	Jindalee NP Tree 10	Modified Tree	Valid	Approximately 80m from the project area

Site ID	Site Name	Site Type	Status on AHIMS	Location to Project area (m)
50-6-0106	Jindalee NP Tree 9	Modified Tree	Valid	Approximately 87m from the project area
51-4-0055	Yass	Modified Tree	Valid	Approximately 96m from the project area
51-4-0039	Queenbyan Site 2	Artefact	Valid	Approximately 116m from the project area
50-6-0104	Jindalee NP Tree 7	Modified Tree	Valid	Approximately 117m from the project area
50-6-0110	Jindalee NP Tree 11	Modified Tree	Valid	Approximately 119m from the project area
50-3-0067	Tubul Tank	Aboriginal Resource and Gathering	Valid	Approximately 128m from the project area
50-6-0105	Jindalee NP Tree 8	Modified Tree	Valid	Approximately 153m from the project area
50-6-0112	Jindalee NP Tree 13	Modified Tree	Valid	Approximately 268m from the project area
50-6-0111	Jindalee NP Tree 12	Modified Tree	Valid	Approximately 289m from the project area

4.3 Additional searches

Other heritage register searches were undertaken to identify any items or places in proximity to the Project area that contain Aboriginal heritage or archaeological potential. The following resources were used as part of this assessment:

- The NSW State Heritage Inventory (SHI), this includes items on the State Heritage Register and items listed by state agencies and local Governments, to identify any items currently listed within or adjacent to the project area.
- The Australian Heritage Database, this includes items on the National and Commonwealth Heritage Lists, to identify any items that are currently listed within or adjacent to the project area.

The results of the NSW SHI database search indicated there are no previously recorded Aboriginal Places listed under the *National Parks and Wildlife Act* within the project area. None of these sites are located within or adjacent to the project area.

The results of the NSW SHI database search indicated there are several previously recorded heritage sites listed under the *NSW Heritage Act* within proximity of the project area. Only two of these, the CWA Rest House (ID# 65) and Temora Railway Station Group (ID# 1950) are located directly within the project area, however neither are listed for Aboriginal heritage values.

The results of the NSW SHI database search indicated there are several dozen previously recorded heritage sites listed by the Local and State Agencies within proximity of the project area. While a total of 63 of these sites are located within the project area, none are currently listed for Aboriginal heritage values.

The results of the Australian Heritage Database search indicate that there are several sites located along the Burley Griffin Way road corridor. However, none of these sites are registered for their Aboriginal heritage values.

It should be noted that the potential impacts to historical heritage values is not assessed in this report. The potential for historical heritage impacts should be assessed, and if there are potential impacts to any historical sites, a Statement of Heritage Impact may need to be prepared.

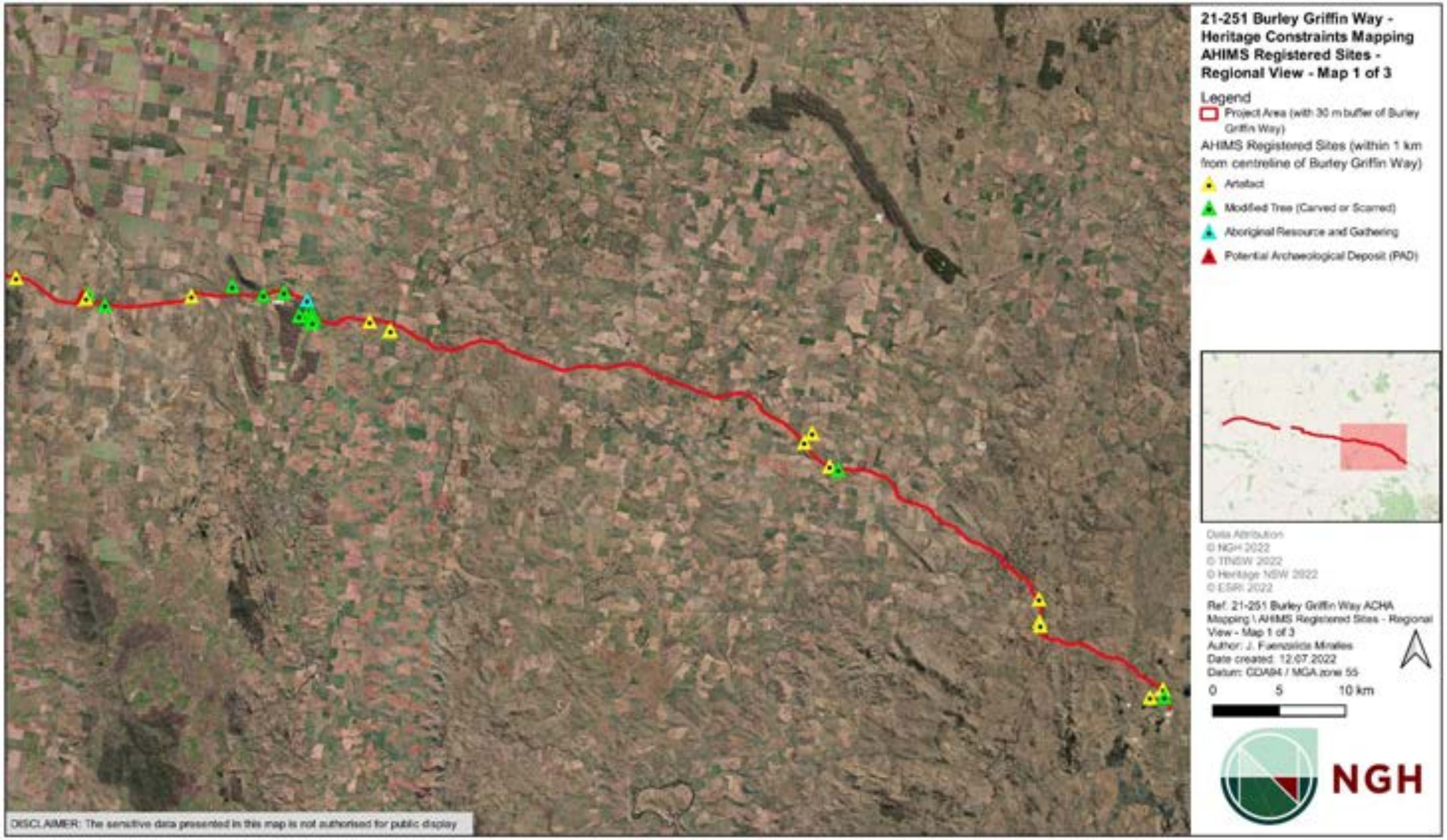

Figure 4-2 AHIMS sites surrounding the Project area. Map 1 of 3.

Figure 4-3 AHIMS sites surrounding the Project area. Map 2 of 3.

Figure 4-4 AHIMS sites surrounding the Project area. Map 3 of 3.

4.4 Regional archaeological record

Due to the size of the project area, and the variation in landscapes throughout it, the regional archaeological record will be split into three sections to describe the archaeological studies that have been performed within each of the three topographical zones that were described in Section 3.2 above and summarised again below for easy reference.

- Topographical Zone 1 from the intersection of Burley Griffin Way and the Hume Highway to Springdale.
- Topographical Zone 2 from Springdale to approximately 15km west of Ardlethan.
- Topographical Zone 3 from approximately 15km west of Ardlethan to the end of Burley Griffin Way.

4.4.1 Topographical Zone 1

A range of archaeological sites are likely to be found generally in this zone, they are described as:

- Open campsites located near streams, especially level elevated ground and low gradient basal slopes;
- Large open campsites will occur most frequently within 100m to 150m of major drainage lines, with a possible preference for areas at the confluence of major streams;
- Open artefact scatters that occur away from major creek lines will tend to be small and sparse; and
- Scarred trees may occur wherever old growth trees of sufficient age are present and will be located anywhere in the landscape.
- Previous archaeological surveys in NSW and the ACT, such as Bulbeck and Boot (1990), and Flood (1973; 1980), argue the following:
  - Sites will be found on dry elevated ground above river or creek systems.
  - Sites will be found on ridge-crest or spurs above cold air drainage and where access to water is likely to be important.
  - Some sites are considered rarer than others but the most commonly recorded archaeological sites in the Southern Highlands and Southern Tablelands are isolated finds, artefact scatters, archaeological deposits, potential archaeological deposits, scarred trees, stone tool quarries, or grinding grooves.
  - Rarer sites may include: rock art sites, stone arrangements, burials, ceremonial sites and carved trees.

These predictive models along with the work of Williams (2006) provides an argument that Aboriginal open site occupation patterning is controlled principally by water, topography, and cold air drainage. Large open sites which were repeatedly visited over time will occur where these three factors are all present and the margins of flood zones are well known. Softer sandy soils which dry out quickly are also likely to be preferred to rocky or clay rich soils that stay waterlogged for a longer period of time.

In 1980 Witter conducted a survey from Canberra north east to Dalton in NSW. Based on the results of his survey he argued a model of two alternative subsistence strategies. His model defines subsistence according to environmental zones, with Riverine Oriented and Plateau Oriented systems each having a different economic basis. Riverine Oriented subsistence strategies were based on the consumption of river animals and plants with seasonal forays into upland plains. The Riverine system he argues is reflected in sites located on the semi- arid plains along the major river systems. In contrast, Witter's Plateau Oriented argues that the local economic system is based on the acacia seed as a staple food. Acacia is found on ridges, slopes, and flats with camp sites close to permanent water sources (Witter 1980a).

This economic base was adopted in highland areas with sites tending to be located both on ridges and highland plains close to permanent waterways.

In 1986 Koettig conducted an archaeological assessment in relation to options for a new water treatment works near Gundagai. A single site was recorded during the survey on the lower waning slopes of northwest Brummy's Hill. The site was situated on the northern bank of a basal hillslope gully, draining directly into the Murrumbidgee River. The site consisted of a low-density scatter of four stone artefacts made from quartz and fine-grained materials along a 28m surface exposure (Koettig 1986:6). The site was in a heavily disturbed context from domestic livestock use and other farming practices (1986:7).

In 1992, Silcox completed an archaeological assessment for two bridge locations for the proposed Hume Highway, Jugiong deviation (Silcox 1992 as cited in Navin Officer Heritage Consultants Pty Ltd 1994:9). During the survey, no sites were identified, and Silcox noted the project area had been previously disturbed.

In 1994 Navin Officer conducted an archaeological survey for the Sheahan Bridge duplication at Gundagai. The study area comprised approximately 75 ha, 80% of which was situated on the present Murrumbidgee River floodplain. Four archaeological sites were identified during the survey consisting of two open artefact scatters and two carved trees. Both open artefact scatters were in disturbed contexts from recent agricultural land use. Identified artefacts included flakes, broken flakes and manuports made from rhyolite and quartz (Navin Officer 1994:10). Navin Officer determined that the potential for subsurface artefacts was low based on previous assessments in the region, cold air drainage along the river corridor, and an absence of elevated or aeolian deposits in the floodplain.

Navin Officer (1994, 1996, and 2004) undertook several assessments of a proposed bypass of Coolac along the Hume Highway. This bypass included an improved alignment from the Dog on the Tuckerbox Roadhouse and approximately 12 km of the Hume Freeway to the north. The most recent assessment recorded six sites. The sites comprised three scarred trees (CBA1, CBA2, and CBA4) and three stone artefact scatters (CBA3, CBA5, and CBA6). CBA5 is a large artefact scatter, with associated archaeological deposit, which extends across an area of approximately 360 m x 100 m identified in associated with the terrace adjacent to Daisy Bed Creek near the junction of Muttama Creek. The site is situated on both sides of a broad hillside spur, adjacent to the basal slope. The proportions of stone types within the flaked material are estimated to be roughly 90% white to translucent common opal, 8% milky quartz, and 2% volcanics (such as rhyolite). The volcanic element is probably derived from creek bed cobbles. The common opal occurs naturally on site in narrow veins within the exposed and underlying bedrock. The presence of bipolar cores of common opal in the site indicates that the site was at least a raw material procurement site.

In 2004, Boot completed a site assessment and plan for installation of bollards for the Gundagai Burbung site. Burbung sites were sites used by Wiradjuri people for male initiation ceremonies, and usually included two raised earth rings that were connected by a ceremonial pathway. The rings were different sizes, with the larger ring being available to all in the ceremonial group. The smaller ring available only to the boys undergoing initiation and men who had already been initiated. Burbung sites often had other ritual objects created at or near them, including tree modifications, ground pictures of spiritual beings and objects, and holes dug for the initiated to stand in (Boot 2004). The Gundagai Burbung site consists of two raised earth rings located on alluvial flats on the northern bank of the Murrumbidgee River, with the ceremonial pathway no longer visible. The last known ceremonies to have taken place at the site were in the 1930s, and the site continues to be highly significant to the local Aboriginal people (Boot 2004). Very few of these site types are known to exist in southeast NSW, with the majority being identified on the NSW south Coast. Based on these considerations, Boot recommended that the site be protected from vehicular impacts via the installation of treated pine bollards encircling the site.

In 2007 Kayandel undertook an Aboriginal cultural heritage excavation for the proposed Sheahan Bridge duplication over a portion of the area assessed by Navin (1994). The excavation was the first subsurface testing on the Murrumbidgee floodplain. Modelling by Kayandel predicted that any artefactual sites identified were likely to be of low density due to the location being within the river floodplain. Soil profiles were noted to be relatively consistent across the test areas, with pits of up to 1.5m in depth being excavated. Soils largely comprised compacted silts deposited by numerous flood events, with layers of shale and clay beginning at approximately 30cm. In some test pits, river sand was encountered at depths of 20cm – 150cm. During the excavation, a total of 61 artefacts were recovered consisting of predominantly flakes and flaked pieces, with lesser numbers of cores, blades, and typological tools. Two areas were deemed to have potential to represent cultural activity sites. However, based on the low numbers and densities of artefacts recovered and previous disturbance it was determined that all sites most likely represented background scatter of artefacts that had been deposited from other areas through landscape processes. Kayandel concluded that there was little potential for significant deposits of Aboriginal materials to be extant in the area and no further assessment was necessary.

4.4.2 Topographical Zone 2

Witter carried out a survey for a gas pipeline between Wagga Wagga and Young in 1980. He recorded 14 artefact scatters, 21 isolated finds, a possible rock well and a modified tree. Most of the sites identified by Witter (1980b) occurred in association with creeks or water courses within a range of landforms including flats, slopes and spurs. Witter recommended the excavation of some of these sites if they were unable to be avoided. One of these sites, artefact scatter BY/4, was salvaged by Kelly (1980) later that same year collecting 319 surface artefacts and excavating an additional 48 artefacts.

A 1983 study by Witter and Hughes (as cited in AECOM Australia Pty Ltd 2010:67) of a proposed transmission line near Murrumburrah recorded 18 Aboriginal sites. This consisted of 13 isolated finds, four artefact scatters and one scarred tree. Witter and Hughes suggested that site patterning in the region is dominated by sites clustered along the valleys of water courses with the open undulating plateau containing significantly lower densities of sites.

An archaeological survey of the Ulandra Nature Reserve was undertaken in 1985 by Paton and Hughes (as cited in AECOM Australia Pty Ltd 2010:67). The survey identified seven artefact scatters and 15 isolated finds. The scatters consisting mostly of quartz with some silcrete basalt and quartzite ranged from between nine and sixty-seven artefacts and all sites were located on low rises associated with creek lines. Paton and Hughes suggested that landforms associated with wide low relief valleys had the highest archaeological potential.

In 1986 Brayshaw and Associates conducted a survey approximately 16km north west of Temora for a proposed open cut mine with a dam and spoil heap. The area was 5.5 km^2 and it was noted that any sites found would be consistent with Witter's "Riverine oriented cultural adaptation" model. A total of five sites were recorded during the survey. The site types included an open camp site with an artefact scatter, hearths and a scarred tree; two hearth sites, an artefact scatter and a scarred tree. The artefacts were predominantly flakes and flakes pieces with cores also recorded. Lithologies were a grey chalcedonic silica will lesser numbers of quartz, chert, fine grained siliceous, volcanic and quartzite. All the hearth sites were noted to have been damaged by erosion and the low density of artefacts in the area was assessed to represent the transient occupation of the area.

Bonhomme (as cited in AECOM Australia Pty Ltd 2010:67) conducted an assessment of a gas pipeline north of Junee in 1987. Eighteen sites consisting of seven artefact scatters, eight isolated finds and three scarred trees were recorded the majority of scatters were located on hill slopes within 100m of a watercourse.

An assessment was undertaken by Nicholson in 1990 for a proposed natural gas pipeline from Junee South towards Wagga Wagga. The predictive model established by this project suggested that artefact scatters would occur more frequently within valleys, along ridges and adjunct to water. The survey did not identify any sites. This was consistent with the model as the proposed line extended across undulating country removed from water sources. While this model is relatively accurate, a study undertaken by Witter (1980) and a subsequent reassessment by Kelton in 2006 did locate evidence of occupation in the form of a quartz scatter and possible waterhole along an ephemeral drainage line within 1km of Nicholson's (1990) survey. This suggests that there is potential for sites to occur within the open undulating plains.

HLA Envirosciences (1995) conducted a preliminary archaeological survey of 90 ha for the proposed expansion of the feedlot on the Jindalee property near Springdale. No archaeological sites were located which was thought to reflect the small area effectively surveyed and possible a less intensive level of Aboriginal settlement in the general area.

In 1991 Culture and Heritage surveyed the proposed transmission line between Temora and Lake Cowal. Primarily the survey targeted water courses as it was noted that Aboriginal people tended to focus their activities in areas where water was readily available. All creek channels, drainage lines and low-lying areas were inspected for archaeological materials with a total sample area of 22.5 linear kilometres or 10% of the total proposed corridor surveyed. A total of seven artefact scatters, an isolated grinding stone, a scarred tree and five areas of archaeological sensitivity were recorded. Culture and Heritage noted that campsites were all found adjacent to water courses with site size appearing to reflect the reliability of the water course. Sites containing only a few artefacts were found next to small creeks and drainage lines while larger sites were recorded near more permanent water sources. Campsites were noted to be most common in the Temora area. This selective survey method of focusing on areas near water would have likely skewed these results as it is expected that a background scatter of artefacts would also be located further away and/or between these water sources.

A subsurface investigation was undertaken by Barber in 1997 adjacent to the Muttama Creek just south of Cootamundra. A total of 61 test probes were excavated with only 24 test pits containing artefacts. Sixty-nine artefacts in total were recovered and 45% of the assemblage originated from a single test pit, E8. The overwhelming majority of artefacts (92.8%) were manufactured from quartz with lesser numbers of fine grained siliceous and volcanic raw materials present. The nature of the quartz assemblage suggested that bipolar flaking techniques were predominantly used, and the high density of artefacts found in test pit E8 suggested a knapping event. Barber (1997) suggests that the generally flat topography of the area prevented the concentration of the archaeological record to a topographic feature however, a significant background scatter of artefacts including single knapping events such as located in E8 are present in the landscape (Barber, 1997).

A second survey in the Ulandra Nature Reserve was undertaken by Dearling and Grinbergs in 2002 (as cited in AECOM Australia Pty Ltd 2010:67). The survey was undertaken along TransGrid access tracks and 28 Aboriginal sites were identified within the reserve and an additional site located on a neighbouring private property. A subsequent survey by Dealing in 2004 identified seven artefact scatters and three isolated finds, recording a total of 146 stone artefacts. Most sites were adjacent to water courses and all occurred on low gradient spurs or locally elevated locations (as cited in AECOM Australia Pty Ltd, 2010, p.67).

AECOM Australia (2010) conducted the Aboriginal and historic heritage study for Stage 1 of a 61 km pipeline project from Bethungra to Wagga Wagga. The survey methodology was designed to only target specific portions of landscapes where archaeological evidence was most likely to be found, resulting in 18 transects being surveyed. A total of 36 Aboriginal sites (30 artefact scatters and 6 isolated artefacts) were recorded along the proposed pipeline route, including 24 previously unrecorded sites. The majority of sites identified during the survey were associated with, or in close proximity to an ephemeral water source with over two thirds of sites located within 50 m of a water source.

A 2011 report by OzArk undertook an assessment of the Wagga north to Junee to Temora 132 kV powerline. The study identified several artefact scatters and a scarred tree (as cited in EMM Consulting 2018:16).

In 2017 EMM undertook an Aboriginal due diligence assessment for the proposed Junee Solar Farm. EMM suggest that the proposal area was not in proximity to a water source and had been extensively disturbed through land management practises. Given the project area was within a relatively flat landscape EMM concluded that there was low potential for cultural material to be present. Based upon the background assessment EMM suggested that artefact scatters were most likely to occur in valleys, along ridges and adjacent to permanent or semi-permanent sources of water. Additionally, the absence of mature trees on the property negated the potential for scared or modified trees to occur (EMM Consulting 2018).

4.4.3 Topographical Zone 3

In 1986, White explored the Riverine and Plateau models in the Wiradjuri Region argued by Witter (1980a), to the west of the project area. White's study emphasised regional variation within the models, arguing that groups in the east of the region tended to have a greater reliance on terrestrial hunting, which is less seasonally affected. White's (1986) study can be applied to the western portion of the project area.

In 1982 Gollan carried out a survey for a transmission line between Griffith and Darlington Point. He recorded a number of scarred River Red Gum trees on the southern bank of the Murrumbidgee River on Tubbo station. He also recorded an artefact scatter on both sides of Mirrool Creek, where artefacts were observed in eroded pans that were affected by stock movement. Of particular note from this survey was the discovery of a stone quarry on Whitton Road, where stone material was extracted for flaking. Gollan identified that the stone source was the pebbles within the pebbly sandstone and conglomerate beds, over an area of 40 m x 50 m. Although the area was heavily disturbed from recent quarrying and machine extraction, he found numerous cores, flakes, hammerstones identifying the Aboriginal use of the outcrop. Raw material included quartz, quartzite, chert, greenstone and basalt. The site also exhibited signs of excavation or quarrying to obtain better materials (Gollan 1982).

Palmer (1984) carried out a survey for a proposed reservoir on the southern ridge of McPhersons Range, at Scenic Hill Reserve, Griffith. A number of artefacts had been identified at the general location by National Parks and Wildlife officers on a graded track. The artefacts had been collected and included a ground edge axe, a pecked axe, two cores and a unifacial pebble implement. Palmer also found additional flakes scattered across the disturbed area and concluded that the location was infrequently visited by Aboriginal people, based on the scattered and low-density nature of the site. Palmer (1984) mentioned that part of the area had been quarried for road base and that the geology was pebbly sandstone and conglomerate, but he makes no connection with the area as a possible stone source, despite noting that a similar outcrop, the Whitton Quarry described by Gollan, was made from the same geological formation.

In 1989, Smith undertook survey of Cocoparra National Park. The objective of the assessment was to identify the types, nature, and extent of Aboriginal sites on the Cocoparra Range (Smith 1989). As part of this assessment Smith (1989) outlined the following hypotheses for settlement strategy as articulated by Witter (pers. Comm. 1989 as cited in Smith 1989:9-10).

- Creek valleys should have provided the longest-term water along the edge of the range. These would have been the main focus of domestic occupation;
- Tributary streams, hill summits and ridge saddles may have been the loci of various activities;
- Seeps and rock holes would have offered short term water after rain. Transient camps may have occurred at these locations;
- Activities were probably less frequent the steeper the slope.

Witter (pers. comm. 1989 as cited in Smith 1989:9-10) also suggests the following pattern of site type and occurrence for the Cocoparra Range:

- The creek valleys should have a high frequency of sites with a high density and variation of artefacts. There should be considerable inter-site and intra-site variation found;
- Tributary streams, hill summits and ridge saddles should have relatively common small artefact clusters or isolated artefacts;
- Rock holes on high ridges and seeps on gentle slopes should have small sites with low artefact variability and low inter-site variability;
- Isolated artefact finds should be less common the steeper the slope.

In order to test Witters hypotheses, Smith (1989) divided the Park into three land systems, Upper Undulating Ridges, Hill Slopes, and Low Gentle Slopes and Alluvial Flats and undertook pedestrian survey across a sample of all three. In total, 42.1km was surveyed with an average effective survey coverage of 6%. Thirty-Five sites were located consisting of twenty five open camp sites, one with a scarred tree, and ten additional scarred trees. The majority of sites were located within the Alluvial Flats land system, however the survey of this landform accounted for 51% of the total survey and when sites were averaged across all landforms both the Upper Undulating Ridges and alluvial flat landforms had approximately equal densities of open sites, though scarred trees occurred more frequently on the alluvial flats.

The majority of open camp sites were located within 25m of a stream and all were within 250m. The most common raw material was silcrete and quartzite with smaller frequencies of fine grained basaltic, quartz, fine grained volcanic and fine grained siliceous located. Milling slabs and mullers were recorded as being made from local sandstone and 15% of assemblages were made up of cores that tended to be larger than flake tools and debitage. Similar to the open camp sites, isolated finds were also observed to generally occur within 30m of a stream and no more than 100m away. While no clear trends in artefact morphology were observed within the isolated find assemblage, it was noted that over half of all isolated finds were usable artefacts, rather than debitage.

Of the scarred tree sites, most were within 30m of water and were generally found on box species, most commonly *Eucalyptus populnea* with some *Eucalyptus melliodora*.

As a result of this assessment Smith (1998) made the following conclusions:

- Relatively flat land in the vicinity of stream on the Cocoparra Range are the locations for the majority of Aboriginal sites;
- Site and isolated artefact density in the upper undulating ridge environments and alluvial flat environments will be very similar;
- Few, if any sites will be found at seep and rock hole locations;
- The overwhelming majority of site types will be open camp sites and scarred trees. Other sites will be rare;
- Larger open camp sites with greater archaeological variability will probably be found in alluvial flat environments;
- Isolated artefacts are more likely to be found away from streams than open sites; and
- The great majority of scarred tree sites will be found in alluvial flat environments and these will be scars on *Eucalyptus populnea* and *Eucalyptus melliodora* in most cases.

In 1998 Barber carried out an archaeological assessment of a proposed subdivision at Lake Wyangan. The area contained a lunette on the eastern side of the southern section of Lake Wyangan as well as a ridge running north-south through the property. Barber (1998) recorded four sites that included three artefact scatters and an isolated find. Silcrete was the most common raw material used for flaking, which is consistent with other studies in the region. Two of the artefact scatters were found on a lunette feature on the eastern side of the lake, one was found in a disturbed context around a farm dam in a drainage depression and an axe was found on the edge of a drainage outlet from the adjacent wetland. It was determined that elevated ground close to depressions and the main ridgeline had high archaeological potential.

As part of further investigations into the proposed development area at Lake Wyangan, Barber (2000) undertook a subsurface testing program. The subsurface investigation was focused on the lunette and the ridgeline. Within the lunette, Barber hand excavated twelve test probes, as well as eight mechanical test pits. A total of 10.4 m^2 in area was excavated and 3.7 m^3 of deposit was sieved on the lunette. On the ridgeline, he excavated thirteen test pits, and three mechanical pits. Excavations from the lunette recovered 35 artefacts, with silcrete the dominant material, followed by fine grained volcanic, quartzite, and quartz. Artefacts were noted as being mostly within the upper 50 cm of the deposits but existed to a maximum depth of 70 cm.

In 2005 Cupper completed further work in the Lake Wyangan area for the Sunset Waters Residential Subdivision and identified a further eleven isolated finds. In 2009, the location of each of these finds were subsequently mechanically excavated by Cupper to establish the subsurface archaeological potential. No further Aboriginal cultural material was identified, and it was concluded that the area's archaeological potential was low due to extensive land disturbance (Cupper 2009).

In 2011 OzArk undertook two assessments for development proposals in the Hanwood area. The first study did not find any sites within a generally flat area with a fine cracking silt deposit. The second assessment included survey of a proposed bottling plant and an 8 km long pipeline across the plain. OzArk (2011) recorded two isolated artefacts in a ploughed paddock and a scatter of three artefacts in a table drain. All of the artefacts were silcrete and in highly disturbed contexts but

OzArk concluded that despite predictions suggesting there would be no archaeological material present, the presence of the artefacts indicated Aboriginal movement across the landscape, and possibly associated with now altered depressions or basins that could have held water after flooding or rain prior to European land alterations.

In 2015 RPS conducted a Due Diligence assessment for the proposed Riverina Solar project at Yoogali. The majority of the Proposal Area had been disturbed over many decades through various land uses including being used as irrigated fields for agricultural crops. Despite the disturbances and land modifications four sites were identified during the visual inspection of the area. The sites consisted of two isolated finds and two low density artefact scatters with a total of six artefacts recorded (RPS 2015).

In 2016 NGH Environmental completed and Aboriginal Cultural Heritage Assessment of the proposed Griffith Solar Farm. A total of 11 artefacts were identified, comprising one scatter and two isolated finds. The sites occurred on level plains in disturbed contexts. The raw materials were predominantly silcretes, with two sandstones and volcanic, and single quartzites and fine grained siliceous. It was noted that models of site location for the Griffith area must be amended to identify that sites can occur at least 600 m from water sources and that Aboriginal artefact scatters, or campsites, exist within the broader floodplain environments, despite intensive agricultural practices. It was recommended that a Cultural Heritage Management plan be prepared for the area, and that if the proposed development is not able to avoid the artefacts that they be collected and relocated within the property (NGH Environmental 2016).

In 2017 NGH Environmental conducted the recommended Aboriginal Heritage collection at the proposed site of the Griffith Solar Farm. The three previously recorded sites were unable to be relocated. However, 10 new artefacts were identified in the same general location and, therefore, considered part of the same site. The raw materials were predominantly silcrete, with lesser volcanic, and individual quartz, sandstone and quartzite (NGH Environmental 2017).

In 2018 NGH Environmental conducted a Due Diligence assessment for the proposed land development at Lake Wyangan, referred to as Lakeside Estate. During the survey eight artefacts were located comprising two clusters. The artefacts were predominantly silcrete and a single sandstone artefact. It was noted that these artefacts were in areas of heavy disturbance and that, therefore, artefacts survive in highly disturbed contexts (NGH Environmental 2018a).

In 2018 NGH Environmental completed an Aboriginal Cultural Heritage assessment for the proposed continuation of development of Lakeside Estate, Griffith (NGH Environmental 2018b). The four sites previously recorded by Barber (1998) were unable to be relocated, possibly due to very low visibility and extensive disturbance over the 20 years since they were originally located. Six artefacts along the edge of the lunette were relocated and three new sites were identified, all of which were low density artefact scatters. The raw materials were predominantly silcretes with lesser frequencies of quartz, volcanic, sandstone (grindstone fragment) and chert. Subsurface testing was undertaken within elevated ground in the Proposal Area with the focus along the ridge line and in areas not tested in Barber's (2000) testing program. Six artefacts were excavated from 20 test pits and it was determined that the results confirmed previous modelling of archaeological sensitivity of elevated ground in close proximity to water sources with a low density of artefacts recorded along north-south ridge lines.

In 2021 NGH performed an Aboriginal Cultural Heritage assessment for the Cocoparra National Park & Cocoparra Nature Reserve. The survey strategy was to cover as much of the ground surface within the two areas as possible by walking a series of transects across the National Park and Nature Reserve. Any mature native trees were also inspected as were any exposures. The survey visibility was generally good due to the track grading and previous disturbances. The ground surface was found to be generally highly disturbed in areas where existing tracks, parking areas and other infrastructure was located. During the assessment a total of 10 km was walked across the two areas, resulting in the identification of extensive artefact scatters at both the Store Creek and Mailmans Gap areas. A total of 82 artefacts and 1 scarred tree recorded at Store Creek and 100 artefacts recorded along the Mailmans Gap Fire Trail. It was concluded that due to the land use history, the good surface visibility during the assessment and levels of disturbance that a subsurface testing programme was not warranted. Subsequent surface collections of the two site areas collected over 2,000 artefacts, including evidence of microblade technology including backed artefacts (NGH in prep).

4.5 Local archaeological studies

The following is a summary of the four known AHIMS registered sites that have GPS coordinates located within the project area.

AHIMS# 50-2-0004 (WT/H?1) – This site was originally recorded by Saunders (1999) during their assessment of a proposed gas pipeline corridor between Wallendbeen and Temora. The site was located on a very low gradient basal slope above the valley floor along the road reserve; approximately 300 m away from the closest water source. The site was noted to be in a very poor condition, having been almost destroyed due to the grading of the highway verge. The site was recorded as a possible hearth, and was described as follows:

> *"The feature comprises compact fist-sized nodules of baked clay or termite nest in a semi-circle 50 cm in diameter. The nodules are reddish-brown and are indurated to a much greater extent than would be produced by the firing of clay subsoil in a bushfire. Small fragments of charcoal are associated with the nodules. The centre of the feature was eroded and the site is in very poor condition. The feature has slumped out of a steeply eroded road cutting onto subsoil at the base of the cutting.*
>
> *The feature could also be a fire-baked termite mound or the base of a burnt tree which had a termite nest in the trunk, although there is no evidence of roots or of a burnt stump. The quantity of baked clay is small [and] localised, as is the charcoal, suggesting the remains of a small fireplace or oven"*

AHIMS# 50-2-0006 (WT/OC2) - This site was originally recorded by Saunders (1999) during their assessment of a proposed gas pipeline corridor between Wallendbeen and Temora. The site was located on the south west slopes and plains along the highway easement. The site was noted to be highly disturbed by the grading of the highway verge. The site was recorded as an artefact scatter, and was described as follows:

> *"Low density scatter of two quartz flakes 50 m apart on a low red soil road embankment."*

AHIMS# 50-3-0010 (WT/ST1) - This site was originally recorded by Saunders (1999) during their assessment of a proposed gas pipeline corridor between Wallendbeen and Temora. The site was located on a low gradient toe slope of a spur along the highway easement; approximately 100 m away from the closest water source. The site was noted to be in a good condition. The site was recorded as a scarred tree and was described as follows:

> *"Very old Box Eucalypt in good health located 1 m from edge of highway. Estimated height 25 m, measured girth 2.94 m. Scar is on northern side, facing road. Depth of regrowth suggests considerable age. Scar dimensions:*
>
> - *Max length (inc. regrowth): 2.00 m*

- *Inside length (exc. regrowth): 89 cm*
- *Max. scar width (inc. regrowth): 1.40 m*
- *Inside scar width (exc. regrowth): 15 cm*
- *Max. regrowth width: 70 cm*
- *Max. regrowth depth: 26 cm*
- *Height above ground*
  - *Base of inside scar: 60 cm*
  - *Base of regrowth: 40 cm – 50 cm"*

AHIMS# 50-3-0046 (Burley Griffin Way Scar Tree 1) – This site was originally recorded by Peter Ingram in 2017. The site is located on a crest along Burley Griffin Way east of Stockinbingal and is approximately 1k m from the closest water source. This site was recorded as a scarred box tree. The scar was described as an elongated shield scar measuring 210cm (length) by 50cm (width), the scar depth was noted to be 21cm while 21cm of regrowth was also recorded.

In 1992, Kuskie conducted an archaeological assessment of the proposed route of an Optus Communications fibre optic cable between Hall, ACT and Cootamundra, NSW; located directly (or adjacent) within the project area in between the Hume Highway/Burley Griffin Way intersection and Murrumburrah, NSW. As a part of this assessment areas of high sensitivity were inspected along the proposed cable route. The works recorded a total of four artefact scatters and three isolated finds along the cable route. Subsurface test excavations also took place in four areas. Of these sites, three of the artefact scatters (AHIMS# 50-5-0020, 50-5-0021, 50-5-0026) are located within 1 km of the current project area. An additional artefact scatter (AHIMS# 50-5-0022) is also located within 1km of the current project area and while it was part of Kuskie's assessment, no further information on its contents is available. The sites within 1km of the project are identified by Kuskie (1992) are described in Table 4-3 below.

While Kuskie only identified artefacts within a small section of land associated with the current project area, other sections of the Burley Griffin Way corridor were also survey by Kuskie. No Aboriginal objects or PADs were identified by Kuskie in these areas.

Table 4-3 Description of sites recorded by Kuskie (1992).

Site	Site Type	Location	Description	Further Comments in Report
AHIMS# 50-5-0020 (Beechwood 1)	Artefact scatter with a subsurface deposit.	Adjacent to the road on a broad gentle slope elevated above a small creek. Outside of the current project area.	The artefact scatter was comprised of four artefacts: • A broken acid volcanic flake; • A sedimentary anvil/hammerstone with heavy pitting and negative flake scars present; • A quartz flake; and • An acid volcanic flake. A total of four test pits were also excavated within an alternative route alignment. Three artefacts were located in the upper deposits (creamy sandy soils) of the test pits: • Test Pit 1: a broken rhyolite flake (approximately 13 cm – 18 cm depth); • Test Pit 2: a rhyolite flake (approximately 16 cm – 20 cm depth); and • Test Pit 4: an acidic volcanic flaked piece (approximately 7 cm – 10 cm depth).	The site is likely to extend over the entire landform unit and cannot be avoided by rerouting. The site is a small artefact scatter and is of low archaeological significance.

Site	Site Type	Location	Description	Further Comments in Report
AHIMS# 50-5-0021 (Beechwood 2)	Artefact Scatter	Located approximately 600 m north of AHIMS# 50-5-0020. Outside of the current project area.	The artefact scatter was comprised of two artefacts: • A rhyolite retouched broken blade; and • A broken silcrete flake.	The site is initially identified in an area of high sensitivity. However, the visual inspection revealed that the area had been heavily disturbed by historical land use.
AHIMS# 50-5-0022 (Beechwood 3)	Artefact Scatter	Located approximately 900m north east of AHIMS# 50-5-0020. Outside of the current project area.	Unknown. The site was not described in the report written by Kuskie (1992) nor is a site card available online. However, it is known the site was recorded by Kuskie at the same time as the previous two.	Unknown
AHIMS# 50-5-0026 (Spring Creek)	Artefact Scatter	Located approximately 100m from Spring Creek on a moderate mid-slope and within a vehicle track. Outside of the current project area.	The artefact scatter was comprised of four artefacts in an 80m x 40m area: • Three black porphyry flakes; and • An acid volcanic core with nine negate flake scars and two striking platforms.	Kuskie reported that conversations with the property owner indicated that a number of similar artefact scatters are located all along Spring Creek. This site was avoided by the final cable route.

In 1995, Mills and Wilkinson Consulting Archaeologists conducted an archaeological survey of the proposed RTA Road Diversion (MR 84) at Illalong Creek near Binalong, NSW. This is in a section of the current project area. The assessment resulted in the identification of two Aboriginal sites and three isolated artefacts during the survey (see Table 4-4 below). Site 1 and all three of the isolated finds were assessed to have a low archaeological significance. However, Site 2 was identified as a PAD with a potentially high archaeological significance. Further sites identified during the assessment comprised of areas with ochre bearing ironstone rock (150m west of Isolated artefact 3) as well as ochre pieces and river cobbles within a creek bed along Illalong Creek. While these two areas contained no archaeological material, the presence of ochre suggests that there is a high potential for unrecorded sites to be located nearby. No further areas of Aboriginal or archaeological sensitivity were identified during the assessment.

Table 4-4 AHIMS sites registered by Mills and Wilkinson Consulting Archaeologists.

Site	Site Type	Location	Description	Further Comments in Report
AHIMS# 51-4-0039 (Queanbeyan Site 2)	Artefact Scatter with PAD	Located in an approximately 150m diameter area on an elevated spur 100m east of Burley Griffin Way and along a tributary to Illalong Creek. Partially within the project area.	The artefact scatter was comprised of 38 artefacts. Multiple typologies were identified within the assemblage such as flakes, cores, manuports, backed blades, and anvils.	Artefacts were found in exposures created by vehicle tracks and the installation of the Optus cable line.
AHIMS# 51-1-0040 (Site 1 in Nowra District)	Artefact Scatter	Located in a 100m x 3m scatter adjacent to Burley Griffin Way. Partially within the project area.	The artefact scatter was comprised of 15 artefacts. Multiple typologies were identified within the assemblage such as flakes, cores, broken flakes, flaked pieces, and debitage. The artefacts were also made of a variety of raw materials such as chert, quartz, and mudstone.	It was argued that the artefacts had been exposed to the surface by the digging of a trench by Optus as there is evidence of heavy machinery tracks along the extent of the artefact scatter.
AHIMS# 51-1-0041 (Isolated Artefact – Pebble Axe)	Isolated Artefact	Located 45m north east of the project area in association with a tributary of Illalong Creek.	A brown quartzite pebble axe with seven negative flake scars.	-

Site	Site Type	Location	Description	Further Comments in Report
Isolated Artefact 2 (Unknown AHIMS)	Isolated Artefact	Located approximately 150 east of the project area in association with a tributary of Illalong Creek.	A single dark grey chert flaked piece with three negative flake scars.	-
Isolate Artefact 3 (Unknown AHIMS)	Isolated Artefact	Located approximately 50m south of the project area.	A single blue/grey chert flake.	-

In 2006 Robert Paton Archaeological Studies Pty Ltd performed test excavations at AHIMS# 51-4-0056 (C-0S-1/Chris P) and associated PADs 1 and 2 for the proposed Bowning Road deviation to connect the Burley Griffin Way to the Hume Highway, NSW. This is located at the eastern most extent of the current study area. These works were a continuation of the survey performed by Mills in 2001, which recorded the AHIMS site and identified the two PADs. Paton conducted a sub-surface testing programme at PADs 1 and 2 in accordance with Section 87 Permit #2226. A total of 56 test pits were excavated within the two PADs, 28 at PAD 1 and 28 at PAD 2. All test pits were place in a 10m grid pattern across the PAD. No subsurface artefacts were recorded at either PAD during the test excavations. Furthermore, Paton attempted to relocate AHIMS# 51-4-0056 but was unable to do so; it was assumed that the artefacts had been washed away. Paton argued that the results of the investigations suggested the following:

- _"The site located by Mills may be one of many small artefact scatters associated with minor ephemeral creeks. The test pitting merely confirms the small size of the site."_
- _"The creek may in fact be a recently formed erosion feature and the finds reported by Mills (2001) may have been located because of exposure from sheet wash. Originally the finds may simply have been isolated artefacts located on a gentle hill slope – as noted previously similar findings have been noted elsewhere during systematic studies (Paton 2004.)."_

Most Aboriginal cultural heritage sites occur in association with major water sources. This includes anabranches, ephemeral and relict lake systems, within relatively intact tracts of riverine Red Gum forest along the floodplains of the major active rivers and creeks, and within Black Box fringed depressions. This is based upon the previous surveys and archaeological studies undertaken in the region. The higher archaeological sensitivity of source bordering dunes and lunettes to water sources, prior streams and sand bodies, including scalded environments is noted.

A range of lithic raw materials have also been identified in the region including silcrete, quartzite, chert and volcanic material. It is likely that much of this material originates from within the pebble conglomerate that outcrops throughout this region. Outcropping of the conglomerate has been observed at places such as Scenic Hill and there is evidence of quarrying and extraction of material near Whitton for stone tool manufacture. The Cocoparra NP is known to have pebble conglomerate outcrops similar to Scenic Hill and is therefore likely to have been a raw material source. Additionally, the majority of studies from this region have recorded Aboriginal cultural heritage within disturbed contexts as a result of farming and irrigation practices prevalent in the region indicating that despite disturbance sites persist within the landscape. Consequently, despite the disturbed context that is present within the majority of the project area, there is still some potential that Aboriginal cultural heritage sites will remain within the project area in Topographical Zone 3, albeit in a highly disturbed context.

4.6 Summary of archaeological context and site location model

The results of these previous archaeological surveys in South Western Slopes and Cobar Peneplain Bioregions show there are Aboriginal objects or archaeological deposits present in a variety of landforms that are common within these regions. However, not enough archaeological research has been performed in order to determine whether there is a pattern of site location relating to the presence of potential resources for Aboriginal use; although it is highly likely that this is the case. Other sites in the area tend to be within close proximity to water sources. The common characteristic of all sites identified and those that have been subject to subsurface testing is that the density of cultural material within the sites is generally low. While there have not been any sites with high-density cultural material identified within 1 km of the Burley Griffin Way corridor, this may be due to the lack of consistent archaeological survey within these areas.

The Aboriginal land use of the South Western Slopes and Cobar Peneplain regions are little understood, as few in-depth regional studies have been completed and no sites have been dated. It is possible to ascertain that proximity to raw materials and resources, such as waterways, was a key factor in the location of Aboriginal sites. It is also reasonable to expect that Aboriginal people ventured away from these resources to utilise the broader landscape, but the current archaeological record of that activity is currently limited.

The Aboriginal site modelling for the region to date suggests that Aboriginal sites are highly common within proximity to waterways and any associated elevated terraces, spurs, hill crests, or gentle slopes. These studies also suggest that most site types in the region are comprised of isolated artefacts and artefacts scatters, with some landforms also containing potential for subsurface archaeological deposits. Furthermore, the presence of modified trees (carved or scarred) along the Burley Griffin Way corridor also suggests that this site type may be present where mature native vegetation remains, including any isolated mature native trees. The previously recorded AHIMS sites in the region support this conclusion. While the historical land use of the project area has caused significant surface disturbances, it is unknown to what extent this has impacted subsurface deposits.

The likely archaeological site types for the local area, and the potential for their presence within the project area, is outlined in Table 4-5 below.

Table 4-5 Aboriginal site prediction statements.

Site Type	Site Description	Potential	Likelihood to Occur
Modified Trees (carved or scarred)	Trees that have undergone cultural modification.	Potential to occur within areas where there are remnant mature native trees, isolated paddock trees, and dead or fallen mature trees.	Moderate
Isolated Artefacts	Single stone artefact.	Isolated finds may occur throughout the project area.	Moderate to High

Site Type	Site Description	Potential	Likelihood to Occur
Stone Artefact Scatters and	Artefact scatter sites can range from high-density concentrations through to very low density sites.	Artefact scatters have potential to occur in low to moderate densities on low gradient spur crests, slopes and elevated flats in close proximity to drainage lines and on flat ridges.	Moderate to High
Potential Archaeological Deposits (PADs)	Potential subsurface deposits of archaeological material.	PADs have potential to occur in areas that are likely to have reasonable subsurface deposits in archeologically sensitive landforms such as on spur crests, flats, basal slopes and alluvial terraces.	Low to Moderate
Burials	Generally found in soft sediments such as aeolian sand, alluvial silts and rock shelter deposits. In valley floor and plains contexts, burials may occur in locally elevated topographies rather than poorly drained sedimentary contexts.	The potential for burial sites to occur within the project area is assessed as low however the possibility cannot not be discounted given that burial sites are known to occur throughout the region.	Low
Stone Quarries	Outcrops of suitable raw material (i.e., silcrete, quartz, quartzite) that show archaeological evidence of previous quarrying by Aboriginal people.	Potential to occur within the project area where outcropping stone is present.	Low
Rock Art	An engraved or painted piece of art. These are often found vertically or horizontally on sandstone outcrops or shelves.	Low potential to occur within the project area due to the lack of any known suitable sandstone outcrops or shelves.	Low
Grinding Grooves	Grooves that have been made into stone (usually sandstone) during the process of creating tools such as ground edge axes.	Potential to occur within the project area where outcropping sandstone is present. These sites are also known to occur on portable sandstone tablets that were placed in strategic locations frequented by Aboriginal people.	Low
Hearths	Concentrated charcoal associated with cultural features (not to be confused with tree clearing or bushfires)	Potential to occur either in disturbed/deflated surface sites or *in situ* sites within the project area.	Low

4.7 Cultural Heritage Constraints Mapping

The constraints mapping developed for this project used a combination of the above site prediction model for the South-Western Slopes and GIS data, such as Digital Elevation Models (DEMs). A series of maps was created that provide an indicative view of the archaeological sensitivity of the entire Burley Griffin Way corridor. A total of 26 maps were produced covering 10 km sections of the Burley Griffin Way. This was done to ensure that the areas of sensitivity and their surrounding landscape context would be visible within an appropriate number of maps. All 26 of the maps are presented in Appendix C.

The mapping has the following limitations:

- The areas of high, medium, and low archaeological sensitivity along with disturbed areas were determined based on the desktop information that NGH has available to them. This includes ESRI and NSW LPI satellite imagery as well a Digital Elevation Model (DEM) data from NSW Spatial Services. As a result, the actual archaeological sensitivity of certain landforms within the project area may be different from that which is visible within this data.
- The likelihood of encountering scarred trees is difficult to truly anticipate, as they may occur wherever mature native vegetation is present including on any isolated trees. While it is noted that as a site type in the region scarred trees tend to have a higher density to have been recorded in proximity to permanent water sources, this is likely to be a sampling bias. As a result, it is difficult to identify areas which have a higher potential for scarred trees to occur using purely desktop methods as satellite imagery is generally only able to identify the presence/absence of vegetation and google earth street view has limited angles, quality and availability (especially in more rural areas).
- The sensitivity modelling only identifies the potential for physical evidence, in the form of stone artefacts, to be present within a landscape. It is generally not able to appropriately capture intangible values and identify the location of cultural and religious sites of importance or departures from 'standardised' human behaviour. In essence, while the model and sensitivity mapping can have a reasonably high predictability success rate, there will be occasions when sites are located outside these parameters.
- The modelling for the entire project area tends to rely on general macro topographic features. It is possible that the data available does not have sufficient micro topographic information in some instances.
- It is acknowledged that there are other variables, unable to be mapped, that relate to social, religious and other intangible cultural behaviours. Societal taboos, attitudes and inhibitors as well as an individual's comfort and familiarity with certain places and landscapes can also influence people's actions and the way in which they move and use space, consequently influencing the archaeological record. While this record is able to be used to confirm the presence and sometime absence of human activity, it may not be able to explain what other features of a landscape may have been important.

The areas of archaeological sensitivity were based on a variety of criteria, involving:

- The sensitive landforms outlined in Step 2b of the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*;
- General archaeological modelling based on the previous archaeological research that has been performed within the region; and
- Previous experience in producing heritage constraints maps within NSW.

The criteria of high, medium, and low sensitivity correlate with the following:

- **High** – an area that is highly likely to contain Aboriginal objects and/or subsurface deposits due to the landforms present within the area, its position within the landscape, and proximity to resource areas such as waterways.
- **Medium** – an area that has a moderate potential to contain Aboriginal objects and subsurface deposits for similar reasons to above. The difference is that these areas are located further away from areas of high potential, which reduces their overall sensitivity in comparison.
- **Low** – an area that has a low potential to contain Aboriginal objects and subsurface deposits. These areas are usually comprised of vast flats and floodplains, or areas with significant slopes. While they are less likely to contain Aboriginal objects, it is still possible for archaeological material to be encountered in these areas, albeit in reduced densities.
- **Disturbed** – a separate category was added to reflect the nature of areas where disturbance has taken place. While the activities that caused this disturbance may have reduced the archaeological sensitivity of the area, it is still possible to find durable Aboriginal objects, such as stone artefacts, in these areas. However, any Aboriginal objects found in disturbed areas is unlikely to retain any significant scientific value.

4.7.1 Summary of Cultural Heritage Constraints Mapping

The cultural heritage constraints mapping developed for the purposes of this assessment is an indicative, desktop-based view of the sensitivity of the project area. It permits some general observations to be made about the potential for Aboriginal heritage along the corridor for Burley Griffin Way. In general, the entire road corridor (10 m each side from the centreline of the road) along with the towns are considered to be disturbed and therefore present a negligible potential for Aboriginal heritage to be present. Furthermore, the section of the project area in between the western boundary of the Binya State Forest and the township of Griffith is considered to be disturbed due to the irrigated farming system present.

The majority of the high sensitivity areas are located east of Temora, where the landforms (i.e., waterways, spurs, elevated flats) are more numerous and/or definable than they are further west. These areas contain higher potential for various site types, although PADs and artefact scatters are expected to be the most frequent site types to likely be present. The areas west of Temora to Binya State Forest however still contain areas of high sensitivity which are usually associated with waterways or areas of remnant native vegetation. The western section of the project area is also considered to have a higher potential for the presence of modified trees as a site type due to the native vegetation that hugs the road corridor.

It should be noted that it is easier to predict the presence of Aboriginal sites in the east due to the variety, definable and pronounced nature of the landforms present. In comparison, the western sections of the project area are located on a more uniform and ‘flat’ landscape, with less discernible topographical variation and/or features that are easily identified at a desktop level of assessment. The result of this is that the definition of sensitive areas is more difficult in the west unless micro-topographical data (i.e., sub-metre DEM data) is obtainable to identify the small changes in the landscape that would make the prediction of Aboriginal site types at a desktop level easier. Furthermore, the western project area is more likely to be characterised by an overall smaller density of cultural material within Aboriginal sites due to the more transient occupation/use of this landscape by the Aboriginal community. The focus of occupation in these areas is considered more likely to be focused on the higher order waterways and the major landscape features present in the region.

This modelling was used to identify disturbed areas and areas of low sensitivity to limit the need for further investigation. Further assessment for the Burley Griffin Way Safety Improvements project is required where it cannot be determined that the proposed works will not impact on Aboriginal heritage.

Overall, the entire project area contains a variable cultural heritage sensitivity based on the topographical, environmental, and archaeological information that describes any given area. The constraints mapping developed by NGH for this project should therefore be used by TfNSW in conjunction with the finalised designs for the proposed works to determine where further assessment is required in line with the PACHCI procedure. This modelling can further be used as a tool to assist in the planning for future assessments which may be required for safety improvements along Burley Griffin Way.

5. Aboriginal Community Consultation

As part of the AABR assessment, consultation with the appropriate LALCs was performed to allow for any Aboriginal cultural values or sites to be identified. The project area passes through five LALCs, Onerwal, Young, Narrandera, Leeton & District, and Griffith. All five LALCs were contacted during this assessment. Onerwal, Young, Leeton and District, and Griffith provided responses.

After the initial background research and sensitivity mapping was completed, NGH provided each of the four LALCs with copies of the sensitivity mapping within their areas for their review. Digital meetings were organised between TfNSW, NGH, and each of the LALCs to discuss:

- The proposed works for the project;
- The sensitivity mapping;
- Provide an opportunity for the community to identify areas which have unrecorded Aboriginal cultural heritage values or sites; and
- Any further concerns.

A single meeting was held with each LALC who responded to the invitation for a consultation meeting. These meetings were held on the 6th and 7th of October 2021. Each meeting discussed the project background and purpose, including the necessity of the proposed road upgrades to improve overall safety along Burley Griffin Way. A significant portion of each meeting was devoted to discussing the project with the members of the LALC in attendance, including the archaeological and Aboriginal sensitivity of the project area. This involved discussing the limitations of the sensitivity model prepared by NGH (see Section 4.7). The most pertinent issue being that the sensitivity model is based on desktop information and focusses on archaeological knowledge of the region. Each of the LALCs expressed variations of the same concern with the project, these were as follows:

- Acknowledged that Burley Griffin Way requires safety upgrades but highlighted the importance of a collaborative, transparent, and open working relationship between all parties from the outset of the project. Particular importance was placed on discussing all possibilities (including contingency plans) so any surprises are avoided.
    - Further suggested that the LALCs should be involved early in the planning phase for the ecological and mapping assessments as well as the heritage and that consideration be made to Aboriginal participation during the construction phase of the project.
- Suggested that a signed management agreement between each LALC and TfNSW be put in place. The purpose of this document would be to provide a roadmap for the future of the project and provide opportunities and positive outcomes for the Aboriginal community as well as TfNSW and road users in general.
- Stated that sites are often found during survey in the regions. Further noted that while waterways are an important indicator to the presence of Aboriginal heritage, other landforms further away from these waterways were often travelled and should not be discounted.
- Stressed that the data available on AHIMS is incomplete and does not accurately capture the Aboriginal significance of any region. Special mention was made to the fact that many Aboriginal Elders were wary of providing sensitive information to members outside of the Aboriginal community as they were unsure as to how that information would be used.
- All LALCs agreed that consultation must continue and that further assessment is required so that all sensitive areas within the project area are properly assessed by both members of the local Aboriginal communities and archaeologists.

6. Recommendations

The desktop level assessment of the proposed works to the 258km Burley Griffin Way road corridor clearly shows that there are areas present that contain high sensitivity for Aboriginal sites and/or archaeological deposits. This has been determined based off the assessment of the general environmental context of the project area as well as its ethnographic and archaeological record. The resulting predictive model and desktop sensitivity mapping (see Sections 4.6 to 4.7 and Appendix C) clearly shows that there are areas within the project area that are likely to contain Aboriginal heritage sites or archaeological deposits that may be impacted by proposed project works. Due to the limited nature of this desktop assessment any proposed works within close proximity (within 200m) to a known AHIMS sites must have the AHIMS site cards inspected by TfNSW to ensure the know boundary and/or extent of these sites does not extent into the proposed work area. It is also noted that extensive AHIMS searches are only valid for a 12 month period.

In line with the PACHCI guidelines, further assessment for the Burley Griffin Way Safety Improvements project is required where it cannot be determined that the proposed works will not impact on Aboriginal heritage.

The recommendations are based on the following information and considerations:

- Consideration of the environmental context of the area;
- Consideration of results from other local archaeological studies;
- Results of initial consultation members of the Aboriginal community;
- The assessed significance of the sites;
- Appraisal of the proposed development, and
- Legislative context for the development proposal.

Due to the nature and variety of the works proposed as a part of this project and due to the fact that the design had not yet been finalised – the recommendations are split between the works described as Type 1 and Type 2 in Section 2.1 of this assessment. The recommendations are as follows:

1. Where any known AHIMS sites will be impacted by either Type 1 or Type 2 works, further assessment to determine the need for an Aboriginal Heritage Impact Permit (AHIP) is required.
2. The removal of any old growth native trees requires further assessment in line with the PACHCI.
3. Type 1 works may proceed with caution (assuming there is no conflict with the above two recommendations).
4. Where Type 2 works are required, further assessment in line with the PACHCI guidelines is necessary to assess the potential for the proposed works to impact on both recorded and un-recorded Aboriginal heritage within the project area.
    a. The cultural heritage constraints mapping prepared for this assessment should be used by TfNSW to inform where further assessment may be required considering the finalised design plans for the proposed works.
5. Members of the Aboriginal community should continue to be engaged and consulted about the project and the potential for Aboriginal heritage impacts. They should also be provided an opportunity to assist in a formal survey of the project area as part of any Stage 2 assessment.

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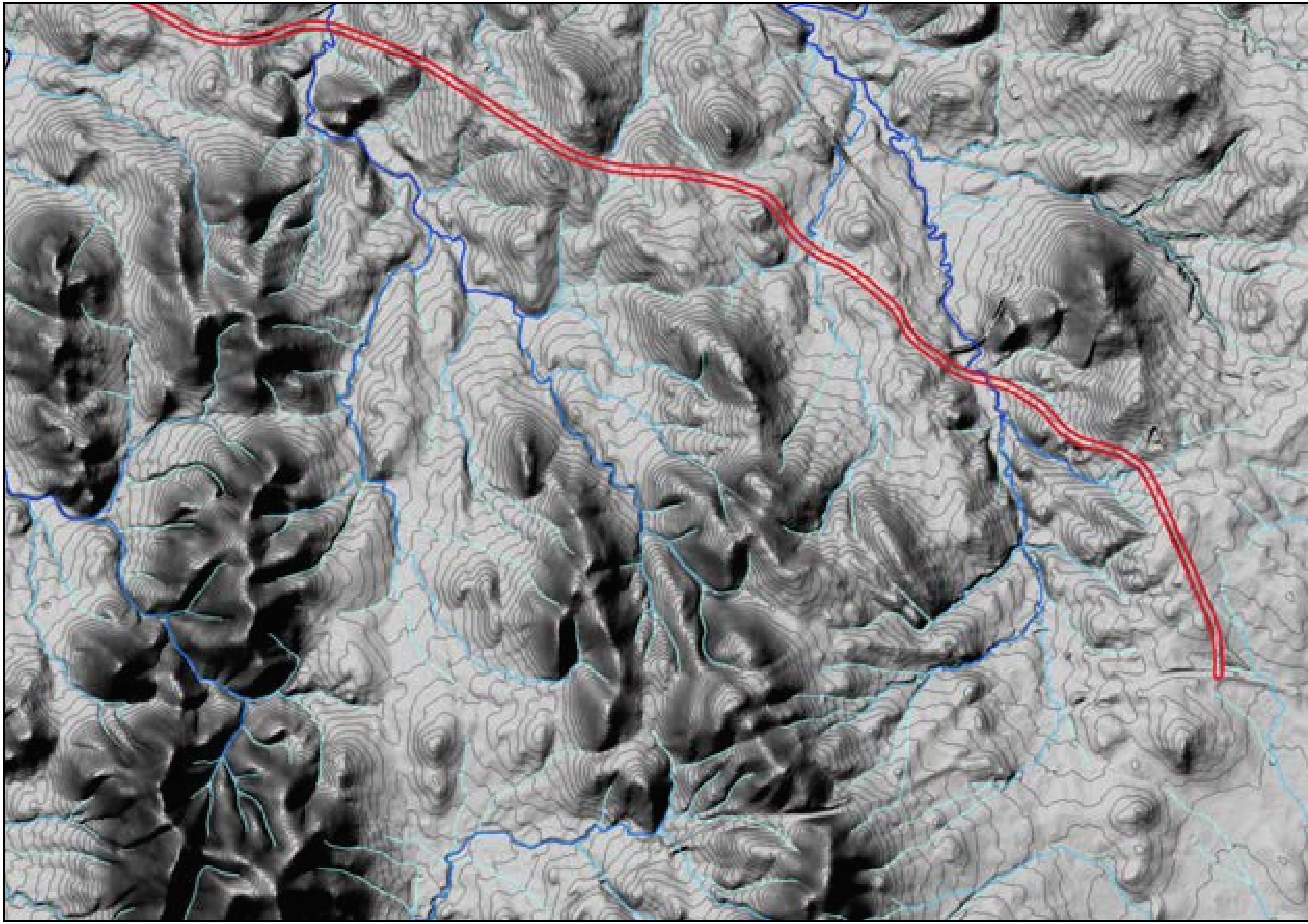
Appendix A Topographical Mapping



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 1 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

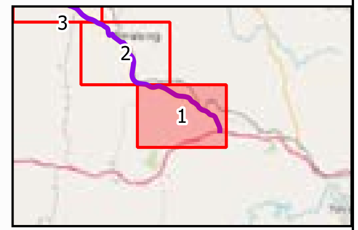
2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream

>5th Order Stream



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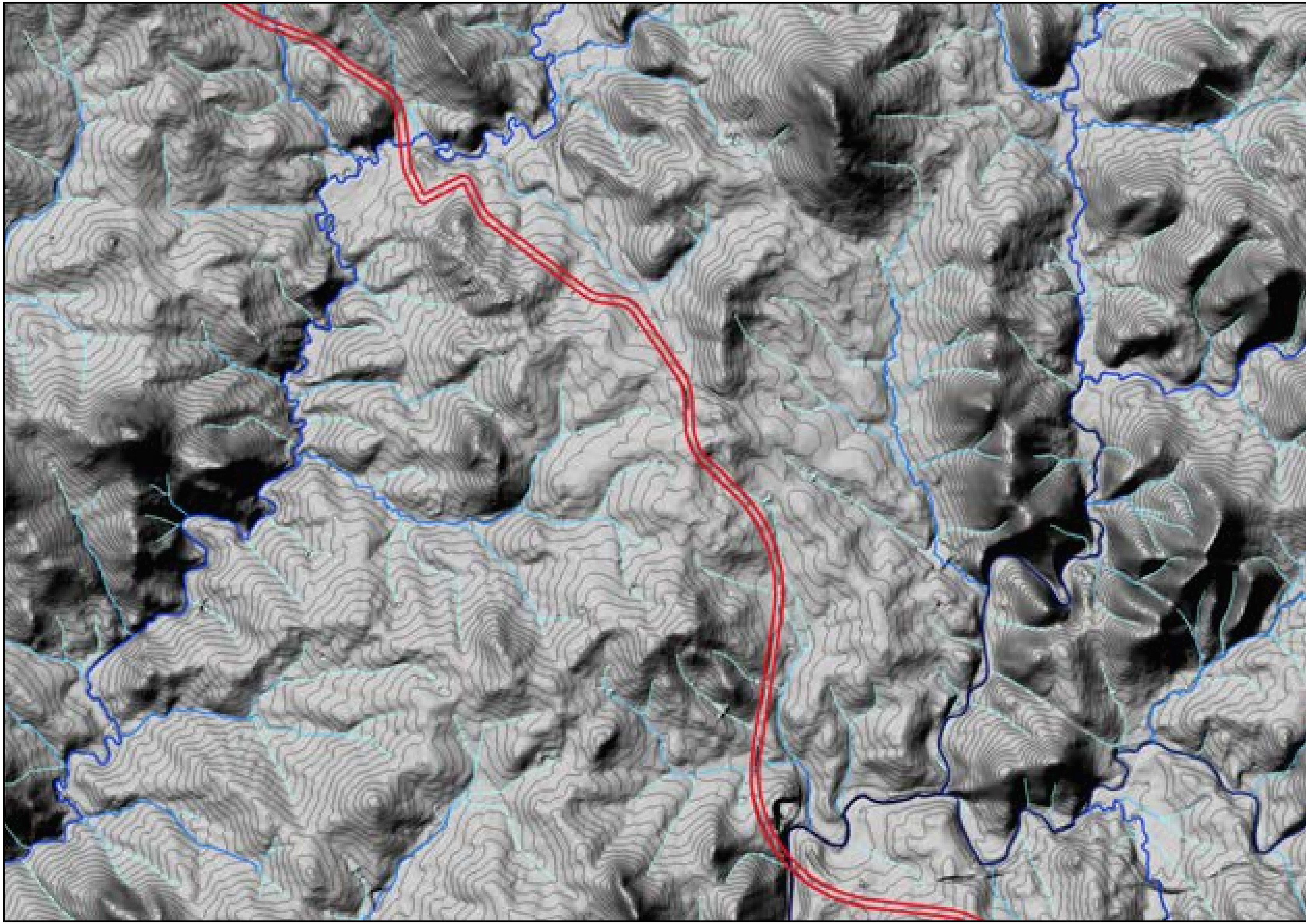
Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 2 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

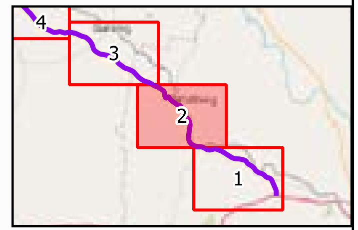
2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream

>5th Order Stream



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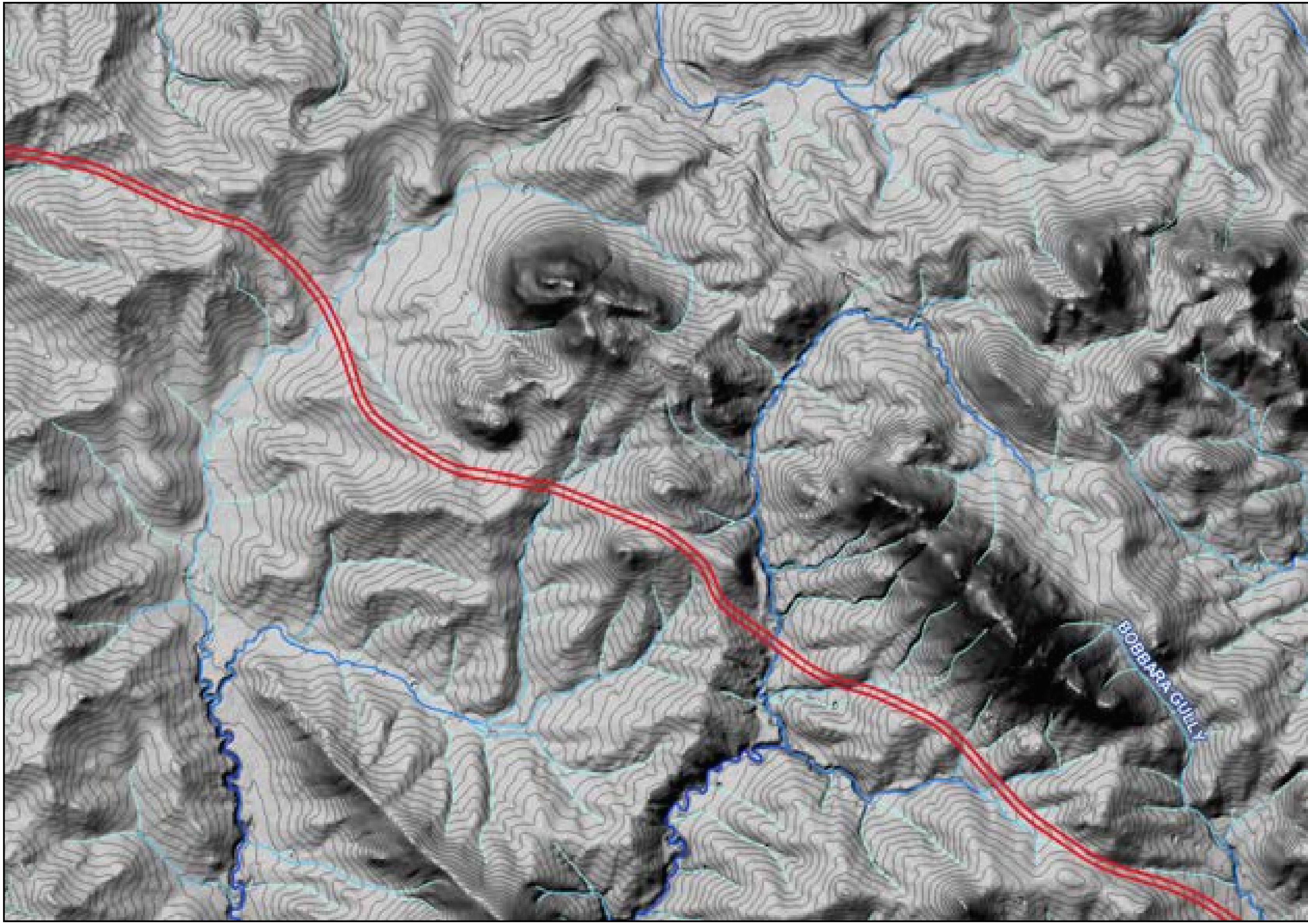
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 3 of 25

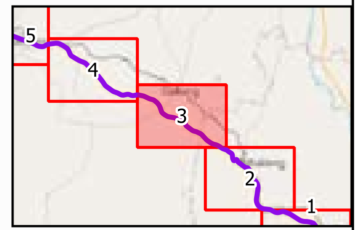


Legend

- Project Area
- Contour (5 m DEM derived)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



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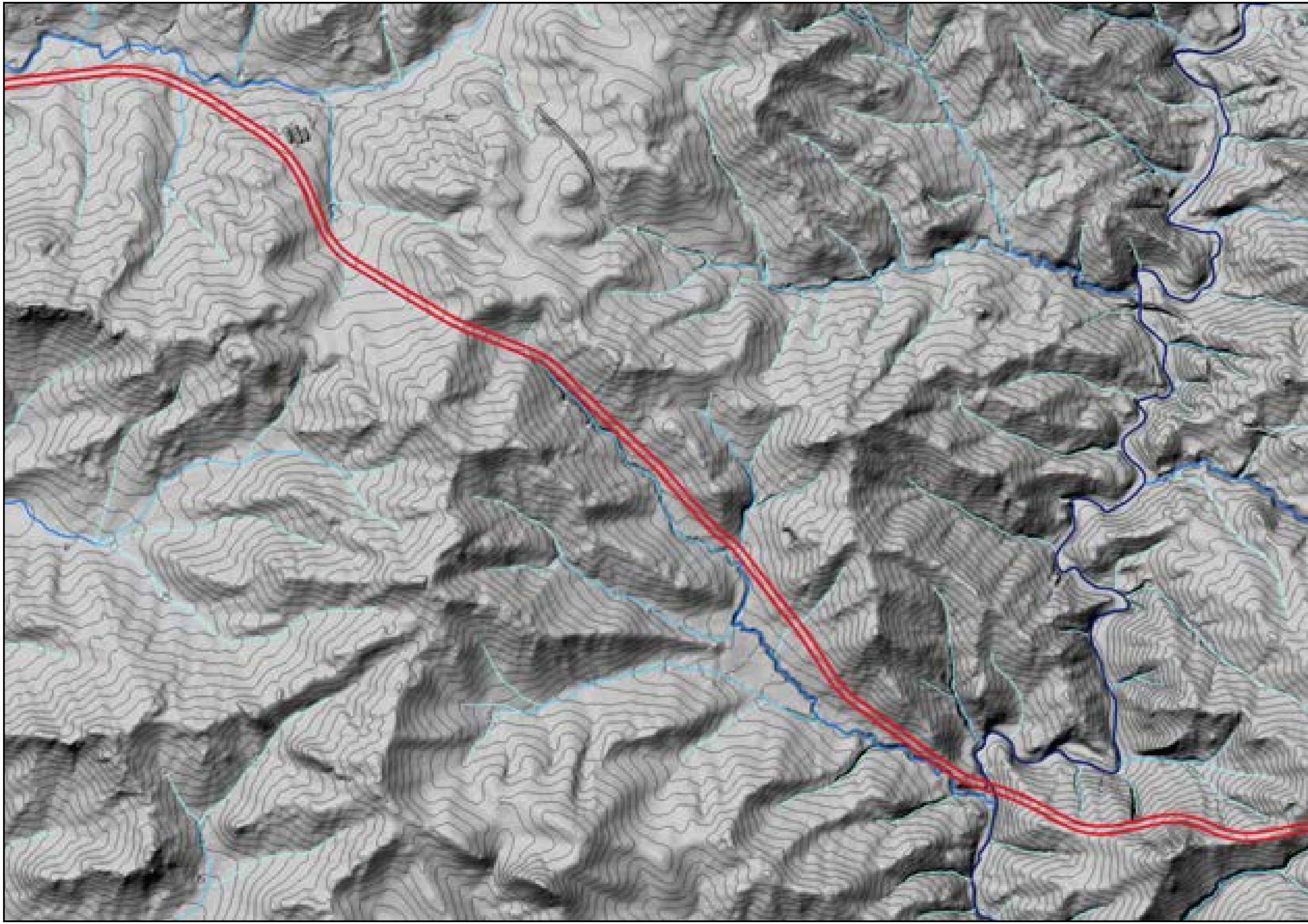
Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 4 of 25

Legend

Project Area

Contour (5 m DEM derived)

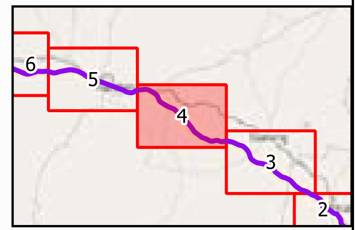
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream



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Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

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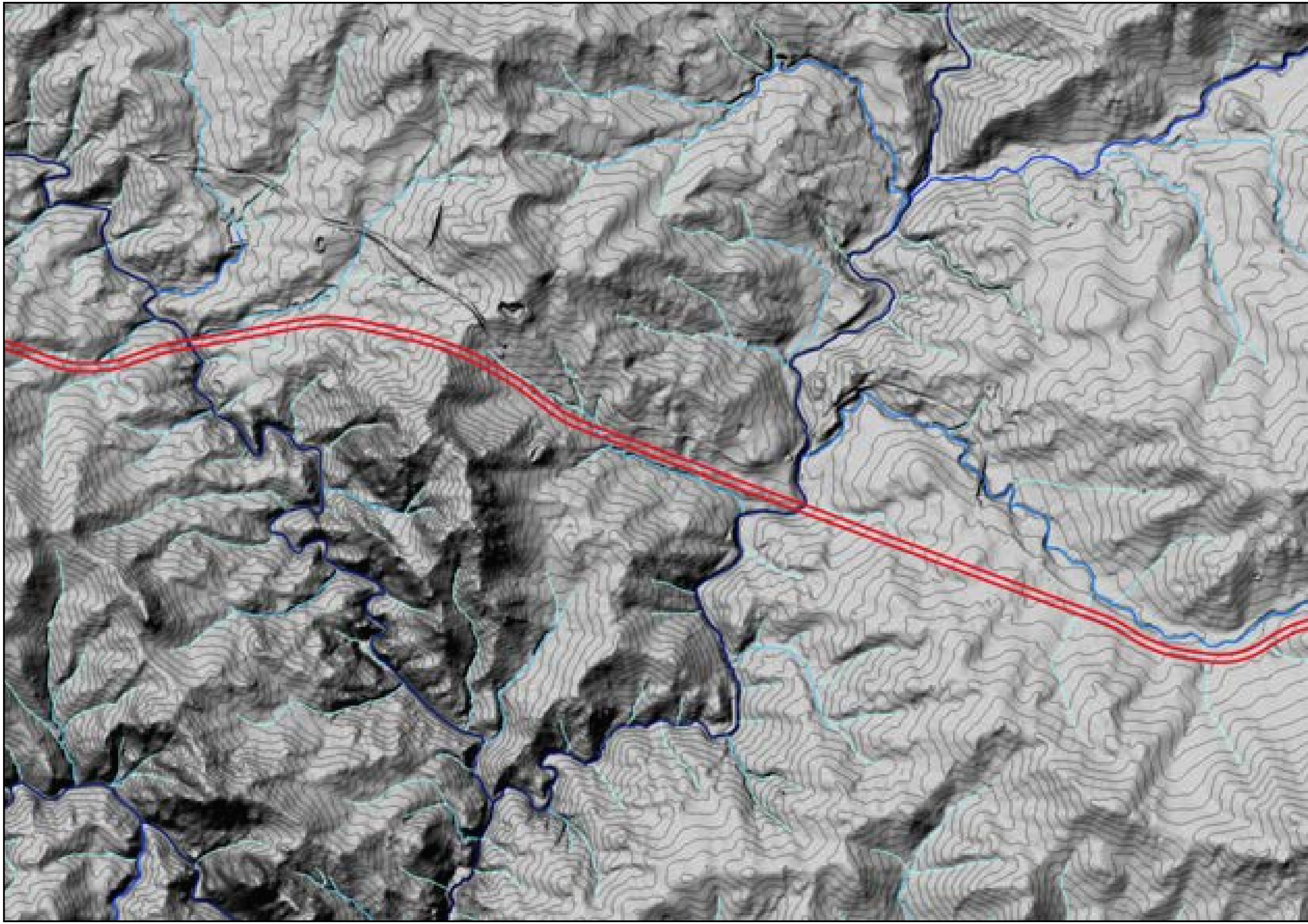


21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 5 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

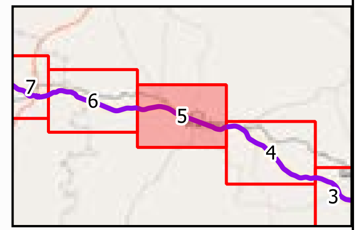
2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream

>5th Order Stream



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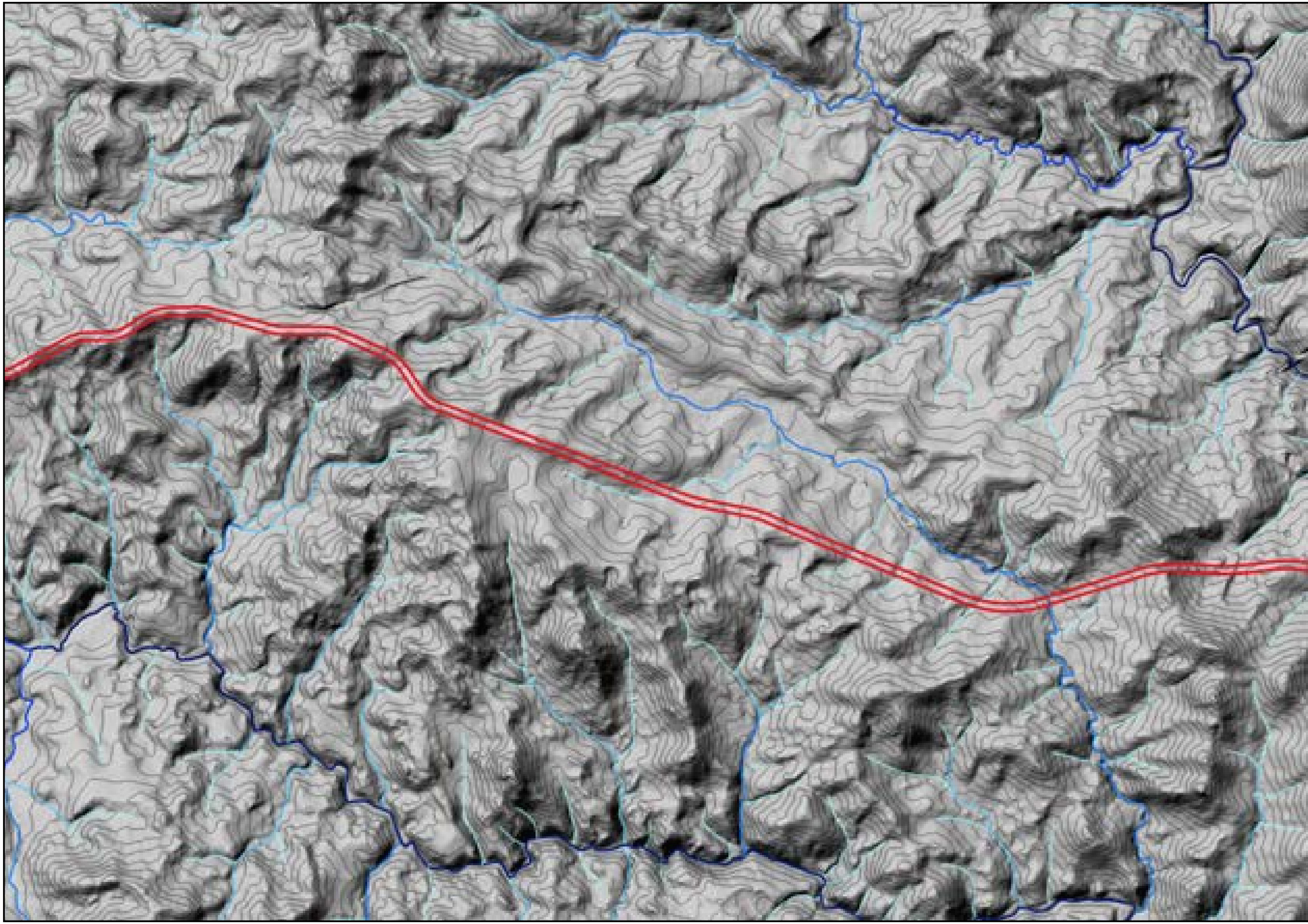
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 6 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

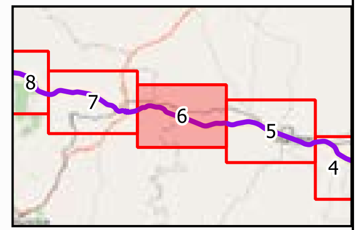
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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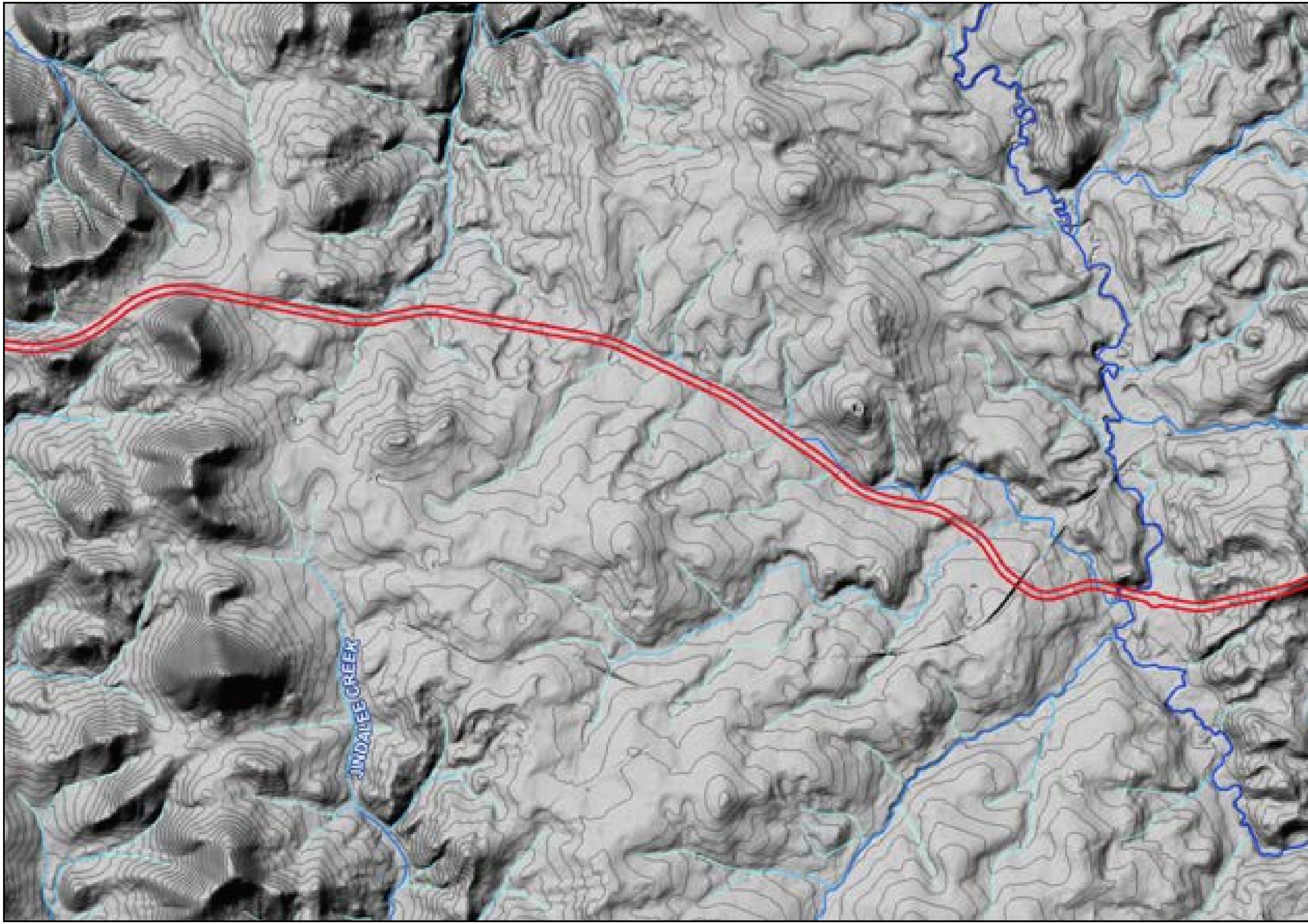
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 7 of 25



Legend

Project Area

Contour (5 m DEM derived)

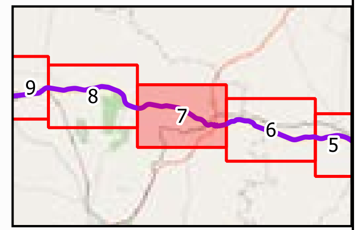
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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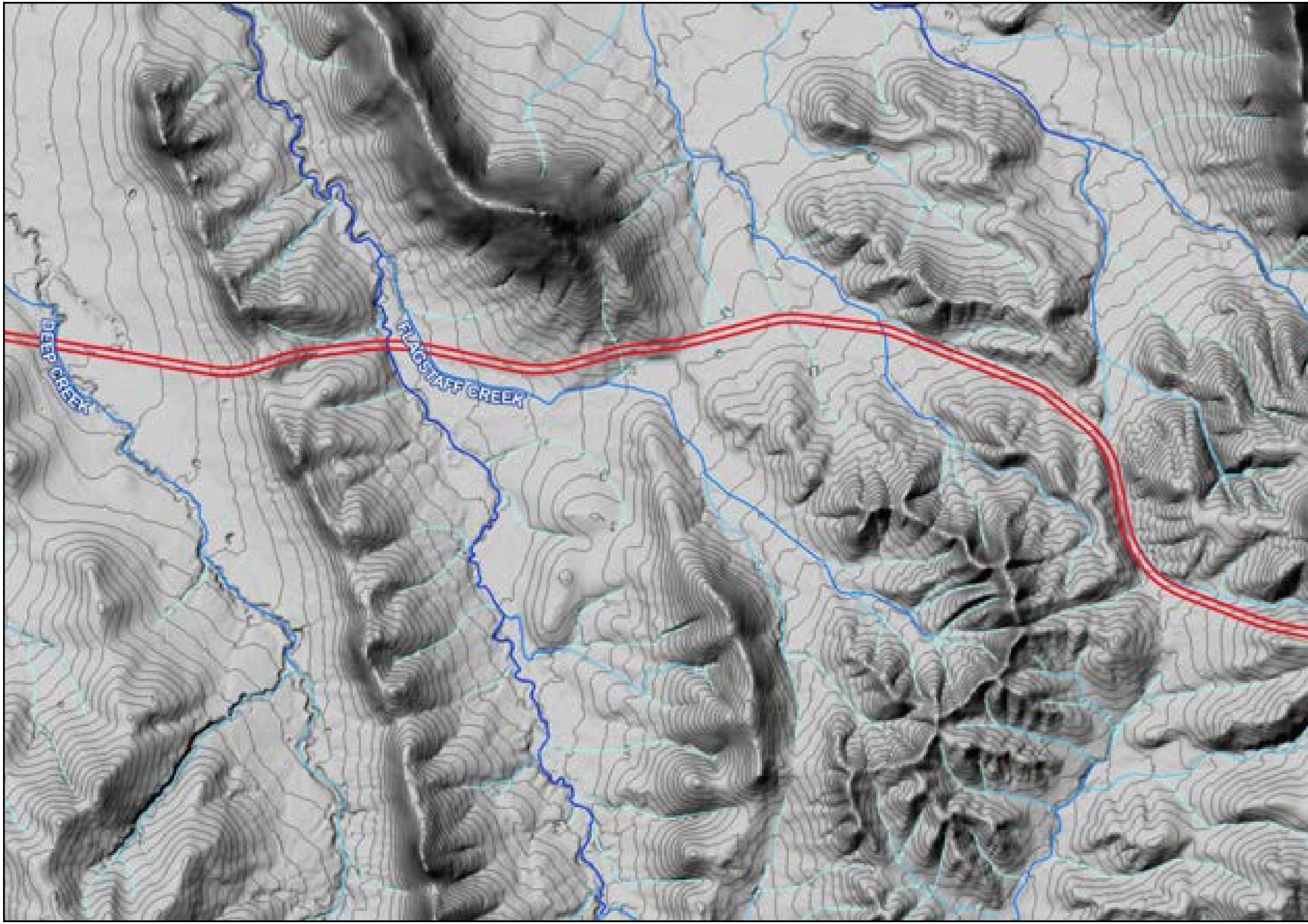
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 8 of 25

Legend

Project Area

Contour (5 m DEM derived)

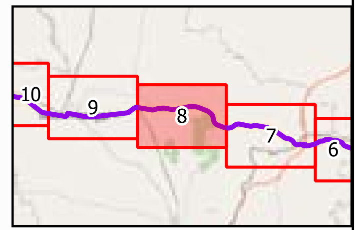
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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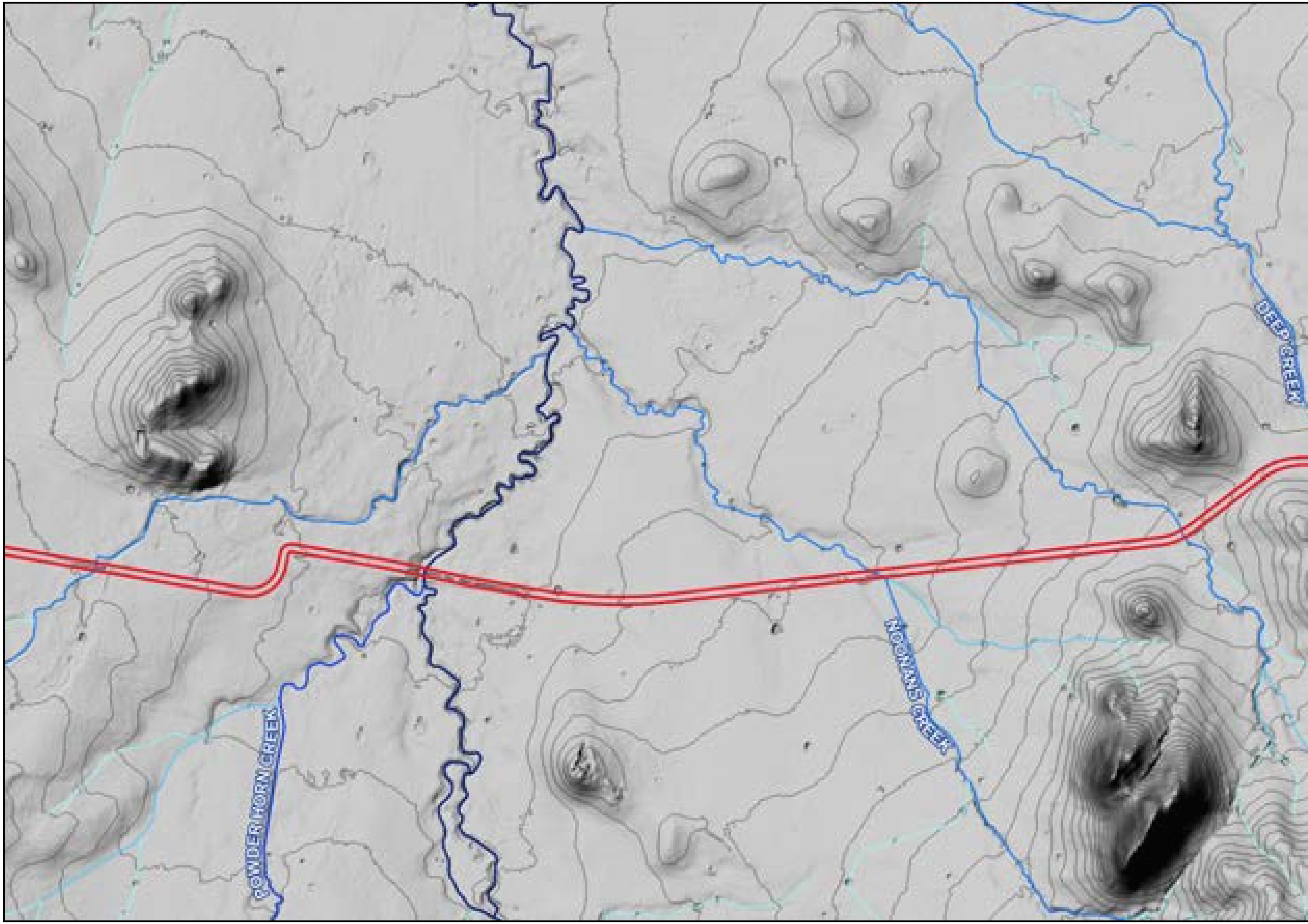
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 9 of 25



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Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

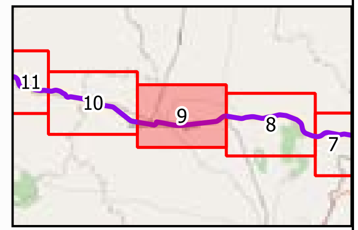
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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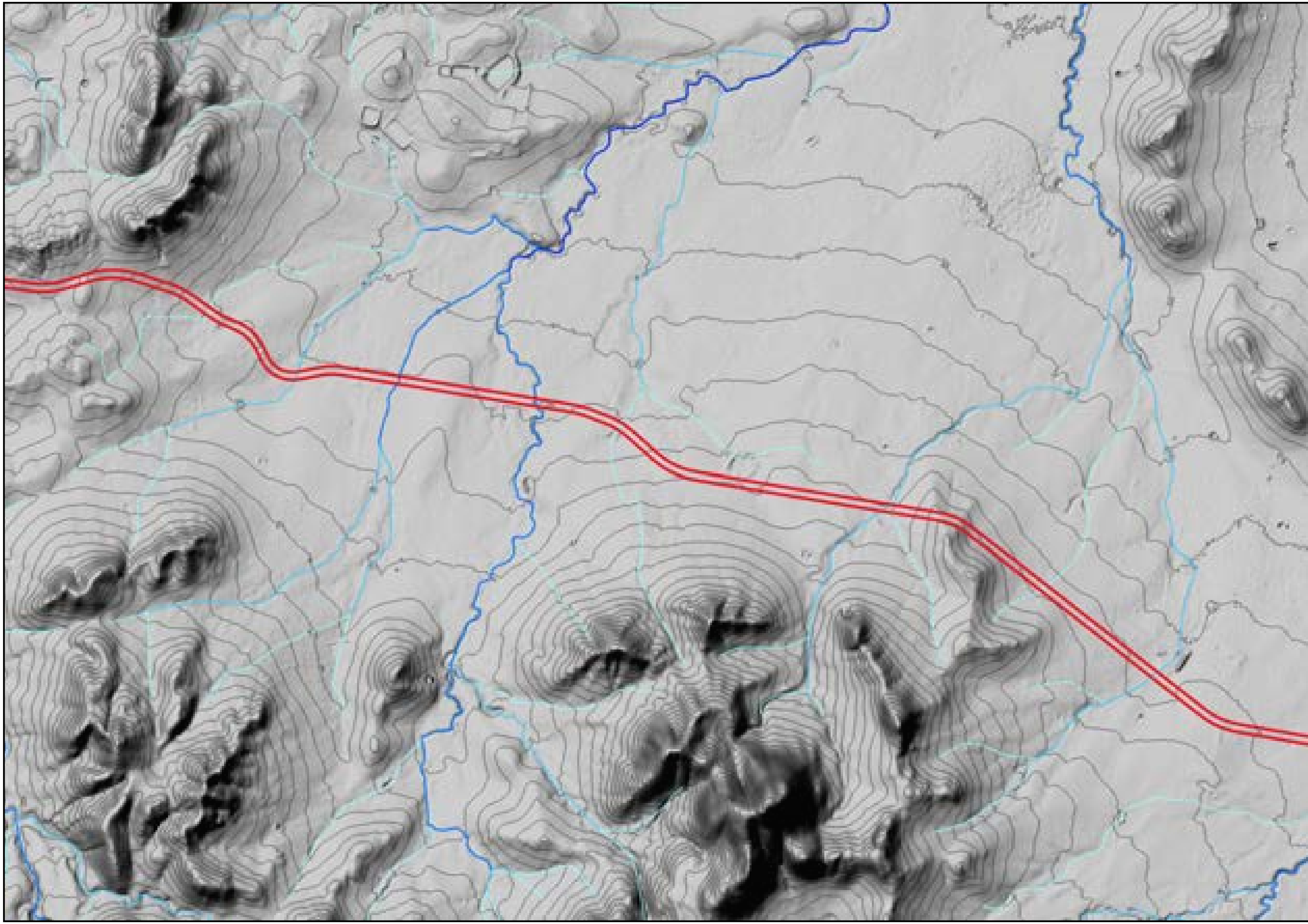
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 10 of 25

Legend

Project Area

Contour (5 m DEM derived)

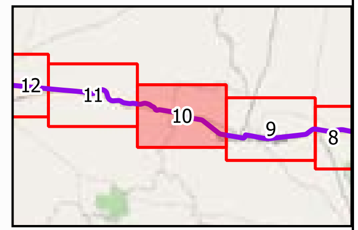
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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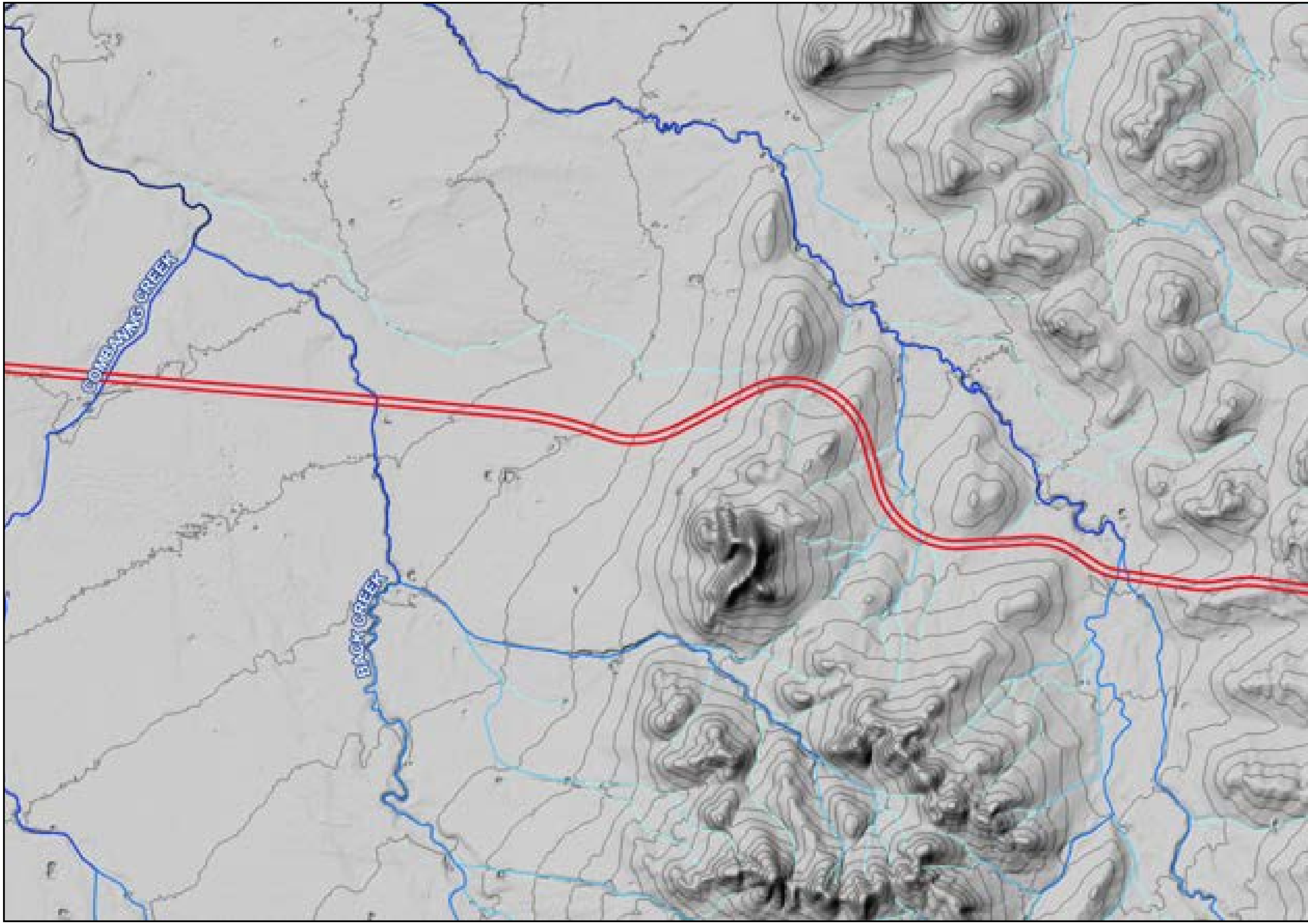
Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 11 of 25

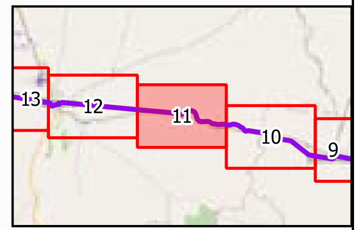


Legend

- Project Area
- Contour (5 m DEM derived)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



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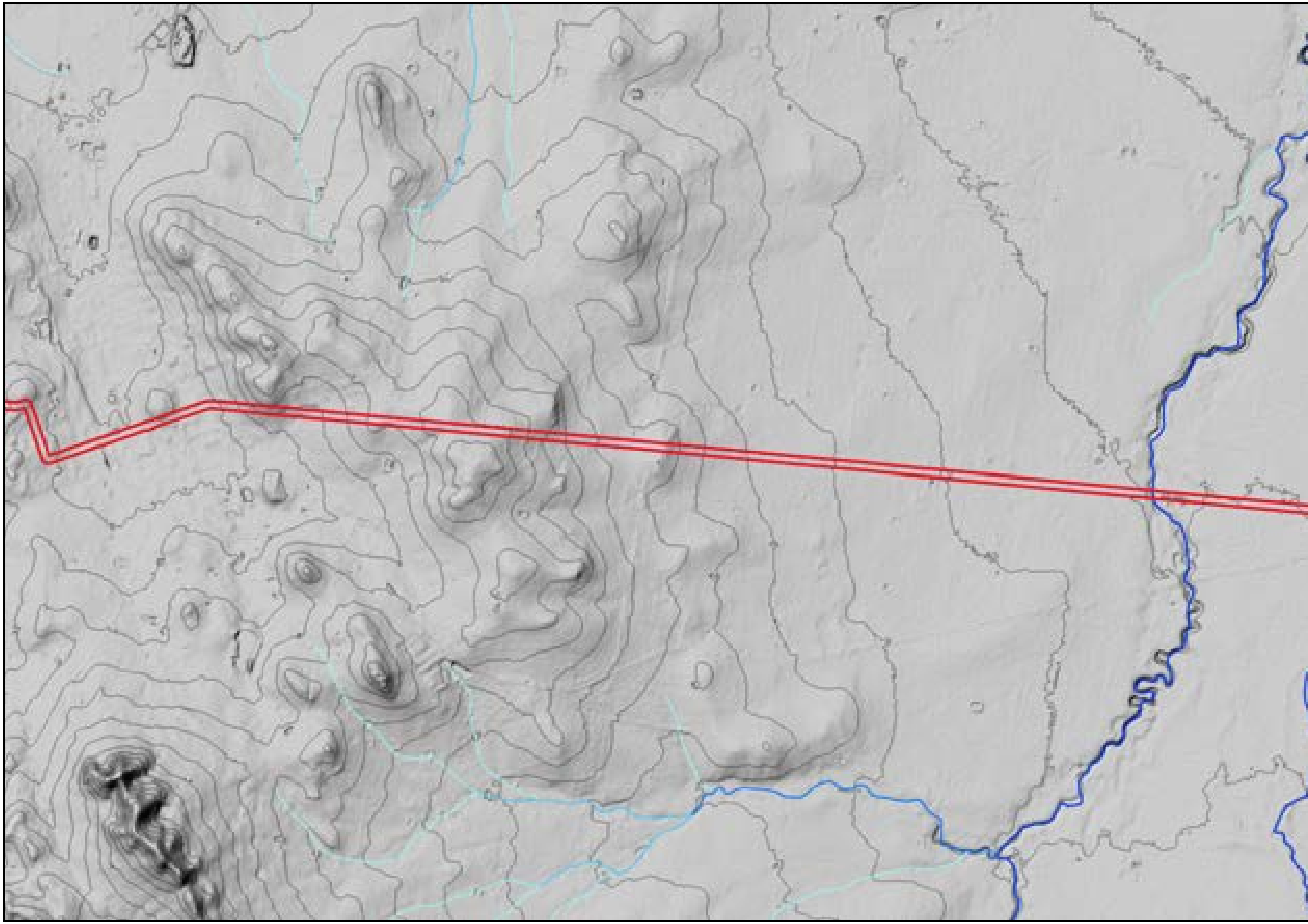
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 12 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

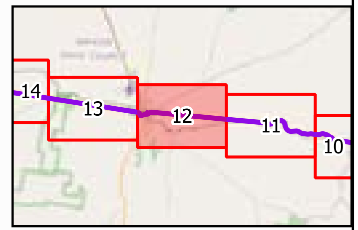
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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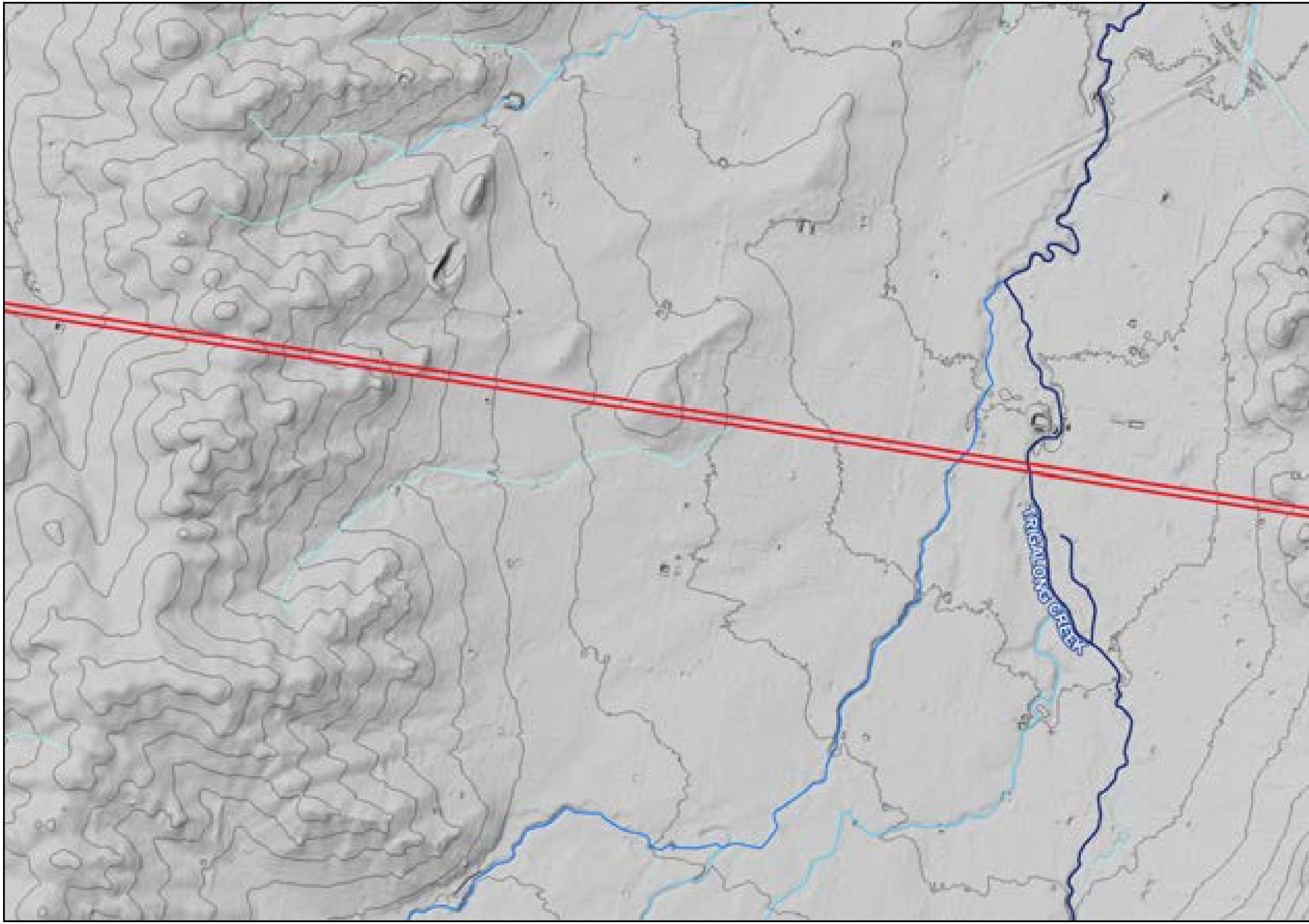
0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 13 of 25



Legend

Project Area

Contour (5 m DEM derived)

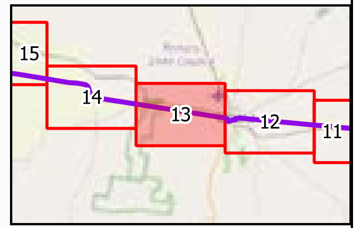
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream



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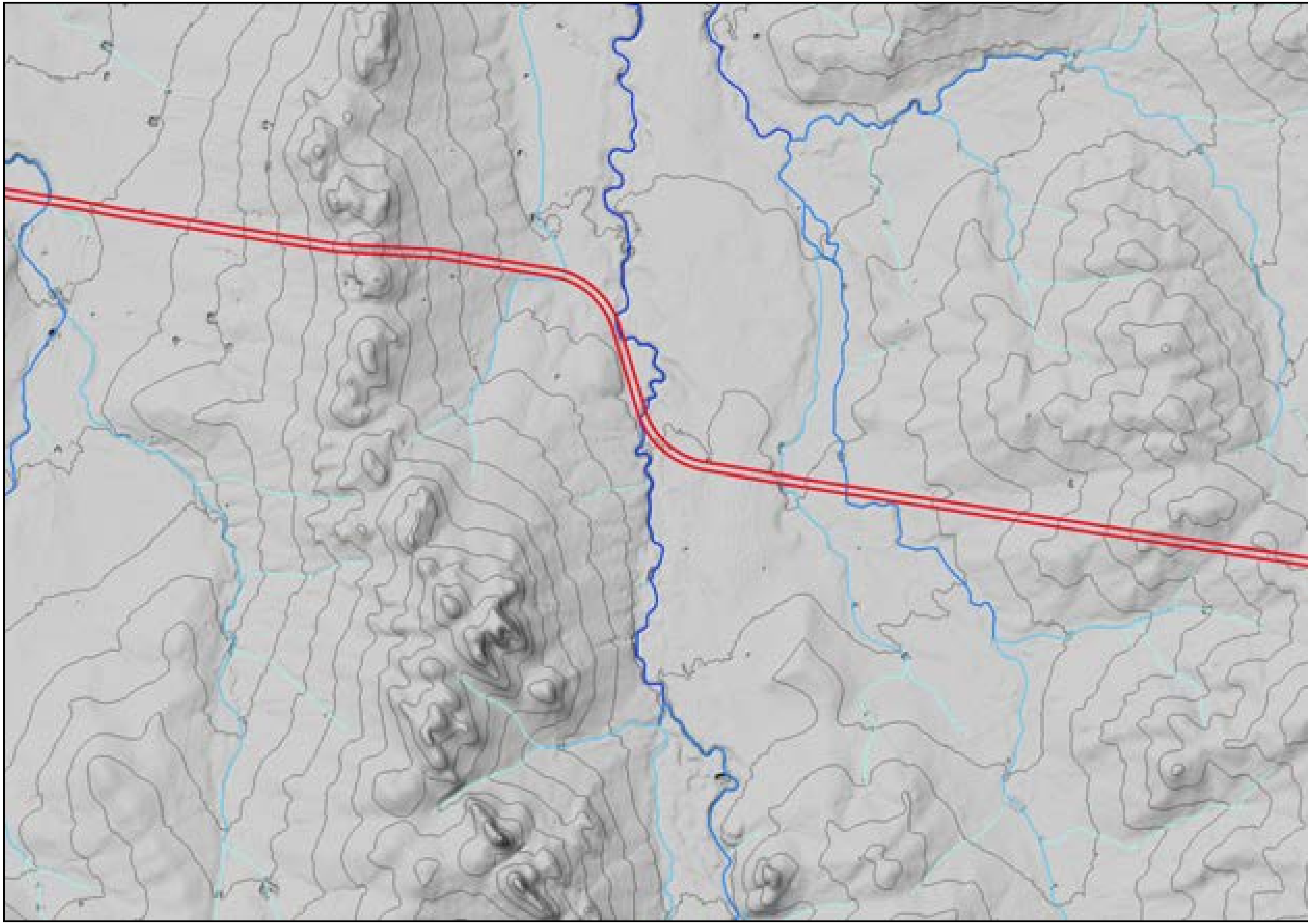
0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 14 of 25



Legend

Project Area

Contour (5 m DEM derived)

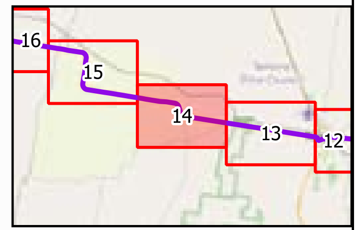
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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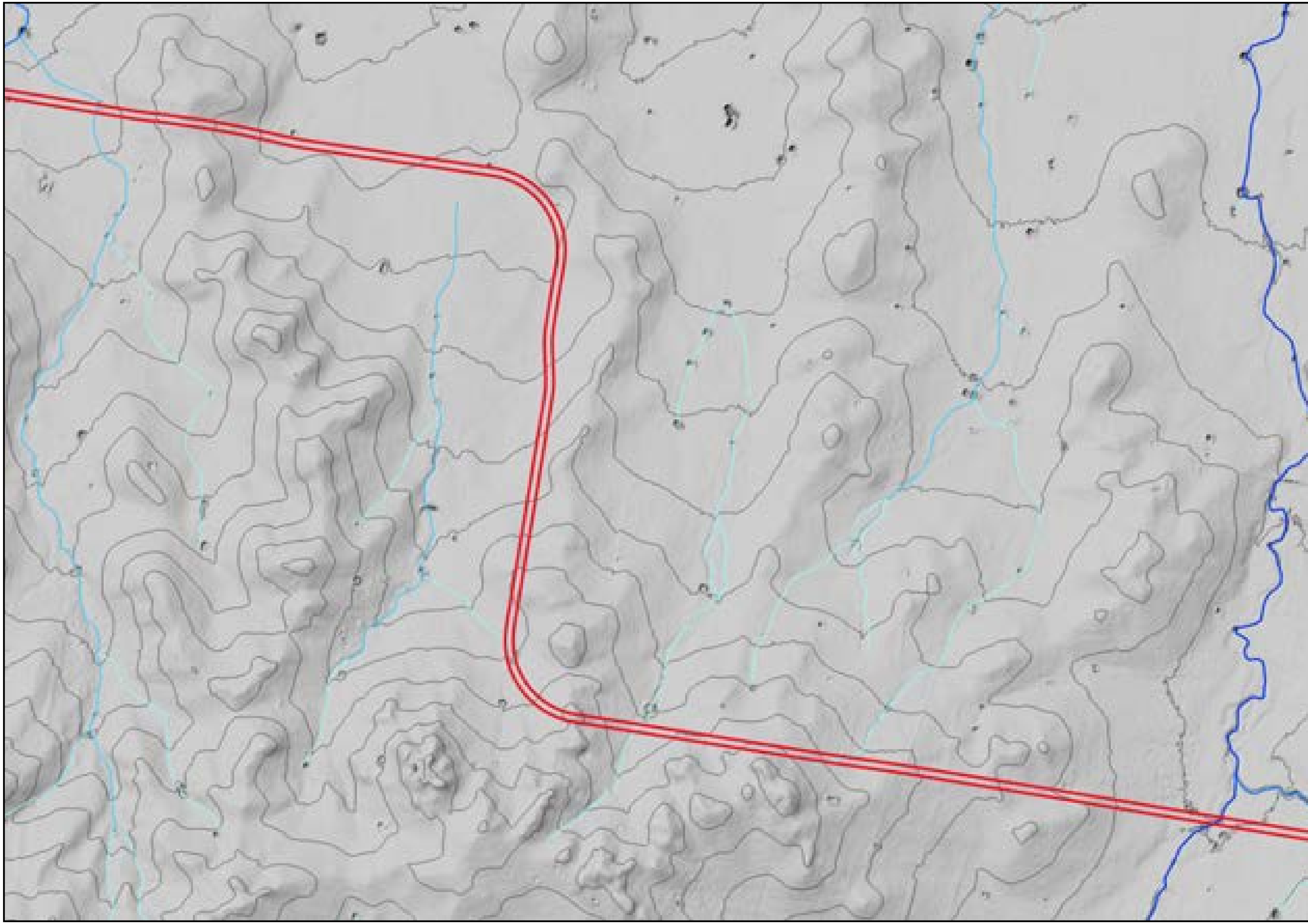
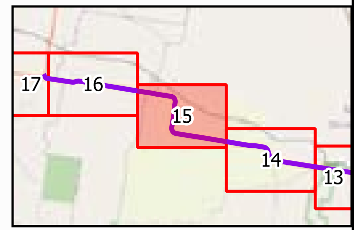
0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 15 of 25

Legend
Project Area
Contour (5 m DEM derived)
Waterways (Strahler Order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream



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Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 16 of 25

Legend

Project Area

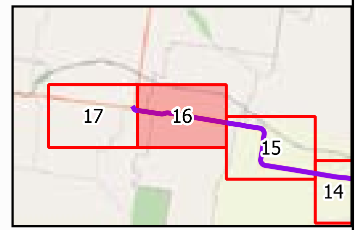
Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream



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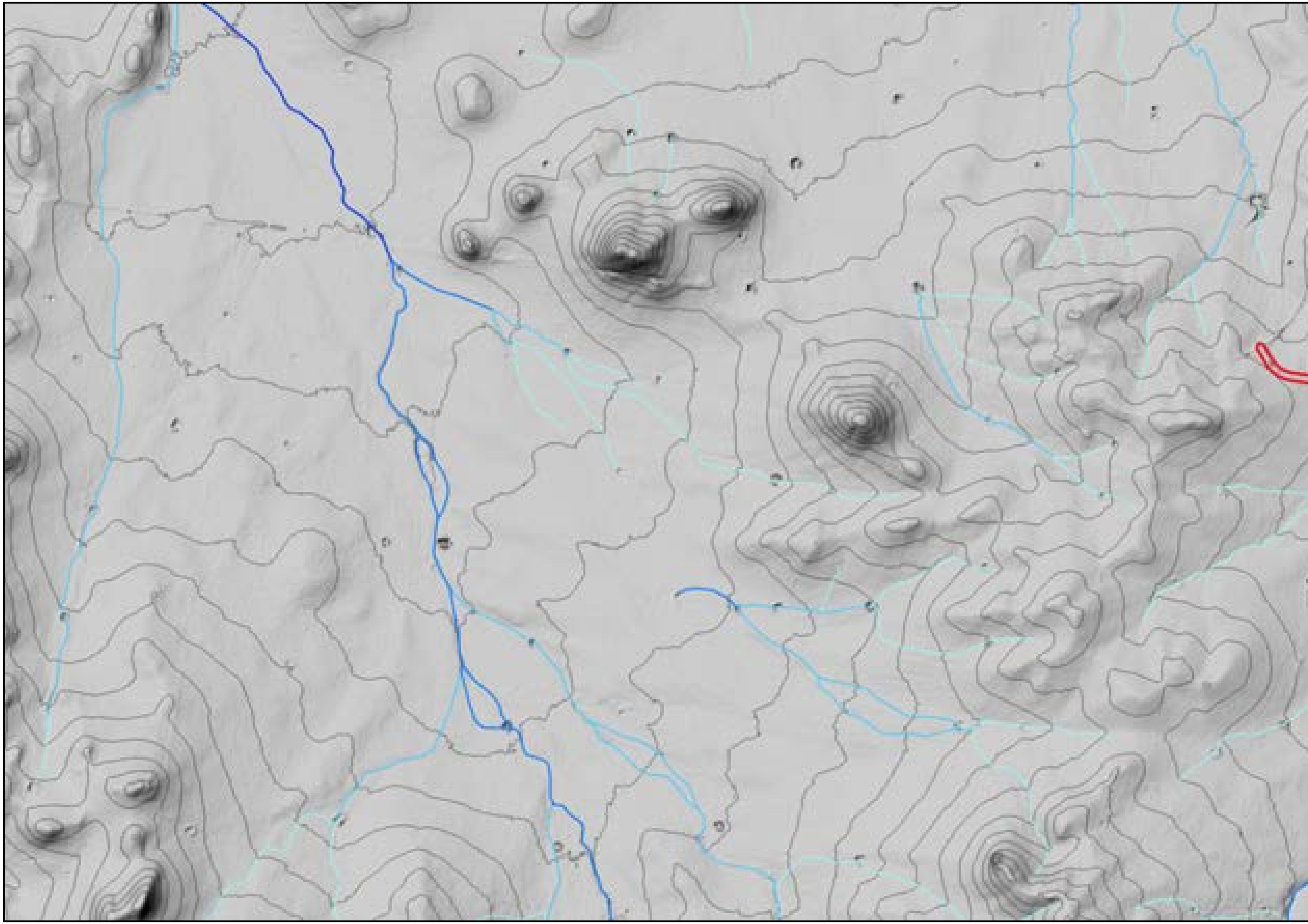
Date created: 14.10.2022

Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 17 of 25

Legend

Project Area

Contour (5 m DEM derived)

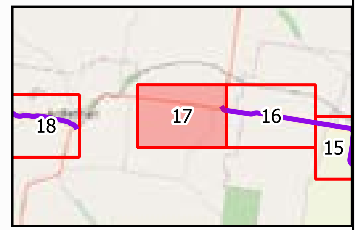
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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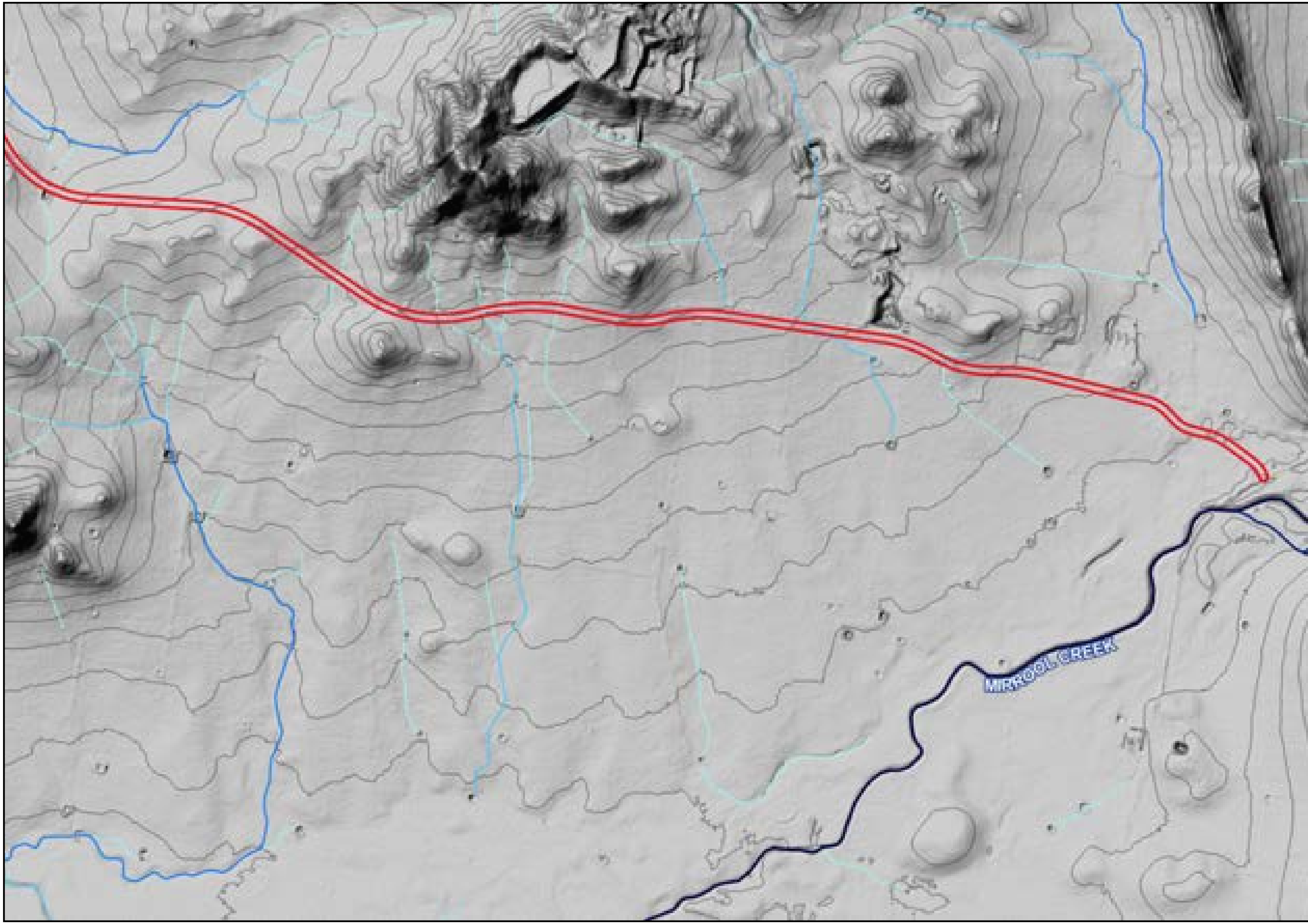
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH



21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 18 of 25

Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

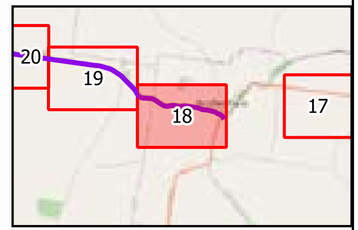
1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream

>5th Order Stream



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Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 19 of 25

Legend

Project Area

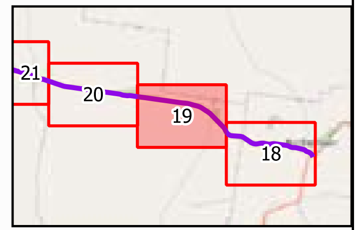
Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream



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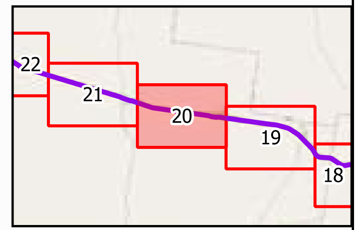
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 20 of 25

Legend
Project Area
Contour (5 m DEM derived)
Waterways (Strahler Order)
1st Order Stream
2nd Order Stream



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Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 21 of 25

Legend

Project Area

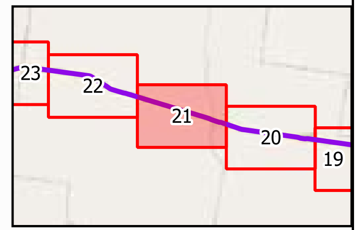
Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

>5th Order Stream



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Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 22 of 25

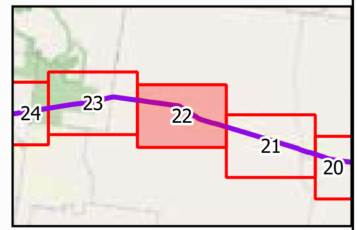
Legend

Project Area

Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream



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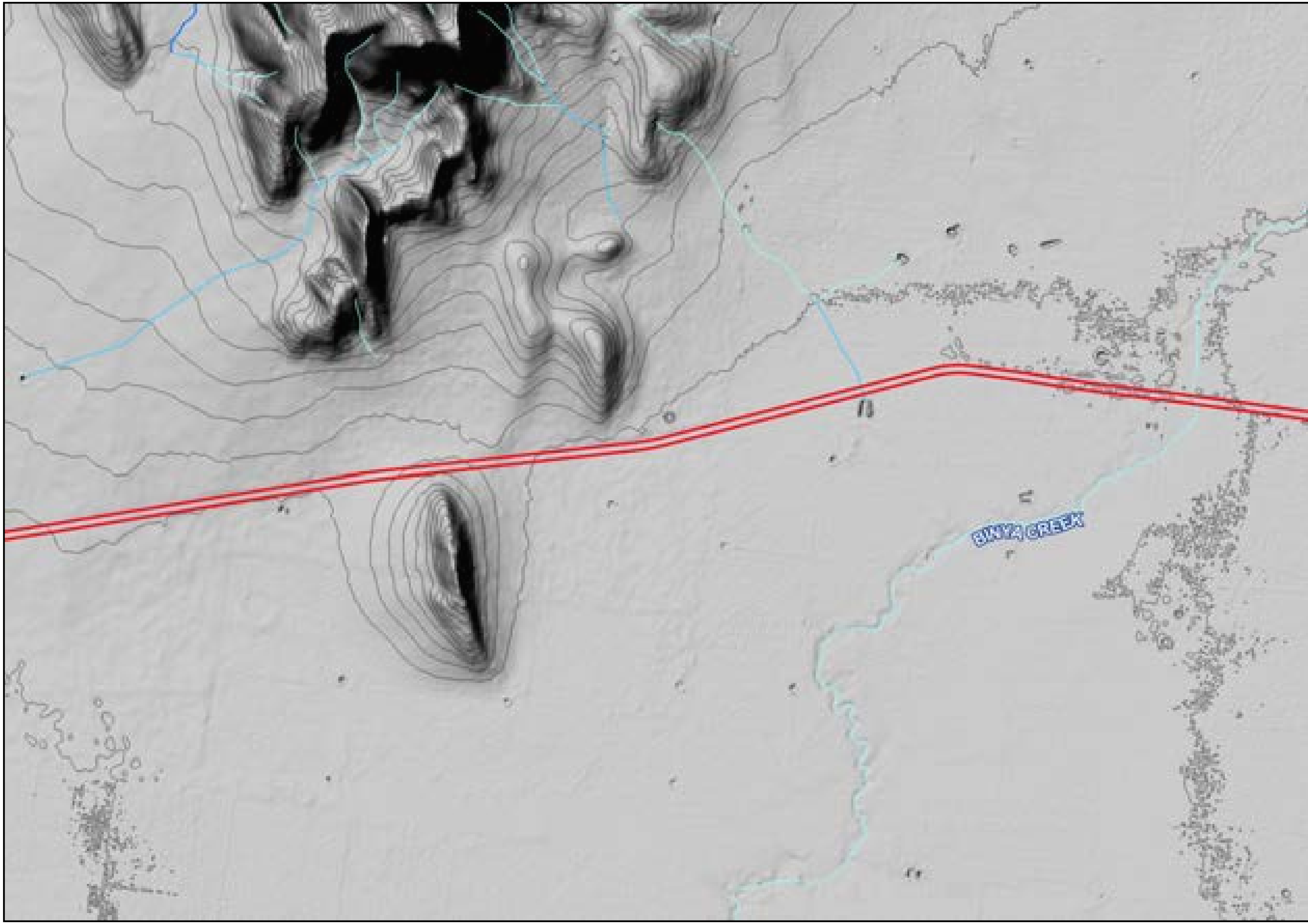
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 23 of 25



Legend

Project Area

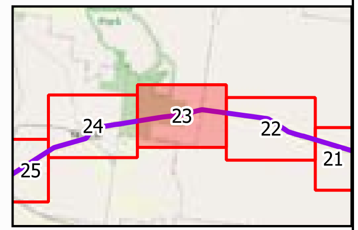
Contour (5 m DEM derived)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream



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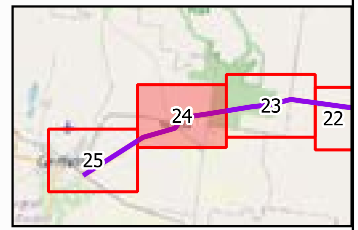
Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area
Map 24 of 25

Legend

- Project Area
- Contour (5 m DEM derived)



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Topography within the Project Area

Map 25 of 25

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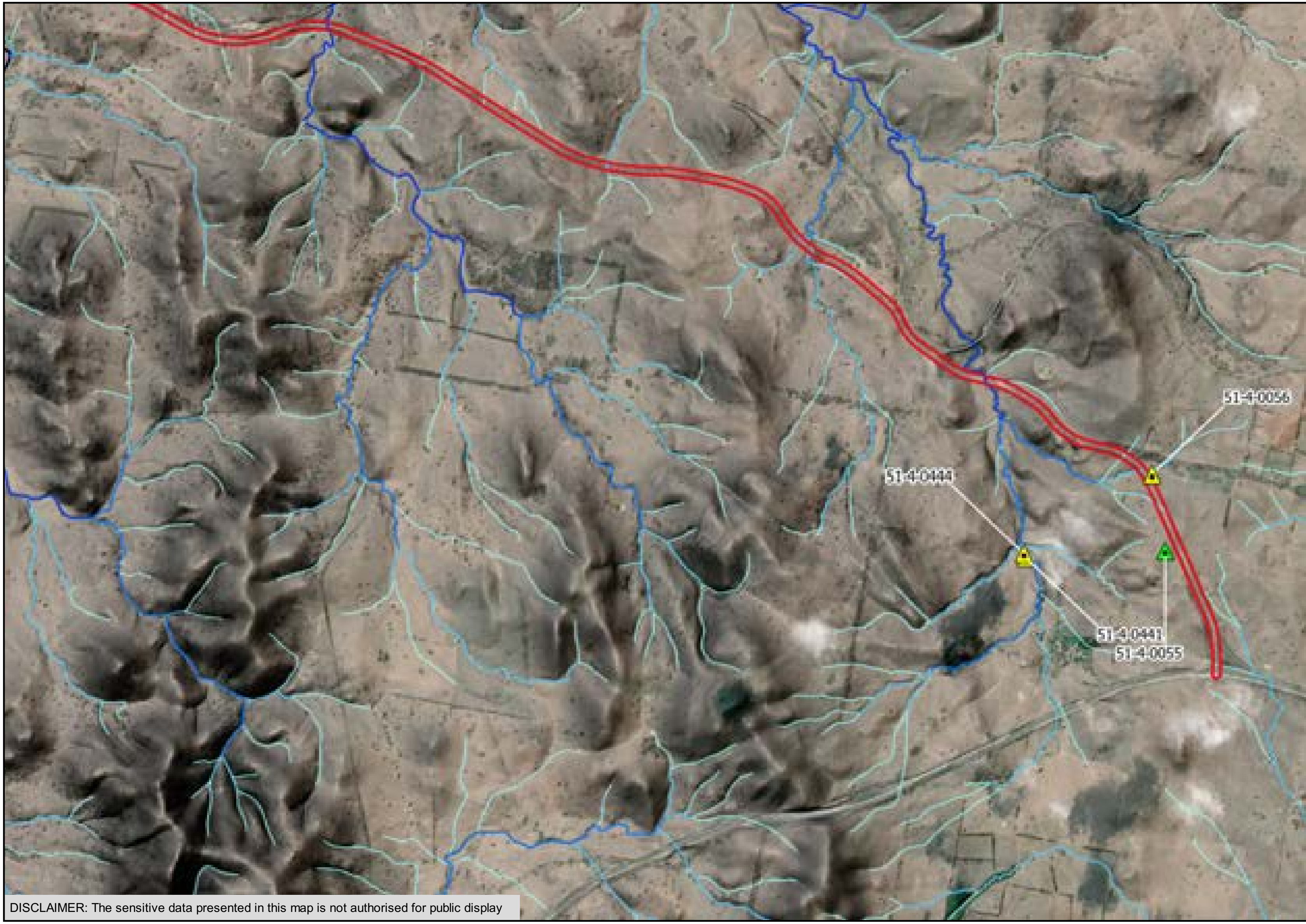
Datum: GDA94 / MGA zone 55

Appendix B Detailed AHIMS Sites within 1km



21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 1 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

1st Order Stream

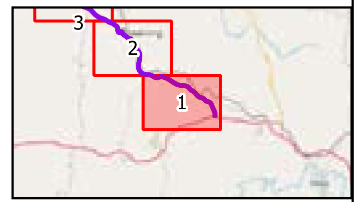
2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream

>5th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 2 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Waterways (Strahler Order)

1st Order Stream

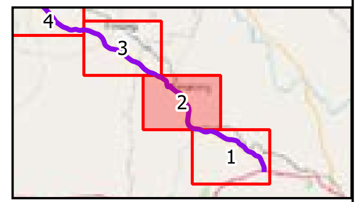
2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream

>5th Order Stream



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0 0.5 1 km

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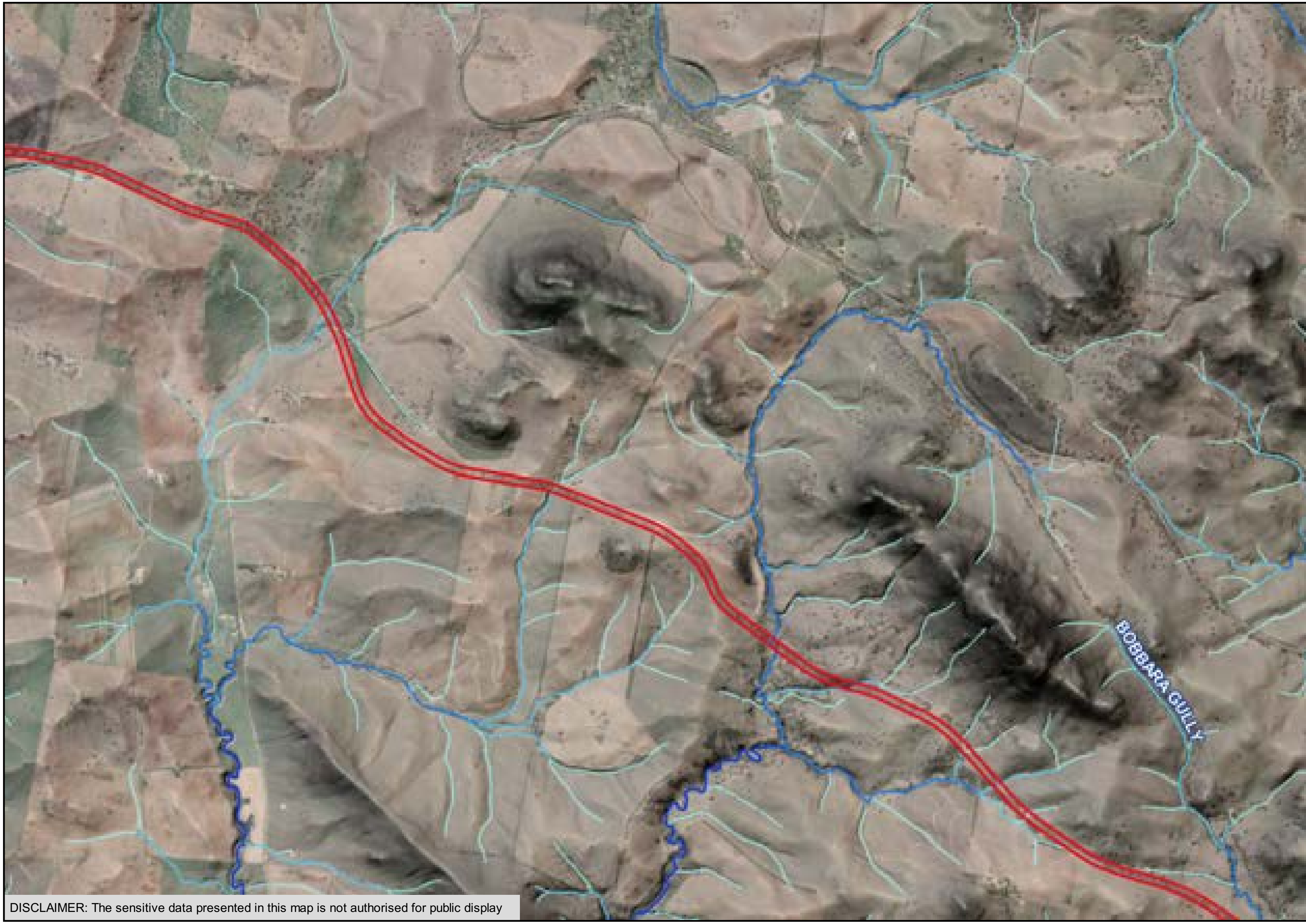


21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 3 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

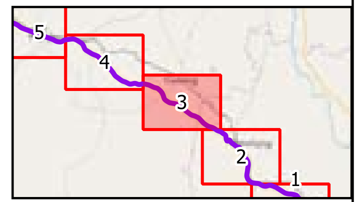
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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Date created: 14.10.2022
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0 0.5 1 km

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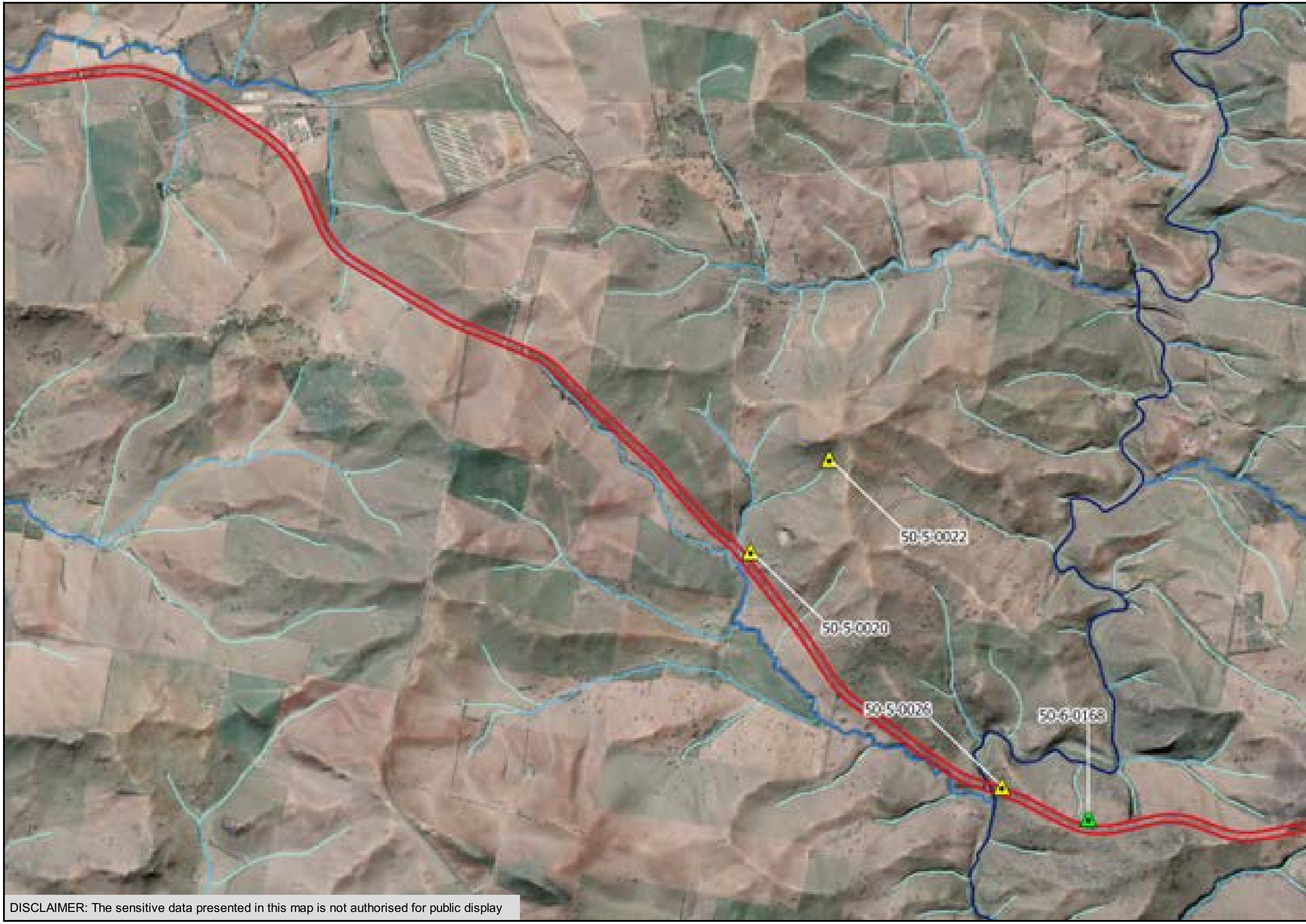
21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 4 of 25



Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Modified Tree (Carved or Scarred)

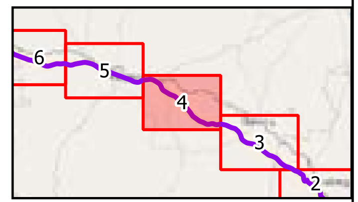
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream



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0 0.5 1 km

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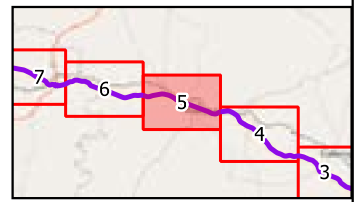
21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 5 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 6 of 25

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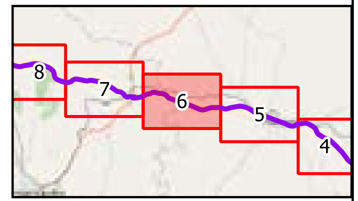
Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites
Map 7 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

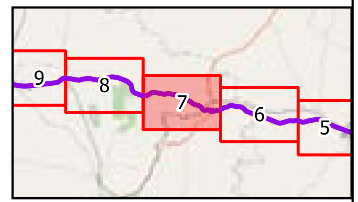
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 8 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Modified Tree (Carved or Scarred)

Aboriginal Resource and Gathering

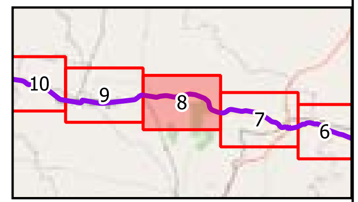
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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0 0.5 1 km

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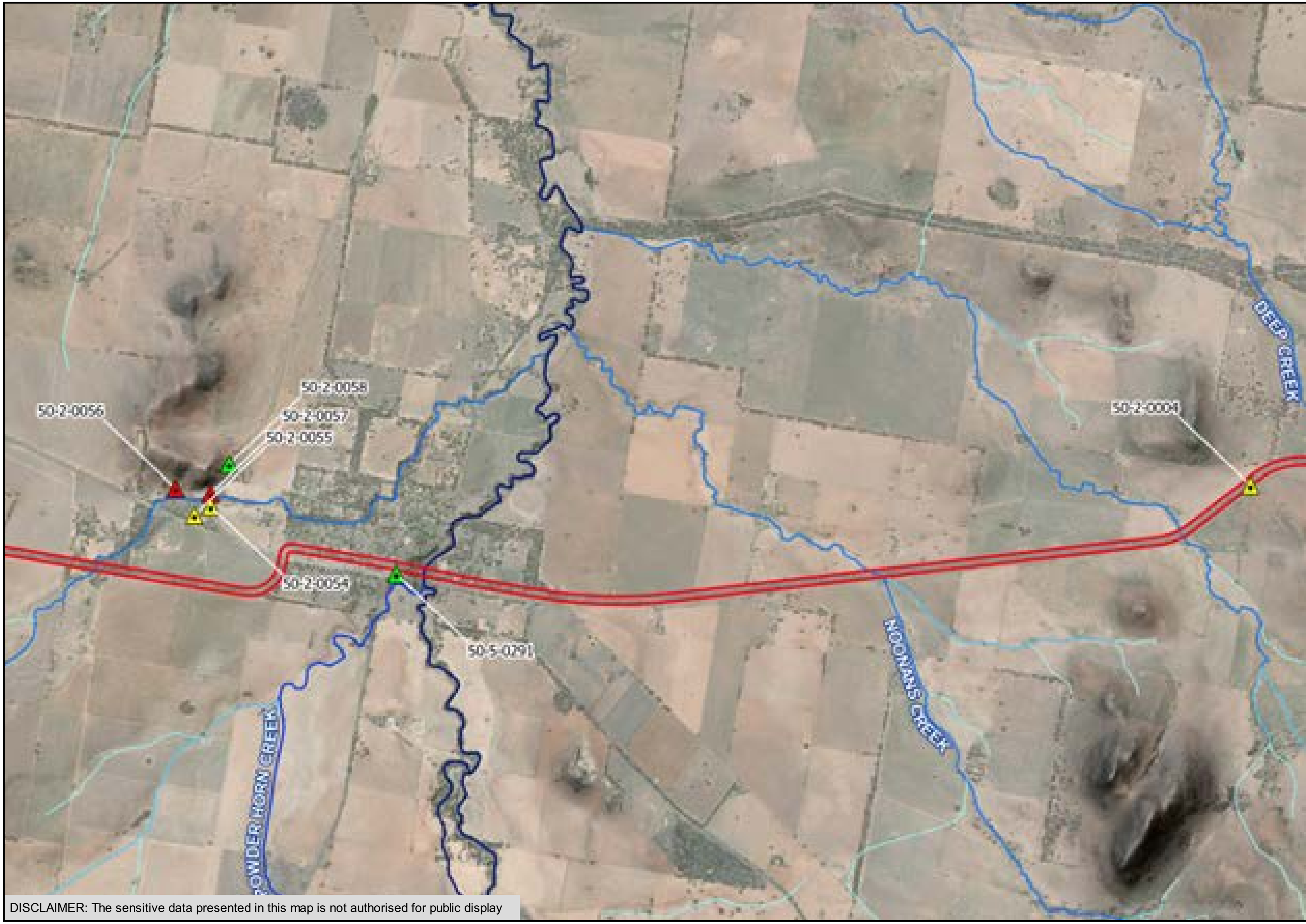


21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 9 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Modified Tree (Carved or Scarred)

Potential Archaeological Deposit (PAD)

Waterways (Strahler Order)

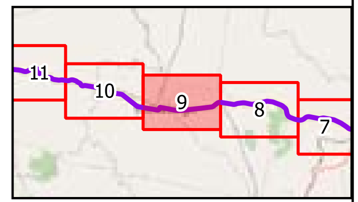
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 10 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

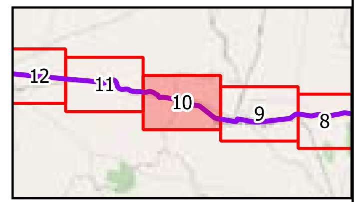
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites
Map 11 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

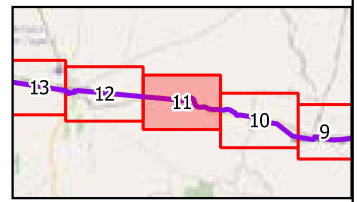
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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0 0.5 1 km

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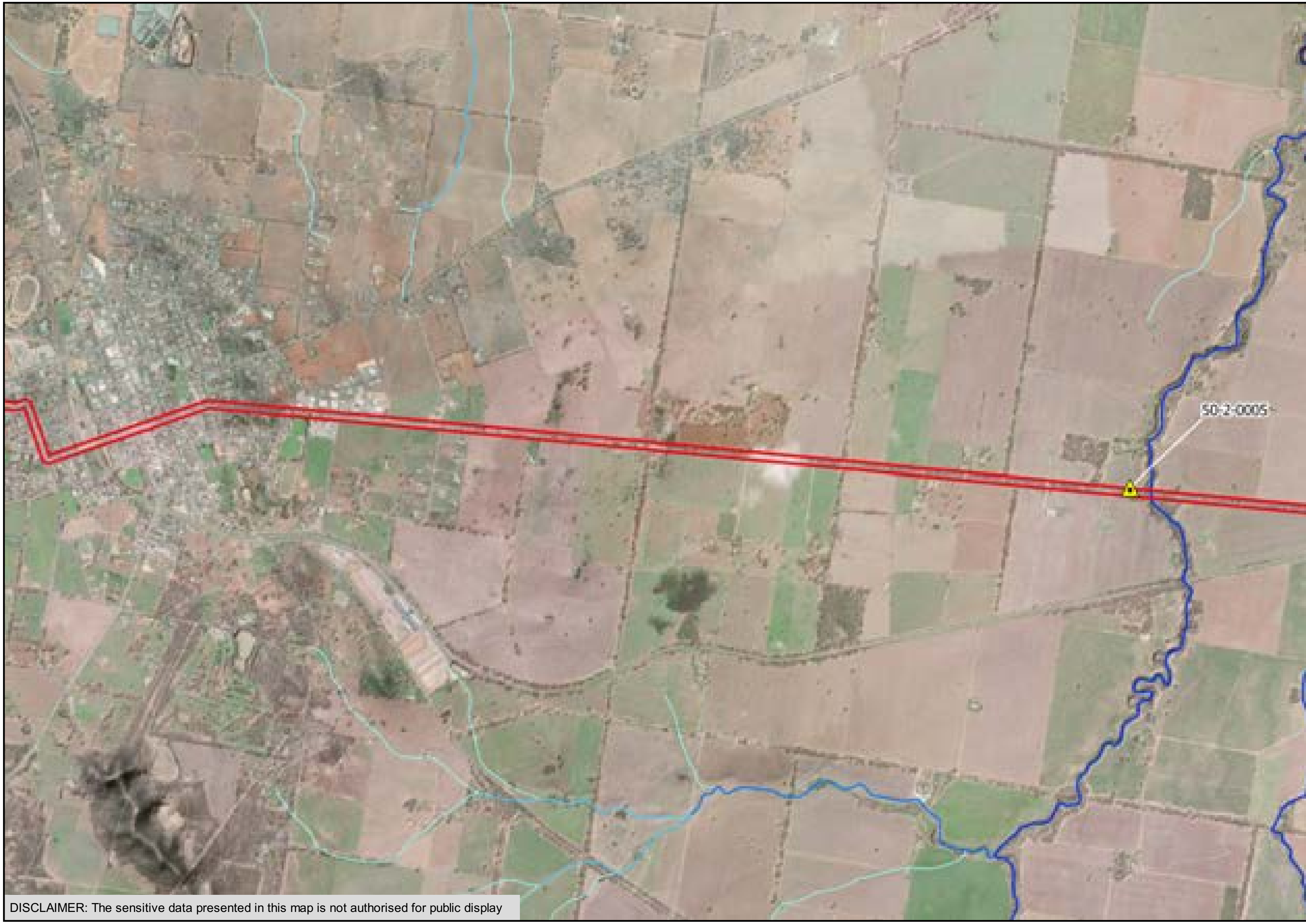
21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 12 of 25



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Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Waterways (Strahler Order)

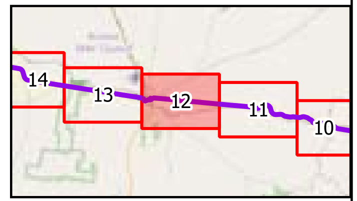
1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream

5th Order Stream



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0 0.5 1 km

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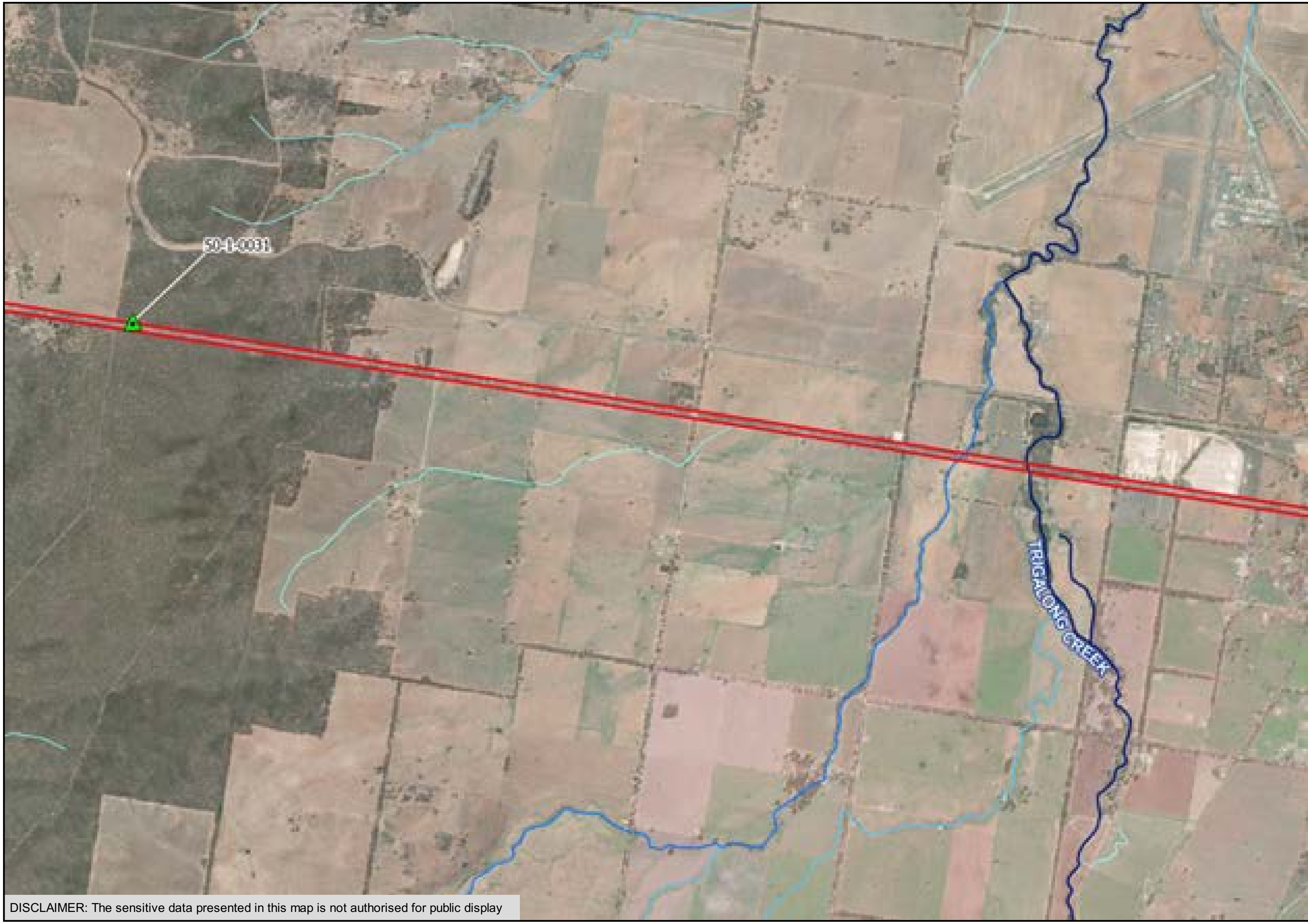


21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 13 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Modified Tree (Carved or Scarred)

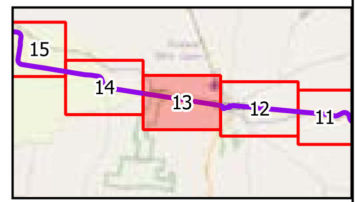
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream



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0 0.5 1 km

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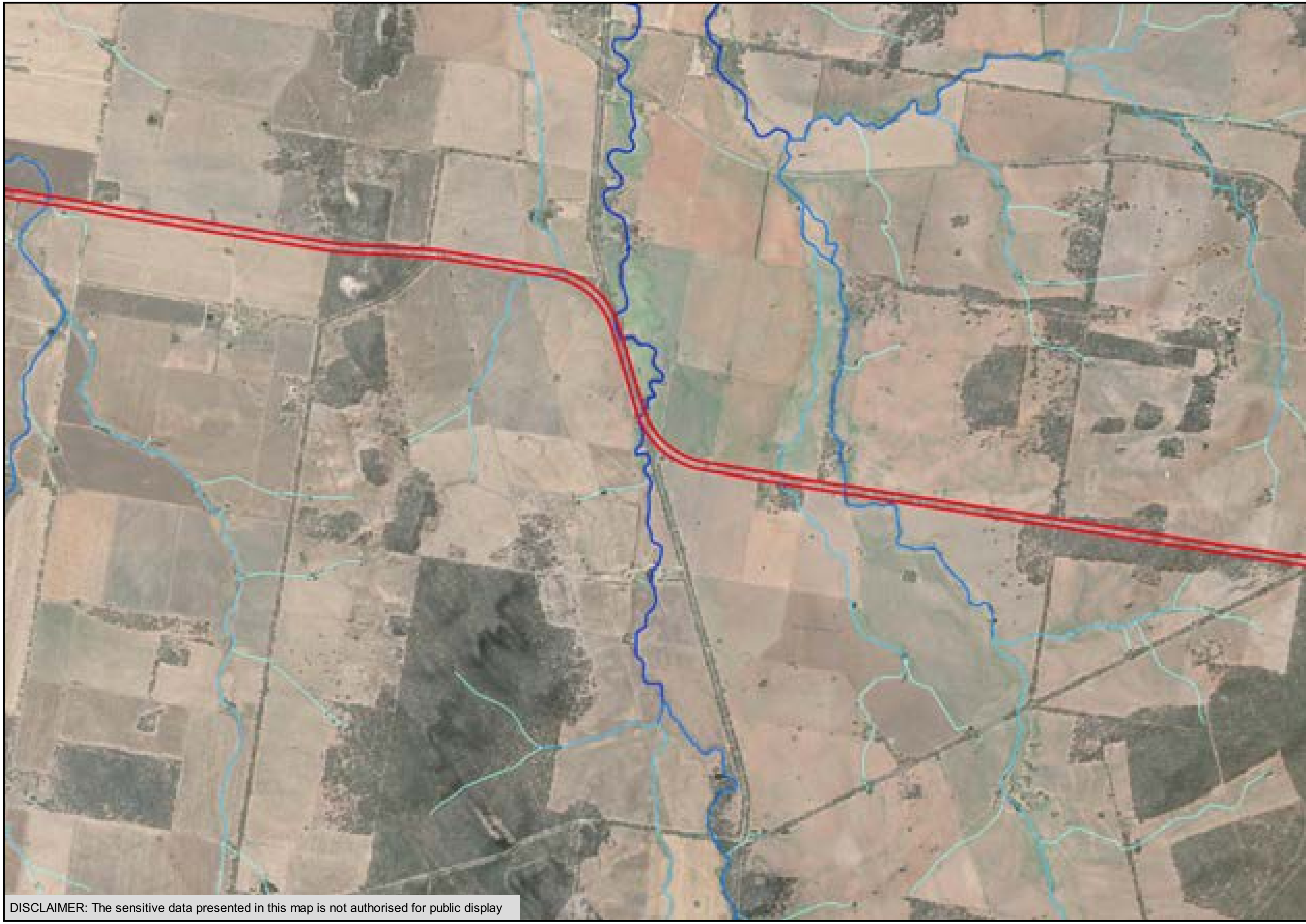


21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 14 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

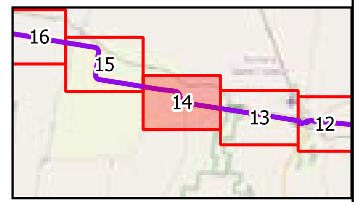
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 15 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

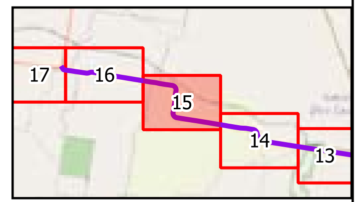
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites
Map 16 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 17 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

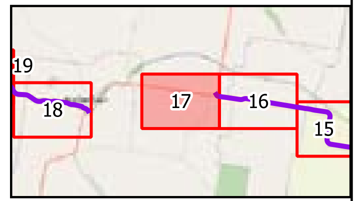
Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 18 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

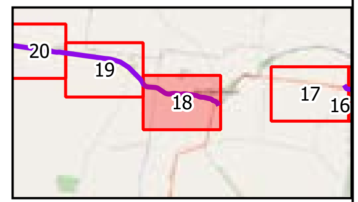
1st Order Stream

2nd Order Stream

3rd Order Stream

5th Order Stream

>5th Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 19 of 25

Legend

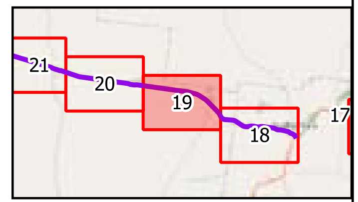
Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 20 of 25

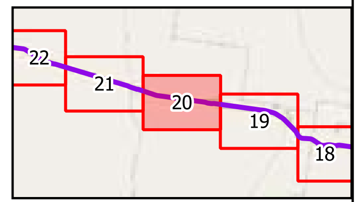
Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream



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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 21 of 25

Legend

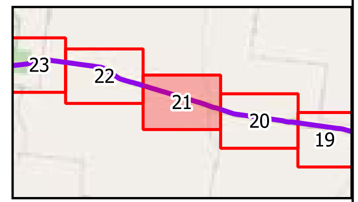
Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

>5th Order Stream



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0 0.5 1 km

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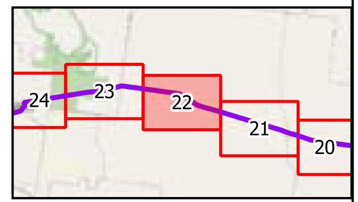
21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 22 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream



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Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH

21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 23 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

Artefact

Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream

3rd Order Stream

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Author: J. Fuenzalida Miralles
Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

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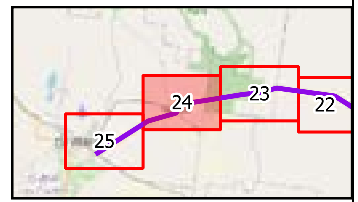
21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites Map 24 of 25

Legend

Project Area (with 30 m buffer of Burley Griffin Way)



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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping AHIMS Registered Sites
Map 25 of 25

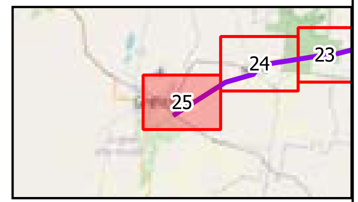
Legend

Project Area (with 30 m buffer of Burley Griffin Way)

Waterways (Strahler Order)

1st Order Stream

2nd Order Stream



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0 0.5 1 km

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Appendix C Cultural Heritage Constraints Mapping

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 1 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact
- Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 2 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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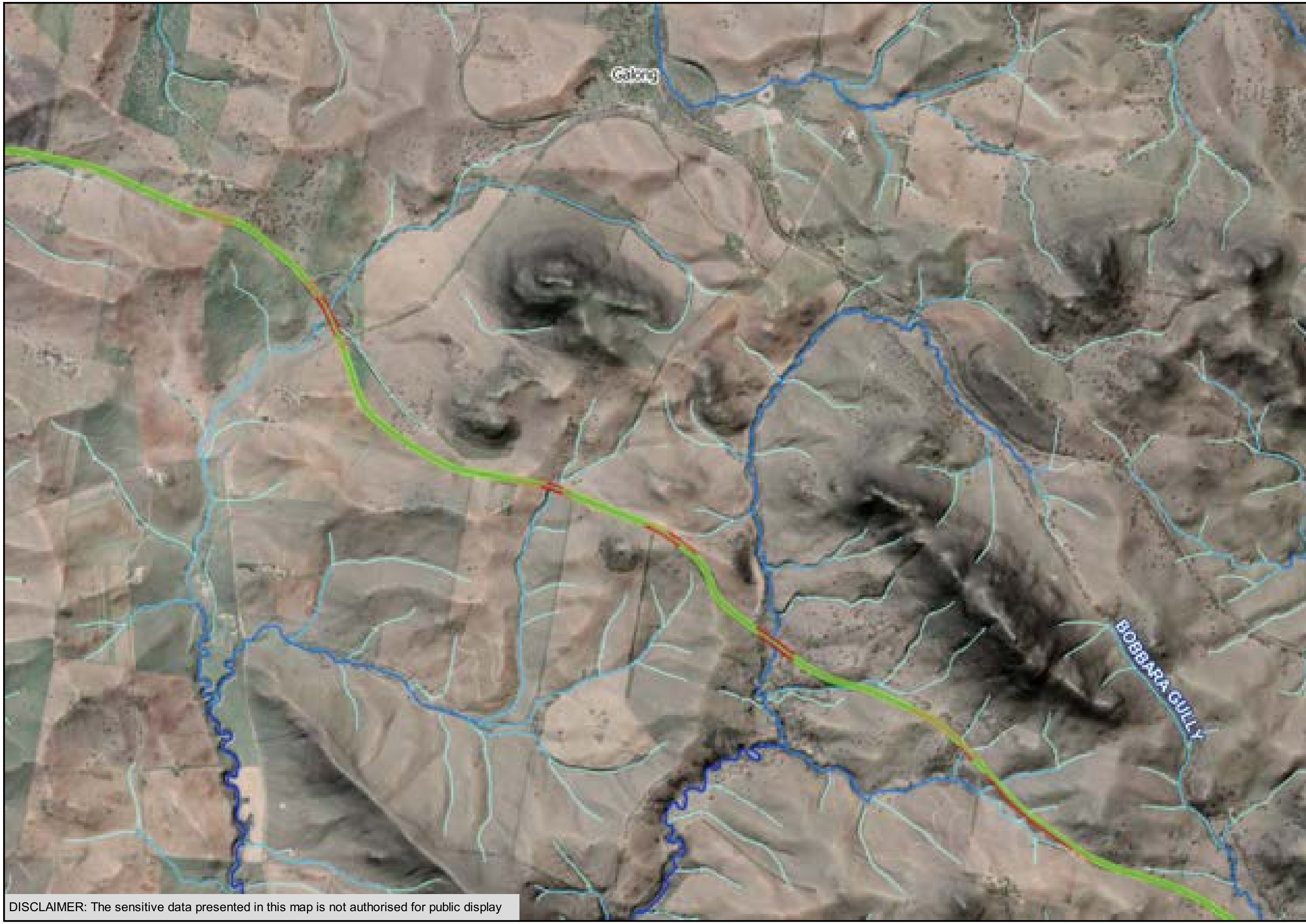

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 3 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 4 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact
- Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream

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Date created: 14.10.2022
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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 5 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 6 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream

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0 0.5 1 km

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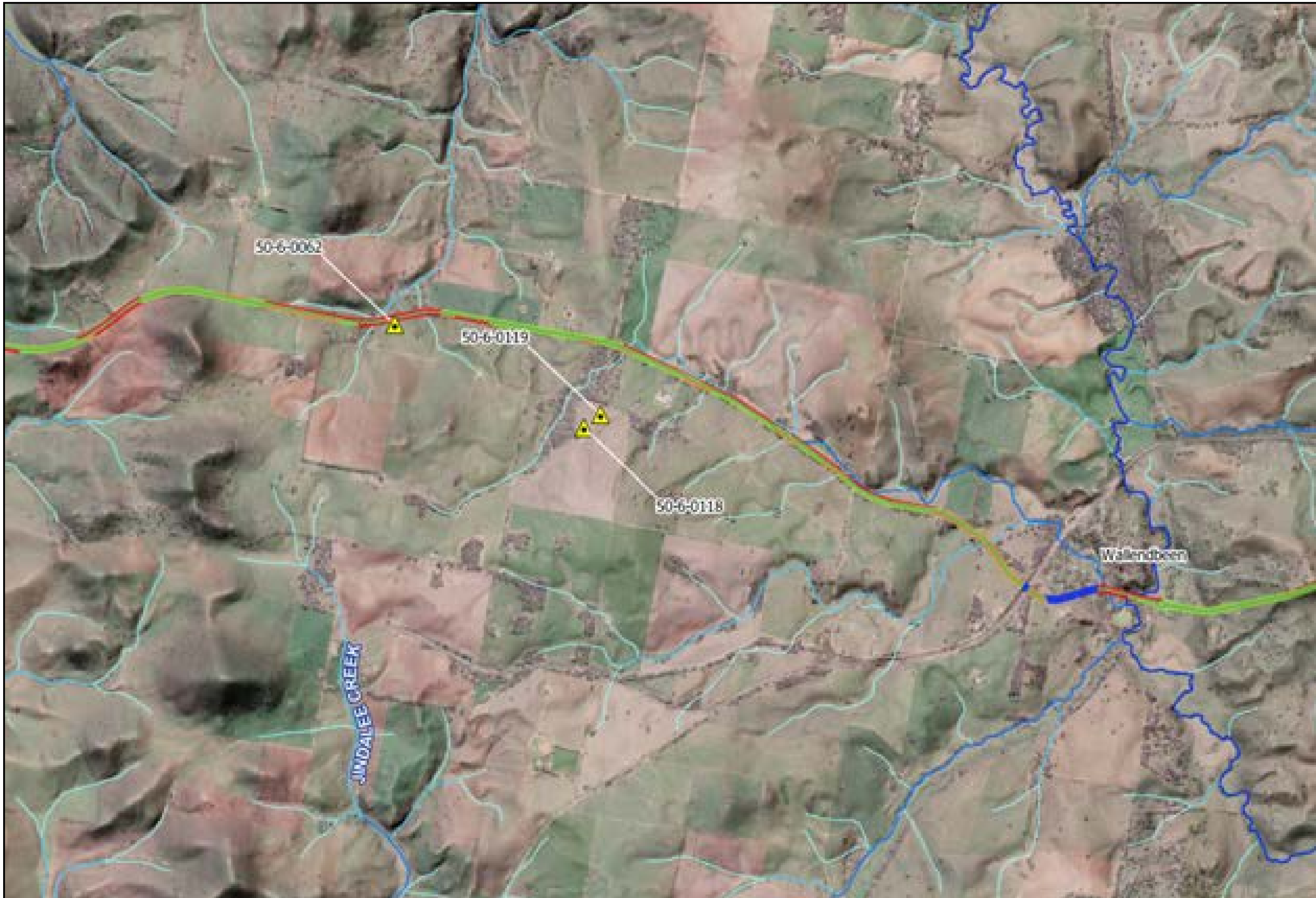

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 7 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)
- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)
- Artefact

Waterways (Strahler Order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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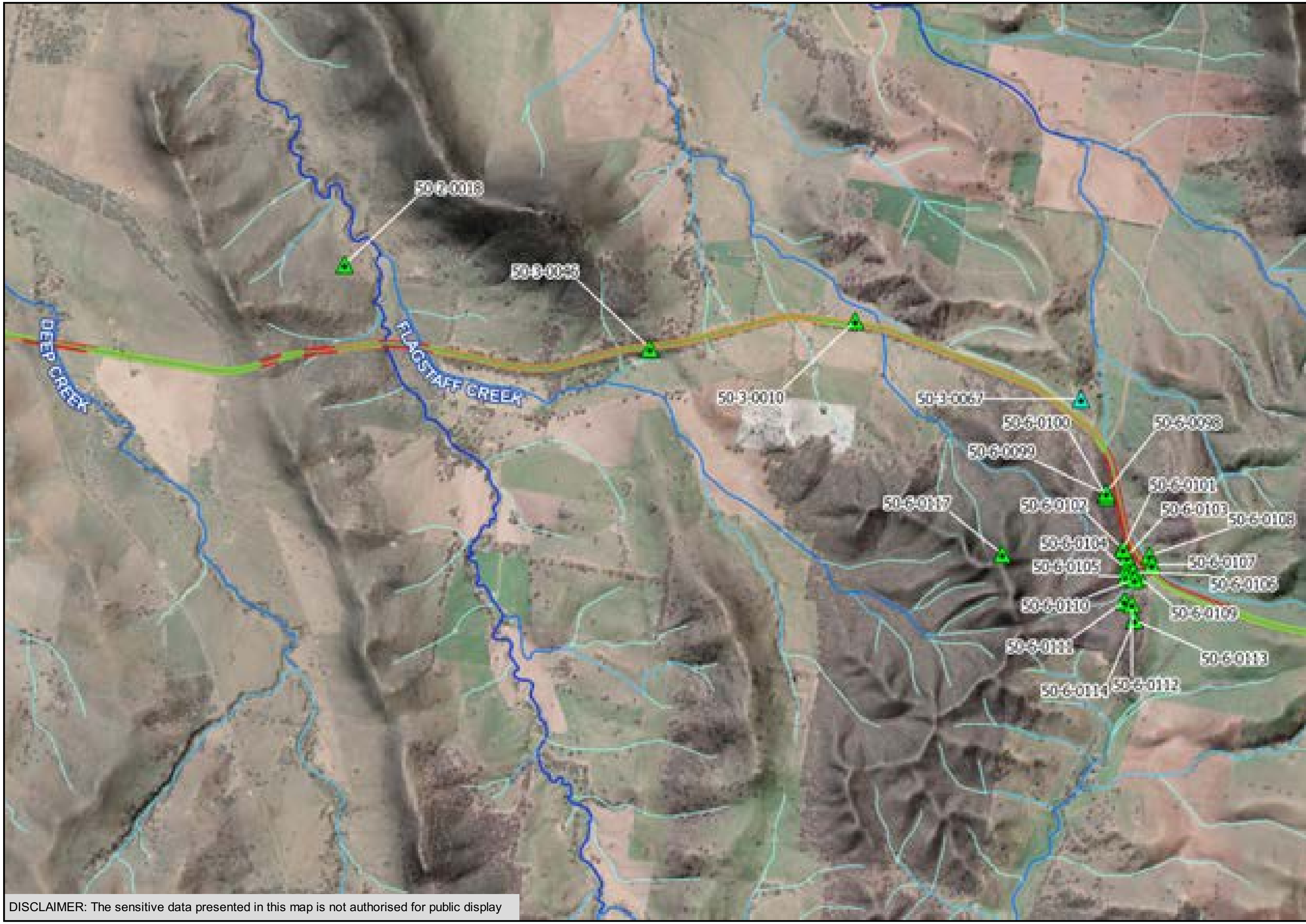

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 8 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)
- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)
- Modified Tree (Carved or Scarred)
- Aboriginal Resource and Gathering

Waterways (Strahler Order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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0 0.5 1 km

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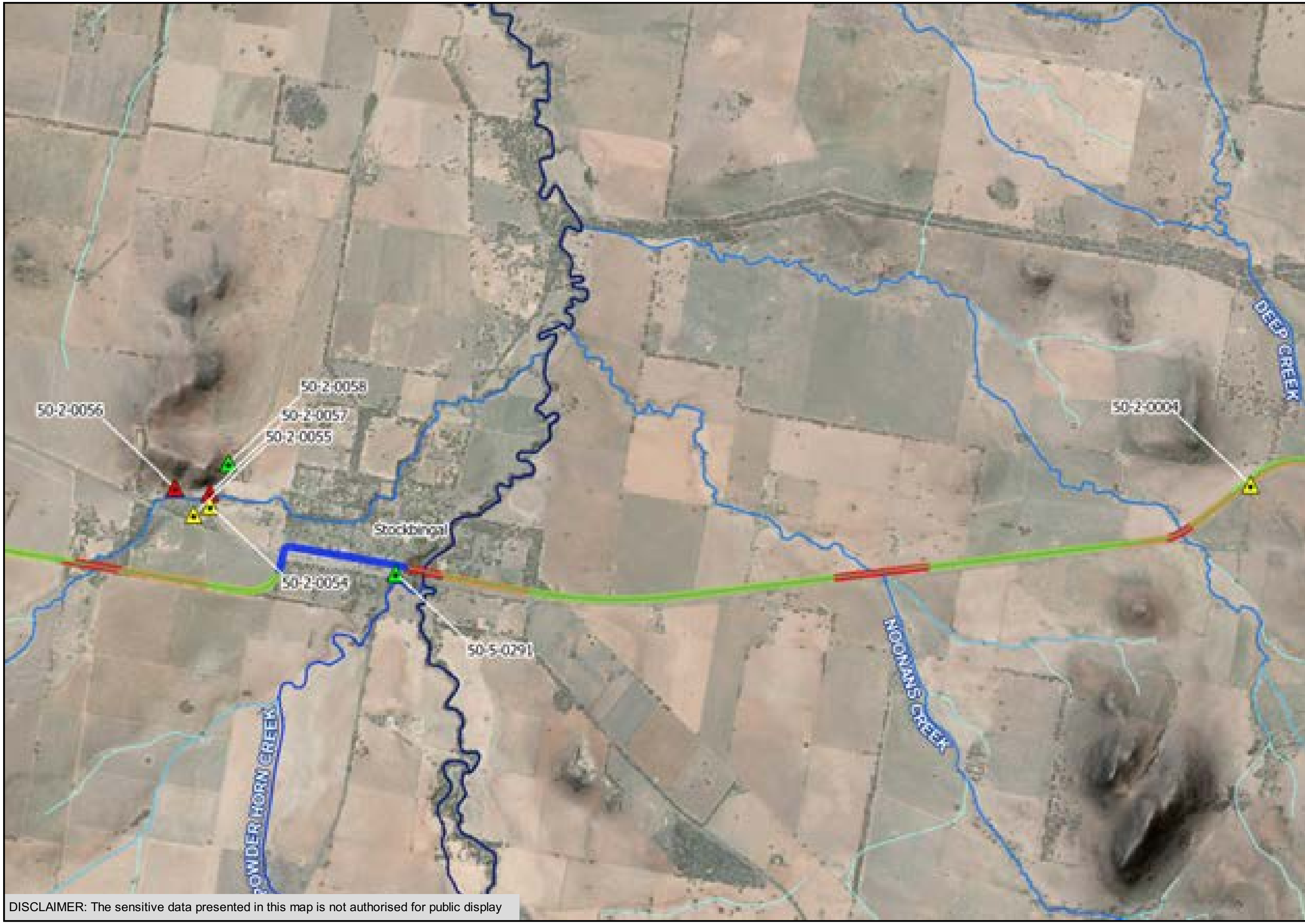

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 9 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact
- Modified Tree (Carved or Scarred)
- Potential Archaeological Deposit (PAD)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 10 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 11 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream

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0 0.5 1 km

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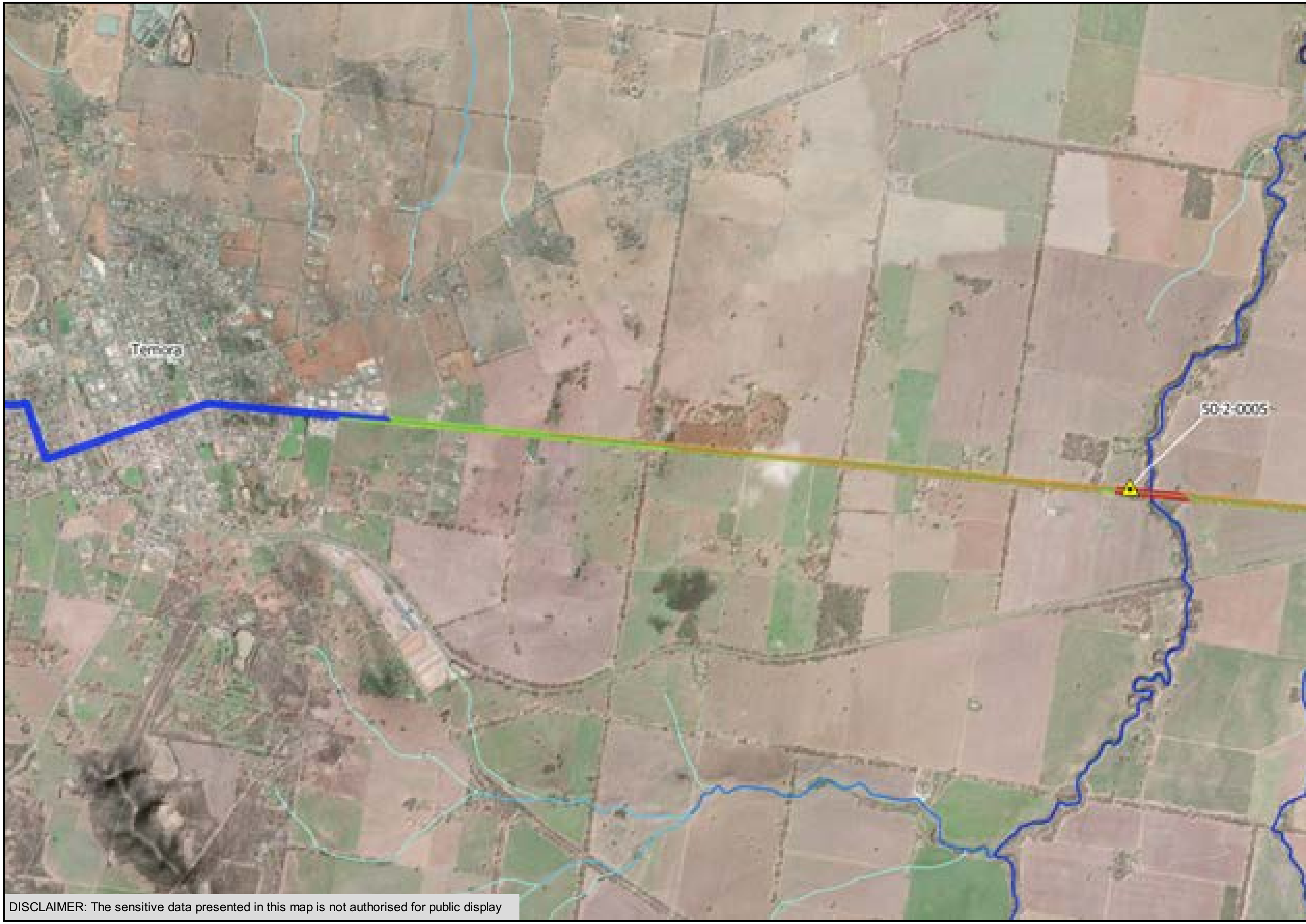
Map 12 of 25



Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream

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0 0.5 1 km

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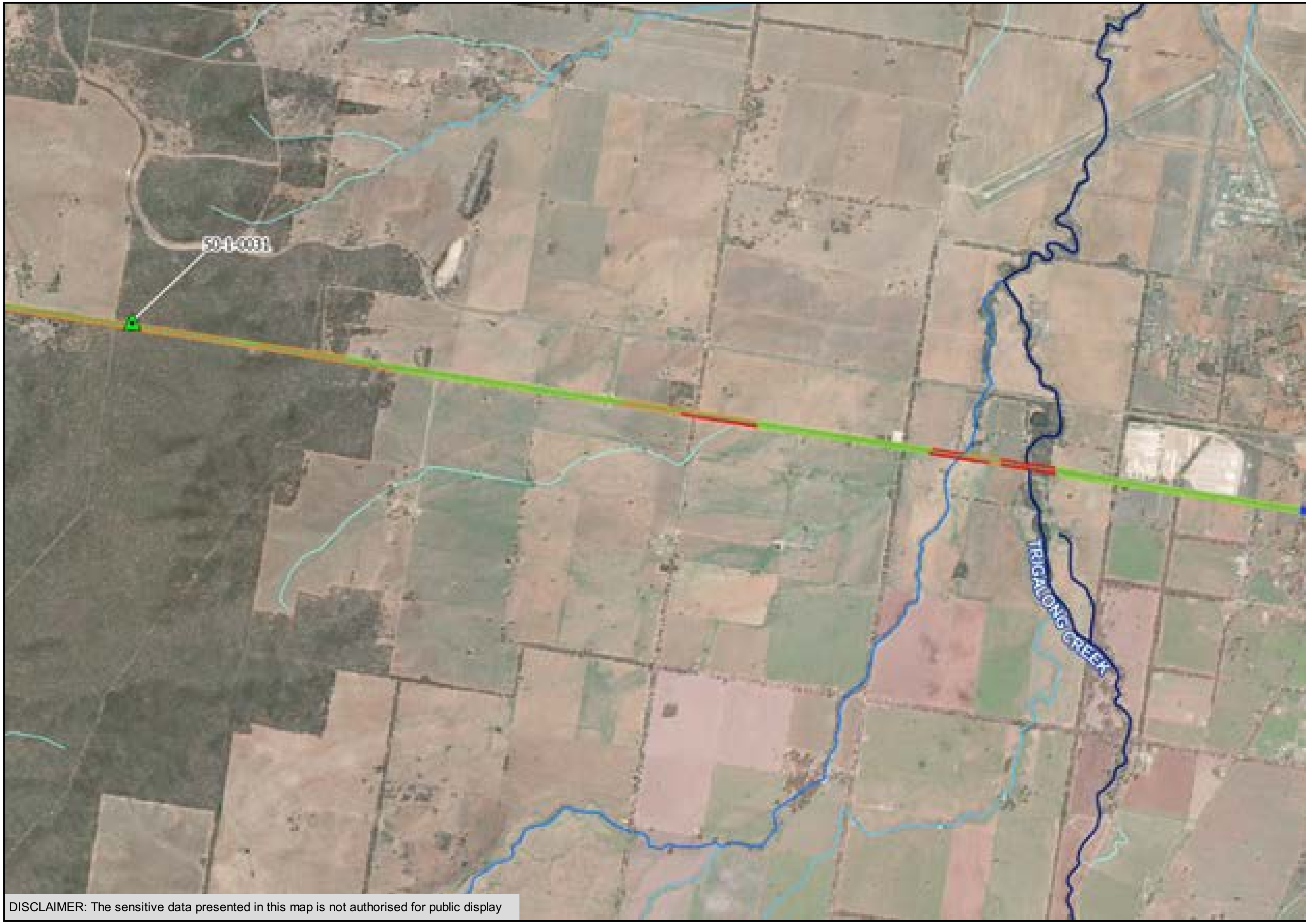

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 13 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 14 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 15 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 16 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream

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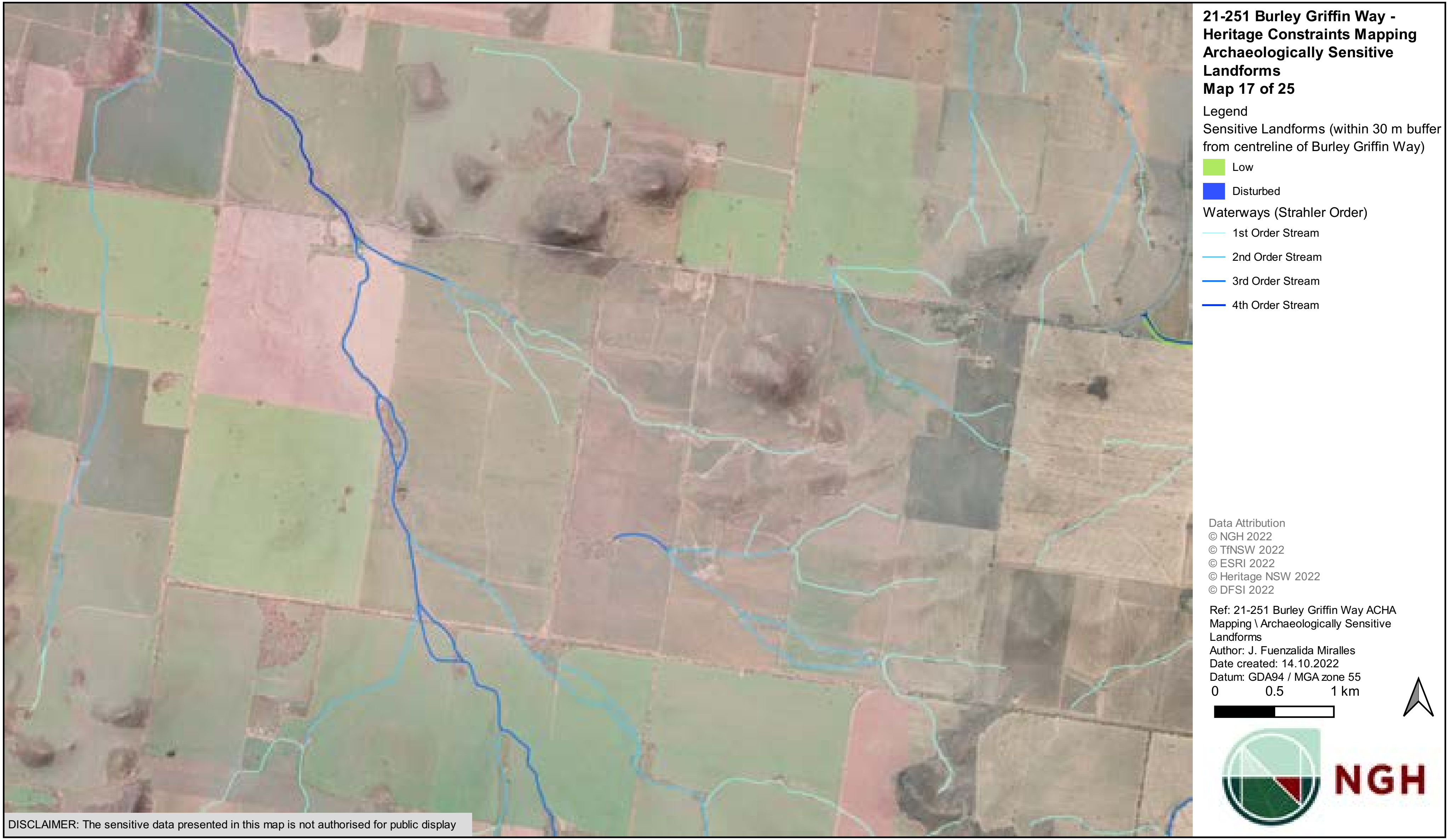
Datum: GDA94 / MGA zone 55

0 0.5 1 km

NGH


21-251 Burley Griffin Way -
Heritage Constraints Mapping
Archaeologically Sensitive
Landforms
Map 17 of 25
Legend
Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)
Low
Disturbed
Waterways (Strahler Order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream
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Datum: GDA94 / MGA zone 55
0
0.5
1 km
NGH
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Map 18 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact
- Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream
- >5th Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 19 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream

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0 0.5 1 km

21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 20 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 21 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream

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Date created: 14.10.2022
Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 22 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Medium
- Low
- Disturbed

Waterways (Strahler Order)

- 1st Order Stream

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0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 23 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- High
- Medium
- Low
- Disturbed

AHIMS Registered Sites (within 1 km from centreline of Burley Griffin Way)

- Artefact
- Modified Tree (Carved or Scarred)

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms

Map 24 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Medium
- Low
- Disturbed

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Datum: GDA94 / MGA zone 55

0 0.5 1 km

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21-251 Burley Griffin Way - Heritage Constraints Mapping Archaeologically Sensitive Landforms
Map 25 of 25

Legend

Sensitive Landforms (within 30 m buffer from centreline of Burley Griffin Way)

- Disturbed

Waterways (Strahler Order)

- 1st Order Stream
- 2nd Order Stream

0 0.5 1 km

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Appendix F Stage 1 Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI)

2 March 2023

Jesse Baaner
Project/Contract Manager
Project Services South
Regional and Outer Metropolitan
Transport for NSW

Dear Jesse,

Preliminary assessment results for the Burley Griffin (MR84) Route Safety Review Safety Improvements project. The key features of these projects are listed below.

- Road edge repair and road widening at various locations (including required ancillary works) including culvert and drainage structure widening works
- Reinstatement of a hazard free roadside, where possible, by removing trees, maintenance of vegetation regrowth, batter flattening and table drain reshaping
- Installation of roadside safety barriers at various locations where a hazard free roadside cannot be achieved (nominally 10m from the existing carriageway edge line)
- Road signage upgrades
- Intersection upgrades at various locations
- Installation of new audio tactile line-marking in line with Transport for NSW policy
- Reinstatement of line marking and raised pavement markers on completion

Based on Stage 1 of the ***Procedure for Aboriginal Cultural Heritage Consultation and Investigation*** (PACHCI), the project, as specified within the PACHCI and through a search of the Aboriginal Heritage Information Management System (AHIMS), was assessed as being unlikely to have an impact on Aboriginal Cultural Heritage.

The assessment is based on the following due diligence considerations:

- The project is unlikely to harm known Aboriginal objects or places.
- The AHIMS search did not indicate moderate to high concentrations of Aboriginal objects or places in the study area.
- The study area does not contain landscape features that indicate the presence of Aboriginal objects, based on the Office of Environment and Heritage's Due diligence Code of Practice for the Protection of Aboriginal objects in NSW and the Transport for NSW procedure.
- The cultural heritage potential of the study area appears to be reduced due to past disturbance.

Your project may proceed in accordance with the environmental impact assessment process, as relevant, and all other relevant approvals. If the scope of your project changes, you must contact Desmond Smith, Aboriginal Cultural Heritage Officer and your regional environmental staff to reassess any potential impacts on Aboriginal cultural heritage.

TfNSW staff and/or contractors should be aware of the potential of Aboriginal objects (including skeletal remains) being discovered during the course of the project, if this occurs all works in the vicinity of the find must cease. Follow the steps outlined in the Roads and Maritime Services' *Unexpected Archaeological Finds Procedure.*

For further assistance in this matter do not hesitate to contact Desmond Smith.

Yours sincerely

Desmond Smith

Transport for NSW
193 – 195 Morgan Street, Wagga Wagga, NSW, 2650
E Desmond.Smith@transport.nsw.gov.au

Desmond Smith
Aboriginal Cultural Heritage Officer
Aboriginal Engagement - Southern

Appendix G Noise estimator results

Scenario 1

Construction Noise Estimator

Please input information into yellow cells

Please pick from drop-down list in orange cells

Project name	Burley Griffin Way REF
Scenario name	Earthworks and shoulder wideing
Receiver address	
Select area ground type	Rural
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or LA90 Background level (dB(A))	Day	40	
	Evening	35	
	Night	30	
LAeq(15minute) Noise mangement level (dB(A))	Day	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

Is all plant at the same representative distance to the receiver? Y/N	Y
Representative distance (m)	25

All at Representative Distance

investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information.

Type/ model plant (See Sources Sheet)	SWL LAeq (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	[illegible]	[illegible]	1		Yes	0	0	25	[illegible]
Grader	110	[illegible]	1		Yes	0	0	25	71
Light vehicles	[illegible]	[illegible]	1		Yes	[illegible]	[illegible]	25	[illegible]
Water cart	[illegible]	[illegible]	1		Yes	[illegible]	[illegible]	25	[illegible]
					Yes	0	0		-888

Total SPL LAeq(15minute) (dB(A))	78

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	[illegible]		65	55			75	70
Level above background (dB(A))	Standard hours	[illegible]							
	Day (OOHW)	[illegible]							
	OOHW Period 1	[illegible]							
	OOHW Period 2	[illegible]							
Level above NML (dB(A))	Standard hours	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Day (OOHW)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	OOHW Period 1	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	OOHW Period 2	[illegible]		[illegible]	[illegible]			[illegible]	[illegible]
Additional mitigation measures	Standard hours	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO
	Day (OOHW)	V, IB, N, R1, DR, PC, SN	V, N, R1, DR	N, R1, DR	V, N, R1, DR	N, R1, DR	V, N, R1, DR	-	N, R1, DR
	OOHW Period 1	V, IB, N, R1, DR, PC, SN		N, R1, DR	V, N, R1, DR	N, R1, DR	V, N, R1, DR	-	N, R1, DR
	OOHW Period 2	AA, V, IB, N, PC, SN, R2, DR		V, N, R2, DR	V, IB, N, PC, SN, R2, DR			-	V, N, R2, DR

Is all plant at the same representative distance to the receiver? Y/N	Y		investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)
Representative distance (m)	30	All at Representative Distance	

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	110	81	1		Yes	0	0	30	67
Grader	110	85	1		Yes	0	0	30	69
Light vehicles	103	78	1		Yes	0	0	30	62
Water cart	107	82	1		Yes	0	0	30	66
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A))	73

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	38		65	55			75	70
Level above background (dB(A))	Standard hours	31							
	Day (OOHW)	31							
	OOHW Period 1	36							
	OOHW Period 2	41							
Level above NML (dB(A))	Standard hours	23	18	8	18	8	13		3
	Day (OOHW)	28	18	8	18	8	13		3
	OOHW Period 1	33		8	18	8	13		3
	OOHW Period 2	35		8	18				3
Additional mitigation measures	Standard hours	N, V	N, V	-	N, V	-	N, V	-	-
	Day (OOHW)	V, IB, N, R1, DR, PC, SN	V,N, R1, DR	N, R1, DR	V,N, R1, DR	N, R1, DR	N, R1, DR	-	-
	OOHW Period 1	V, IB, N, R1, DR, PC, SN		N, R1, DR	V,N, R1, DR	N, R1, DR	N, R1, DR	-	-
	OOHW Period 2	AA, V, IB, N, PC, SN, R2, DR		V, N, R2, DR	V, IB, N, PC, SN, R2, DR			-	N

Is all plant at the same representative distance to the receiver? Y/N	Y		investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)
Representative distance (m)	130	All at Representative Distance	

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	130	53
Grader	113	88	1		Yes	0	0	130	58
Light vehicle	103	78	1		Yes	0	0	130	48
Water truck	107	82	1		Yes	0	0	130	52
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A))	60

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	38		65	55			75	70
Level above background (dB(A))	Standard hours	20							
	Day (OOHW)	20							
	OOHW Period 1	25							
	OOHW Period 2	30							
Level above NML (dB(A))	Standard hours	10	5		5		0		
	Day (OOHW)	15	5		5		0		
	OOHW Period 1	20			5		0		
	OOHW Period 2	22			5				
Additional mitigation measures	Standard hours	N, V	-	-	-	-	-	-	-
	Day (OOHW)	V, N, R1, DR	N, R1, DR	-	N, R1, DR	-	-	-	-
	OOHW Period 1	V, N, R1, DR		-	N, R1, DR	-	-	-	-
	OOHW Period 2	AA, V, IB, N, PC, SN, R2, DR		-	V, N, R2, DR			-	-

Is all plant at the same representative distance to the receiver? Y/N	Y		investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)
Representative distance (m)	140	All at Representative Distance	

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	140	52
Grader	113	88	1		Yes	0	0	140	57
Light vehicle	103	78	1		Yes	0	0	140	47
Water truck	107	82	1		Yes	0	0	140	51
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A))	59

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	38		65	55			75	70
Level above background (dB(A))	Standard hours	19							
	Day (OOHW)	19							
	OOHW Period 1	24							
	OOHW Period 2	29							
Level above NML (dB(A))	Standard hours	9	4		4				
	Day (OOHW)	14	4		4				
	OOHW Period 1	19			4				
	OOHW Period 2	21			4				
Additional mitigation measures	Standard hours	-	-	-	-	-	-	-	-
	Day (OOHW)	N, R1, DR	-	-	-	-	-	-	-
	OOHW Period 1	V, N, R1, DR		-	-	-	-	-	-
	OOHW Period 2	V, IB, N, PC, SN, R2, DR		-	N			-	-

Is all plant at the same representative distance to the receiver? Y/N	Y		[illegible] investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)
Representative distance (m)	250	All at Representative Distance	

Type/ model plant (See Sources Sheet)	SWL LAeq (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	250	44
Grader	110	85	1		Yes	0	0	250	46
Light vehicles	103	78	1		Yes	0	0	250	39
Water cart	107	82	1		Yes	0	0	250	43
					Yes	0	0		-888

Total SPL LAeq(15minute) (dB(A))	50

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	35		65	55			75	70
Level above background (dB(A))	Standard hours	10							
	Day (OOHW)	10							
	OOHW Period 1	15							
	OOHW Period 2	20							
Level above NML (dB(A))	Standard hours	0							
	Day (OOHW)	5							
	OOHW Period 1	10							
	OOHW Period 2	15							
Additional mitigation measures	Standard hours	-	-	-	-	-	-	-	-
	Day (OOHW)	N, R1, DR	-	-	-	-	-	-	-
	OOHW Period 1	N, R1, DR		-	-	-	-	-	-
	OOHW Period 2	V, IB, N, PC, SN, R2, DR		-	-			-	-

Scenario 2

Transport
Roads & Maritime
Services

NSW GOVERNMENT

Construction Noise Estimator

Please input information into yellow cells

Please pick from drop-down list in orange cells

Project name	Burley Griffin Way REF
Scenario name	Vegetation Removal
Receiver address	
Select area ground type	Rural
Select type of background noise level input	Representative Noise Environment

		Representative Noise Environment	User Input
Noise area category		R1	
RBL or LA90 Background level (dB(A))	Day	40	
	Evening	35	
	Night	30	
LAeq(15minute) Noise mangement level (dB(A))	Day	50	
	Day (OOHW)	45	
	Evening	40	
	Night	35	

investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Is all plant at the same representative distance to the receiver? Y/N	Y	
Representative distance (m)	44	All at Representative Distance

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	44	64
Excavator	110	85	1		Yes	0	0	44	66
Tub grinder/mulcher 40-50hp	116	91	1		Yes	0	0	44	72
Chainsaw	110	85	2		Yes	3	0	44	69

Total SPL $L_{Aeq(15minute)}$ (dB(A)) 75

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	35		65	55			75	70
Level above background (dB(A))	Standard hours	35							
	Day (OOHW)	35							
	OOHW Period 1	40							
	OOHW Period 2	45							
Level above NML (dB(A))	Standard hours	25	20	10	20	10	15	0	5
	Day (OOHW)	30	20	10	20	10	15	0	5
	OOHW Period 1	35		10	20	10	15	0	5
	OOHW Period 2	40		10	20			0	5
Additional mitigation measures	Standard hours	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO	N, V, PC, RO
	Day (OOHW)	V, IB, N, R1, DR, PC, SN	V, N, R1, DR	N, R1, DR	V, N, R1, DR	N, R1, DR	V, N, R1, DR	-	N, R1, DR
	OOHW Period 1	V, IB, N, R1, DR, PC, SN		N, R1, DR	V, N, R1, DR	N, R1, DR	V, N, R1, DR	-	N, R1, DR
	OOHW Period 2	AA, V, IB, N, PC, SN, R2, DR		V, N, R2, DR	V, IB, N, PC, SN, R2, DR			-	V, N, R2, DR

investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Is all plant at the same representative distance to the receiver? Y/N	Y	
Representative distance (m)	100	All at Representative Distance

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	100	49
Excavator	110	85	1		Yes	0	0	100	51
Tub grinder/mulcher 40-50hp	116	91	1		Yes	0	0	100	57
Chainsaw	110	85	2		Yes	3	0	100	54
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A)) 60

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	35		65	55			75	70
Level above background (dB(A))	Standard hours	20							
	Day (OOHW)	20							
	OOHW Period 1	25							
	OOHW Period 2	30							
Level above NML (dB(A))	Standard hours	10	5		5		0		
	Day (OOHW)	15	5		5		0		
	OOHW Period 1	20			5		0		
	OOHW Period 2	25			5				
Additional mitigation measures	Standard hours	N, V	-	-	-	-	-	-	-
	Day (OOHW)	V, N, R1, DR	N, R1, DR	-	N, R1, DR	-	-	-	-
	OOHW Period 1	V, N, R1, DR		-	N, R1, DR	-	-	-	-
	OOHW Period 2	AA, V, IB, N, PC, SN, R2, DR		-	V, N, R2, DR			-	-

investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)

Is all plant at the same representative distance to the receiver? Y/N	Y	
Representative distance (m)	100	All at Representative Distance

Type/ model plant (See Sources Sheet)	SWL L_{Aeq} (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	108	83	1		Yes	0	0	100	45
Excavator	110	85	1		Yes	0	0	100	50
Tub grinder/mulcher 40-50hp	116	91	1		Yes	0	0	100	56
Chainsaw	110	85	2		Yes	3	0	100	53
					Yes	0	0		-888

Total SPL $L_{Aeq(15minute)}$ (dB(A)) 59

		Residential receiver	Non-residential receivers: Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	35		65	55			75	70
Level above background (dB(A))	Standard hours	19							
	Day (OOHW)	19							
	OOHW Period 1	24							
	OOHW Period 2	29							
Level above NML (dB(A))	Standard hours	9	4		4				
	Day (OOHW)	14	4		4				
	OOHW Period 1	19			4				
	OOHW Period 2	24			4				
Additional mitigation measures	Standard hours	-	-	-	-	-	-	-	-
	Day (OOHW)	N, R1, DR	-	-	-	-	-	-	-
	OOHW Period 1	V, N, R1, DR		-	-	-	-	-	-
	OOHW Period 2	V, IB, N, PC, SN, R2, DR		-	N			-	-

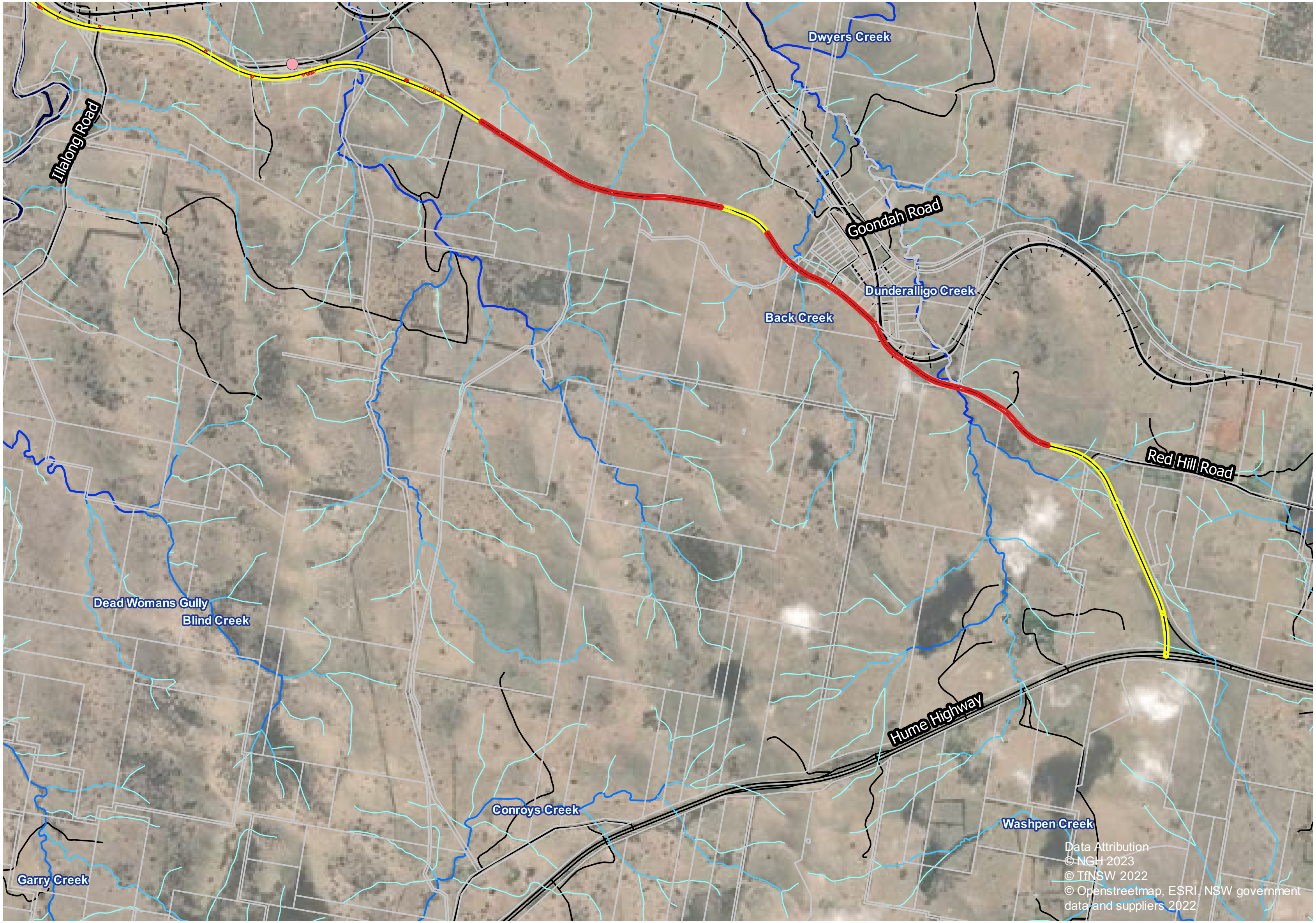
Is all plant at the same representative distance to the receiver? Y/N	Y		investigated on a project-by-project basis. Please contact a Roads and Maritime noise specialist for more information)
Representative distance (m)	360	All at Representative Distance	

Type/ model plant (See Sources Sheet)	SWL LAeq (dB(A))	SPL @7m (dB(A))	Quantity	Individual distance to receiver (m)	Is there line of sight to receiver? Y/N	Quantity correction (dBA)	Shielding correction (dBA)	Distance used in calculation (m)	Contribution SPL (dB(A))
Dump Trucks	110	83	1		Yes	0	0	360	40
Excavator	110	85	1		Yes	0	0	360	42
Tub grinder/mulcher 41-50hp	116	91	1		Yes	0	0	360	45
Chainsaw	112	86	2		Yes	3	0	360	45
					Yes	0	0		-999
Total SPL LAeq(15minute) (dB(A))		**59**							

		Residential receiver	Non-residential receivers						
			Classroom at schools and other educational institutions	Hospital wards and operating theatres	Place of worship	Active recreation	Passive recreation	Industrial premise	Offices, retail outlets
Noise Management Level (dB(A))	Standard hours	50	55	65	55	65	60	75	70
	Day (OOHW)	45	55	65	55	65	60	75	70
	OOHW Period 1	40		65	55	65	60	75	70
	OOHW Period 2	35		65	55			75	70
Level above background (dB(A))	Standard hours	[illegible]							
	Day (OOHW)	[illegible]							
	OOHW Period 1	[illegible]							
	OOHW Period 2	[illegible]							
Level above NML (dB(A))	Standard hours	9							
	Day (OOHW)	[illegible]							
	OOHW Period 1	[illegible]							
	OOHW Period 2	[illegible]							
Additional mitigation measures	Standard hours	-	-	-	-	-	-	-	-
	Day (OOHW)	N, R1, DR	-	-	-	-	-	-	-
	OOHW Period 1	N, R1, DR		-	-	-	-	-	-
	OOHW Period 2	V, IB, N, PC, SN, R2, DR		-	-			-	-

Appendix H Mapping sets

H.1 Proposal area and Construction footprint



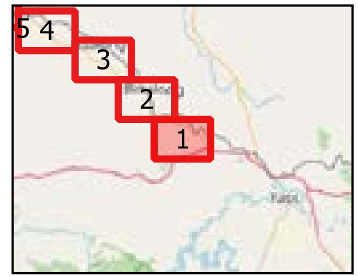
Proposal Area Overview
Map 1 of 25

Legend

- Proposal Area
- Construction Footprint
- Existing permanant stockpiles
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream

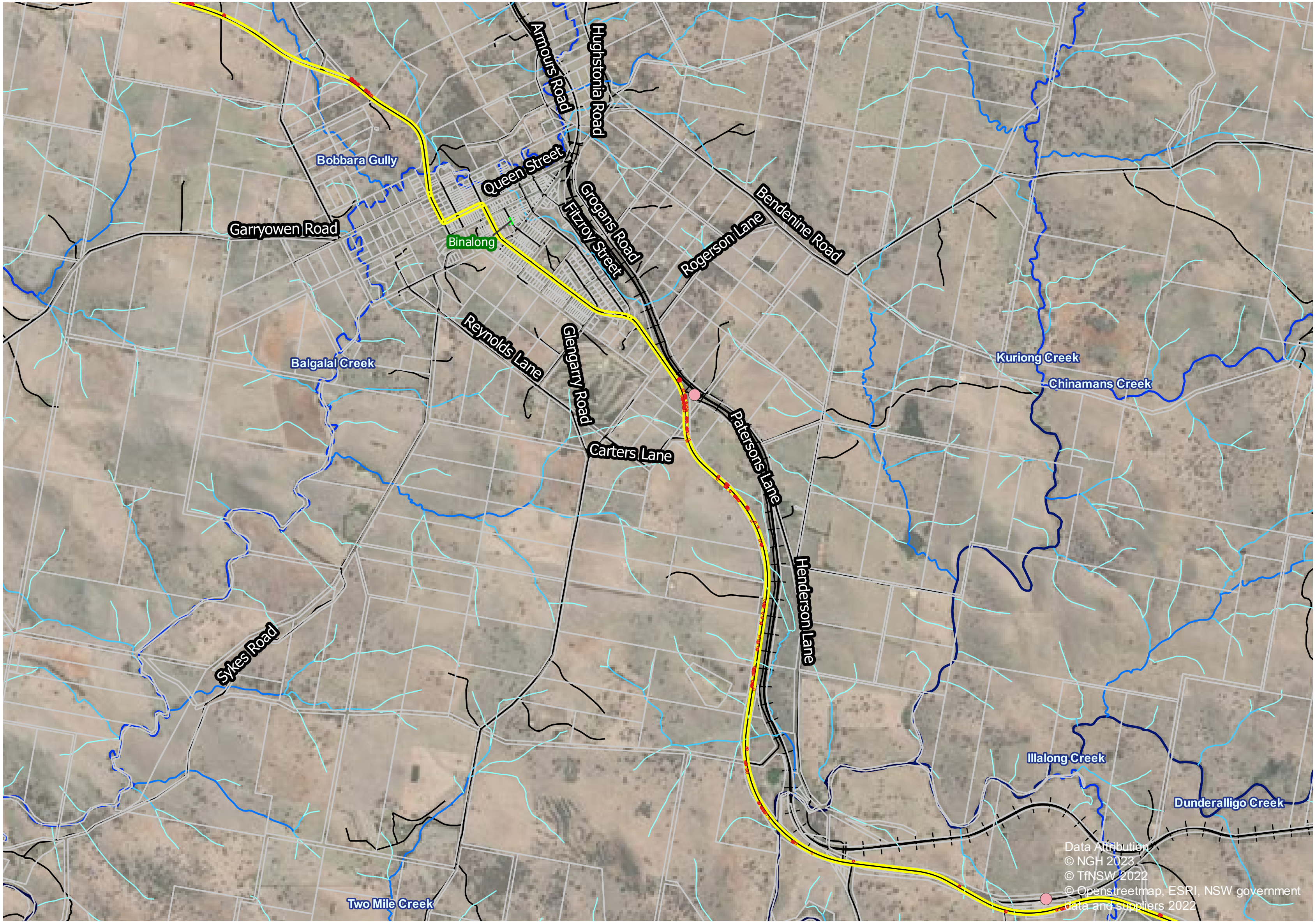


Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Proposal Area Overview
Map 2 of 25

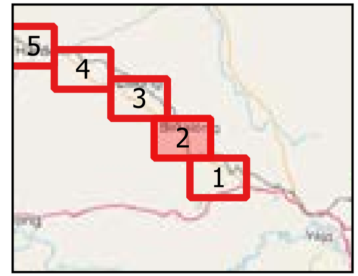


Legend

- Proposal Area
- Construction Footprint
- Existing permanent stockpiles
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

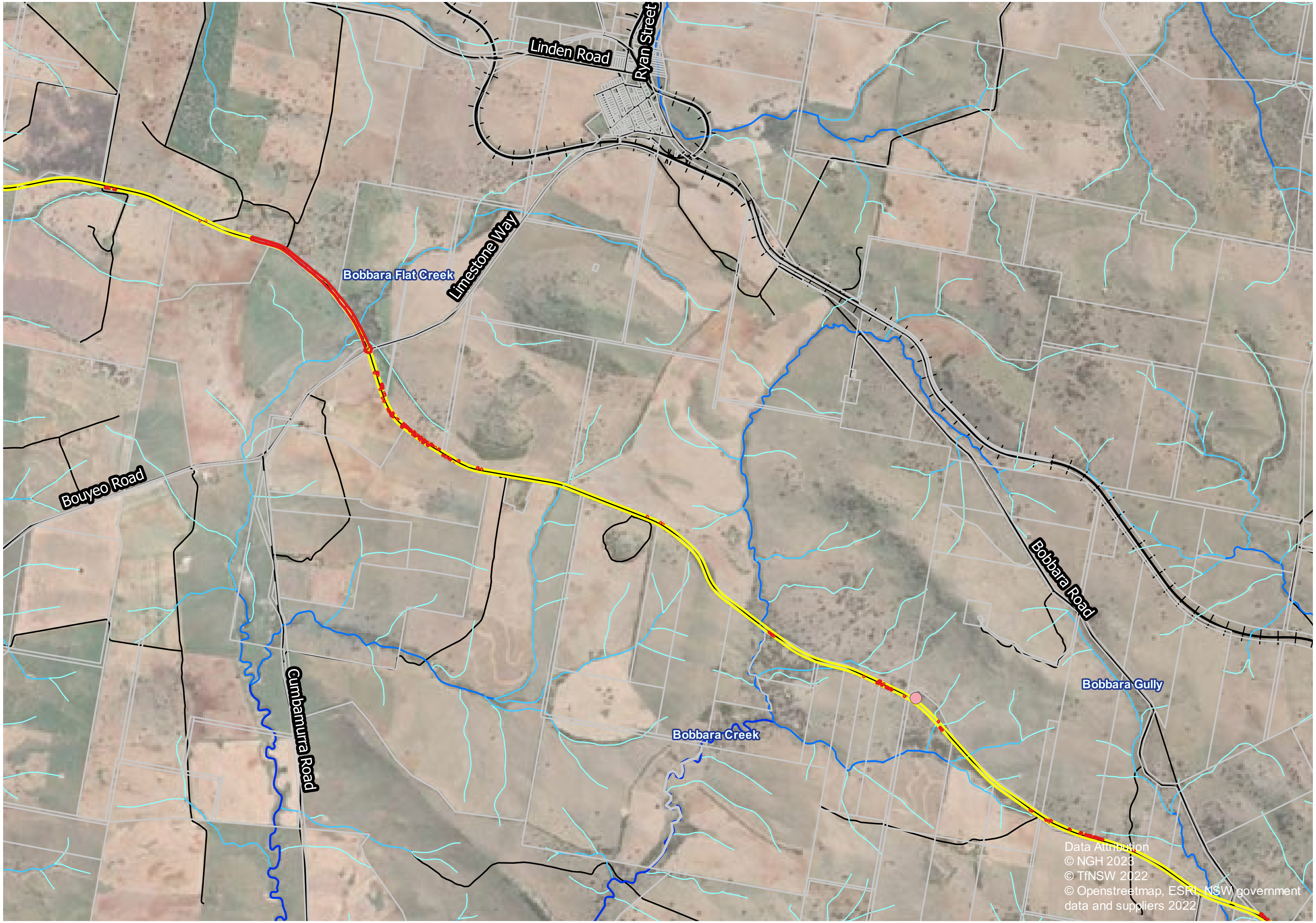
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH



Proposal Area Overview
Map 3 of 25

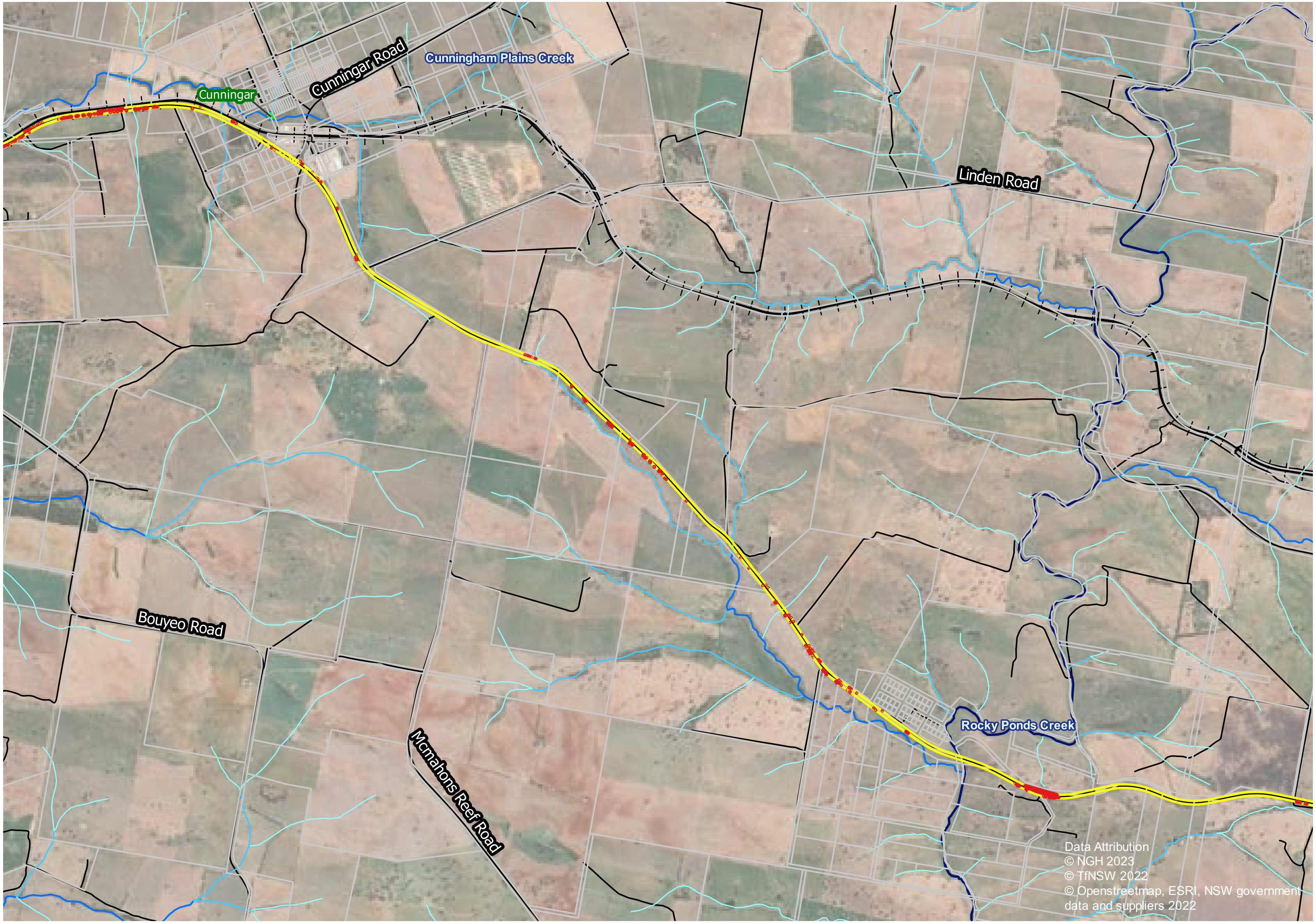
Legend
Proposal Area
Construction Footprint
Existing permanent stockpiles
Road
Railway
Lot

Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream

Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH



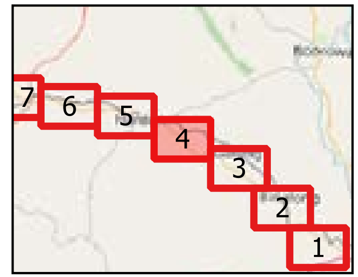
Proposal Area Overview
Map 4 of 25

Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream

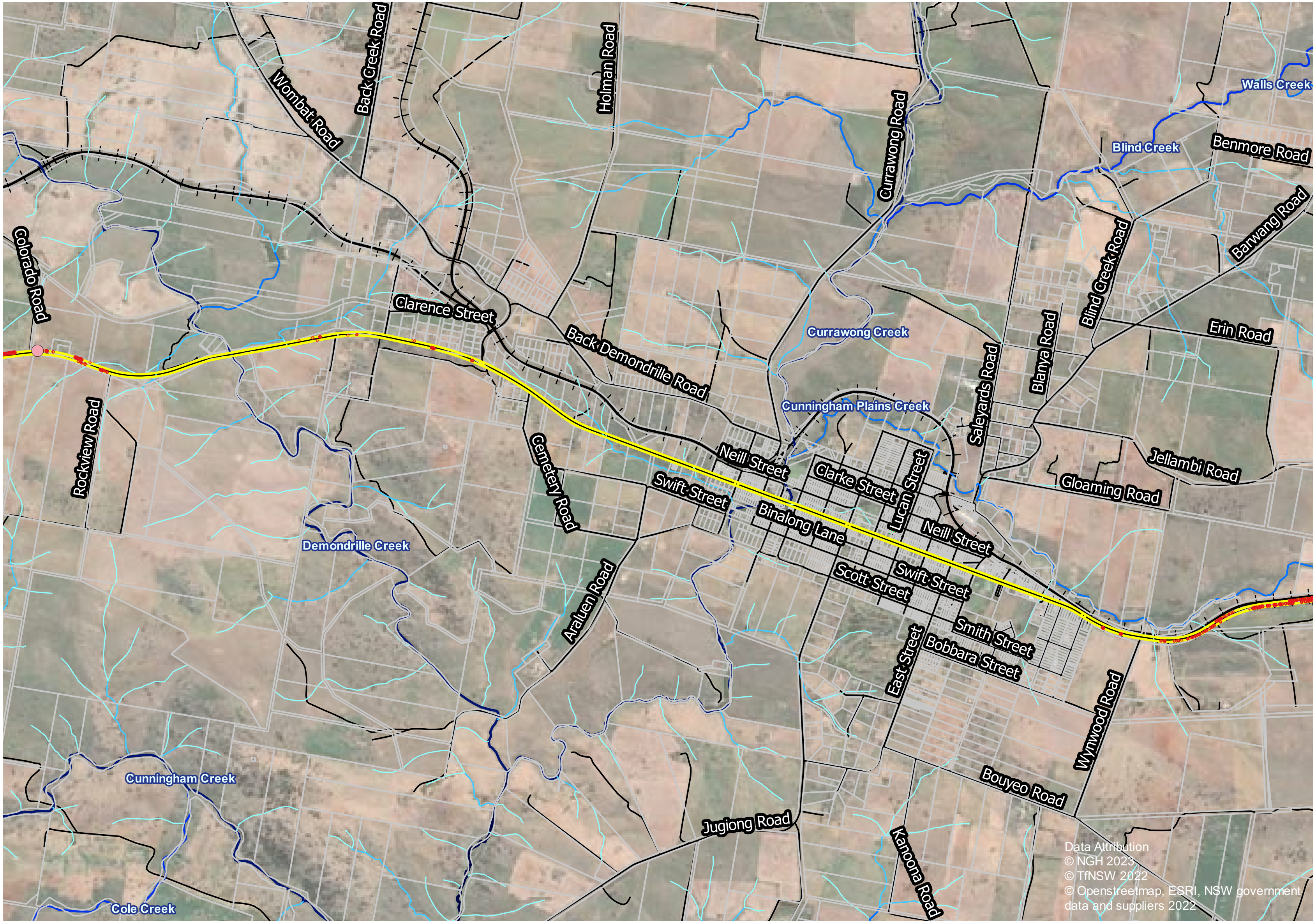


Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Proposal Area Overview
Map 5 of 25

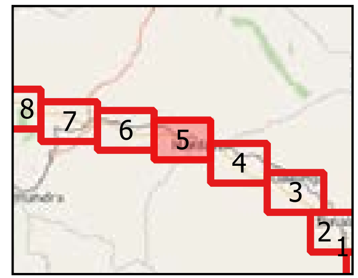


Legend

- Proposal Area
- Construction Footprint
- Existing permenant stockpiles
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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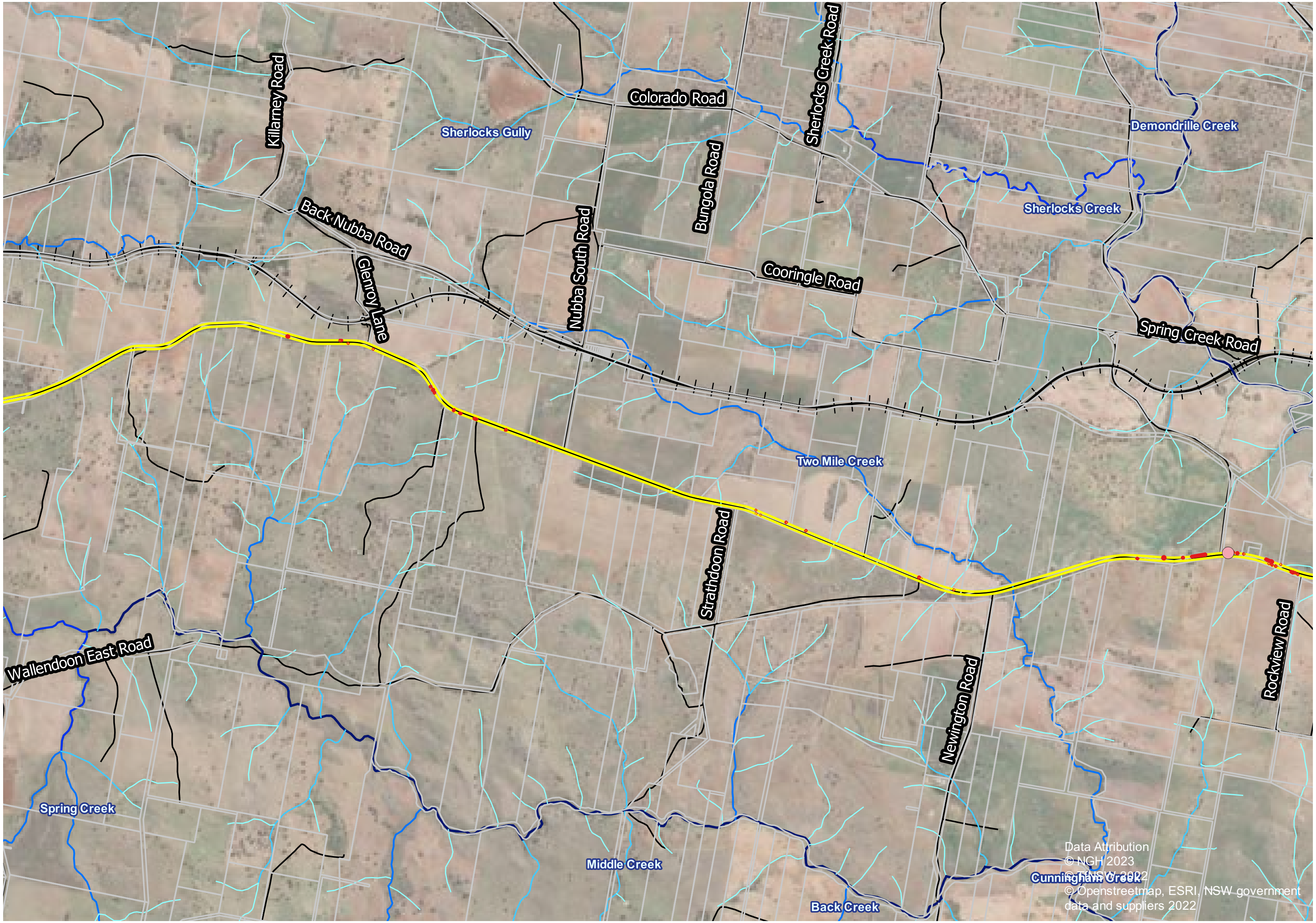
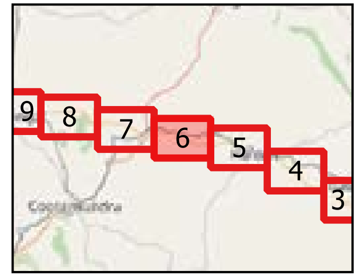
NGH

Proposal Area Overview
Map 6 of 25



Legend
- Proposal Area
- Construction Footprint
- Existing permanant stockpiles
- Road
- Railway
- Lot

Waterways (strahler stream order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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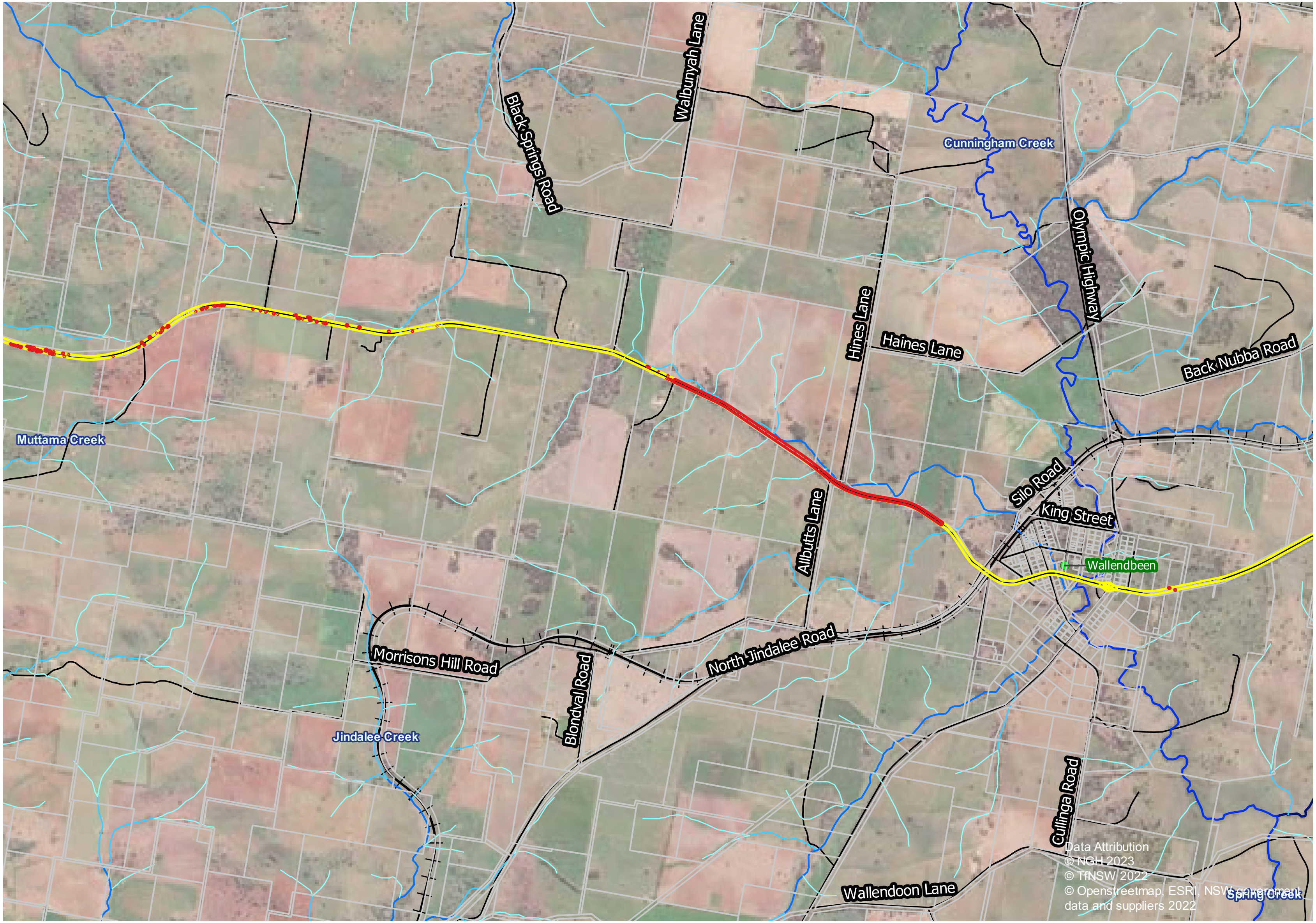
Proposal Area Overview
Map 7 of 25

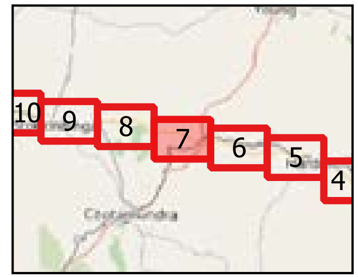


Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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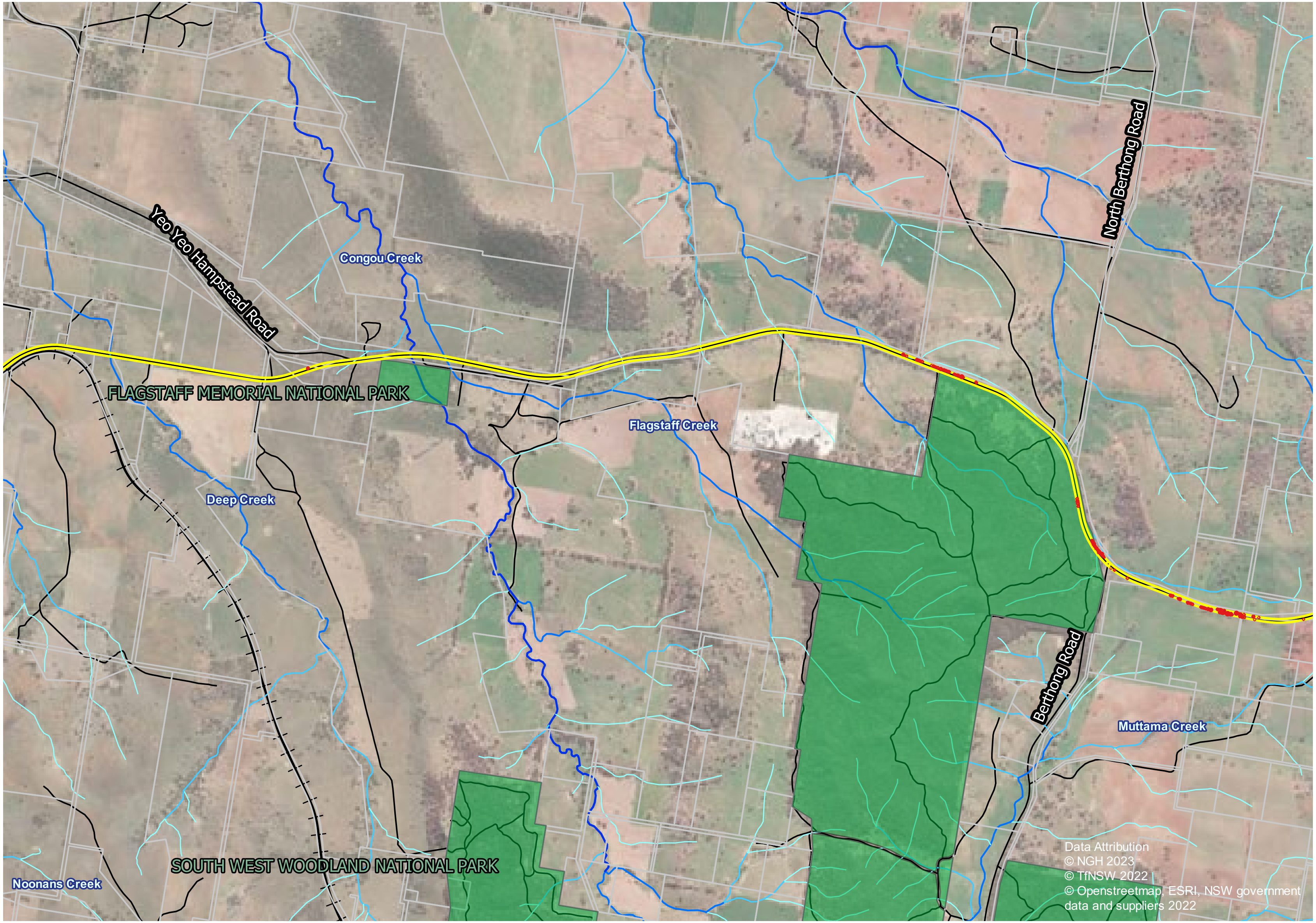
Proposal Area Overview
Map 8 of 25



Legend
- Proposal Area
- Construction Footprint
- Road
- Railway
- Lot
- NPWSReserve

Waterways (strahler stream order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream

Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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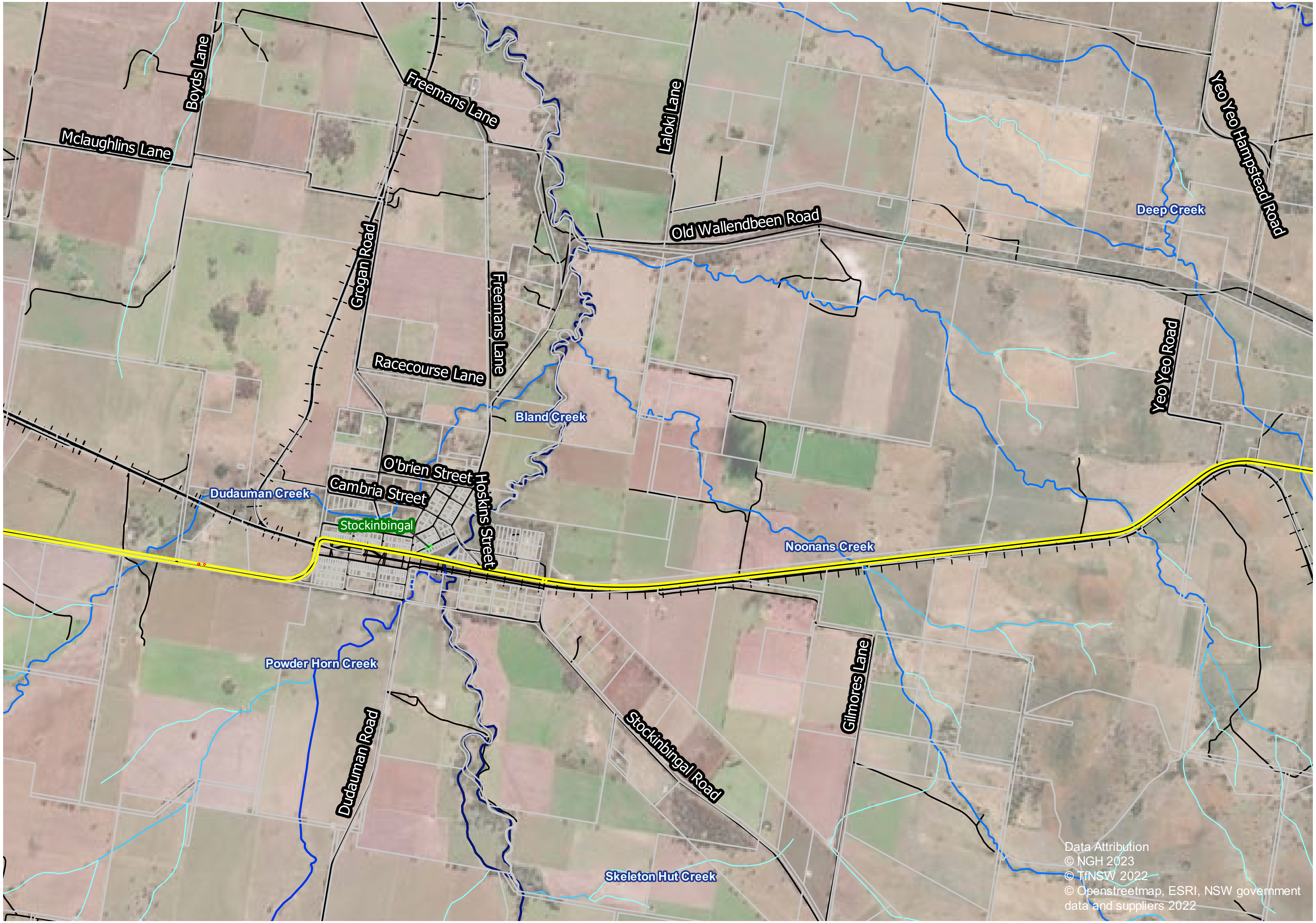


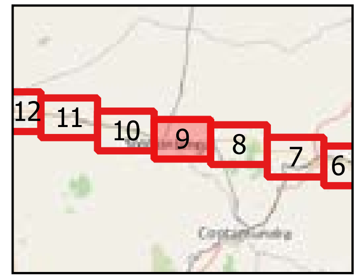
Proposal Area Overview
Map 9 of 25

Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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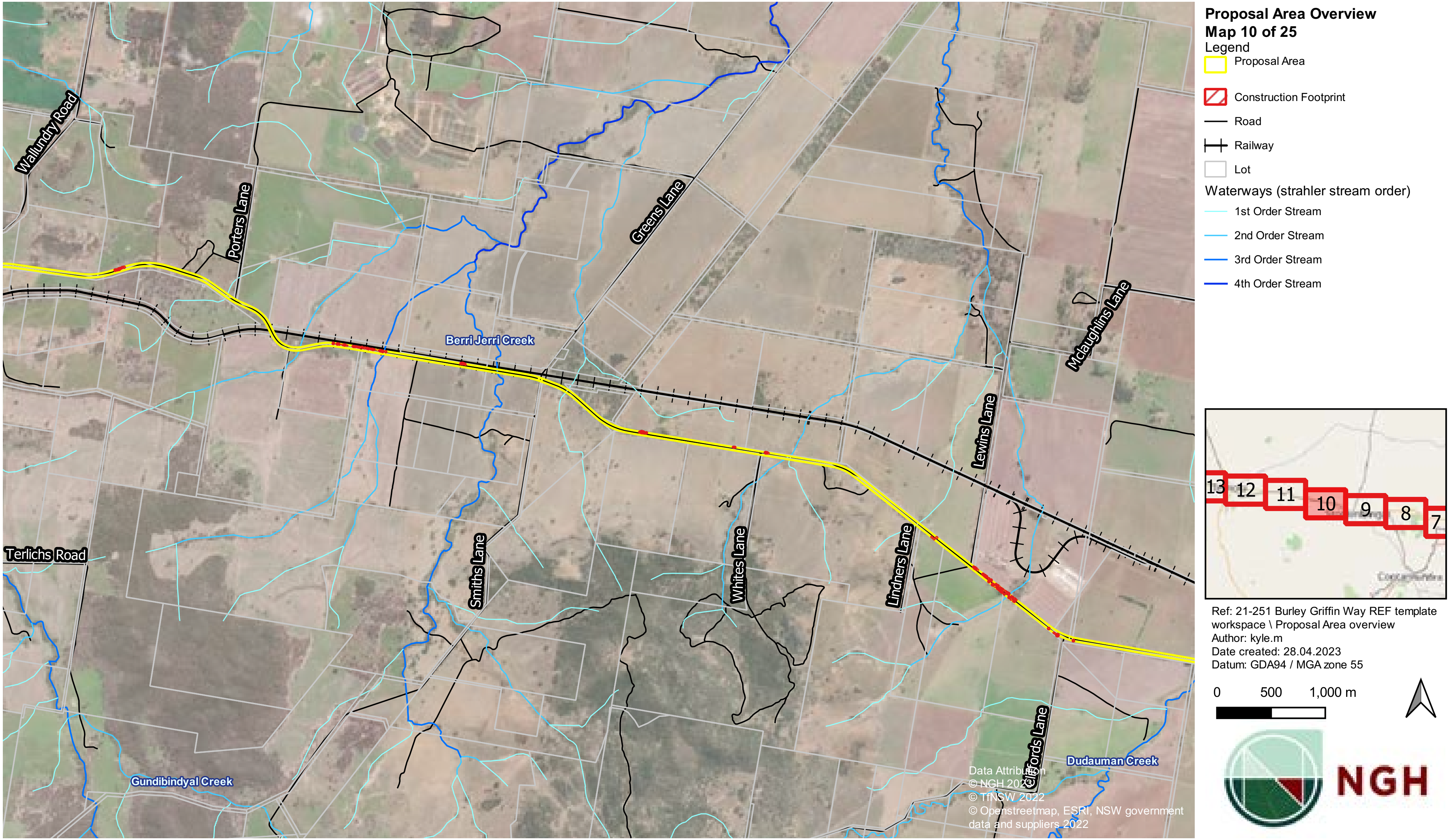
Proposal Area Overview
Map 10 of 25
Legend
Proposal Area
Construction Footprint
Road
Railway
Lot
Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream
Wallundry Road
Porters Lane
Greens Lane
Berri Jerri Creek
Mclaughlins Lane
Lewins Lane
Terlichs Road
Smiths Lane
Whites Lane
Lindners Lane
Cliffords Lane
Gundibindyal Creek
Dudauman Creek
13
12
11
10
9
8
7
Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
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1,000 m
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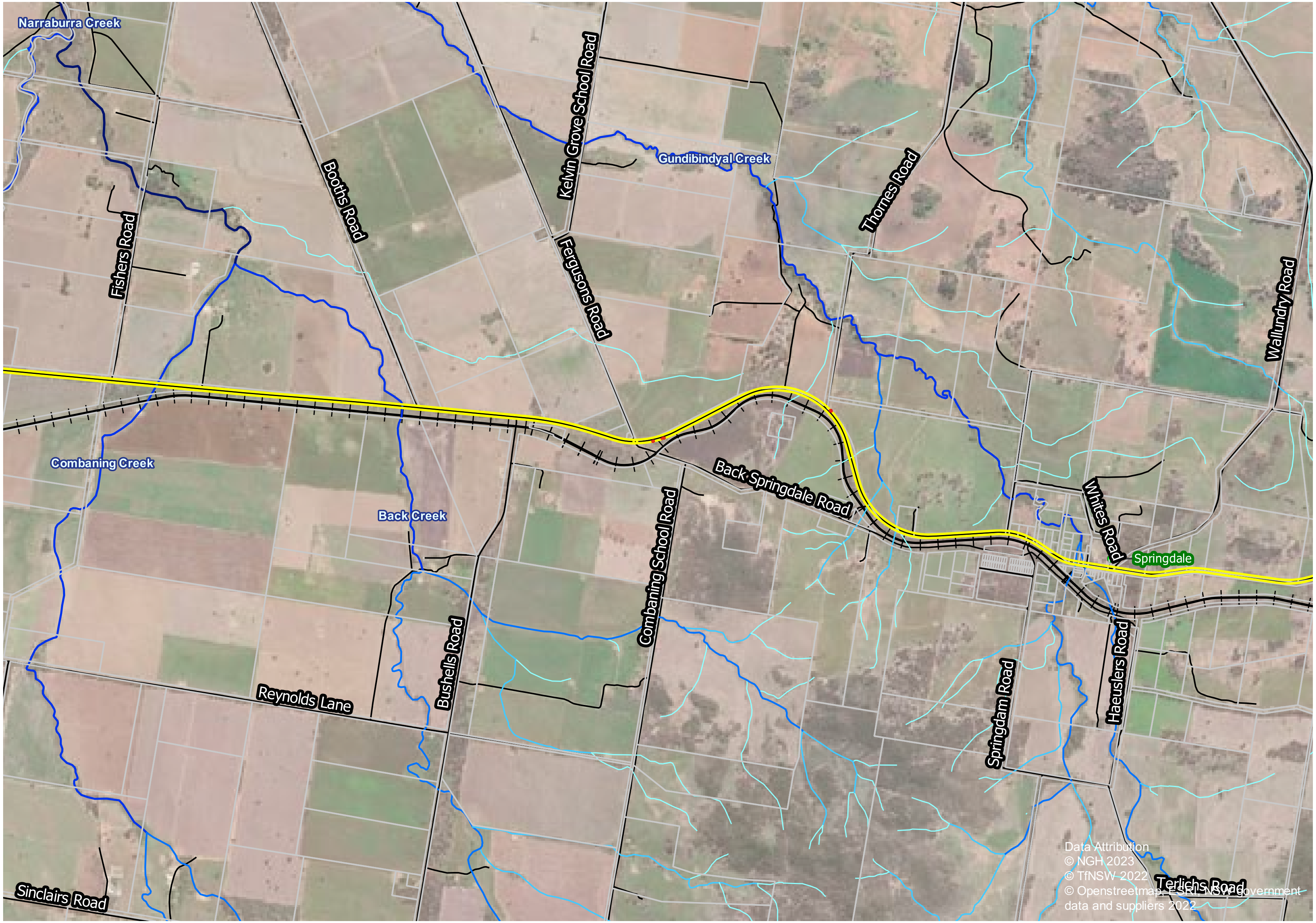


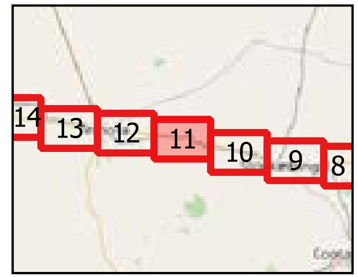
Proposal Area Overview
Map 11 of 25

Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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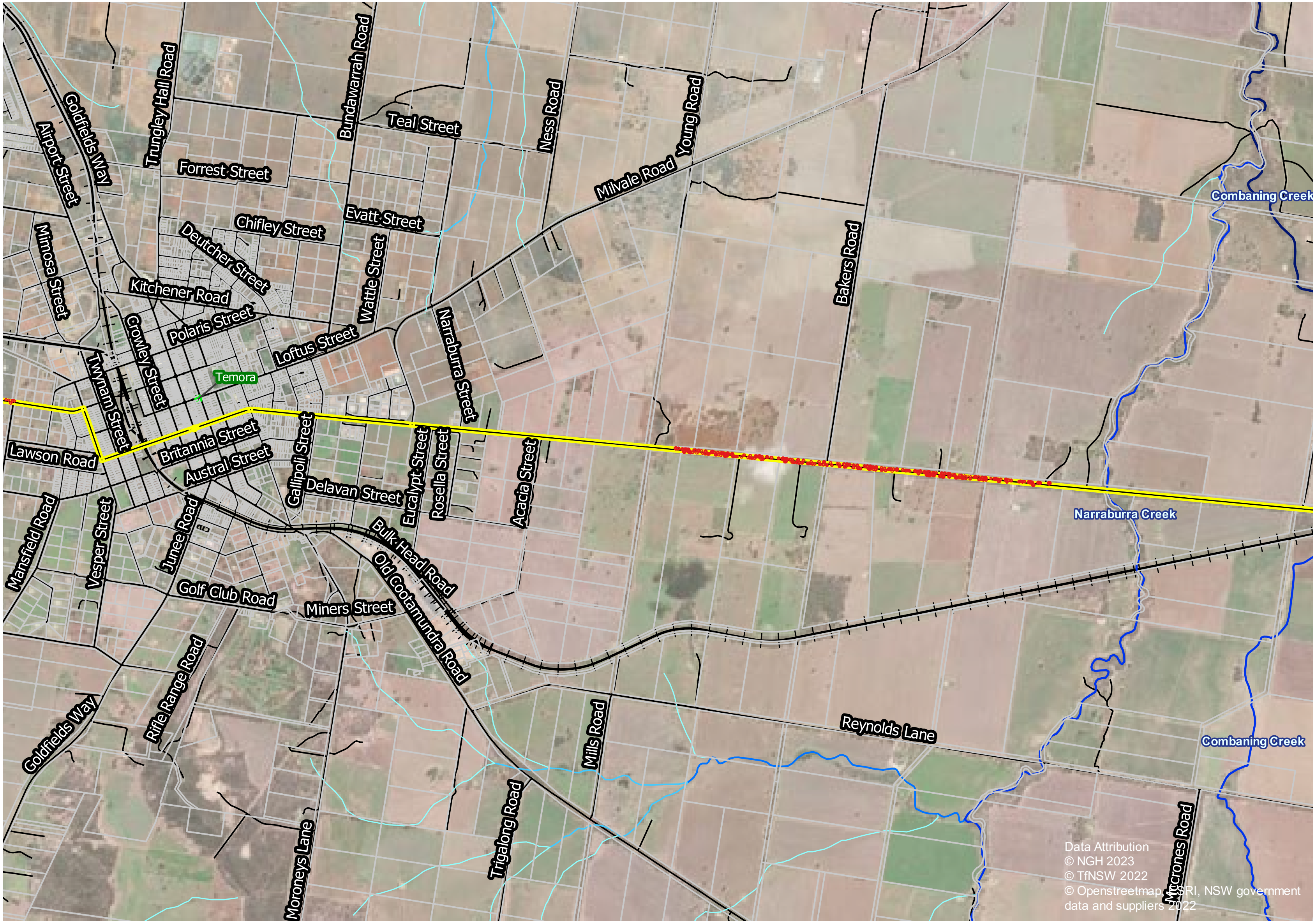


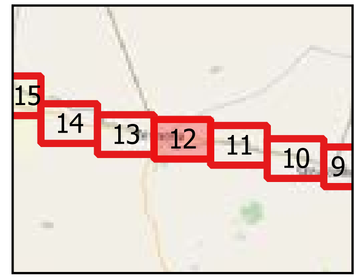
Proposal Area Overview
Map 12 of 25

Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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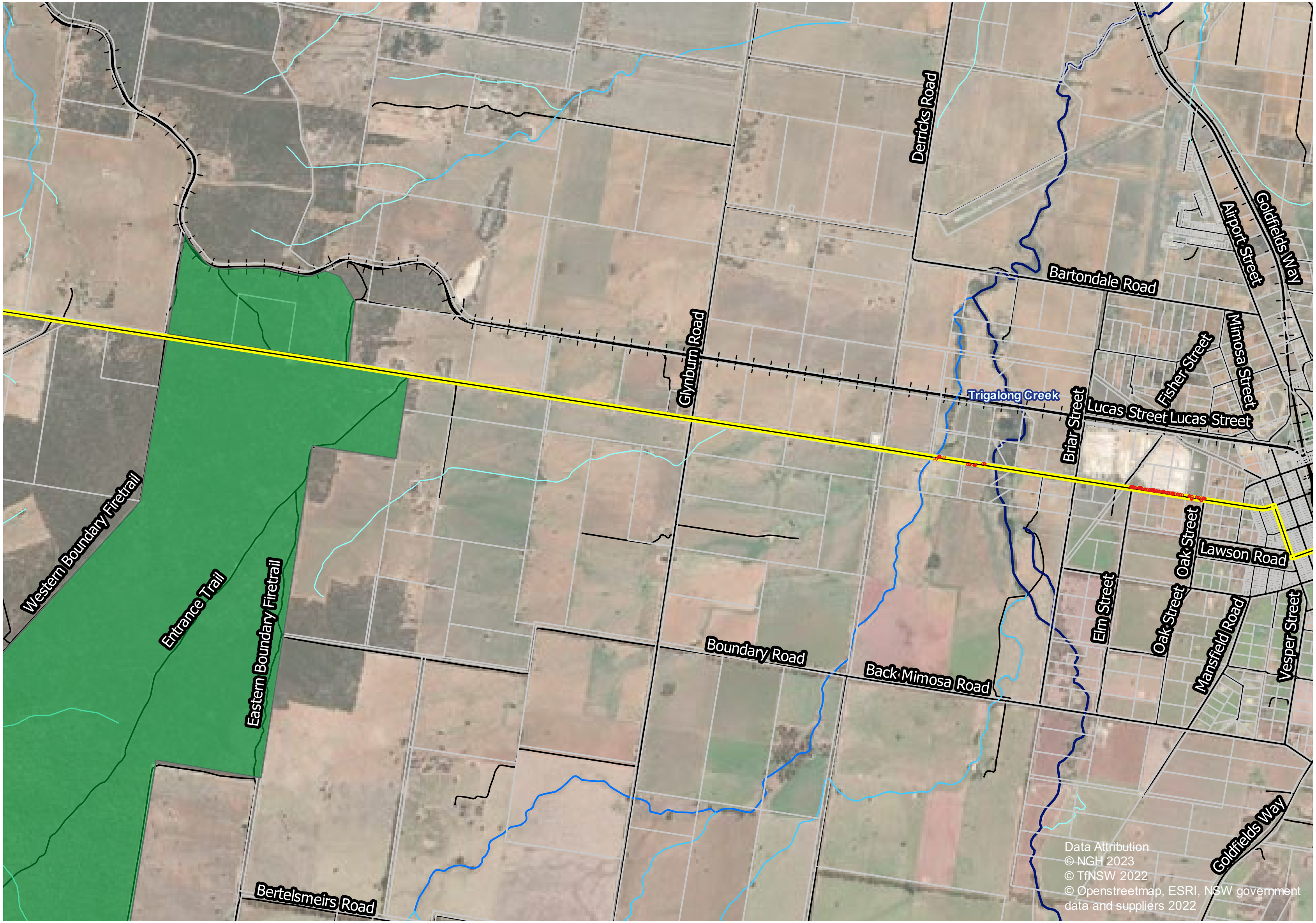


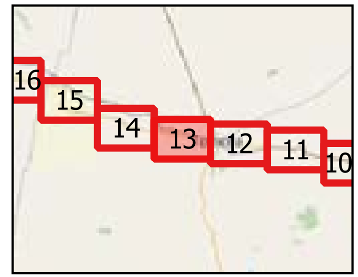
Proposal Area Overview
Map 13 of 25

Legend

- Proposal Area
- Construction Footprint
- Road
- Railway
- Lot
- NPWSReserve

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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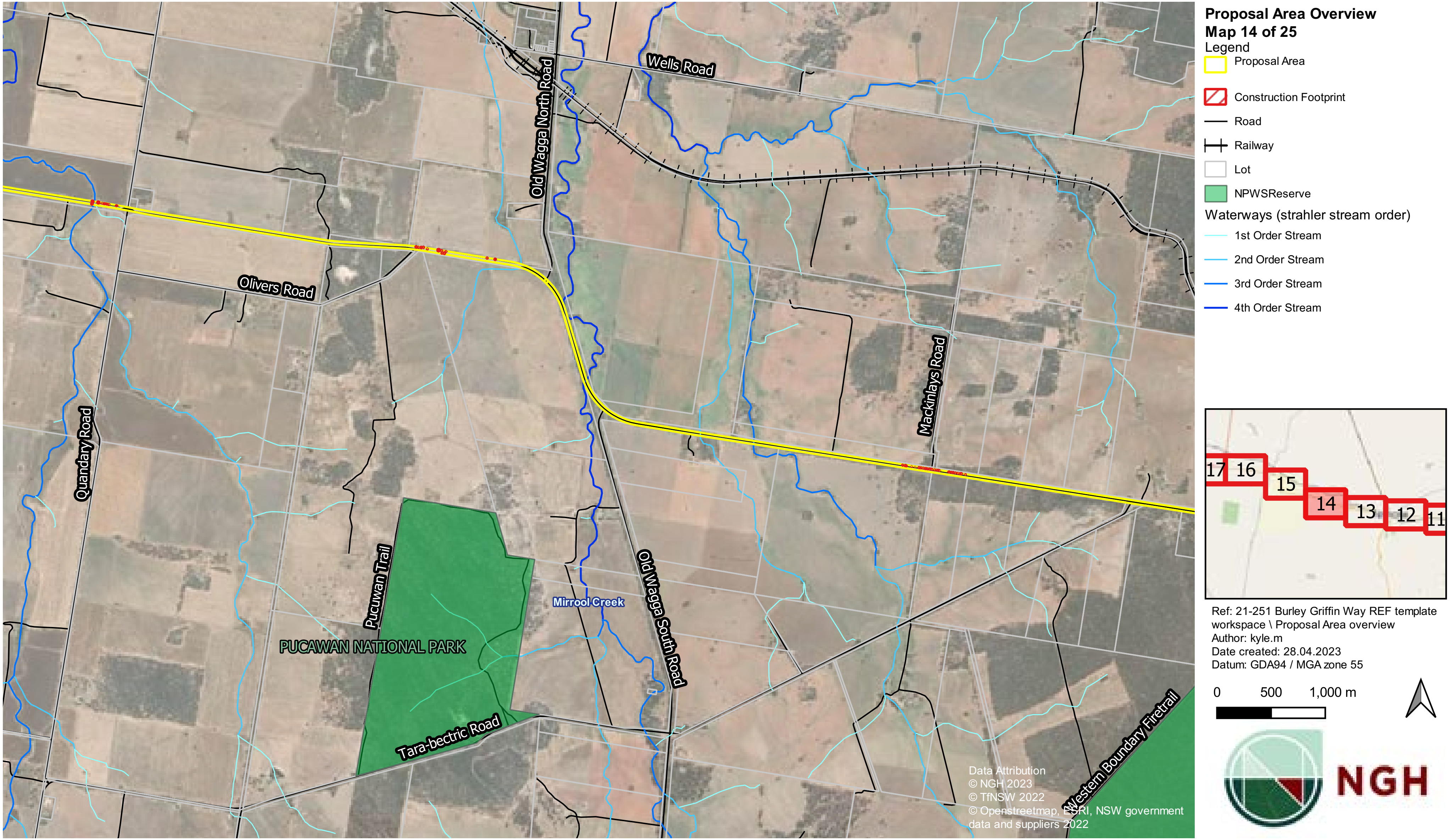
Proposal Area Overview
Map 14 of 25



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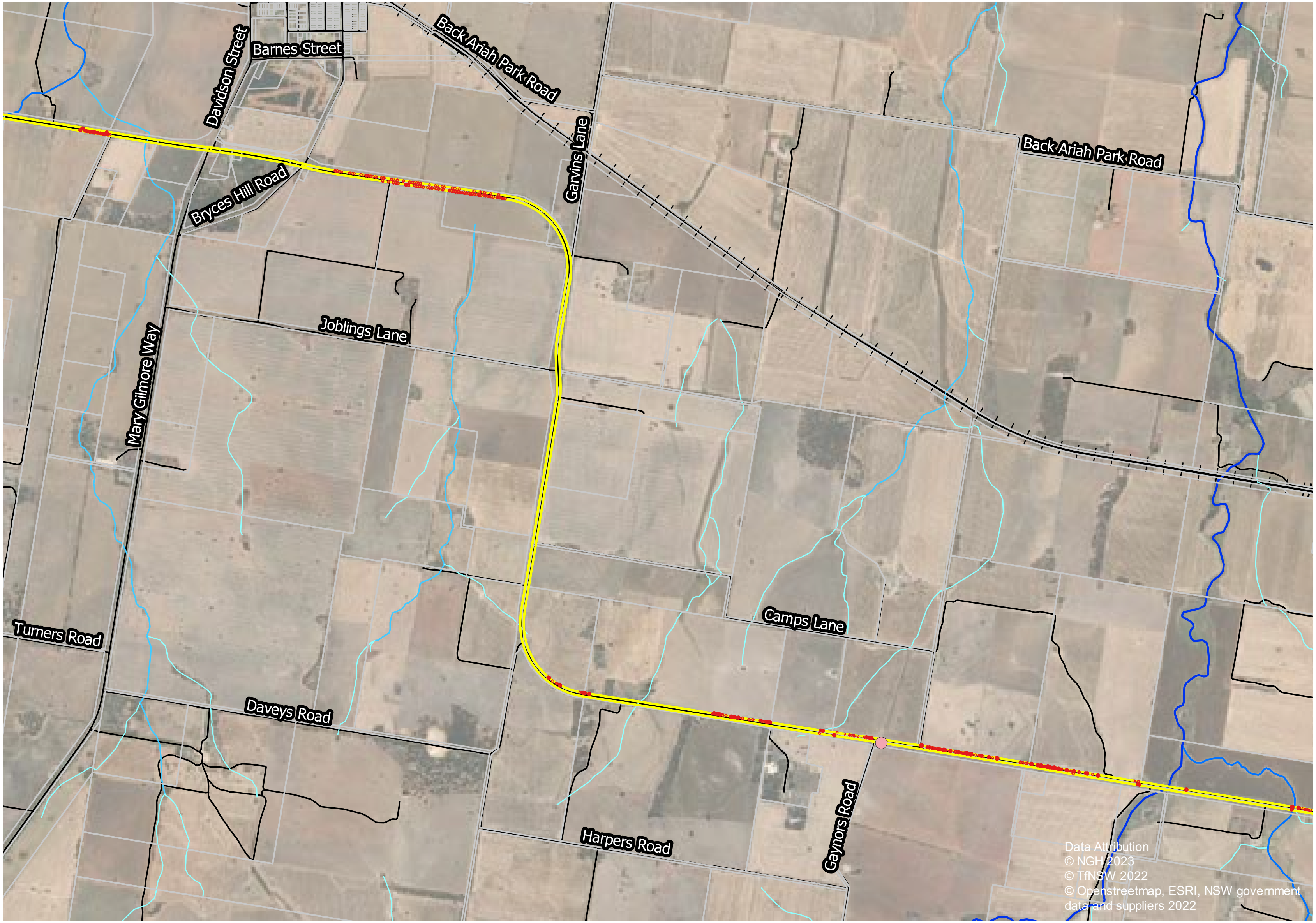
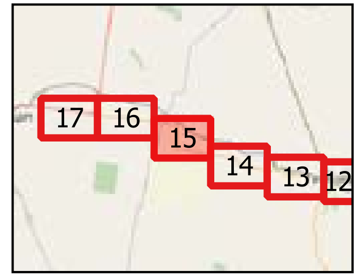
Proposal Area Overview
Map 15 of 25



Legend
- Proposal Area
- Construction Footprint
- Existing permanant stockpiles
- Road
- Railway
- Lot

Waterways (strahler stream order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
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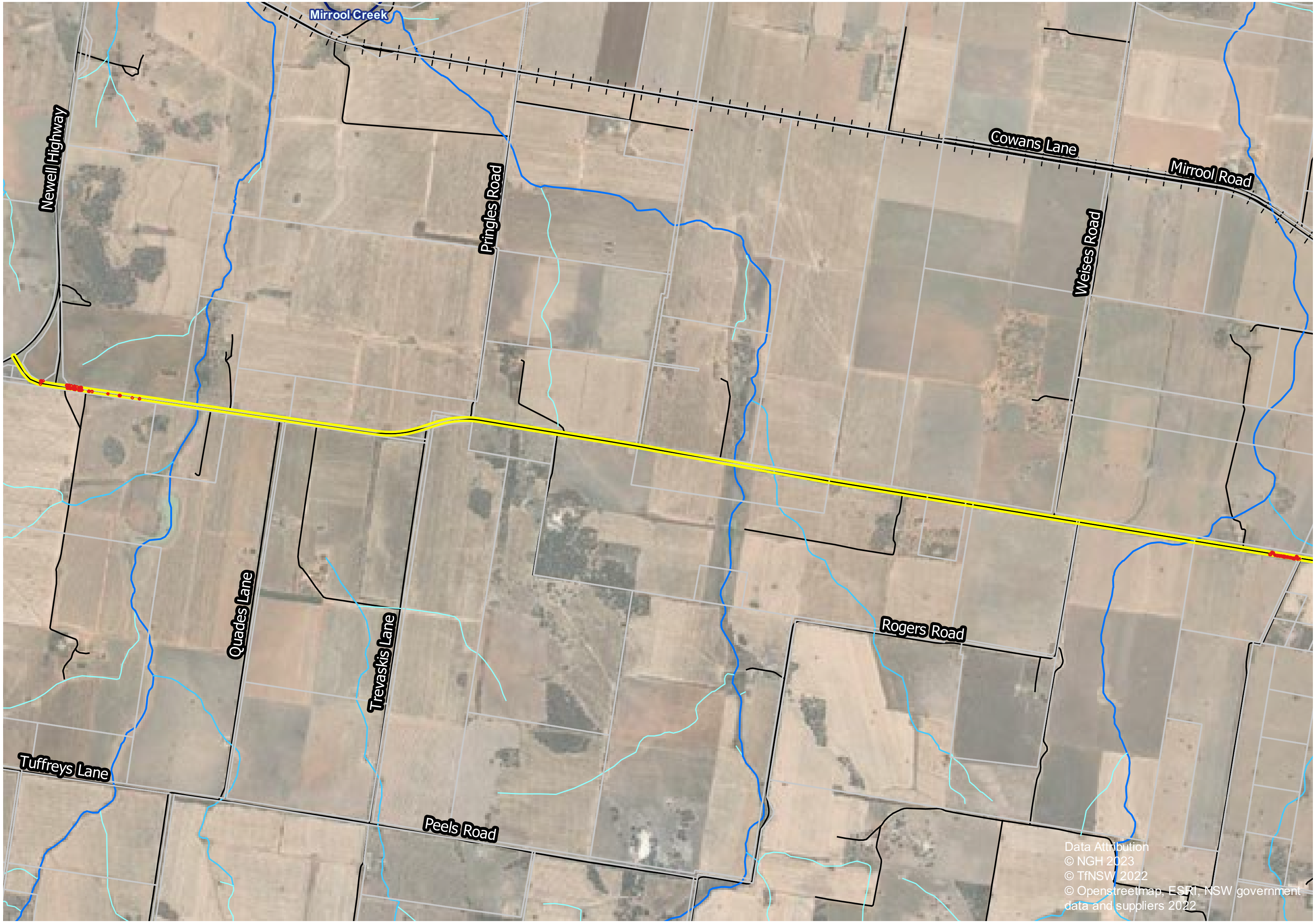
Proposal Area Overview
Map 16 of 25

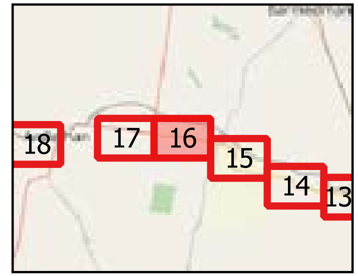
Legend

- Proposal Area
- Construction Footprint
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream





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Author: kyle.m
Date created: 28.04.2023
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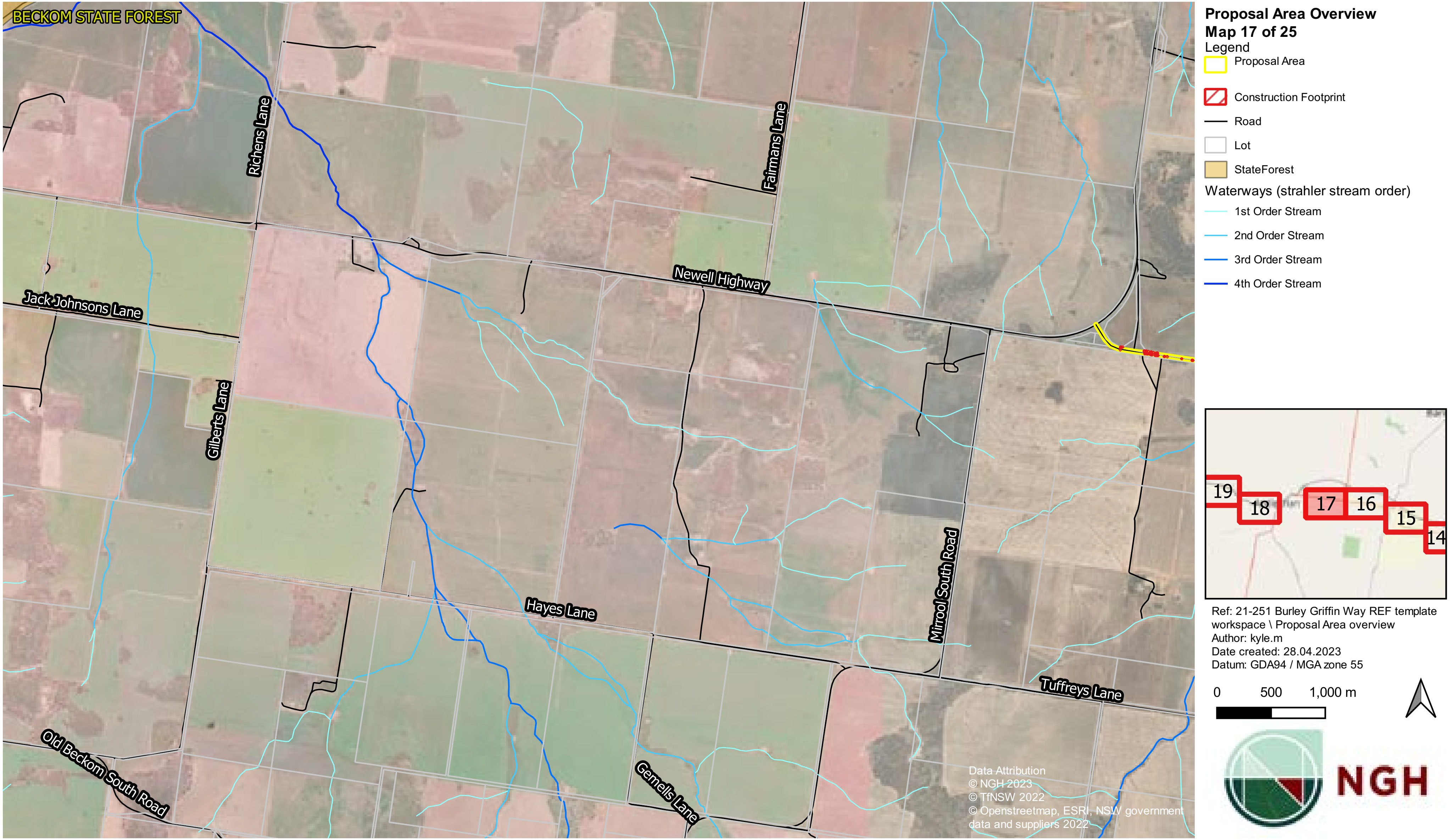

BECKOM STATE FOREST
Richens Lane
Fairmans Lane
Newell Highway
Jack Johnsons Lane
Gilberts Lane
Hayes Lane
Mirrool South Road
Tuffreys Lane
Old Beckom South Road
Gemells Lane
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Proposal Area Overview
Map 17 of 25
Legend
Proposal Area
Construction Footprint
Road
Lot
StateForest
Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream
19
18
17
16
15
14
Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
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1,000 m
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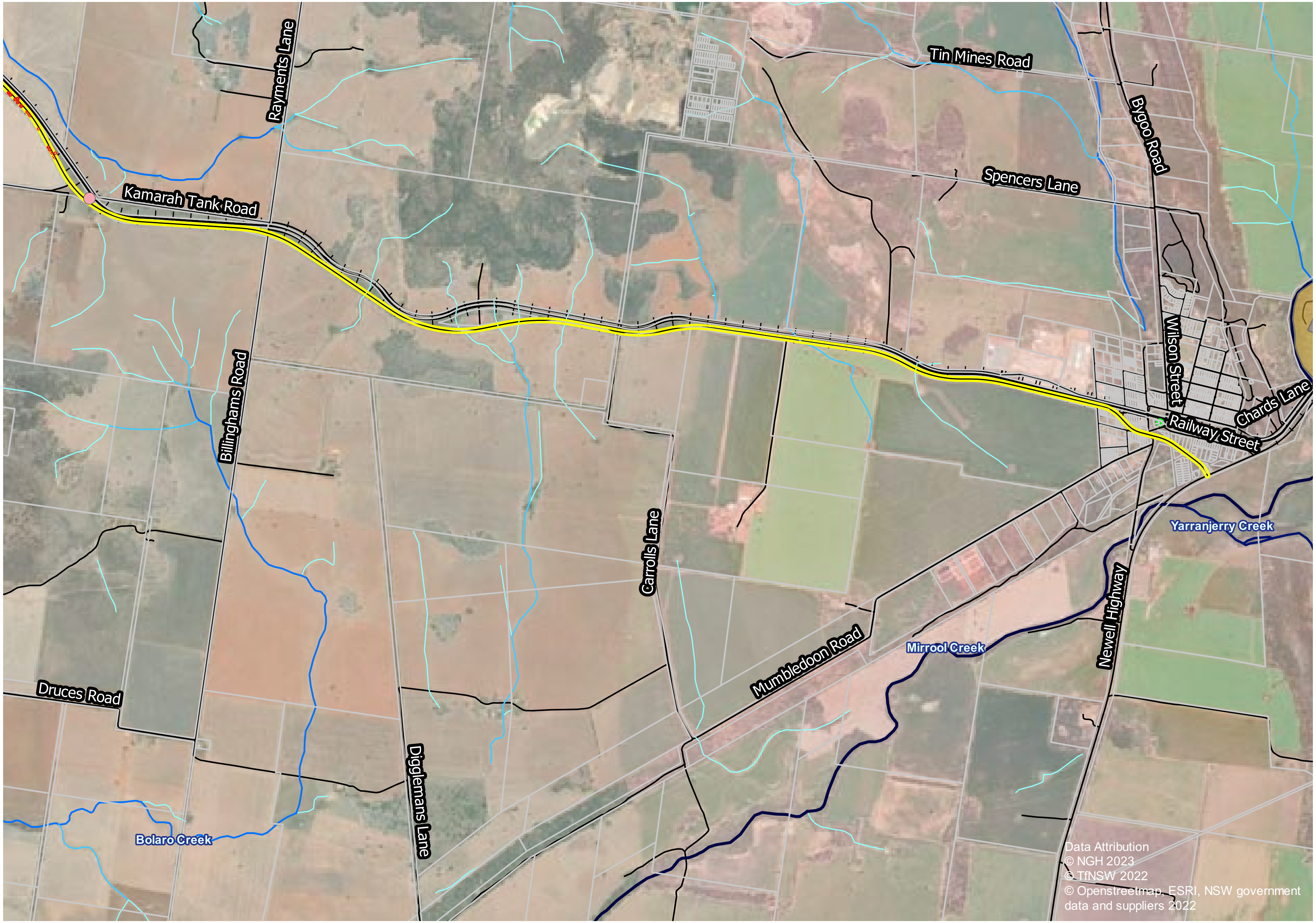
Proposal Area Overview
Map 18 of 25

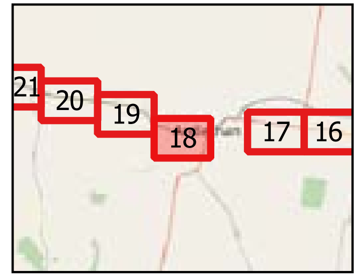


Legend

- Proposal Area
- Construction Footprint
- Existing permanent stockpiles
- Major population centres
- Road
- Railway
- Lot
- StateForest

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
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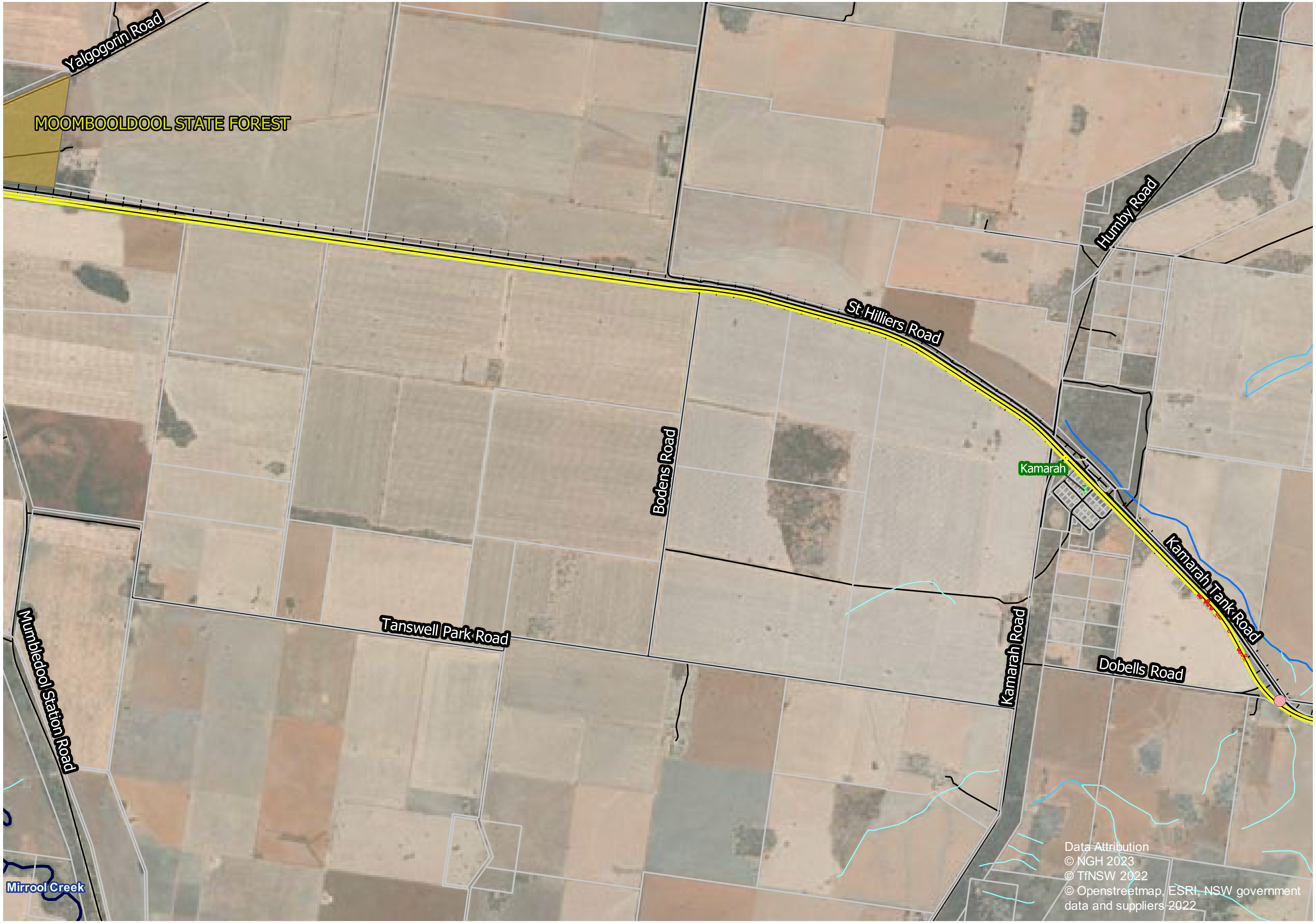


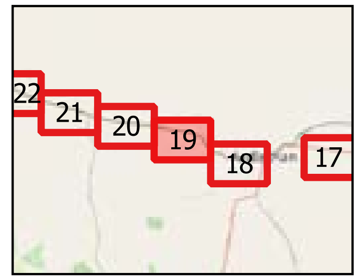
Proposal Area Overview
Map 19 of 25

Legend

- Proposal Area
- Construction Footprint
- Existing permanent stockpiles
- Major population centres
- Road
- Railway
- Lot
- StateForest

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

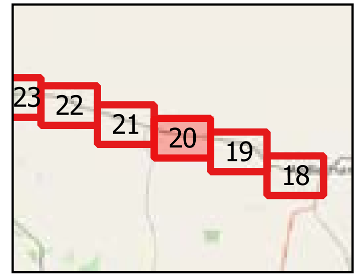
Proposal Area Overview
Map 20 of 25

Legend

- Proposal Area
- Construction Footprint
- Existing permenant stockpiles
- Road
- Railway
- Lot
- StateForest

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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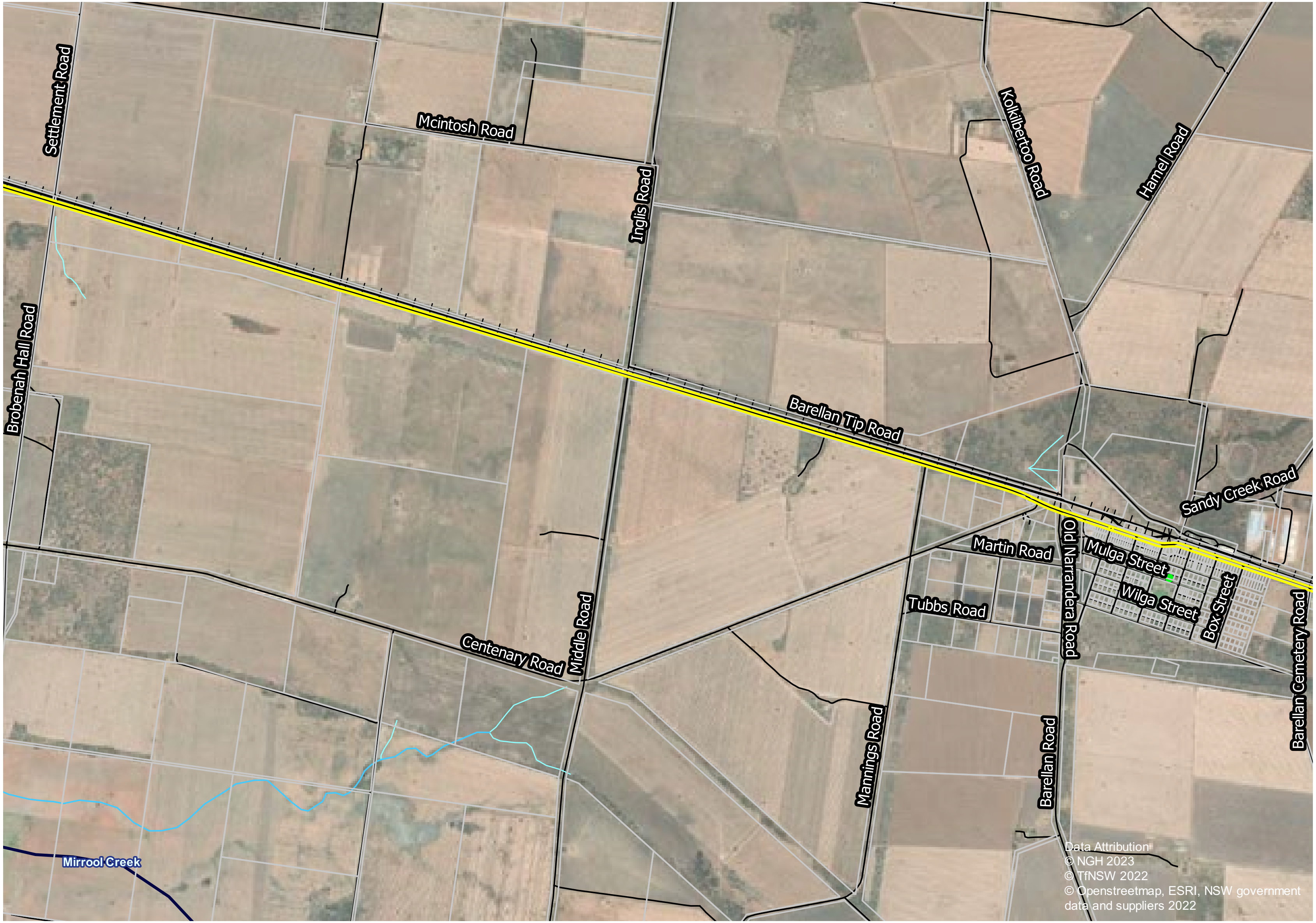
Proposal Area Overview
Map 21 of 25

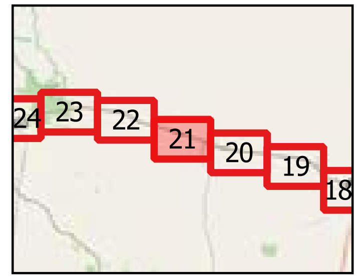


Legend

- Proposal Area
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
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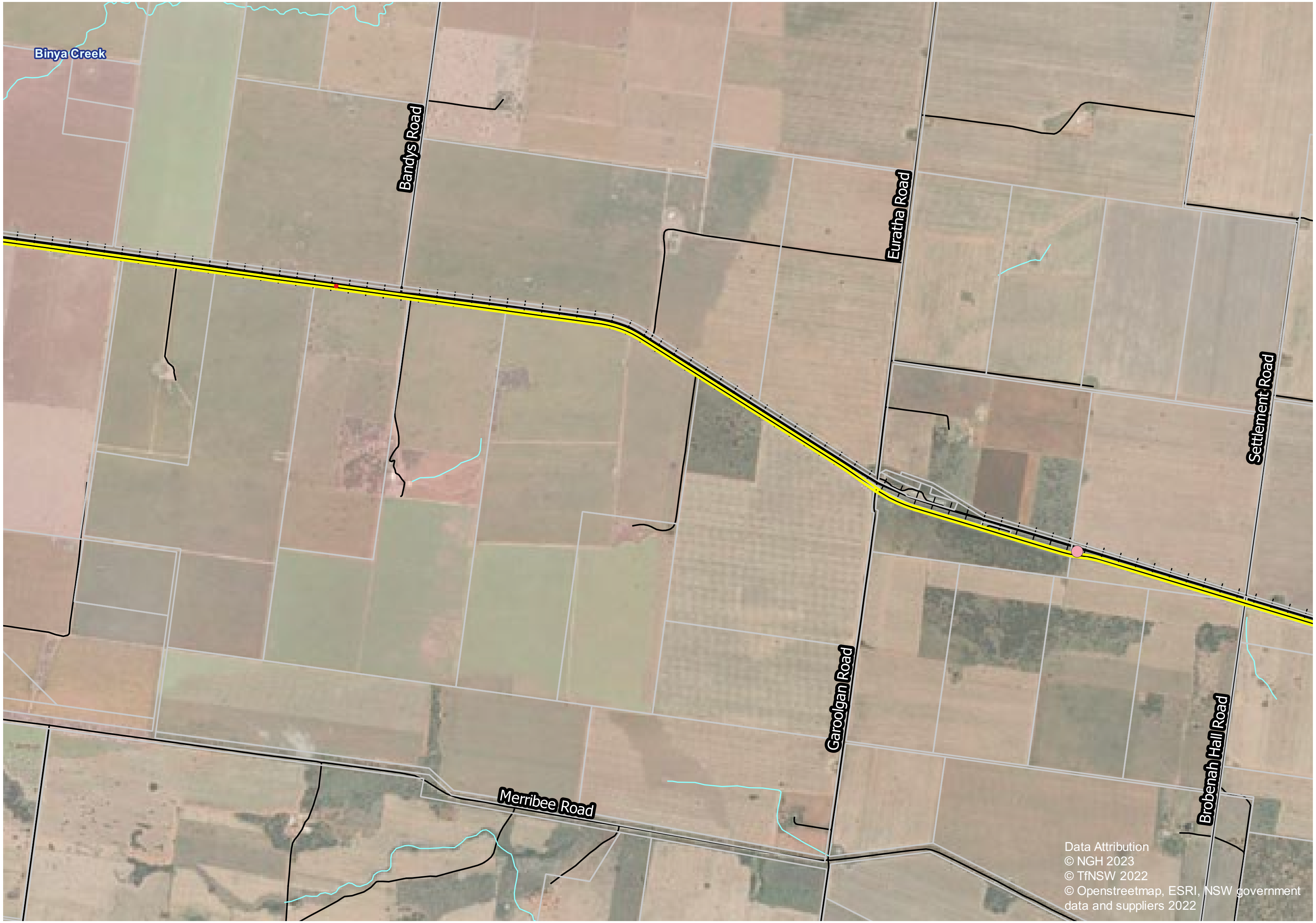


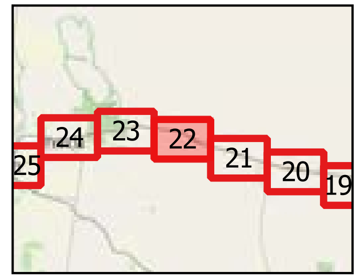
Proposal Area Overview
Map 22 of 25

Legend

- Proposal Area
- Construction Footprint
- Existing permenant stockpiles
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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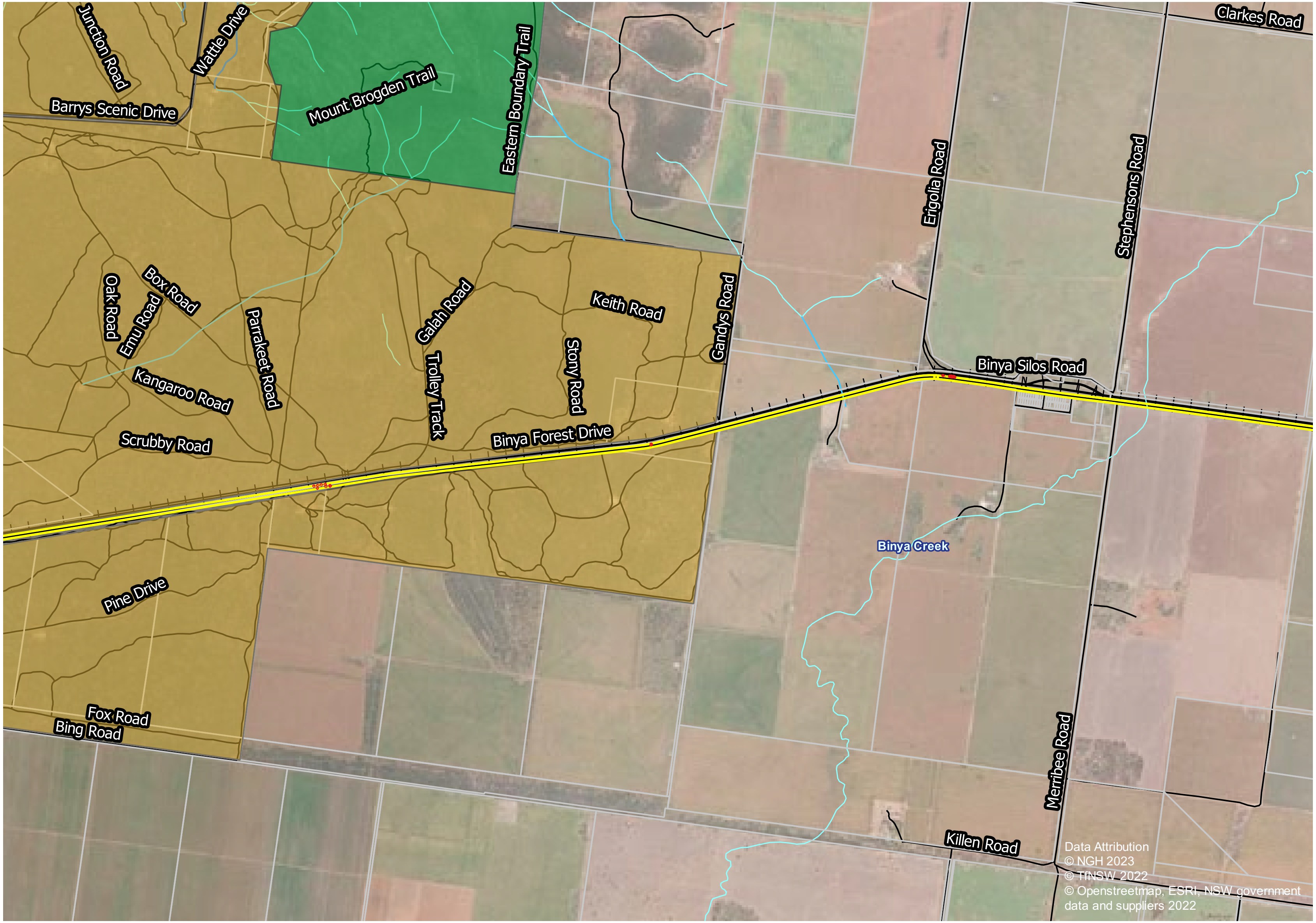


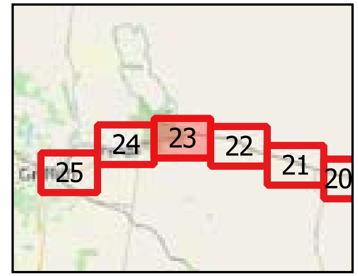
Proposal Area Overview
Map 23 of 25

Legend

- Proposal Area
- Construction Footprint
- Road
- Railway
- Lot
- NPWSReserve
- StateForest

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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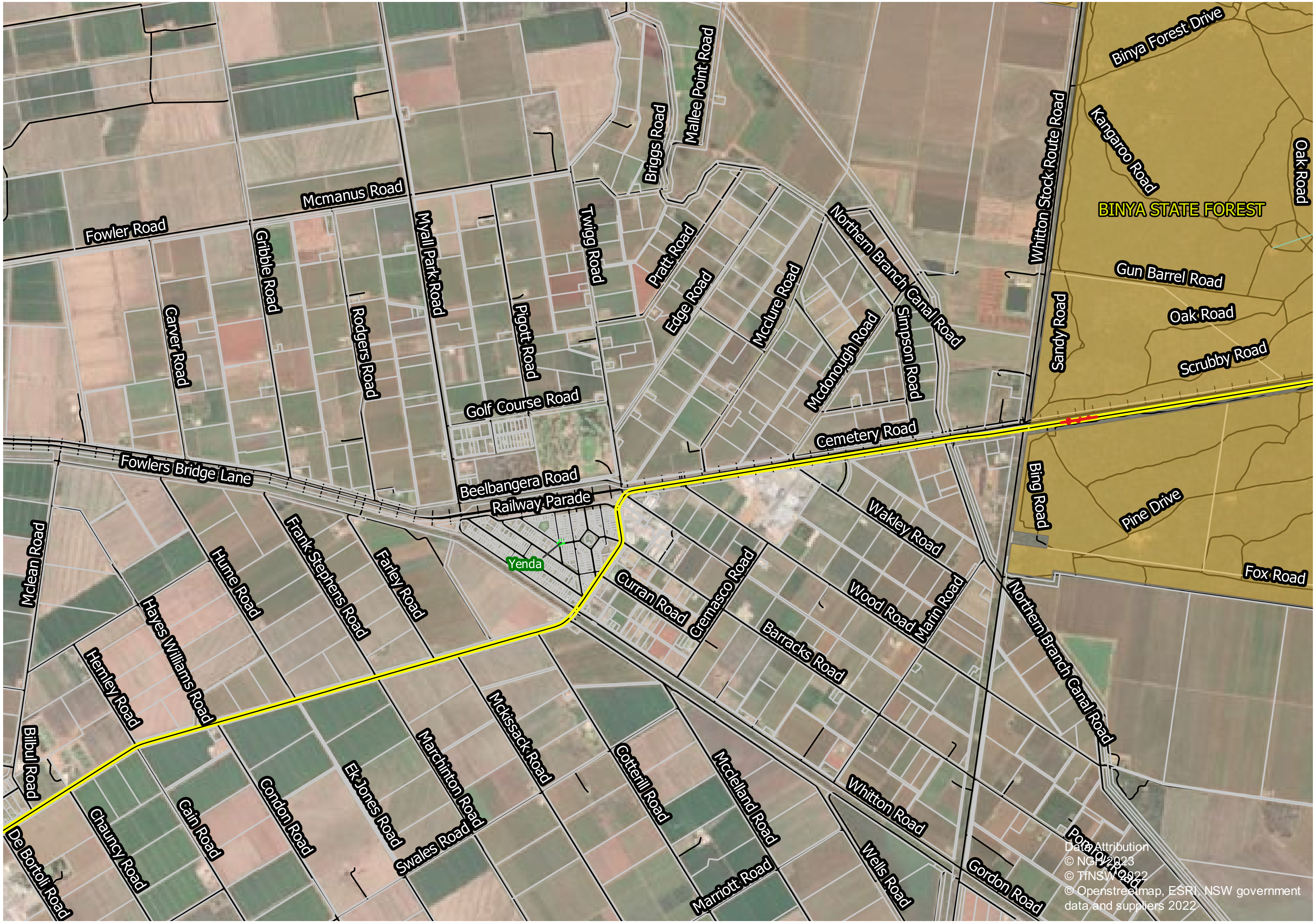
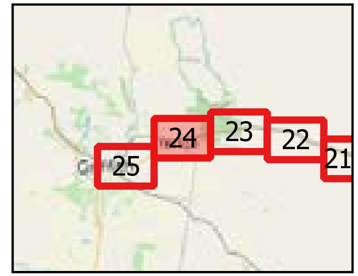
Proposal Area Overview
Map 24 of 25



Legend
- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Railway
- Lot
- StateForest

Waterways (strahler stream order)
- 2nd Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Proposal Area overview
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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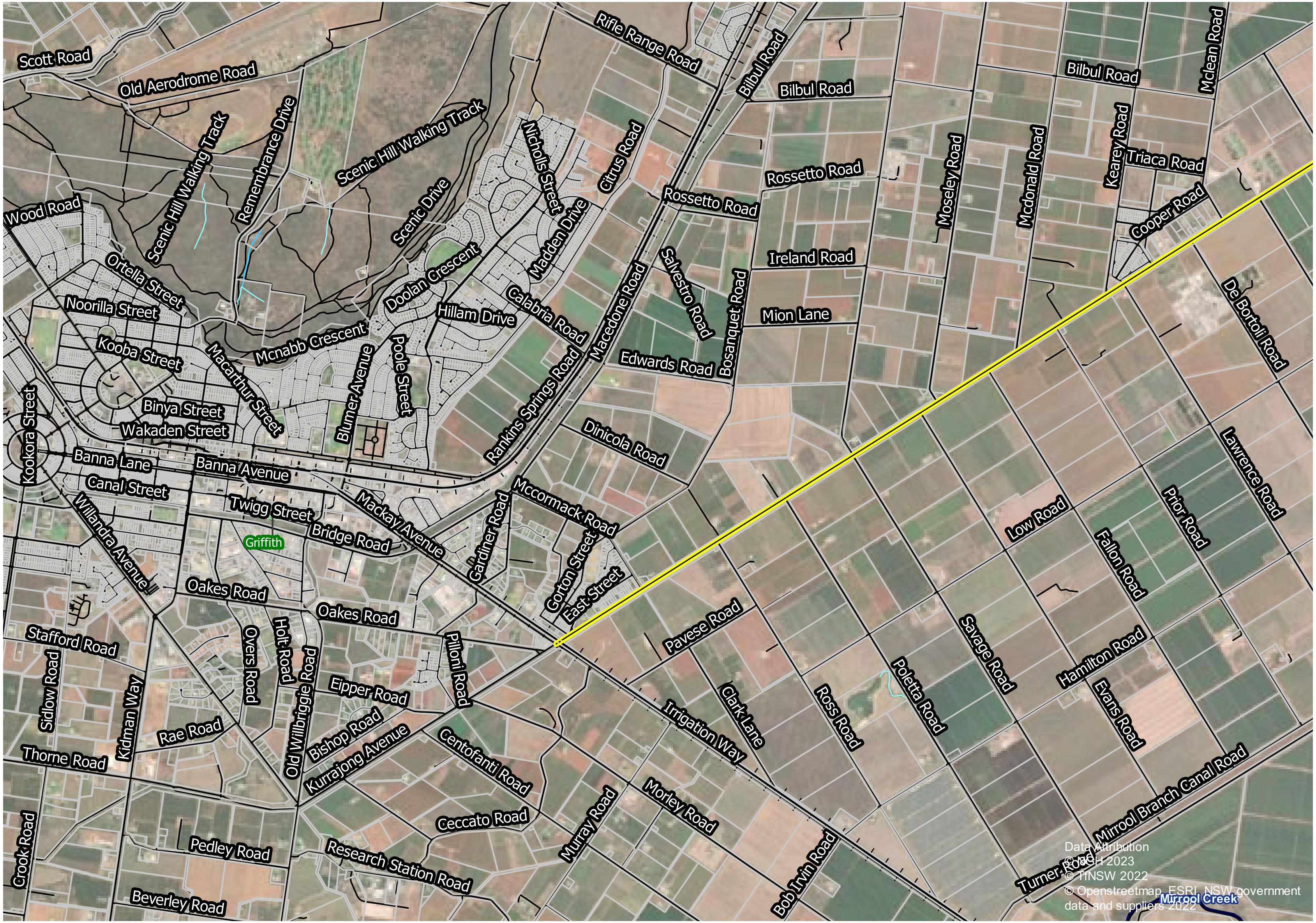


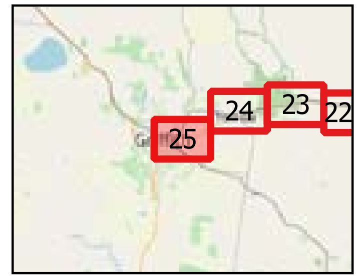
Proposal Area Overview
Map 25 of 25

Legend

- Proposal Area
- Major population centres
- Road
- Railway
- Lot

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream



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0 500 1,000 m

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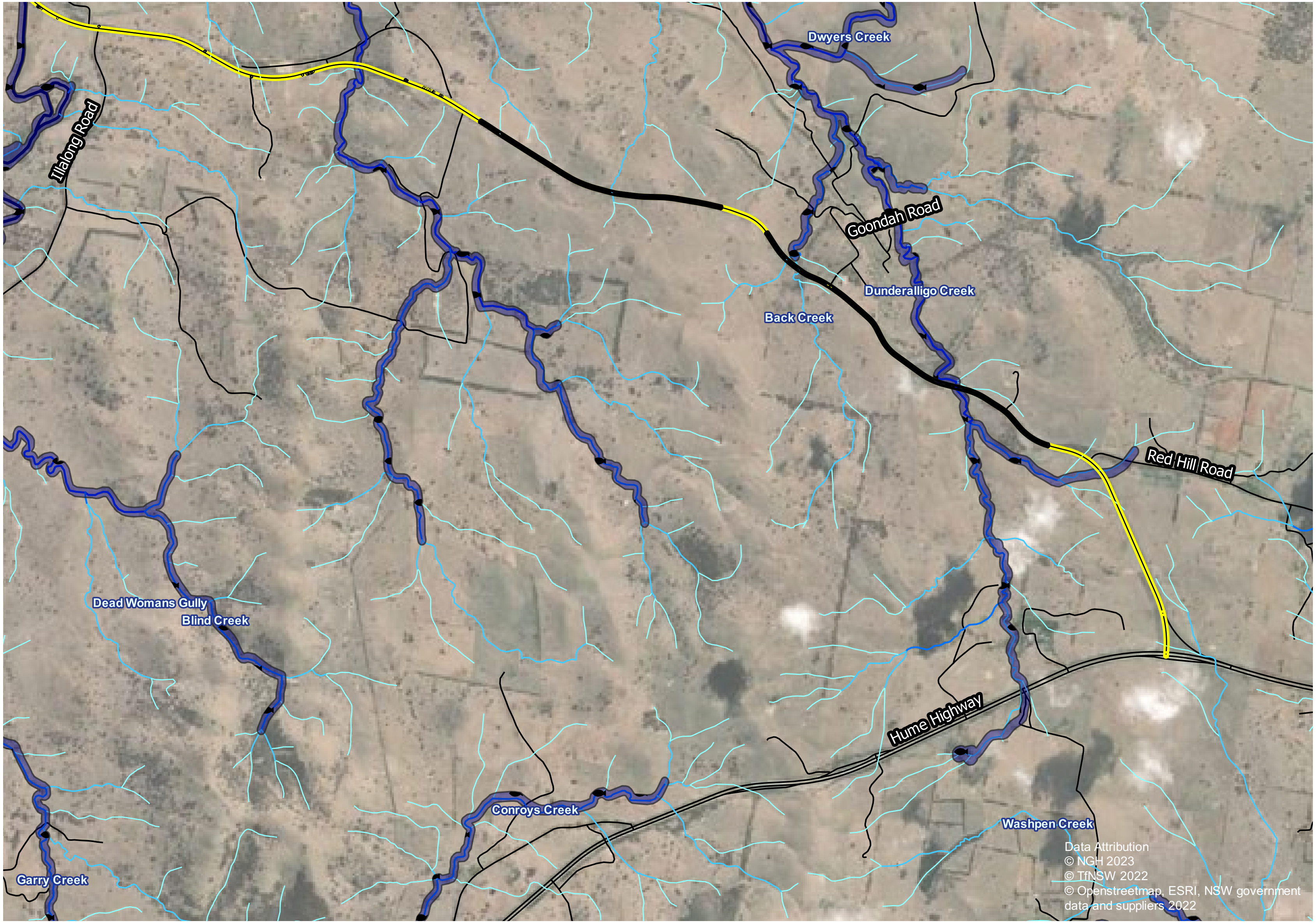
H.2 Key Fish Habitat and Flood Prone Land



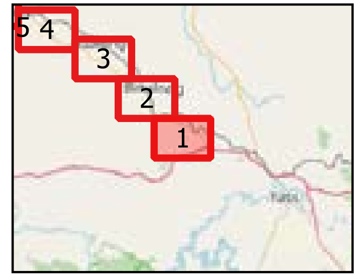
Hydrology and KFH
Map 1 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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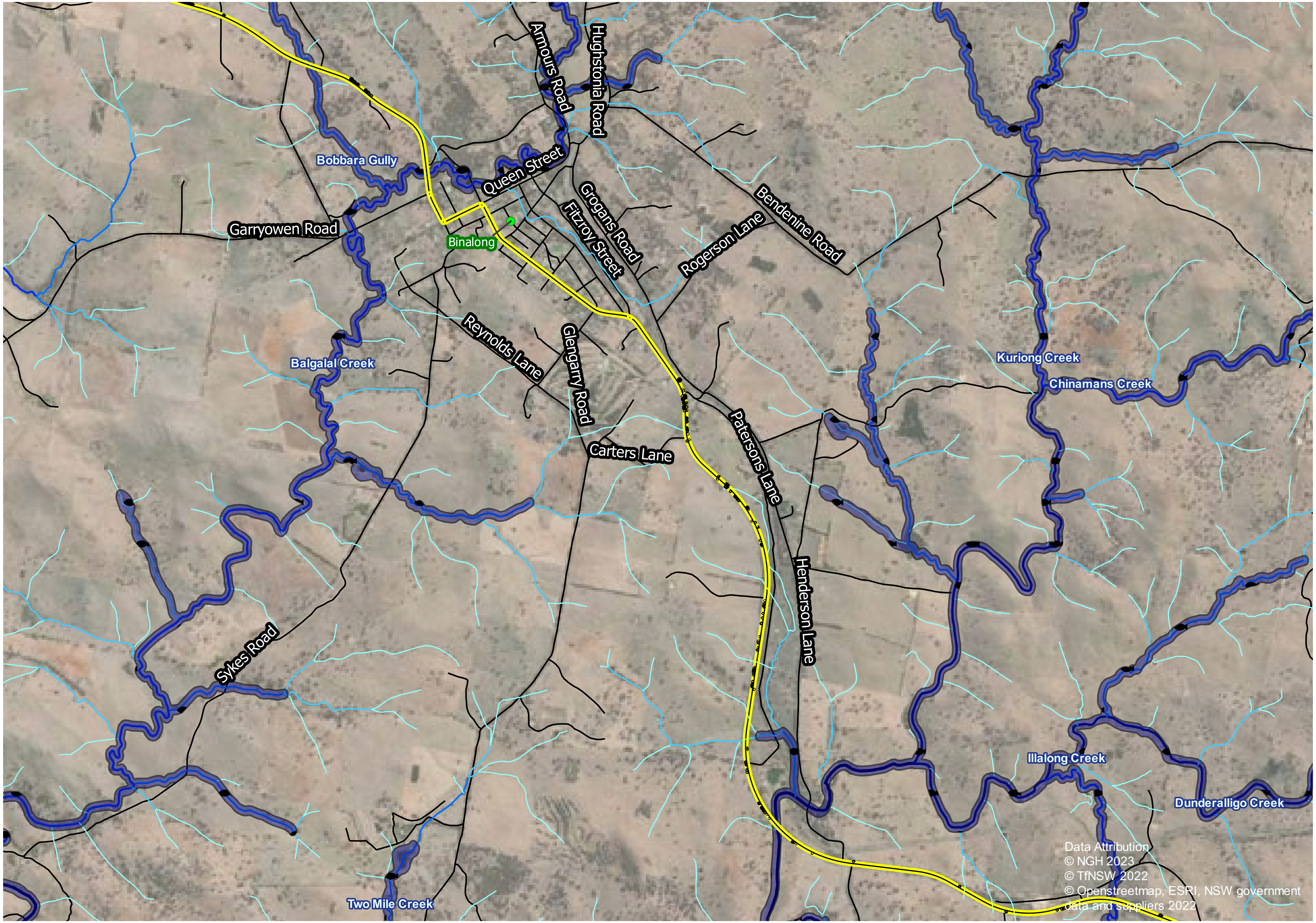
Hydrology and KFH
Map 2 of 25

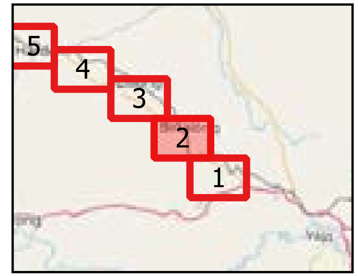


Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
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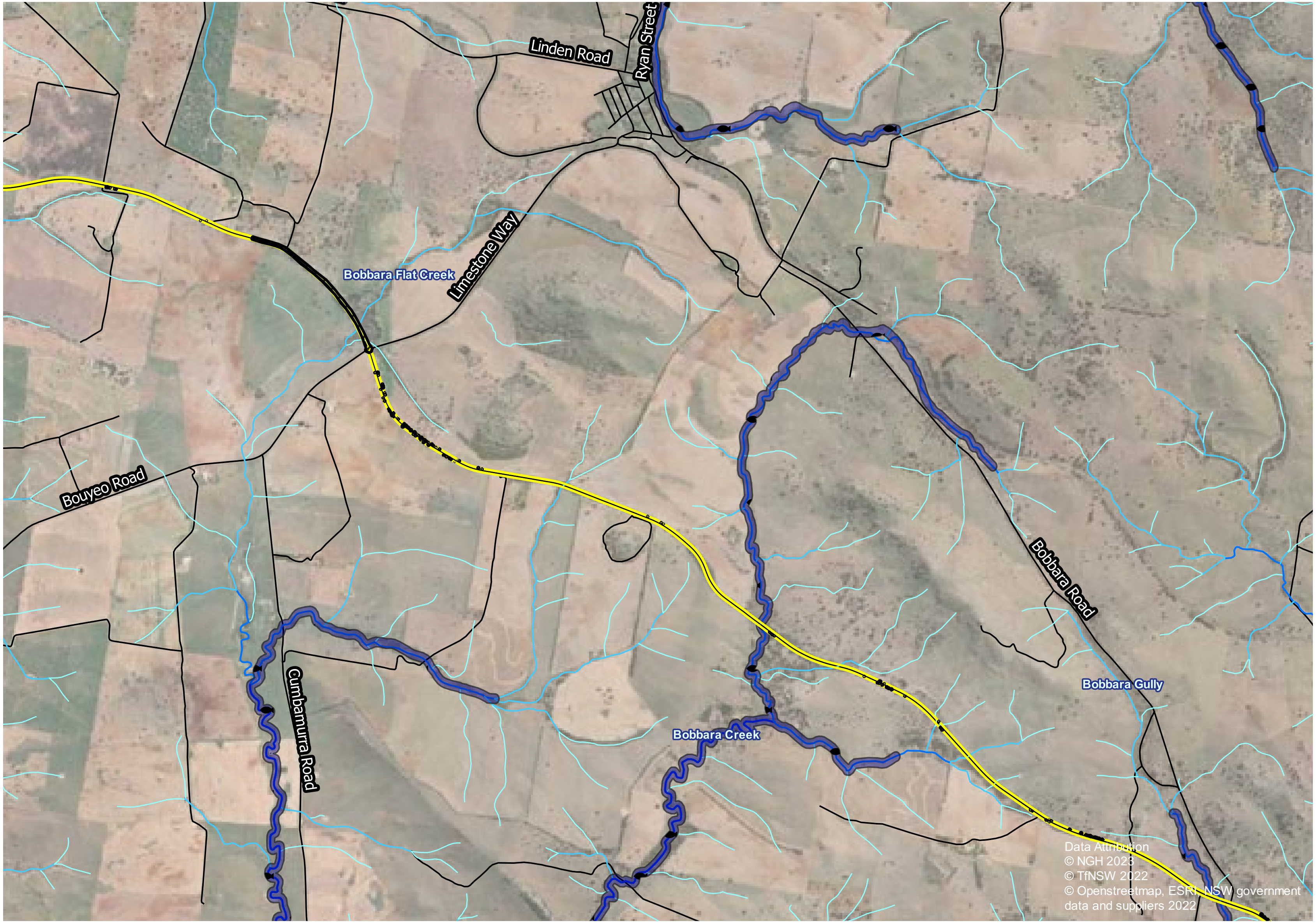
Hydrology and KFH
Map 3 of 25

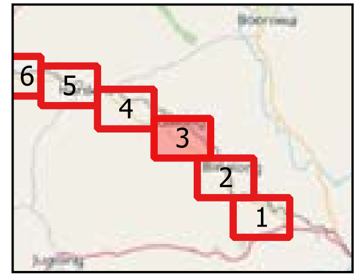


Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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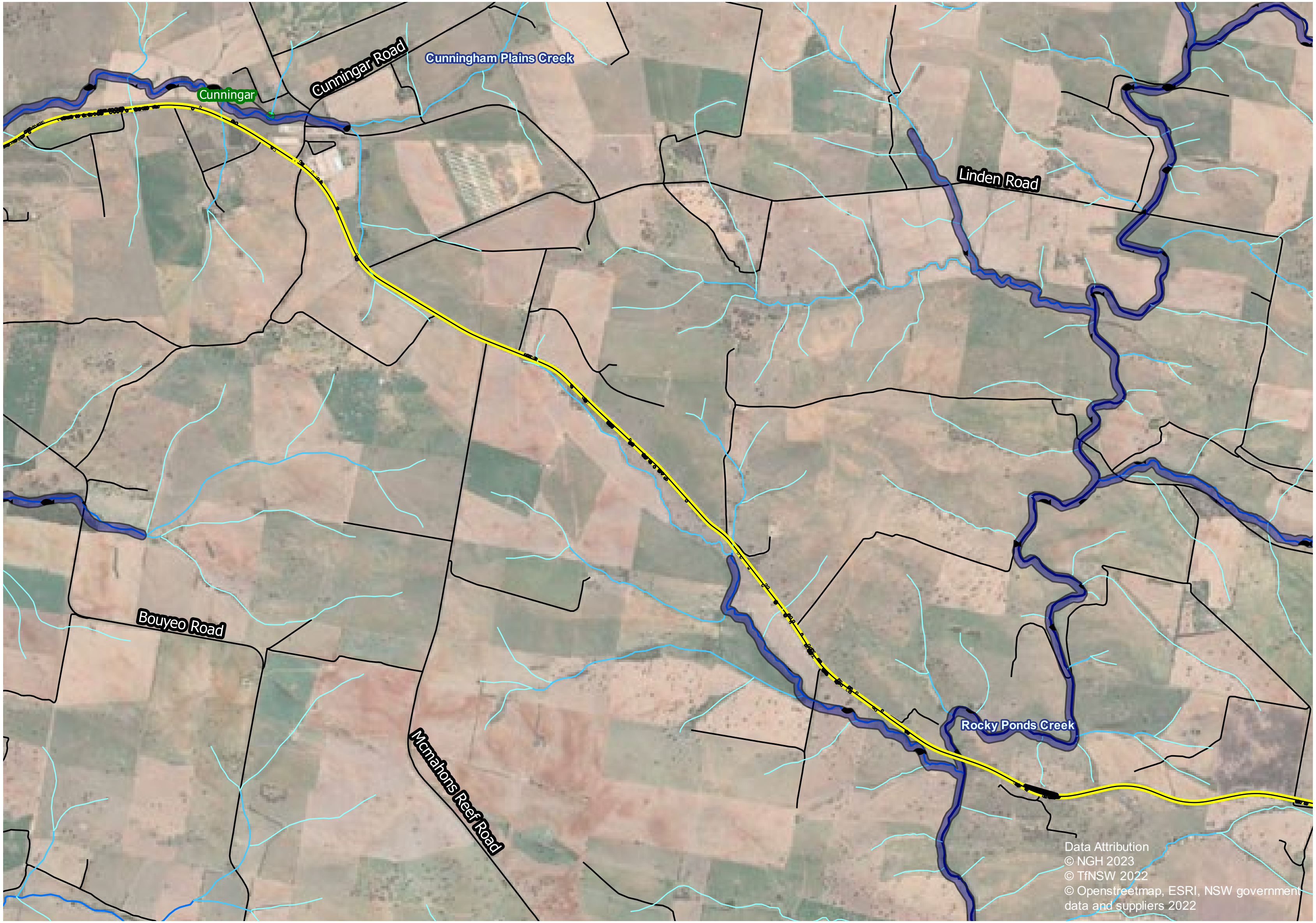
NGH

Hydrology and KFH
Map 4 of 25

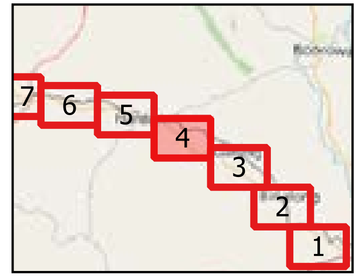


Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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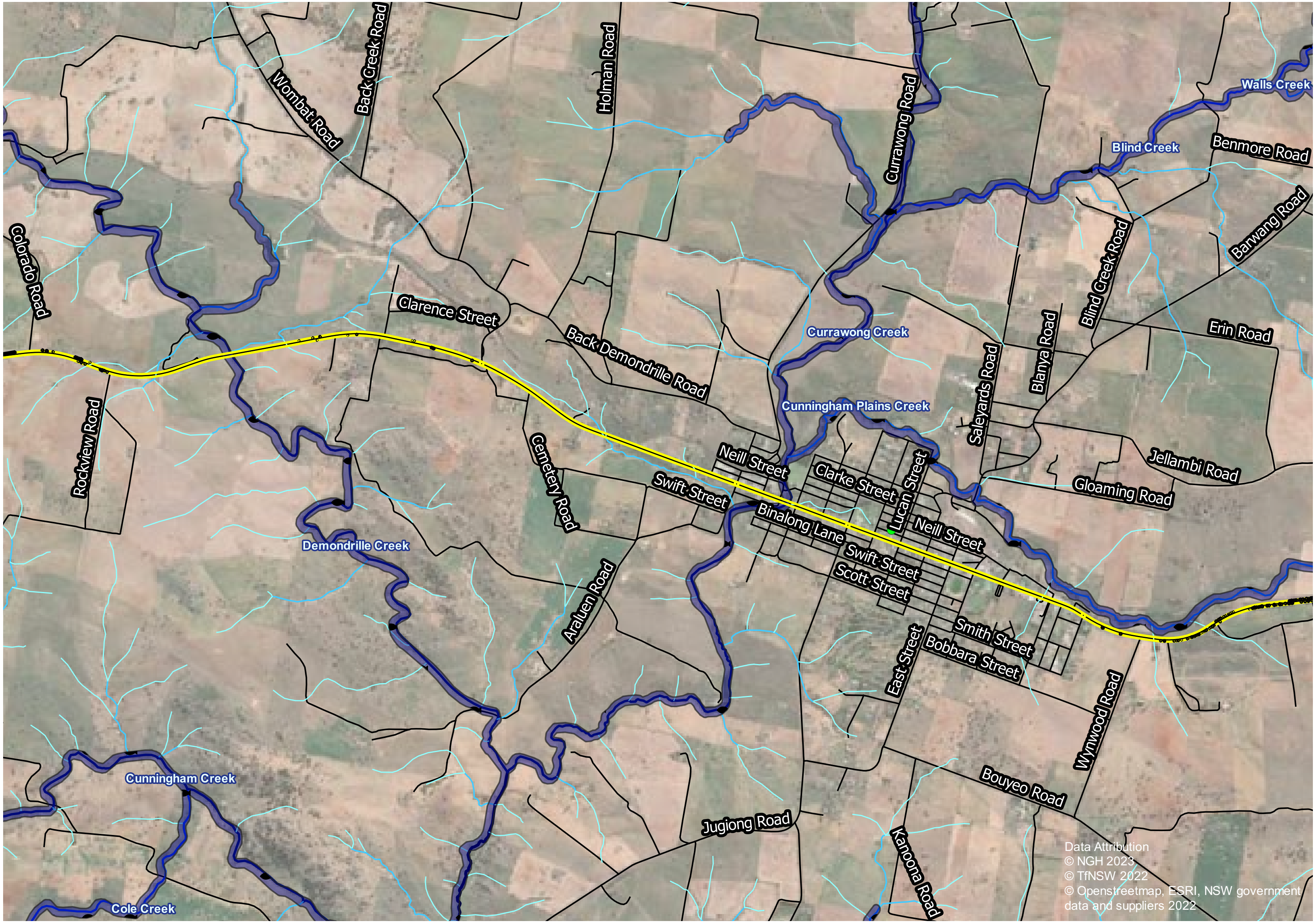


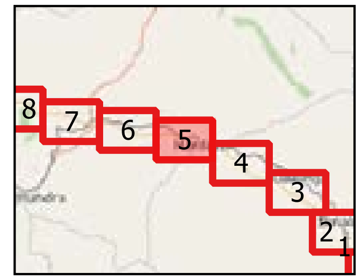
Hydrology and KFH
Map 5 of 25

Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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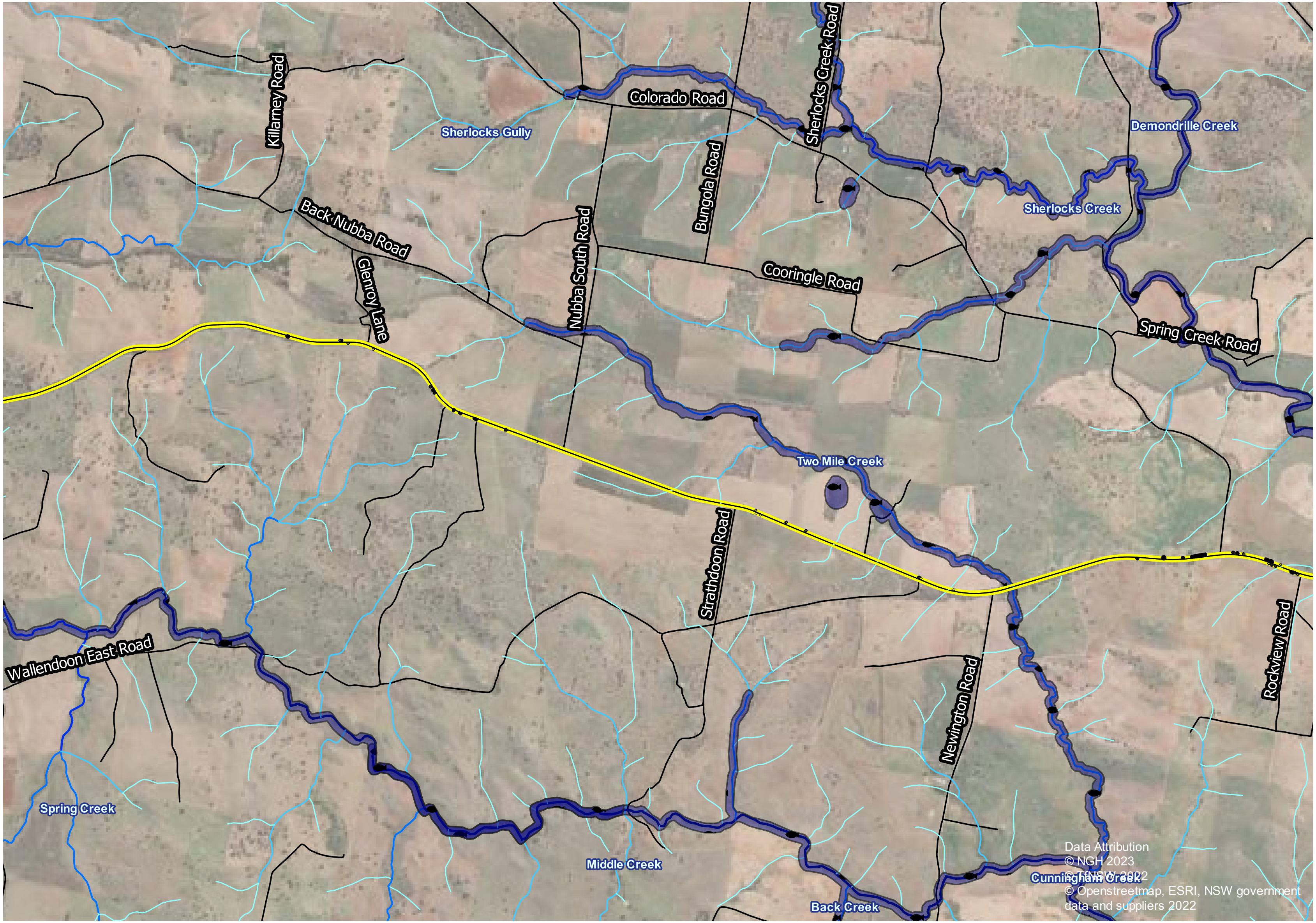
NGH

Hydrology and KFH
Map 6 of 25

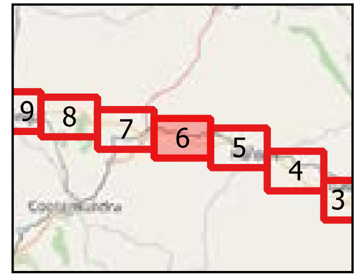


Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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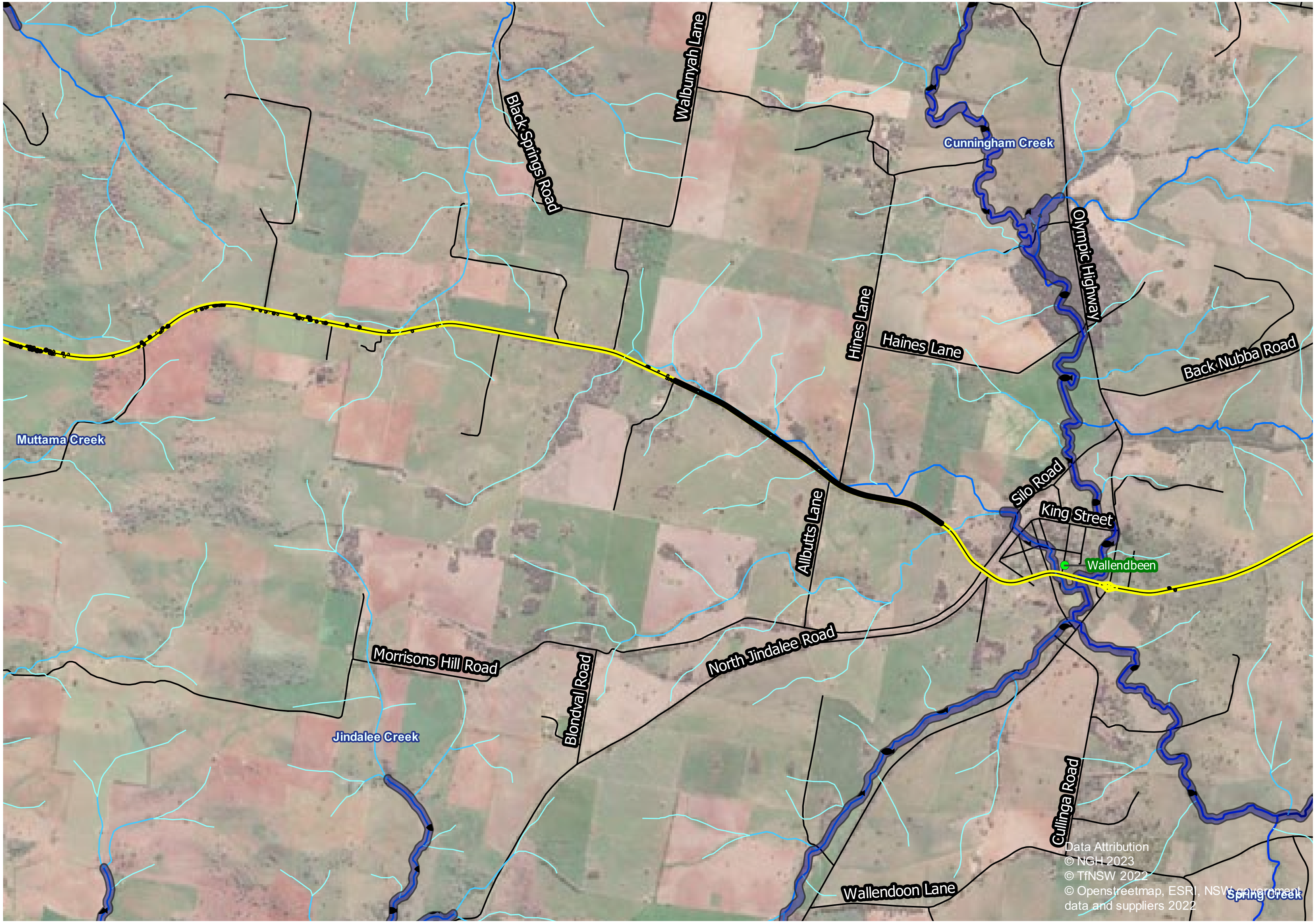


Hydrology and KFH

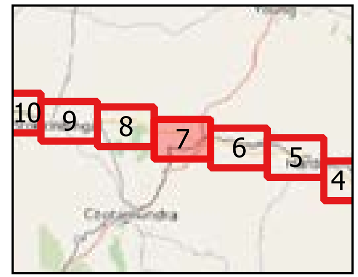
Map 7 of 25

Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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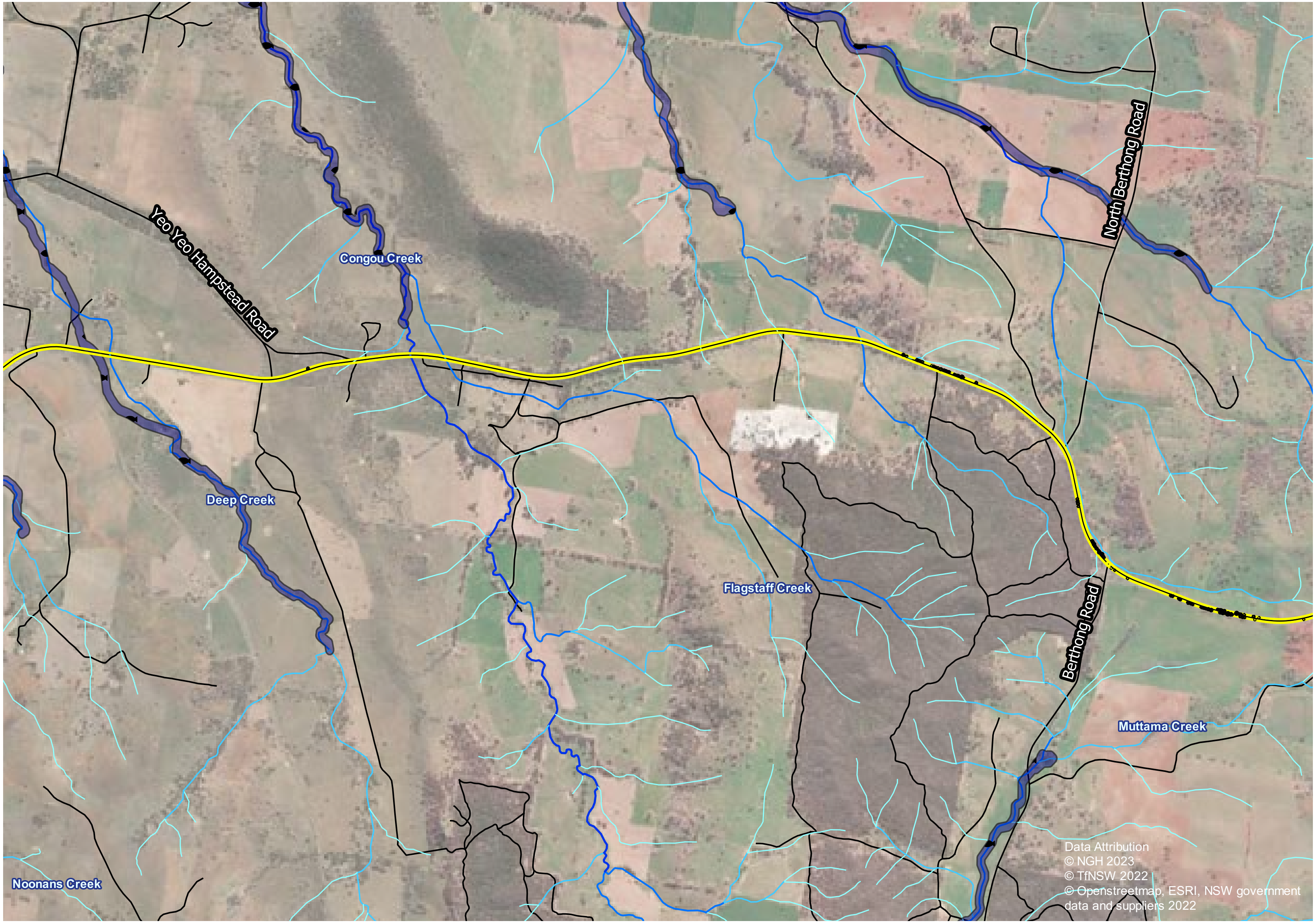


Hydrology and KFH
Map 8 of 25

Legend

Proposal Area

Construction footprint

RoadSegment

Key Fish Habitat

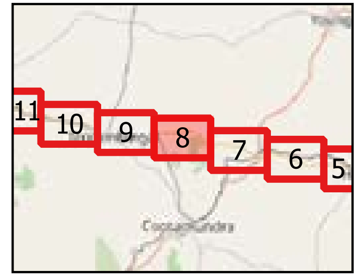
Waterways (strahler stream order)

1st Order Stream

2nd Order Stream

3rd Order Stream

4th Order Stream



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Author: kyle.m
Date created: 28.04.2023
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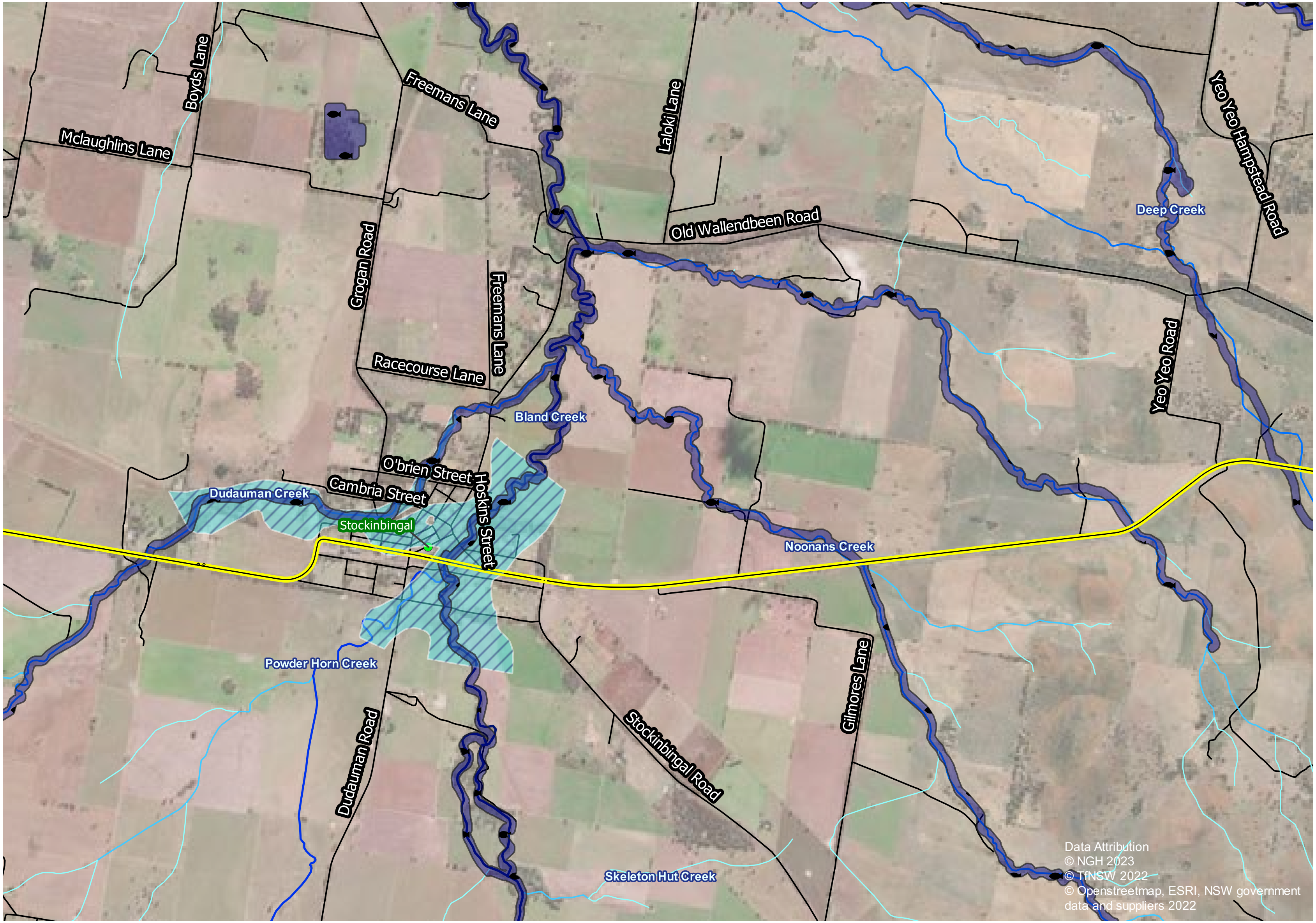


Hydrology and KFH
Map 9 of 25

Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Flood Prone Land
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream

Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

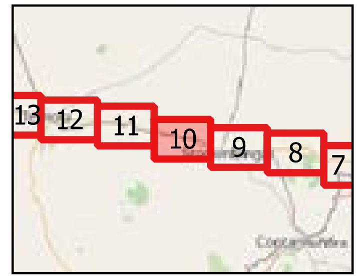
Hydrology and KFH
Map 10 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

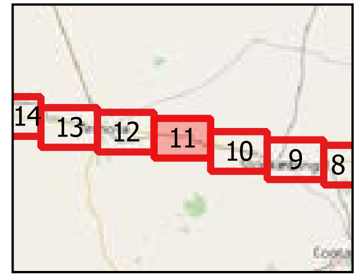
0 500 1,000 m

NGH

Hydrology and KFH
Map 11 of 25

Legend
- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Flood Prone Land
- Key Fish Habitat

Waterways (strahler stream order)
- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream
- 5th Order Stream



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Author: kyle.m
Date created: 28.04.2023
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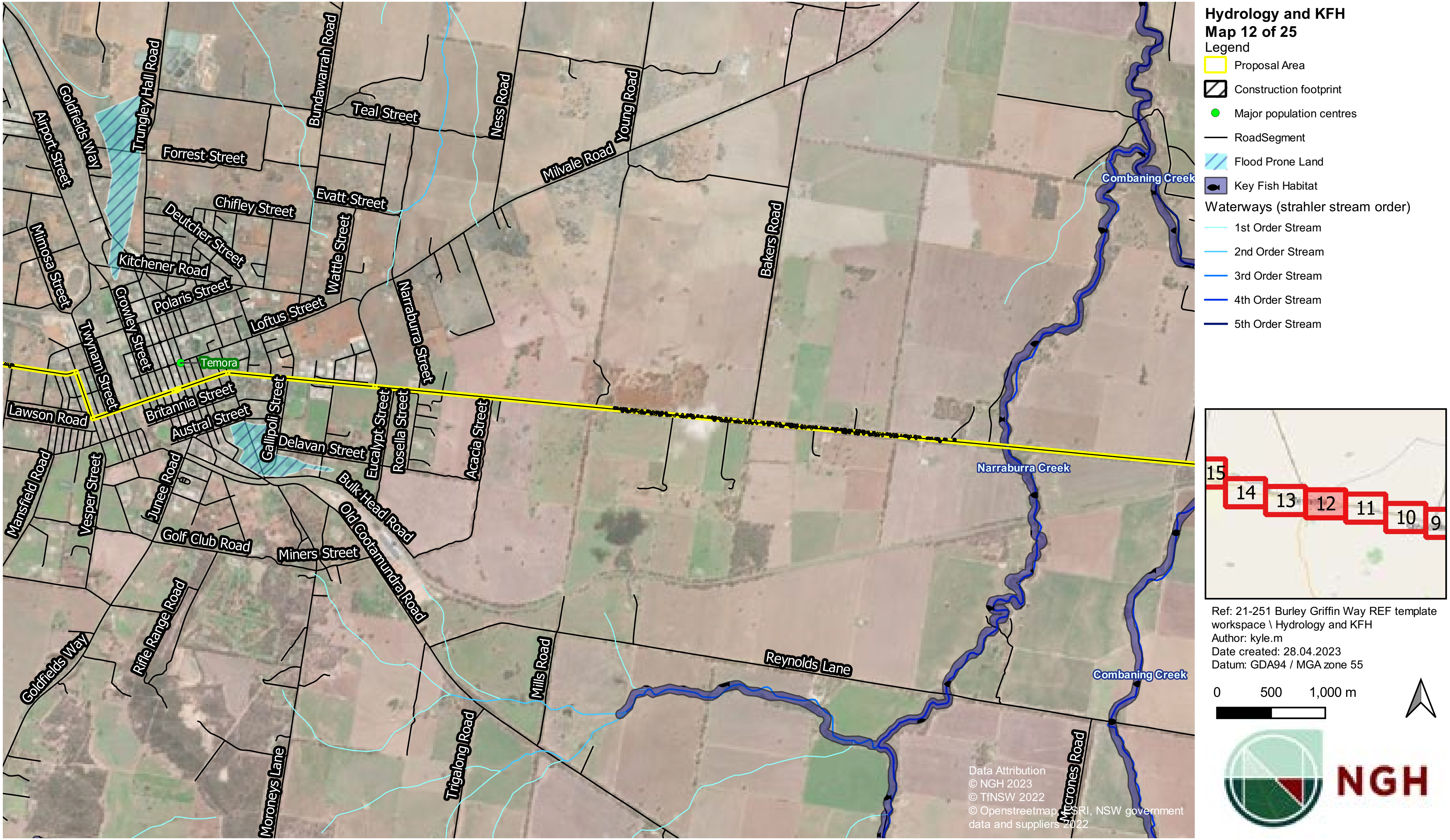

Hydrology and KFH
Map 12 of 25
Legend
Proposal Area
Construction footprint
Major population centres
RoadSegment
Flood Prone Land
Key Fish Habitat
Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream
5th Order Stream
15
14
13
12
11
10
9
Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0
500
1,000 m
NGH
Temora
Combaning Creek
Narraburra Creek
Combaning Creek
Airport Street
Goldfields Way
Trungley Hall Road
Bundawarrah Road
Teal Street
Ness Road
Young Road
Milvale Road
Forrest Street
Evatt Street
Chifley Street
Deutcher Street
Wattle Street
Kitchener Road
Polaris Street
Loftus Street
Narraburra Street
Bakers Road
Mimosa Street
Crowley Street
Twynam Street
Britannia Street
Austral Street
Gallipoli Street
Delavan Street
Eucalypt Street
Rosella Street
Acacia Street
Lawson Road
Mansfield Road
Vesper Street
Junee Road
Golf Club Road
Miners Street
Bulk Head Road
Old Cootamundra Road
Goldfields Way
Rifle Range Road
Mills Road
Reynolds Lane
Moroneys Lane
Trigalong Road
Mcrones Road
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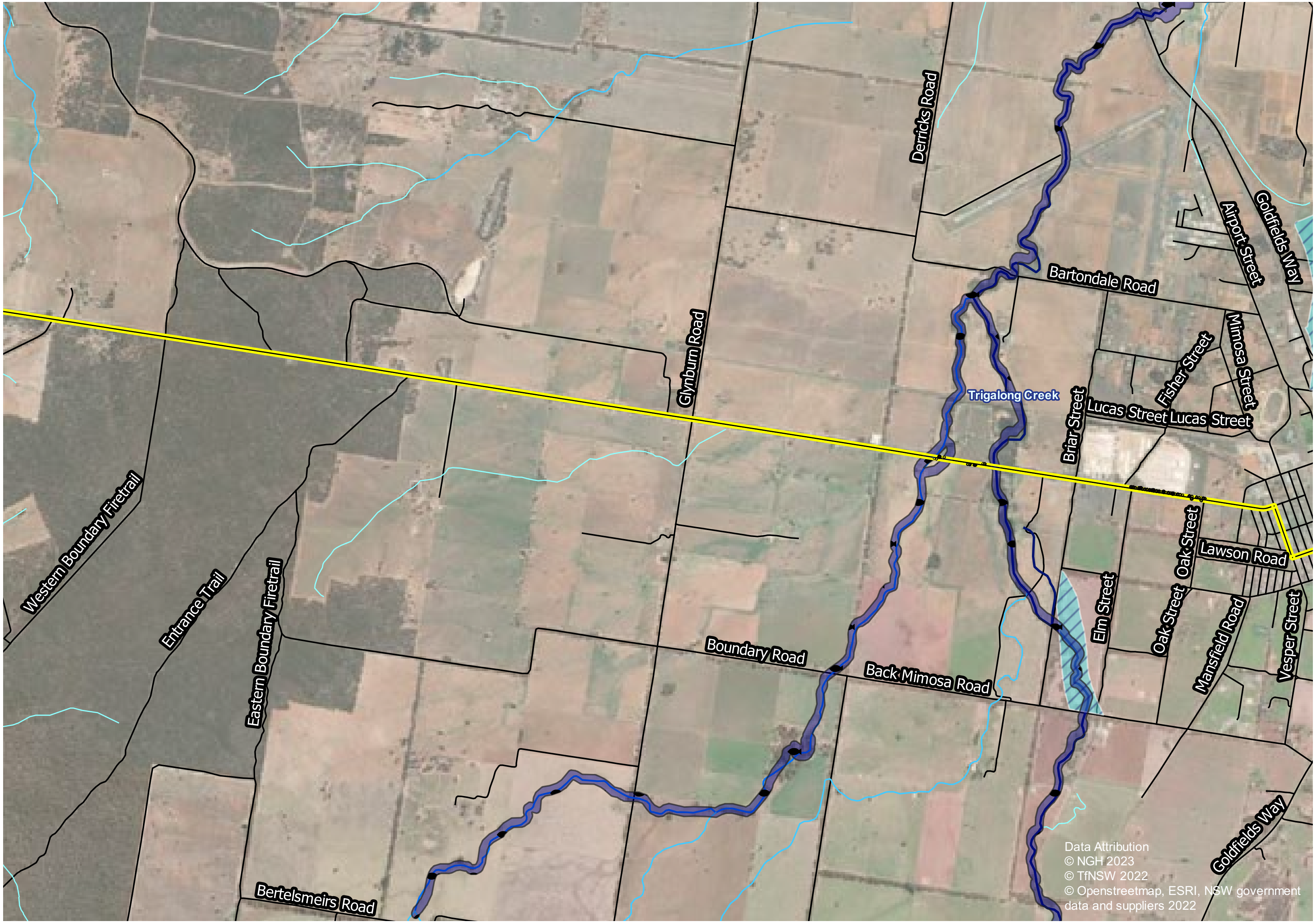


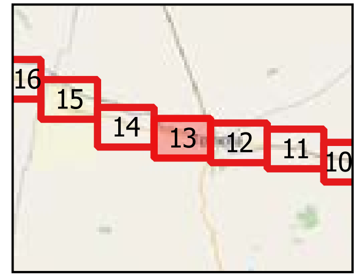
Hydrology and KFH
Map 13 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Flood Prone Land
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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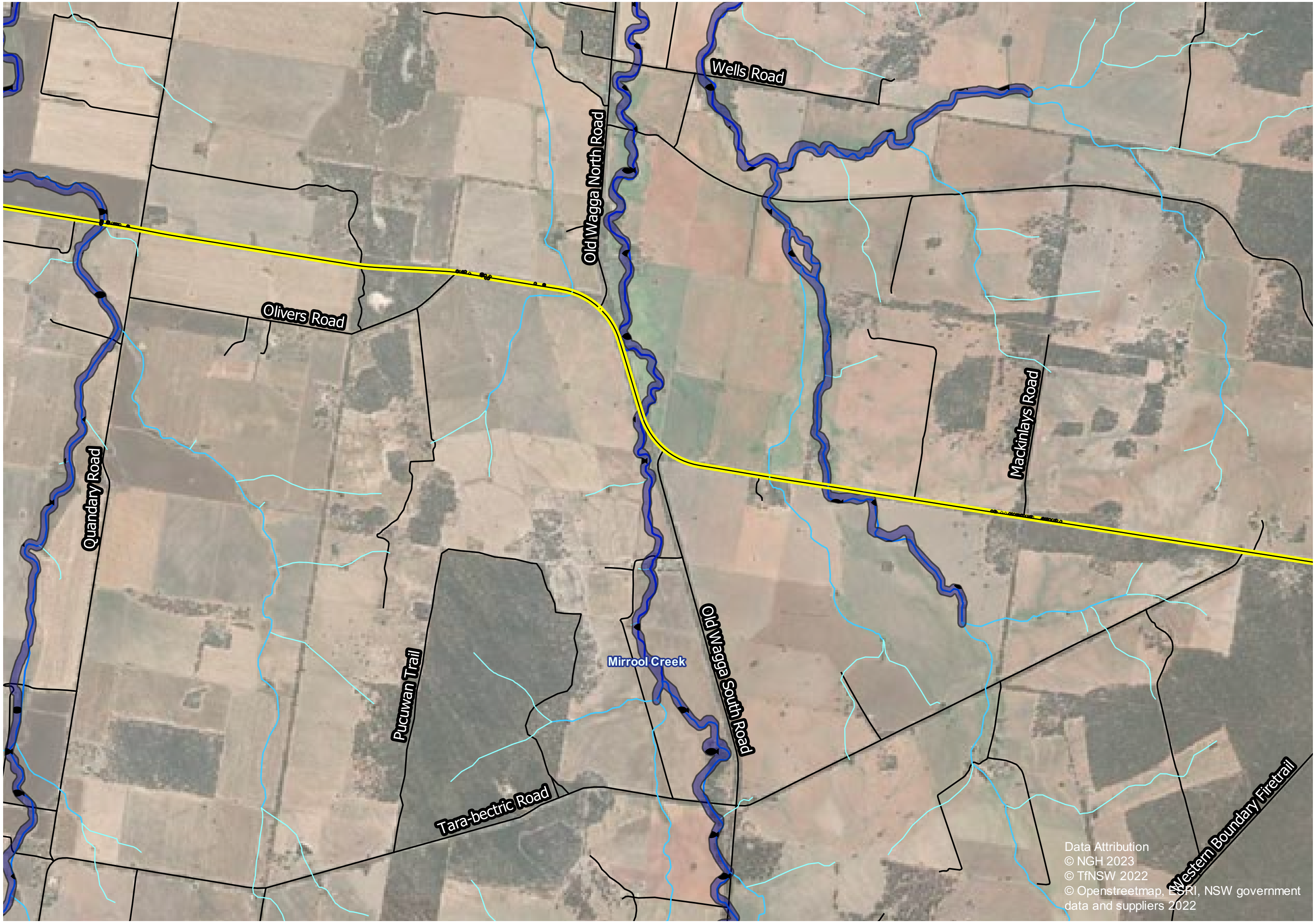


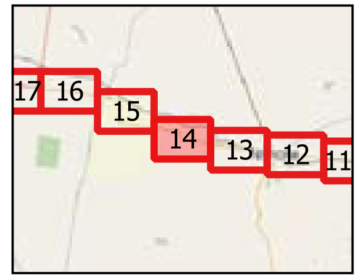
Hydrology and KFH
Map 14 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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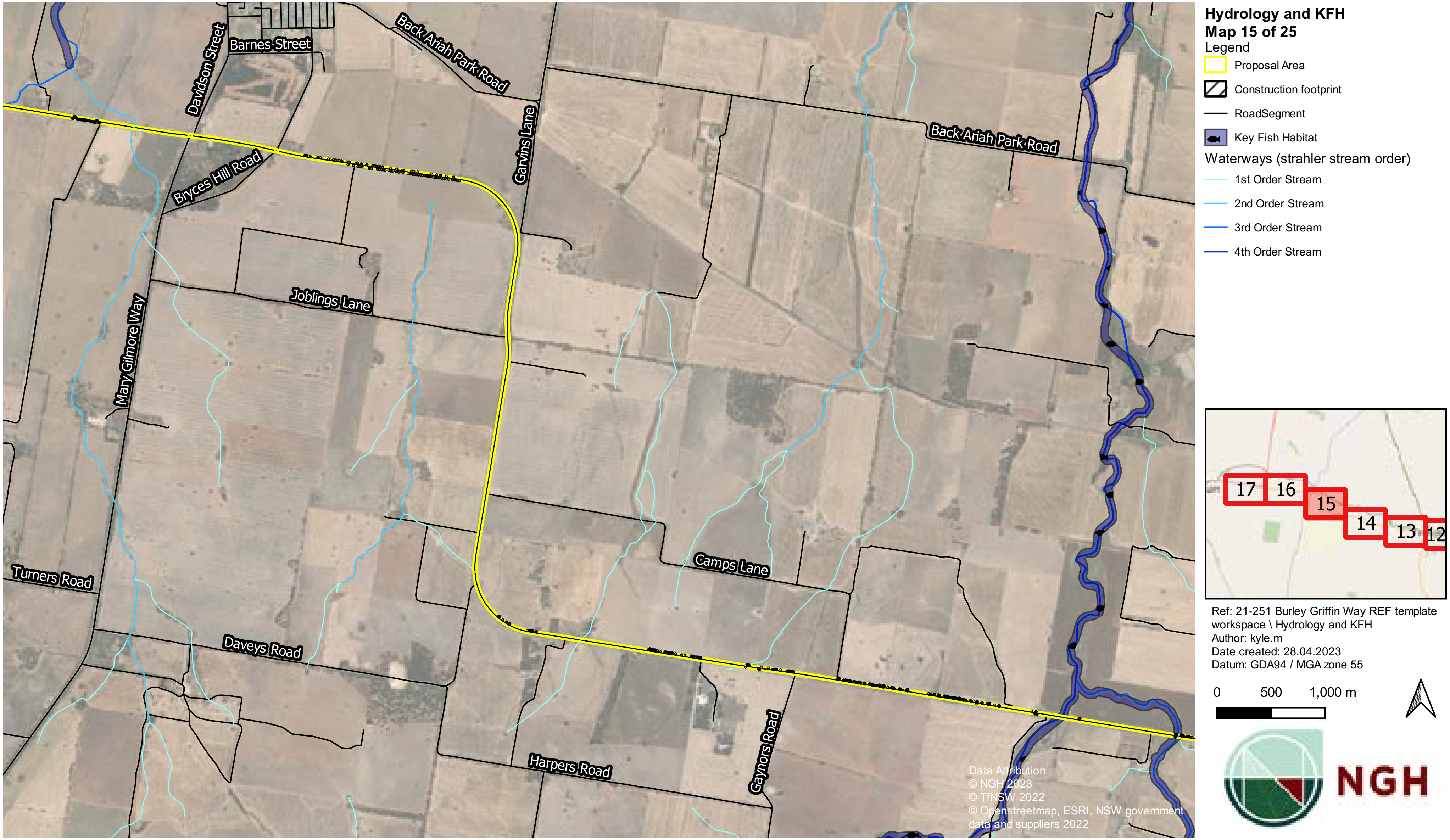
Hydrology and KFH
Map 15 of 25
Legend
Proposal Area
Construction footprint
RoadSegment
Key Fish Habitat
Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
4th Order Stream
17
16
15
14
13
12
Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0
500
1,000 m
NGH
Barnes Street
Davidson Street
Back Ariah Park Road
Garvins Lane
Bryces Hill Road
Joblings Lane
Mary Gilmore Way
Turners Road
Daveys Road
Camps Lane
Harpers Road
Gaynors Road
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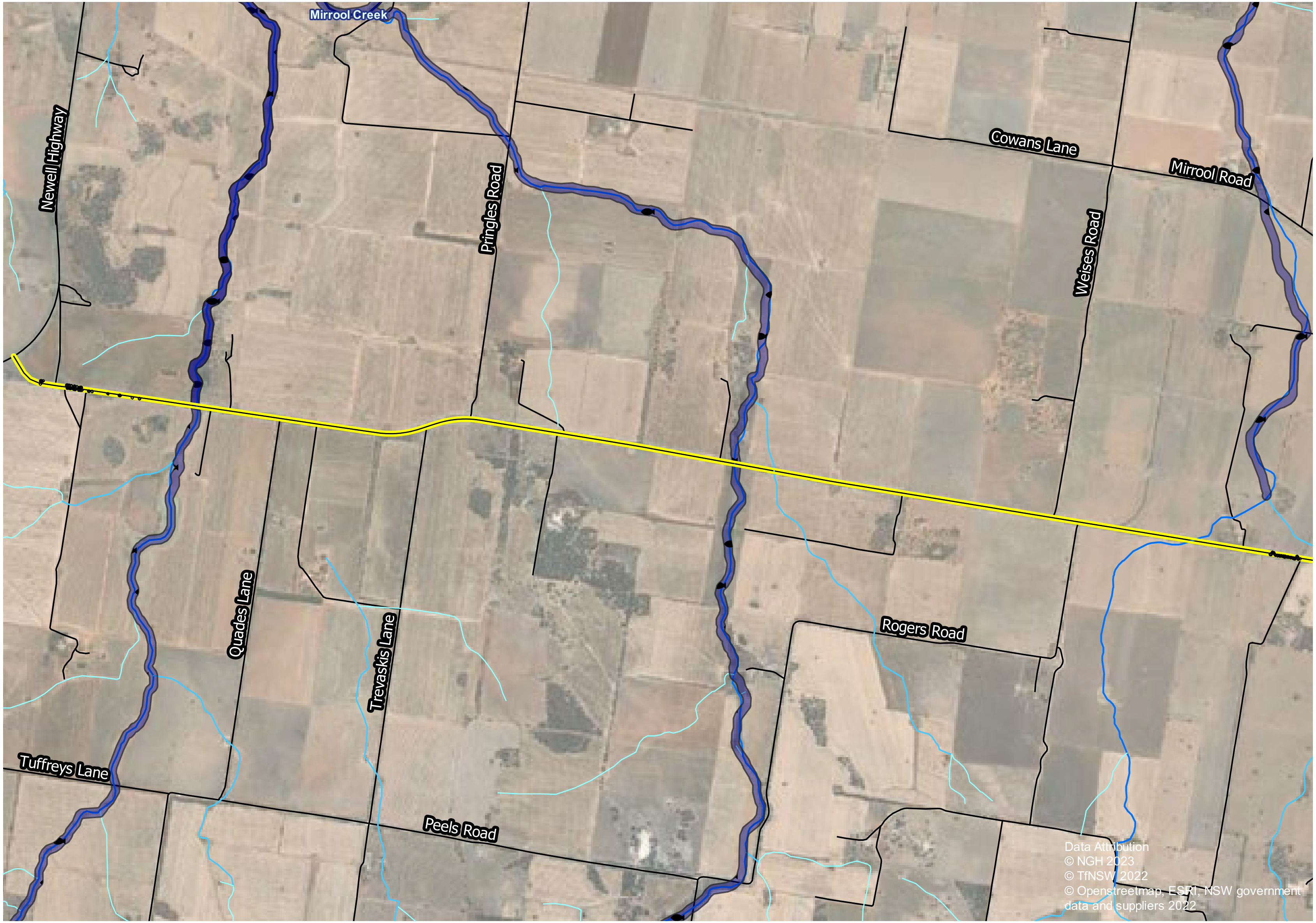


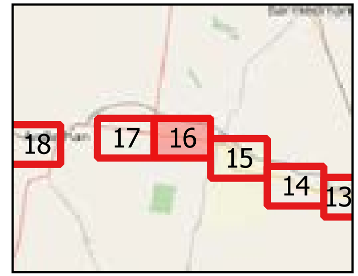
Hydrology and KFH
Map 16 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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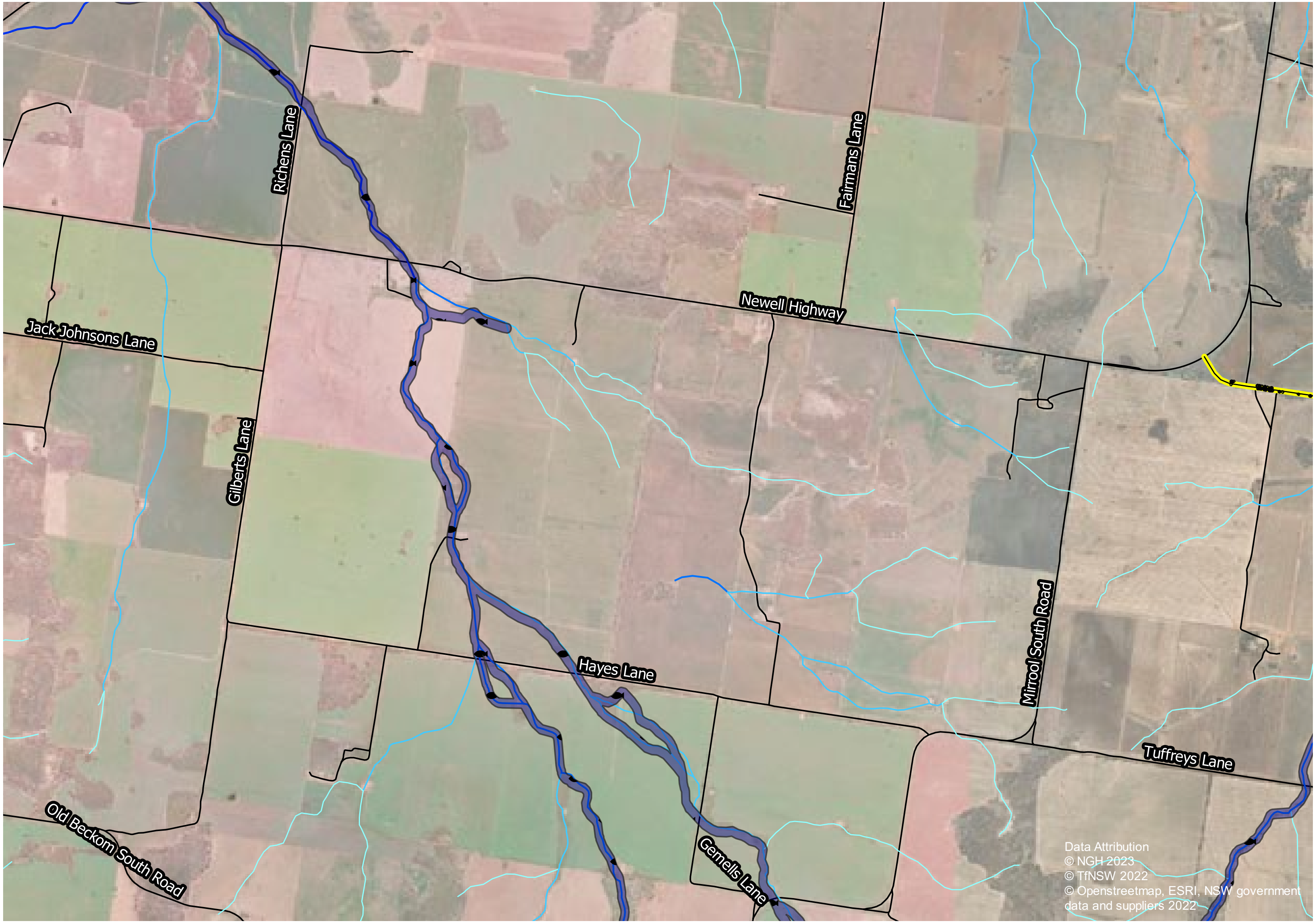


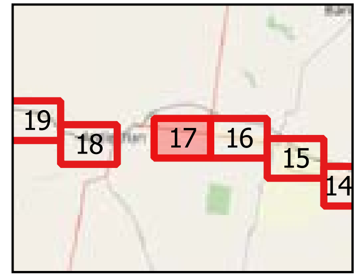
Hydrology and KFH
Map 17 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 4th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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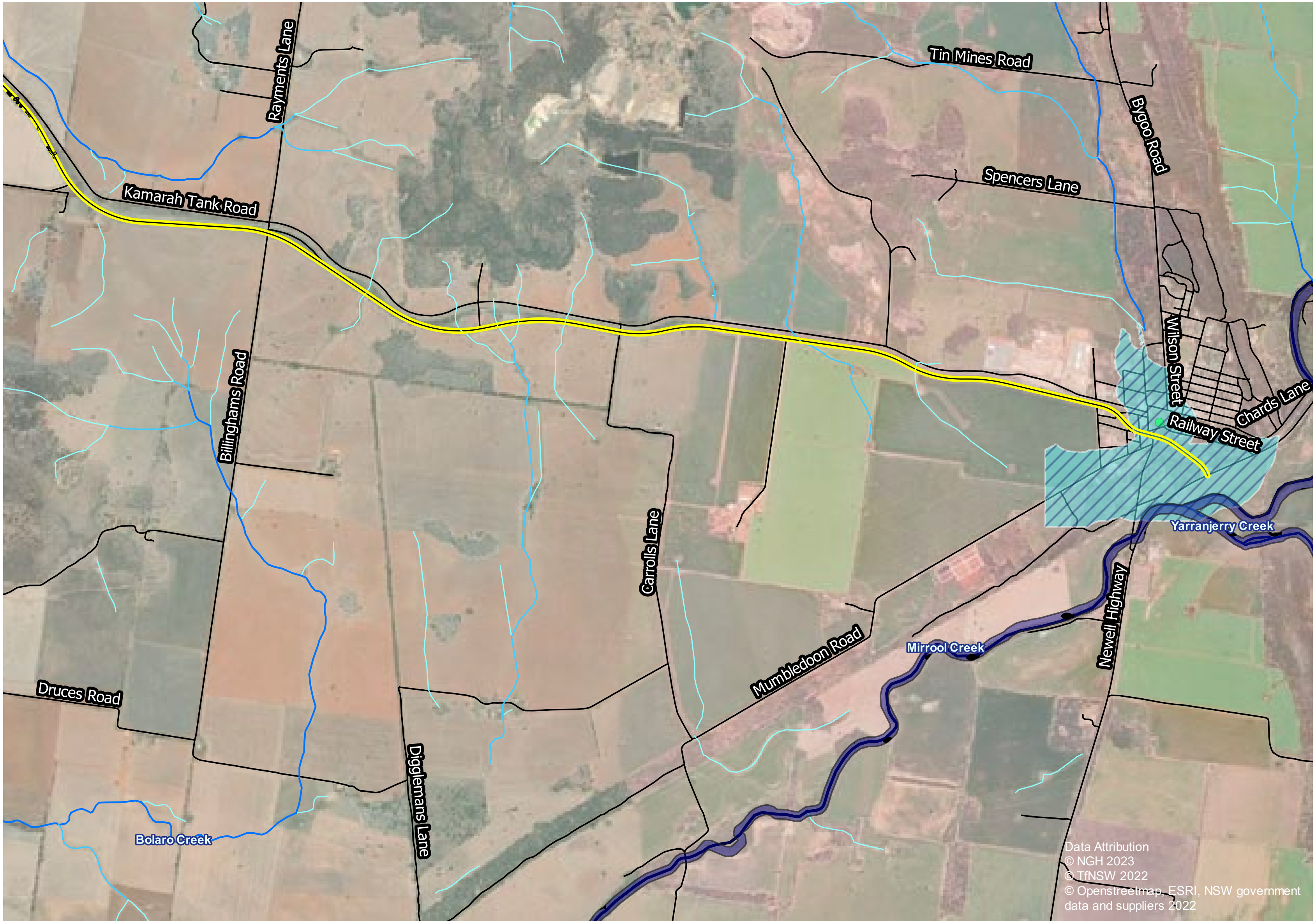
Hydrology and KFH
Map 18 of 25

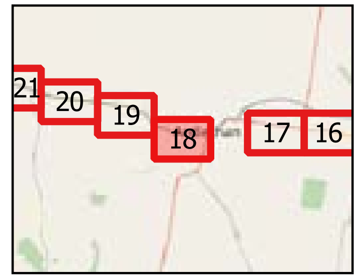


Legend

- Proposal Area
- Construction footprint
- Major population centres
- RoadSegment
- Flood Prone Land
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream
- 5th Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
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0 500 1,000 m

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Hydrology and KFH
Map 19 of 25
Legend
Proposal Area
Construction footprint
Major population centres
RoadSegment
Key Fish Habitat
Waterways (strahler stream order)
1st Order Stream
2nd Order Stream
3rd Order Stream
>5th Order Stream
Yalgogorin Road
Humby Road
St Hilliers Road
Bodens Road
Kamarah
Kamarah Tank Road
Kamarah Road
Tanswell Park Road
Dobells Road
Mumbledool Station Road
Mirrool Creek
22
21
20
19
18
17
Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0 500 1,000 m
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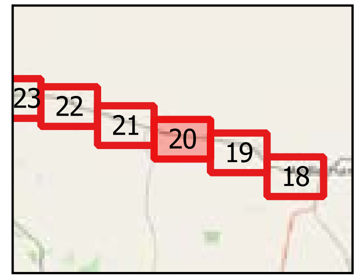
Hydrology and KFH
Map 20 of 25

Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

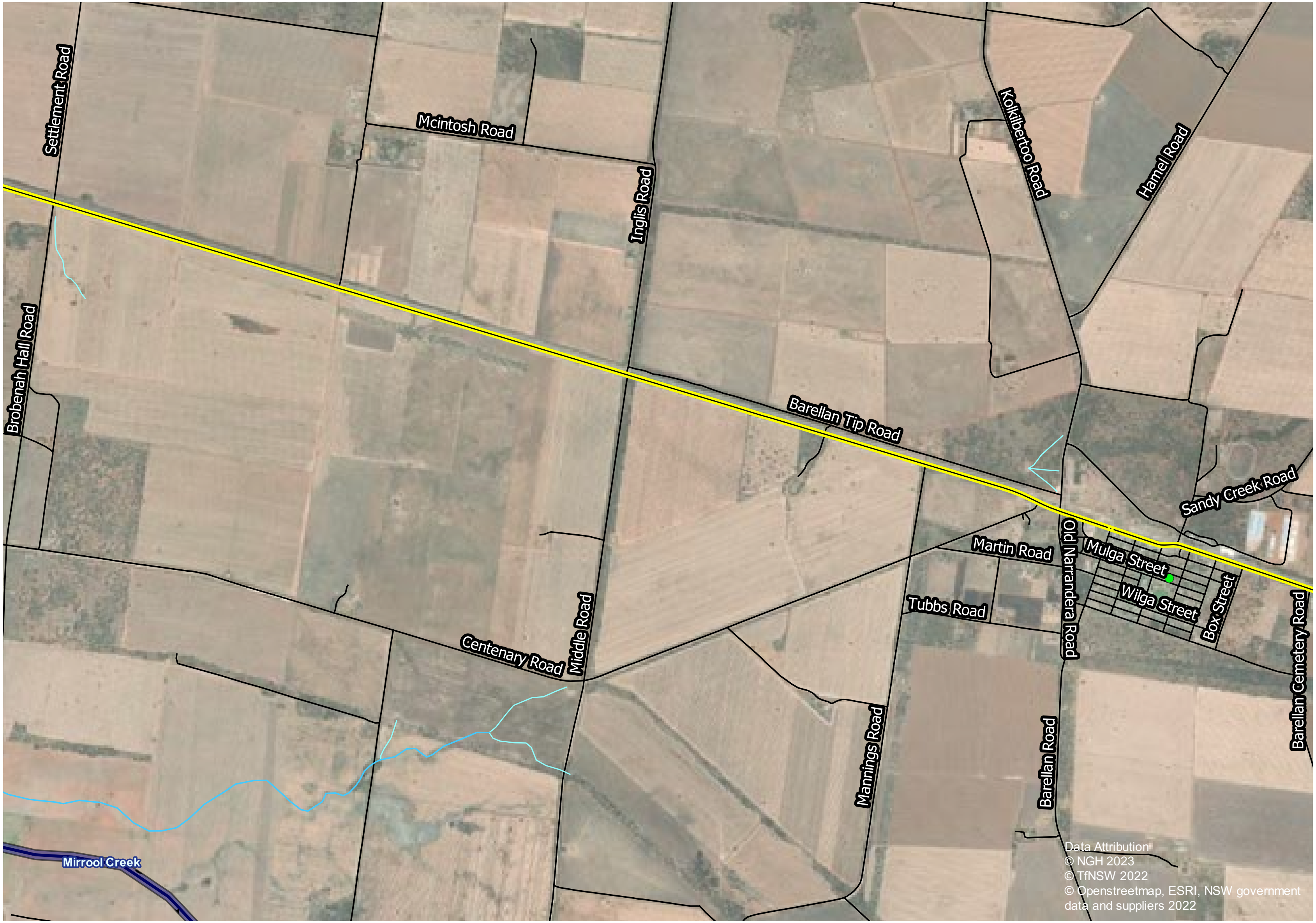
0 500 1,000 m

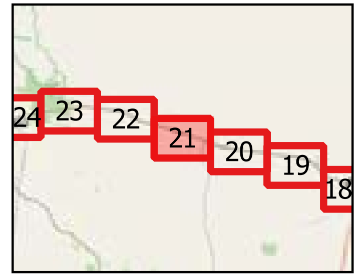
NGH

Hydrology and KFH
Map 21 of 25

Legend
- Proposal Area
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)
- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream





Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

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Hydrology and KFH
Map 22 of 25

Legend

Proposal Area

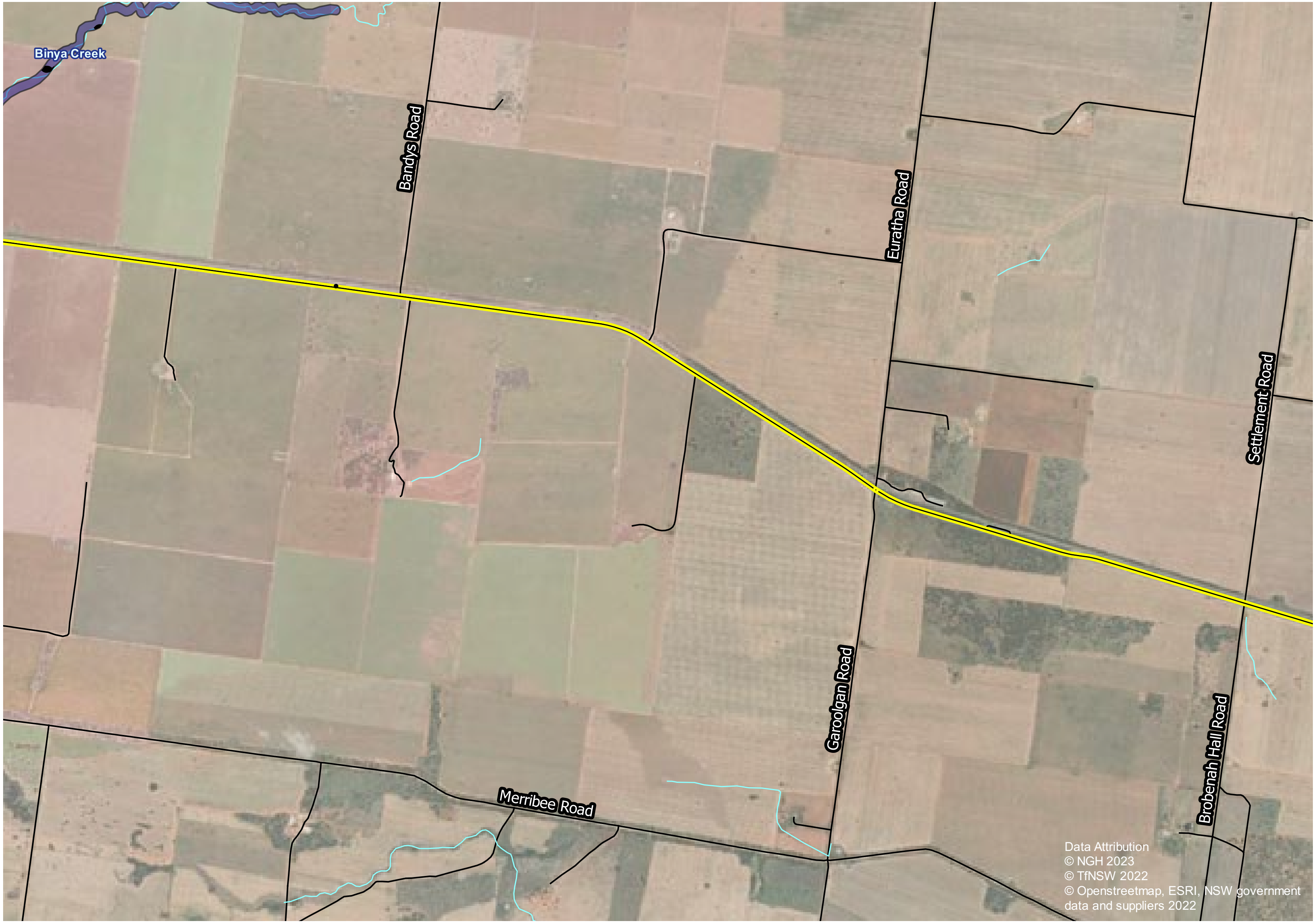
Construction footprint

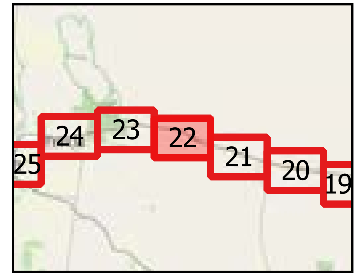
RoadSegment

Key Fish Habitat

Waterways (strahler stream order)

1st Order Stream



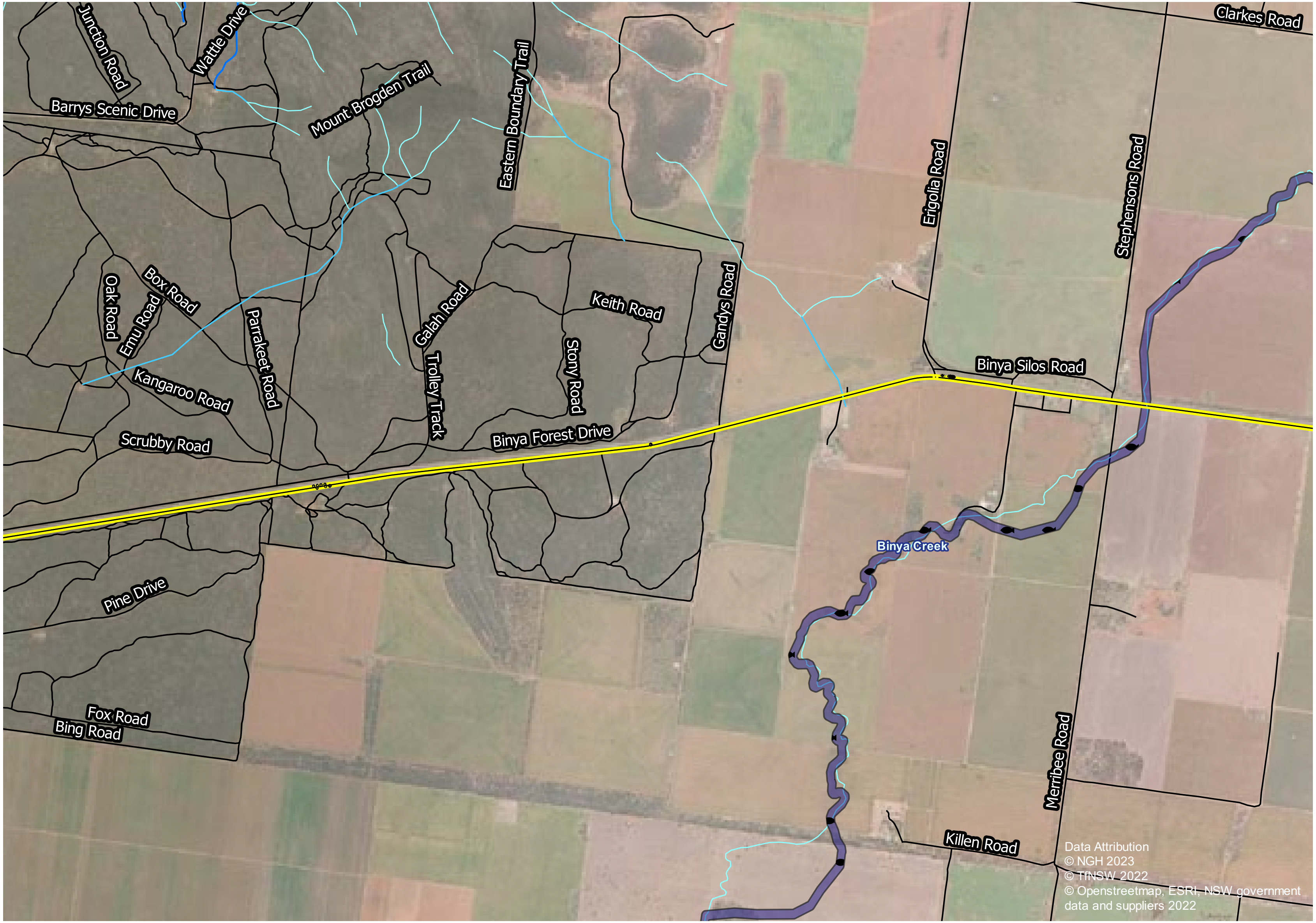


Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Hydrology and KFH
Map 23 of 25

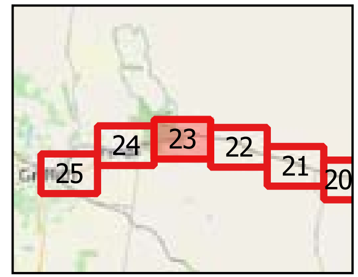


Legend

- Proposal Area
- Construction footprint
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- 3rd Order Stream



Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Hydrology and KFH
Map 24 of 25

Legend

Proposal Area

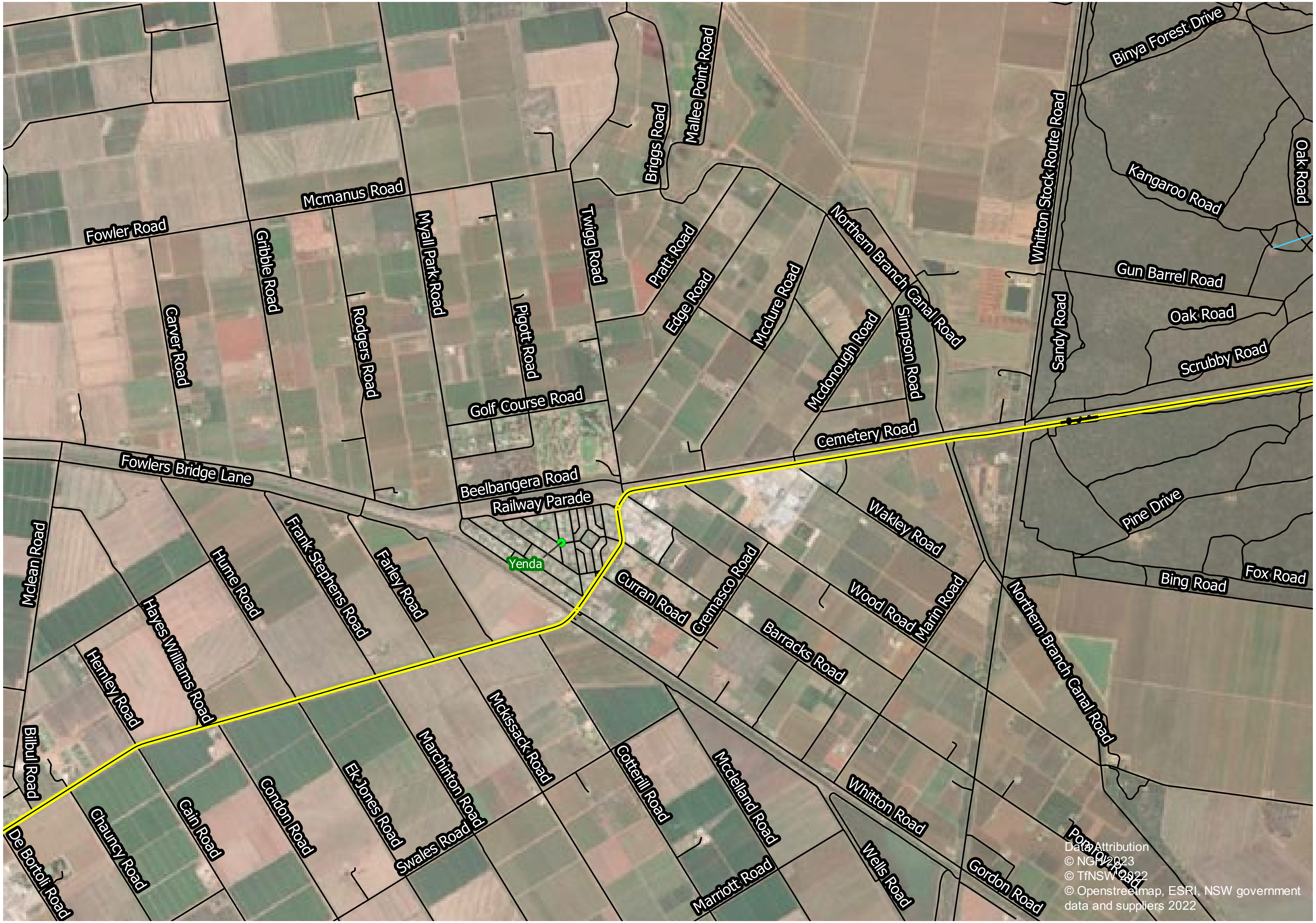
Construction footprint

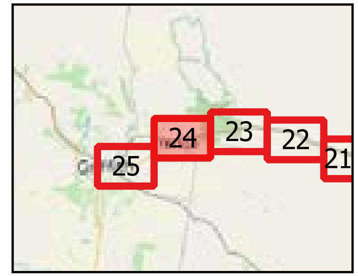
Major population centres

RoadSegment

Waterways (strahler stream order)

2nd Order Stream



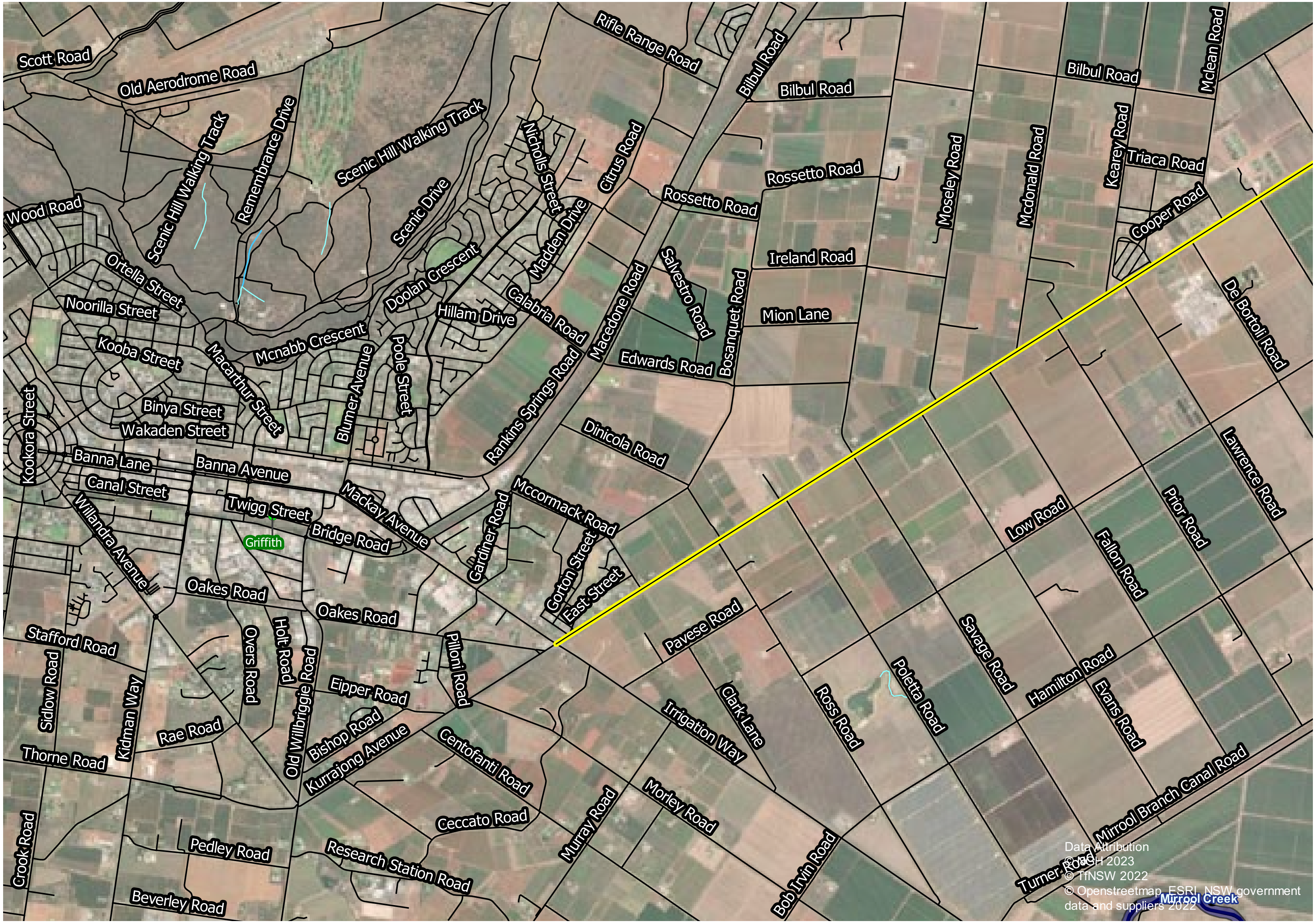


Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Hydrology and KFH
Map 25 of 25

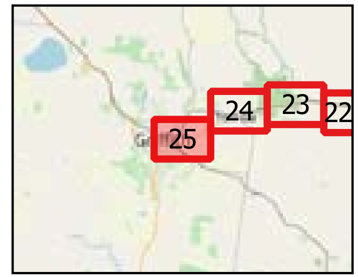


Legend

- Proposal Area
- Major population centres
- RoadSegment
- Key Fish Habitat

Waterways (strahler stream order)

- 1st Order Stream
- 2nd Order Stream
- >5th Order Stream

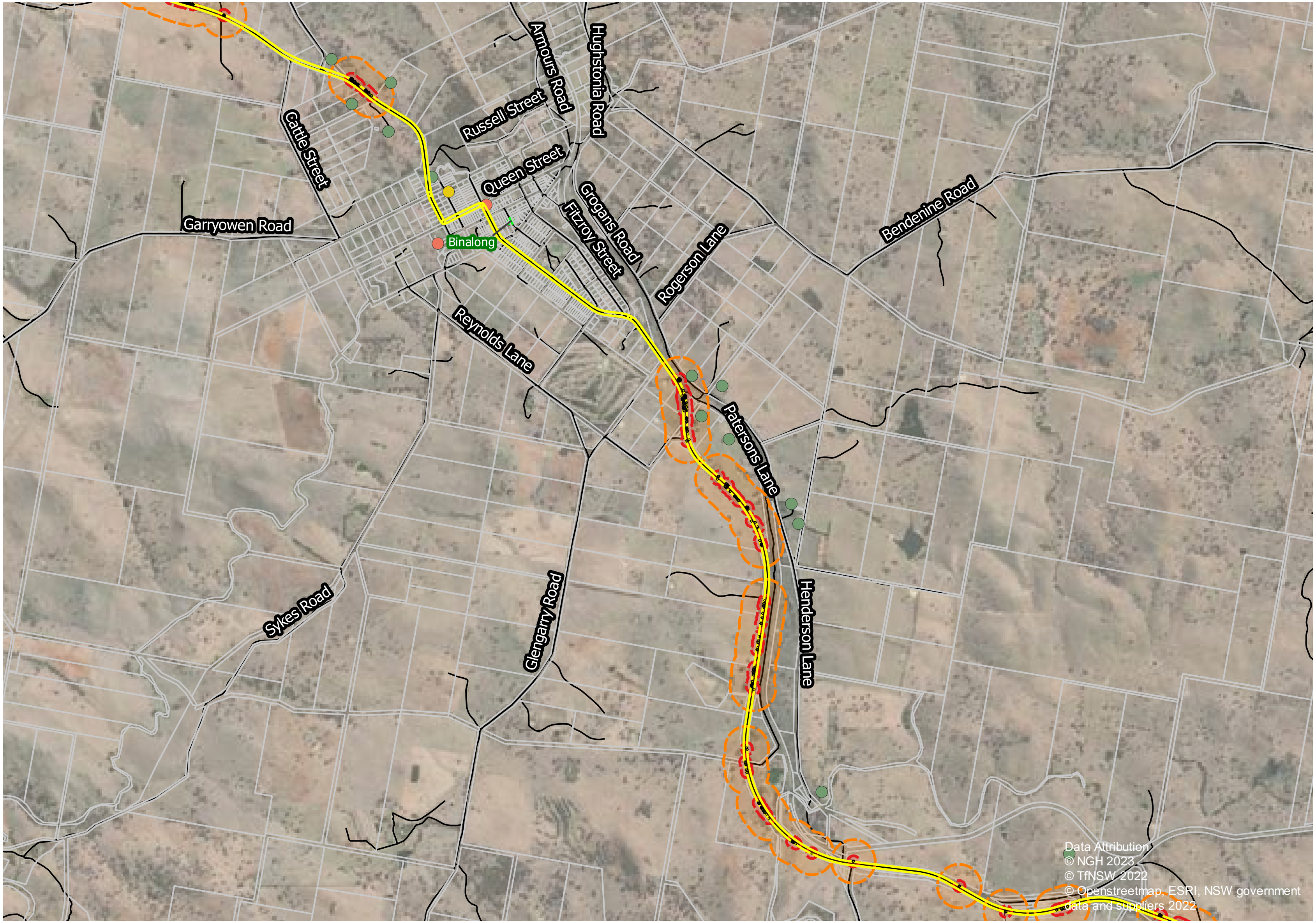


Ref: 21-251 Burley Griffin Way REF template workspace \ Hydrology and KFH
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

H.3 Scenario 2 noise mapping



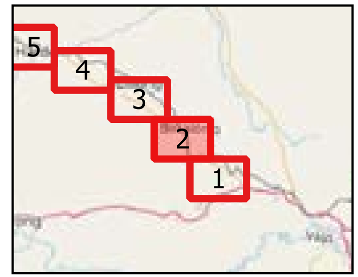
Noise
Map 2 of 25

Legend

- Proposal Area
- Construction Footprint
- Major population centres
- Road
- Lot
- Sensitive recievers

Noise sensitve recievers other than residents

- Place Of Worship
- Primary School
- Scenario 2 44m highly affected area
- Scenario 2 180m Substantial exceedance area



Ref: 21-251 Burley Griffin Way REF template workspace \ Noise
Author: kyle.m
Date created: 12.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

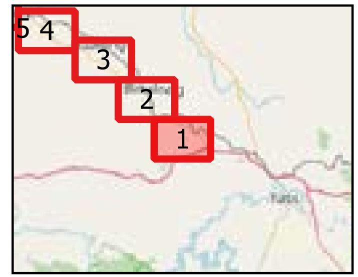
NGH

H.4 Non-Aboriginal heritage mapping

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Road
- Local Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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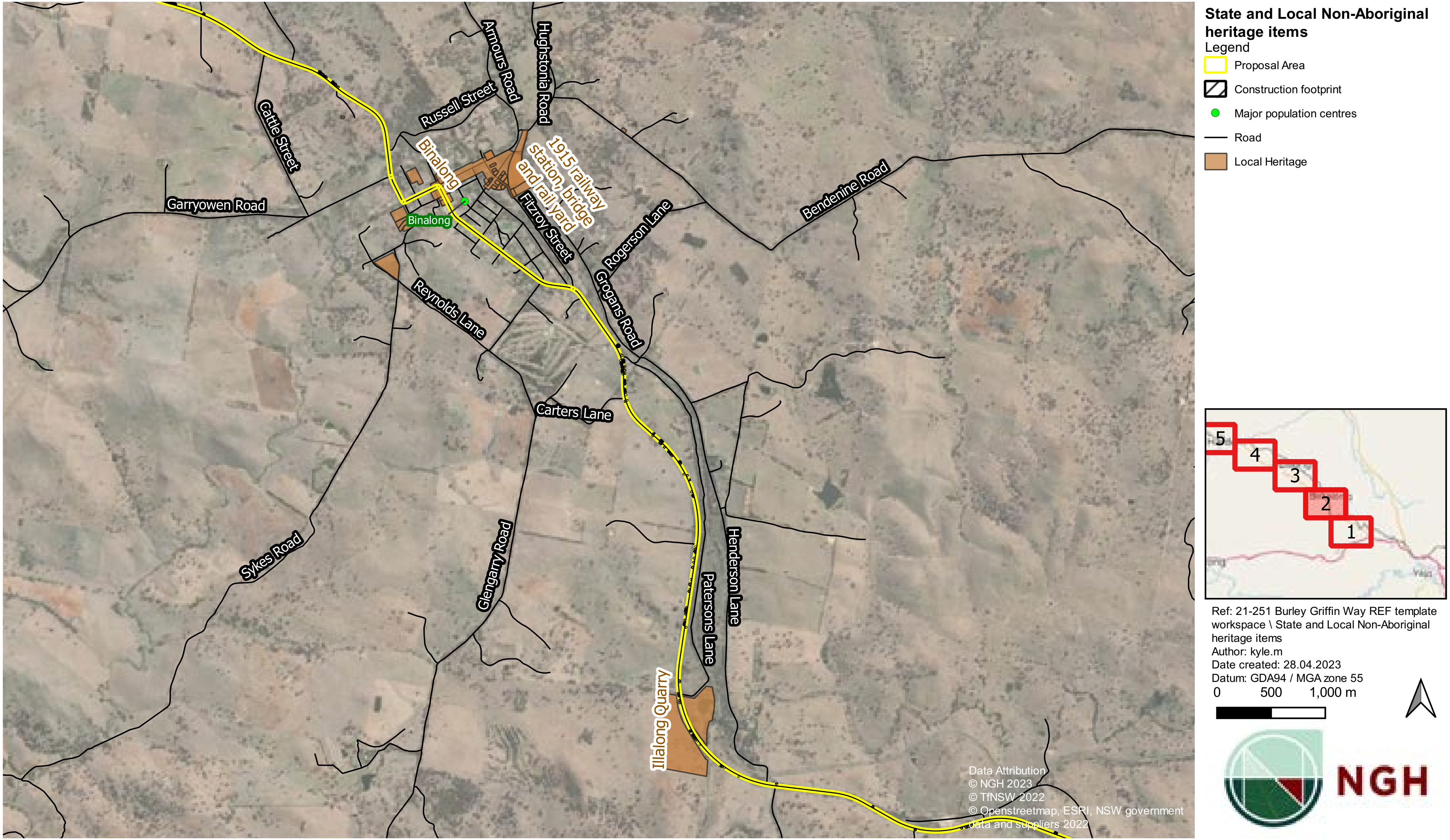
NGH



State and Local Non-Aboriginal heritage items
Legend
Proposal Area
Construction footprint
Major population centres
Road
Local Heritage
Armours Road
Hughstonia Road
Russell Street
Cattle Street
Binalong
1915 railway station, bridge and rail yard
Garryowen Road
Binalong
Fitzroy Street
Rogerson Lane
Bendenine Road
Reynolds Lane
Grogans Road
Carters Lane
Sykes Road
Glengarry Road
Henderson Lane
Patersons Lane
Illalong Quarry
5
4
3
2
1
Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0 500 1,000 m
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NGH

Linden Road
Ryan Street
Galong Railway Station and yard group
Limestone Way
Bouyeo Road
Cumbamurra Road
Bobbara Road
Data Attribution
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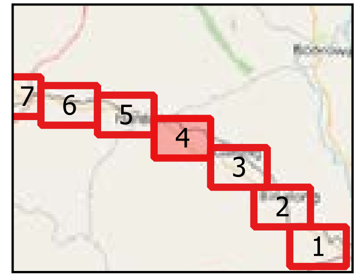
© Openstreetmap, ESRI, NSW government data and suppliers 2022
State and Local Non-Aboriginal heritage items
Legend
Proposal Area
Construction footprint
Road
Local Heritage
State Heritage
6
5
4
3
2
1
Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0 500 1,000 m
NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m


State and Local Non-Aboriginal heritage items
Legend
Proposal Area
Construction footprint
Major population centres
Road
Local Heritage
State Heritage
Former Oxton Park Farm cottage
Wombat Road
Holman Road
Colorado Road
Clarence Street
Currawong Road
Benmore Road
Barwang Road
Blind Creek Road
Erin Road
Saleyards Road
Blanya Road
Back Demondrille Road
Showground
Rockview Road
Cemetery Road
Jellambi Road
Gloaming Road
Neill Street
Ward Street
Derby Street
Lucan Street
Harden Railway Station and Yard Group
Swift Street
Binalong Lane
Scott Street
Smith Street
Bobbara Street
East Street
Araluen Road
Wynwood Road
Jugiong Road
Weirview Road
Kanoona Road
Bouyeo Road
Hillside homestead
8
7
6
5
4
3
2
1
Data Attribution
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Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
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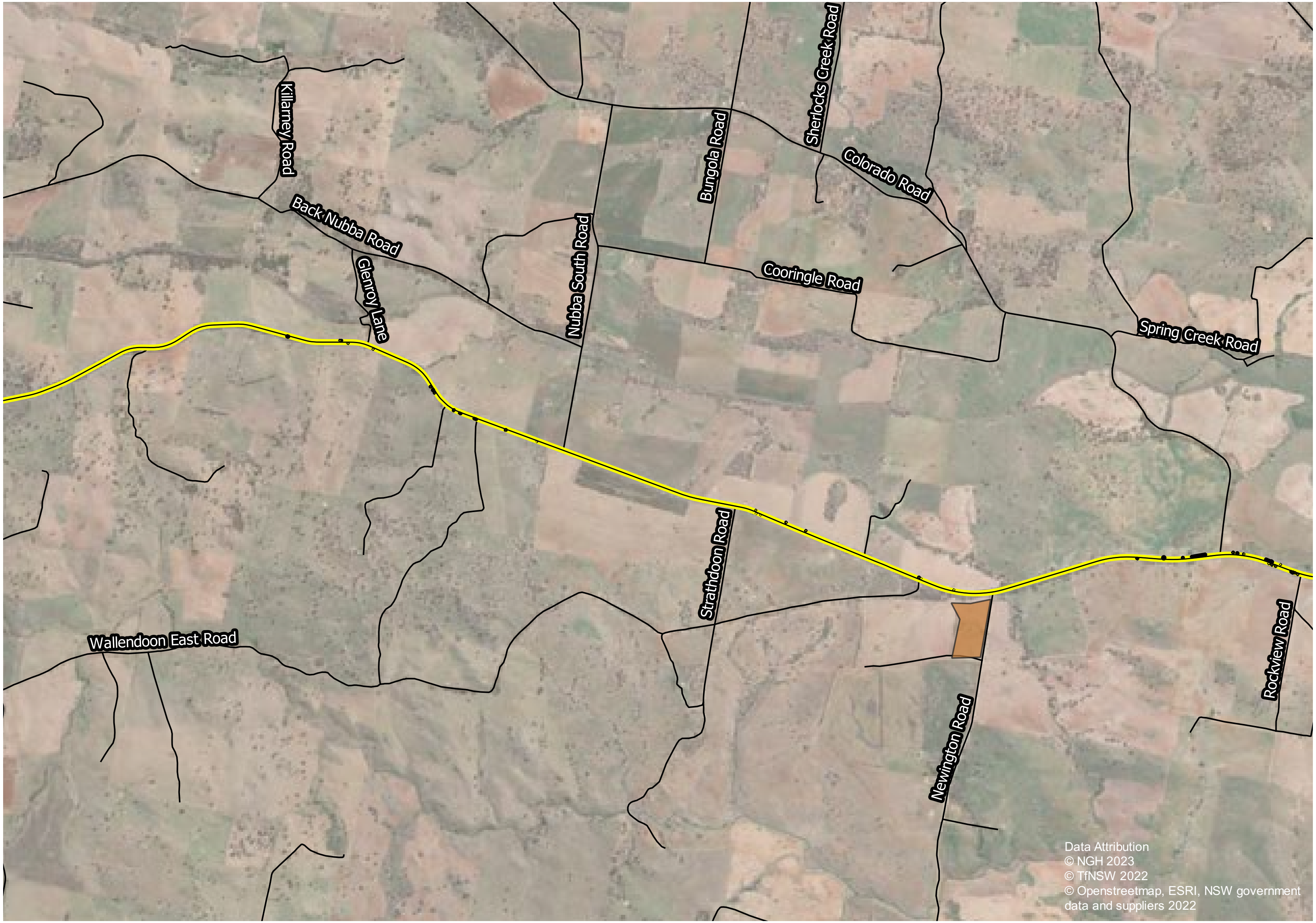
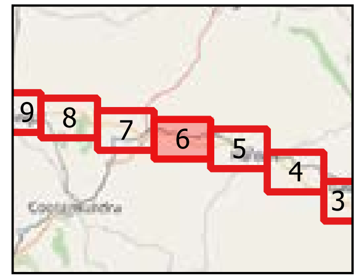
0 500 1,000 m
NGH



State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Road
- Local Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
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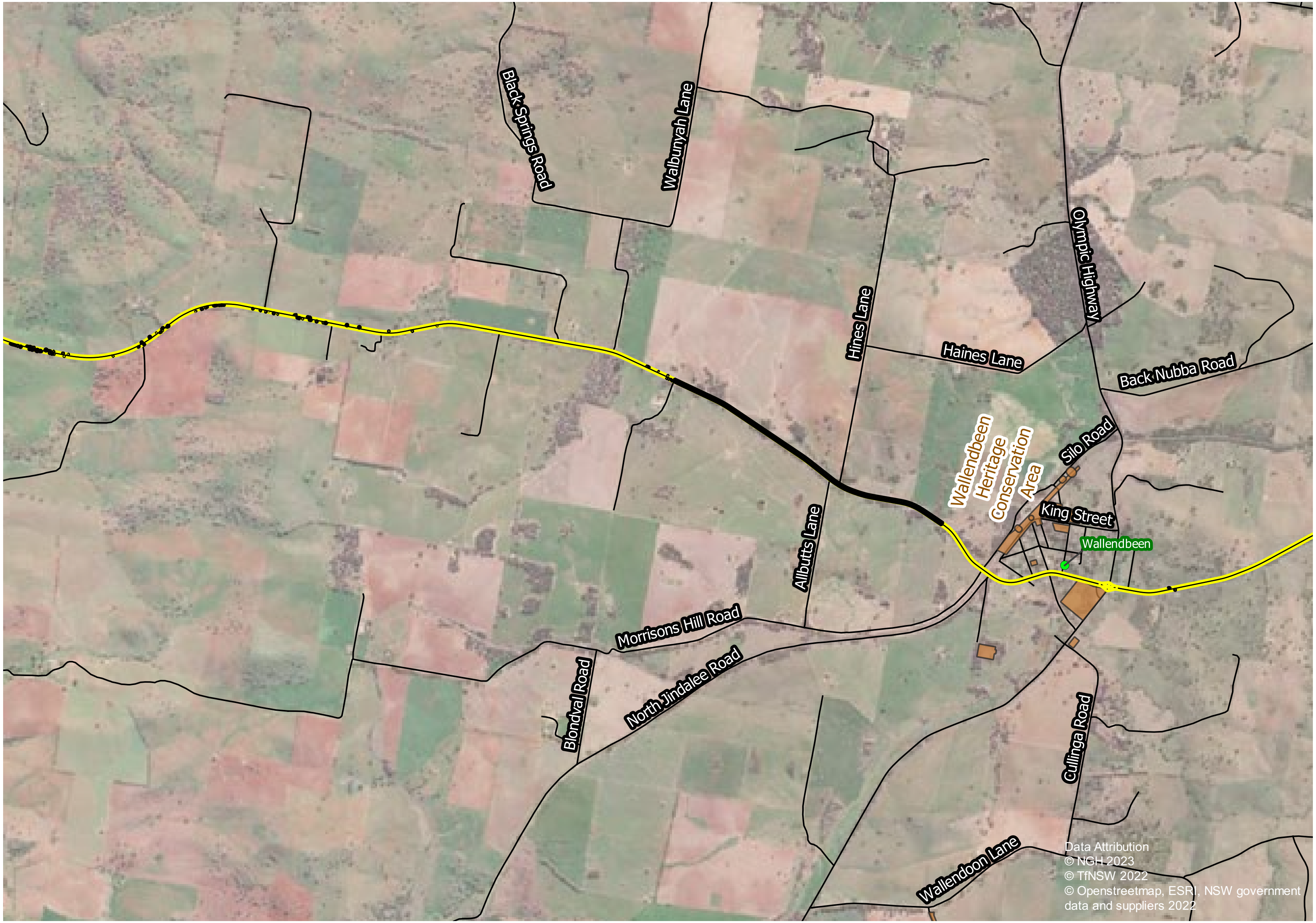
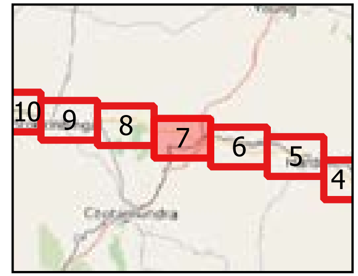
0 500 1,000 m

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage





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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

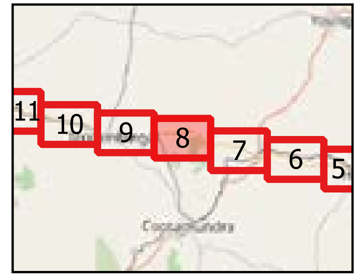
0 500 1,000 m

NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Road
- Local Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

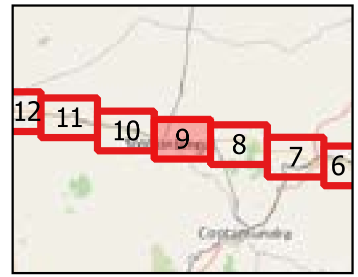
0 500 1,000 m

NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

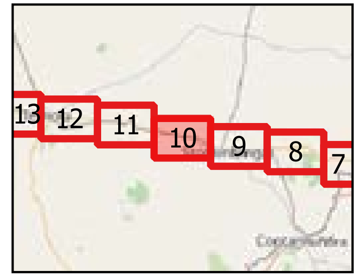
State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items

Author: kyle.m

Date created: 28.04.2023

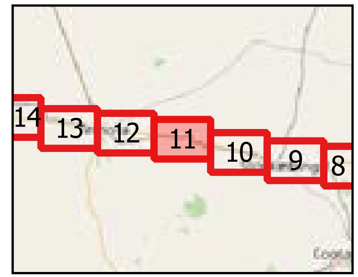
Datum: GDA94 / MGA zone 55

0 500 1,000 m

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
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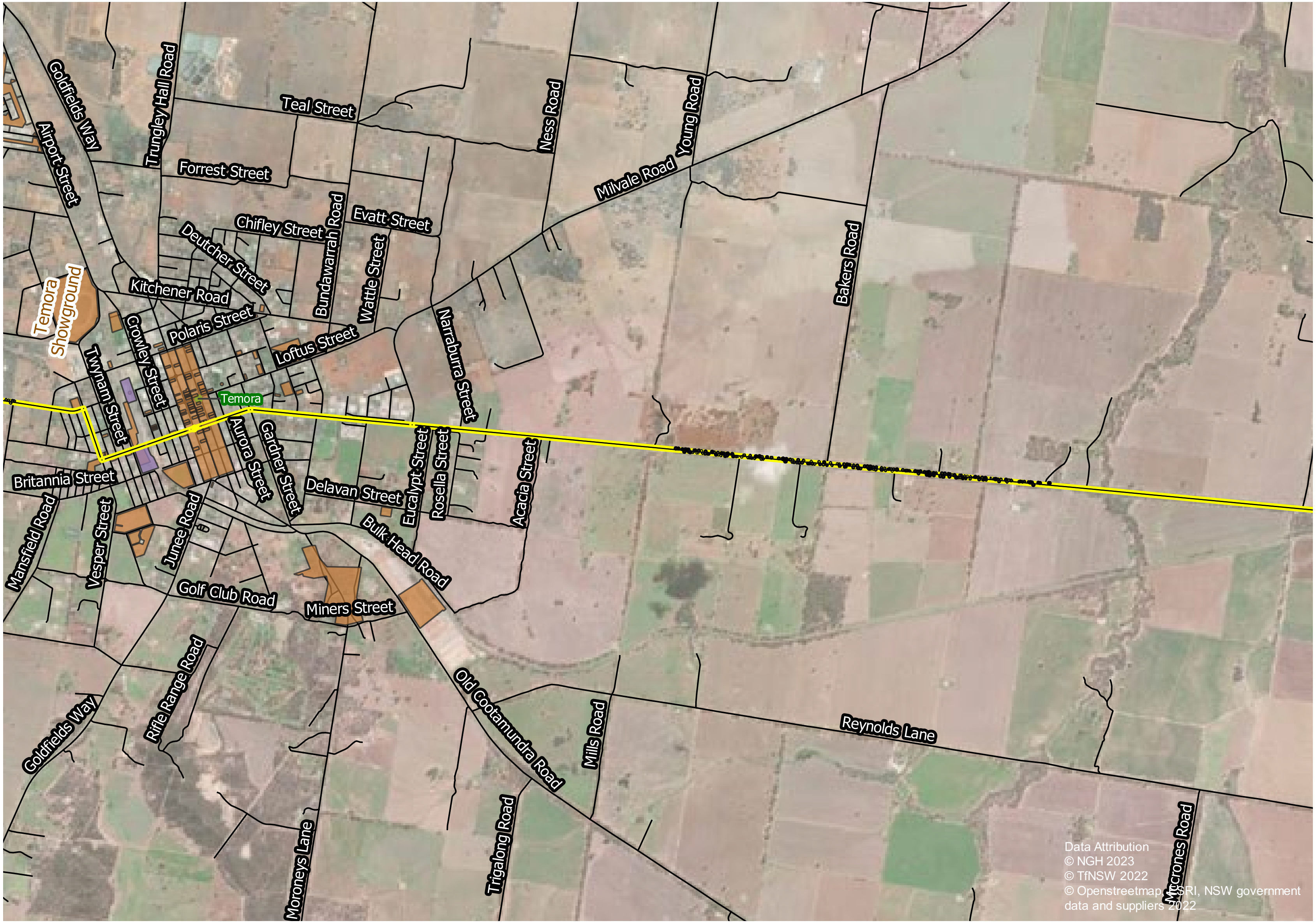
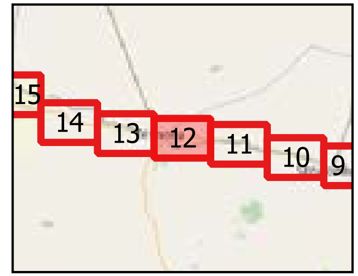


State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage
- State Heritage



Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH


State and Local Non-Aboriginal heritage items
Legend
Proposal Area
Construction footprint
Road
Local Heritage
State Heritage
Original Hangar (Temora Airport)
WWII Ammunition Bunker (Temora Airport)
Temora Railway Station group
Derricks Road
Bartondale Road
Goldfields Way
Airport Street
Mimosa Street
Fisher Street
Lucas Street
Briar Street
Glynburn Road
Oak Street
Lawson Road
Elm Street
Mansfield Road
Vesper Street
Boundary Road
Back Mimosa Road
Western Boundary Firetrail
Entrance Trail
Eastern Boundary Firetrail
Bertelsmeirs Road
16
15
14
13
12
11
10
Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
0 500 1,000 m
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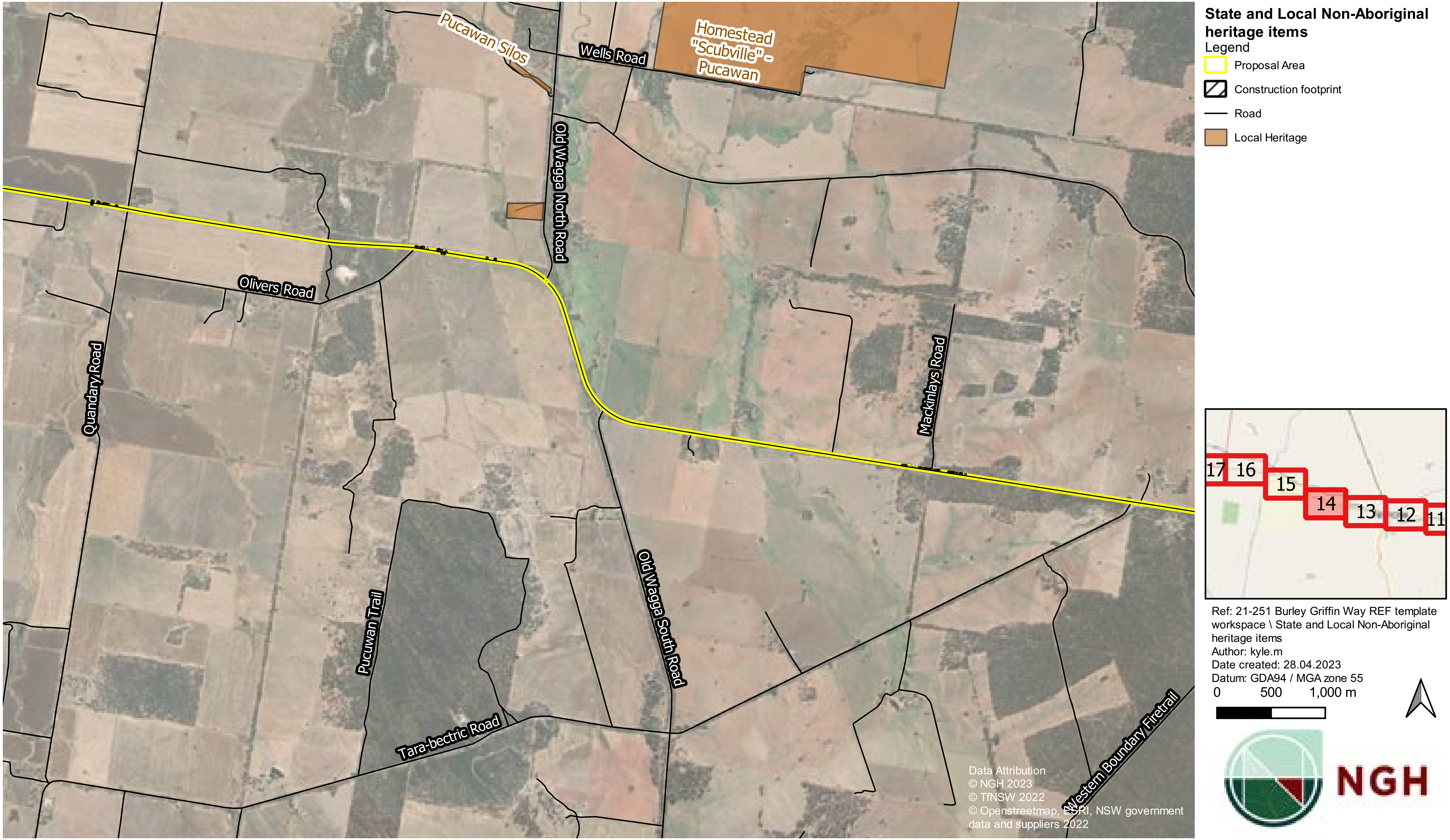

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Road
- Local Heritage

Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
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Datum: GDA94 / MGA zone 55

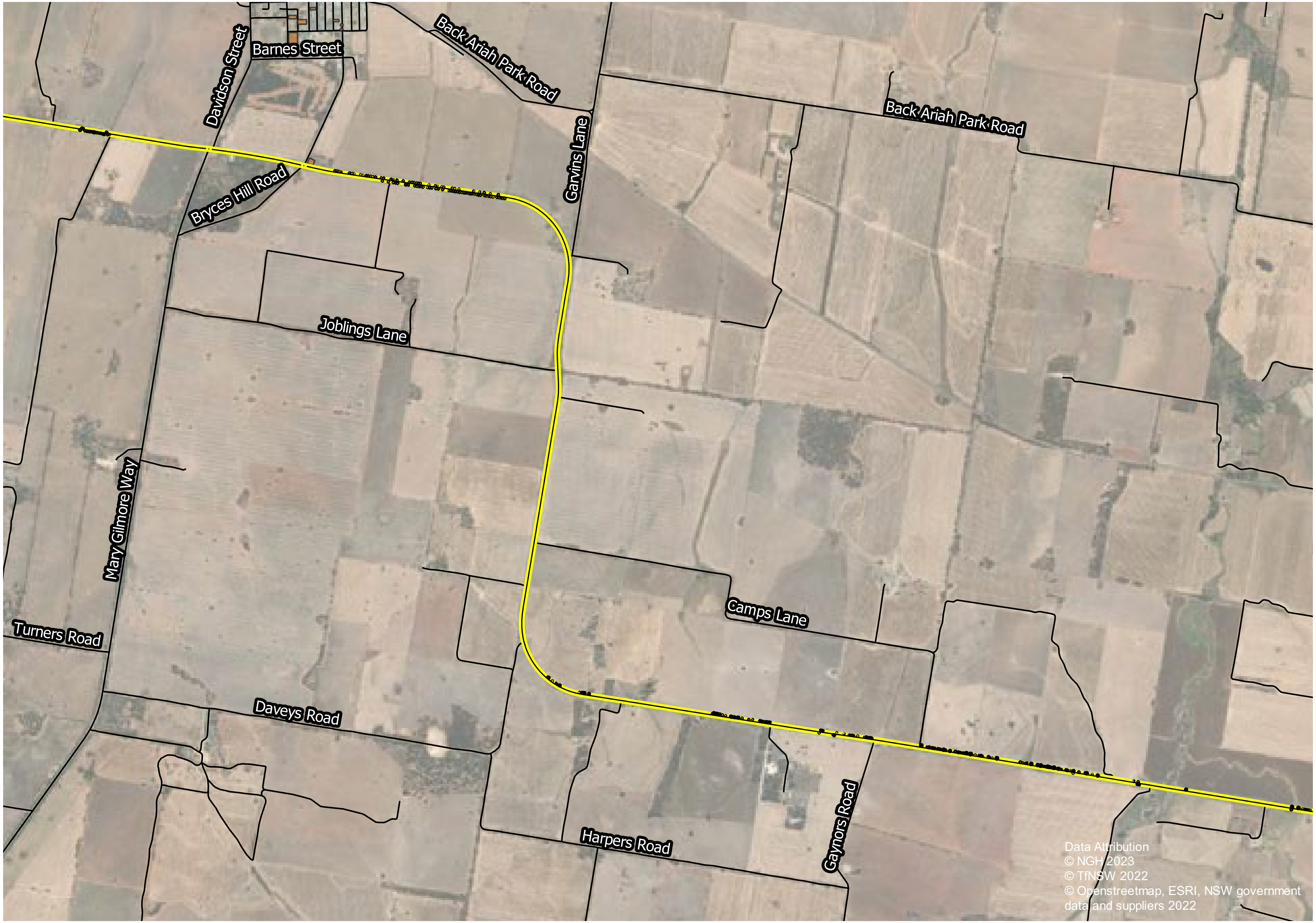
0 500 1,000 m

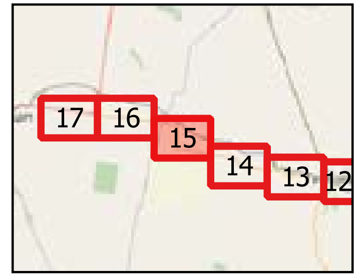
NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Road
- Local Heritage





Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

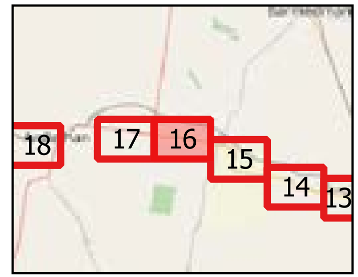
State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road



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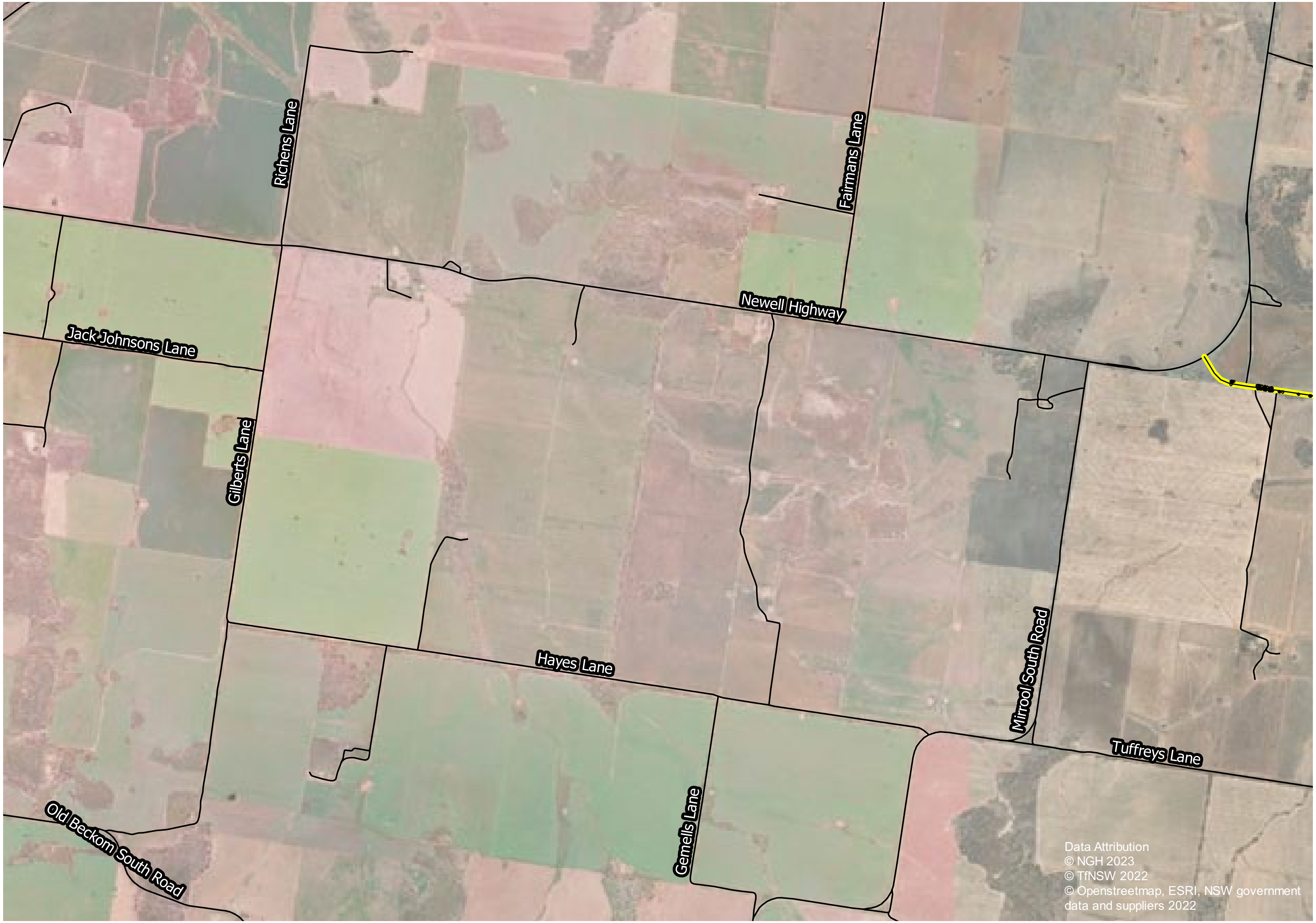


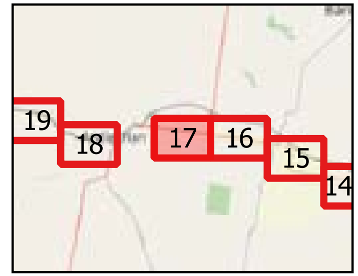
State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road



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Author: kyle.m
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Datum: GDA94 / MGA zone 55

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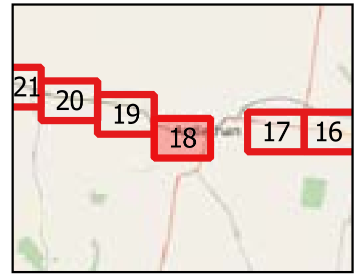
NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage



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Date created: 28.04.2023
Datum: GDA94 / MGA zone 55
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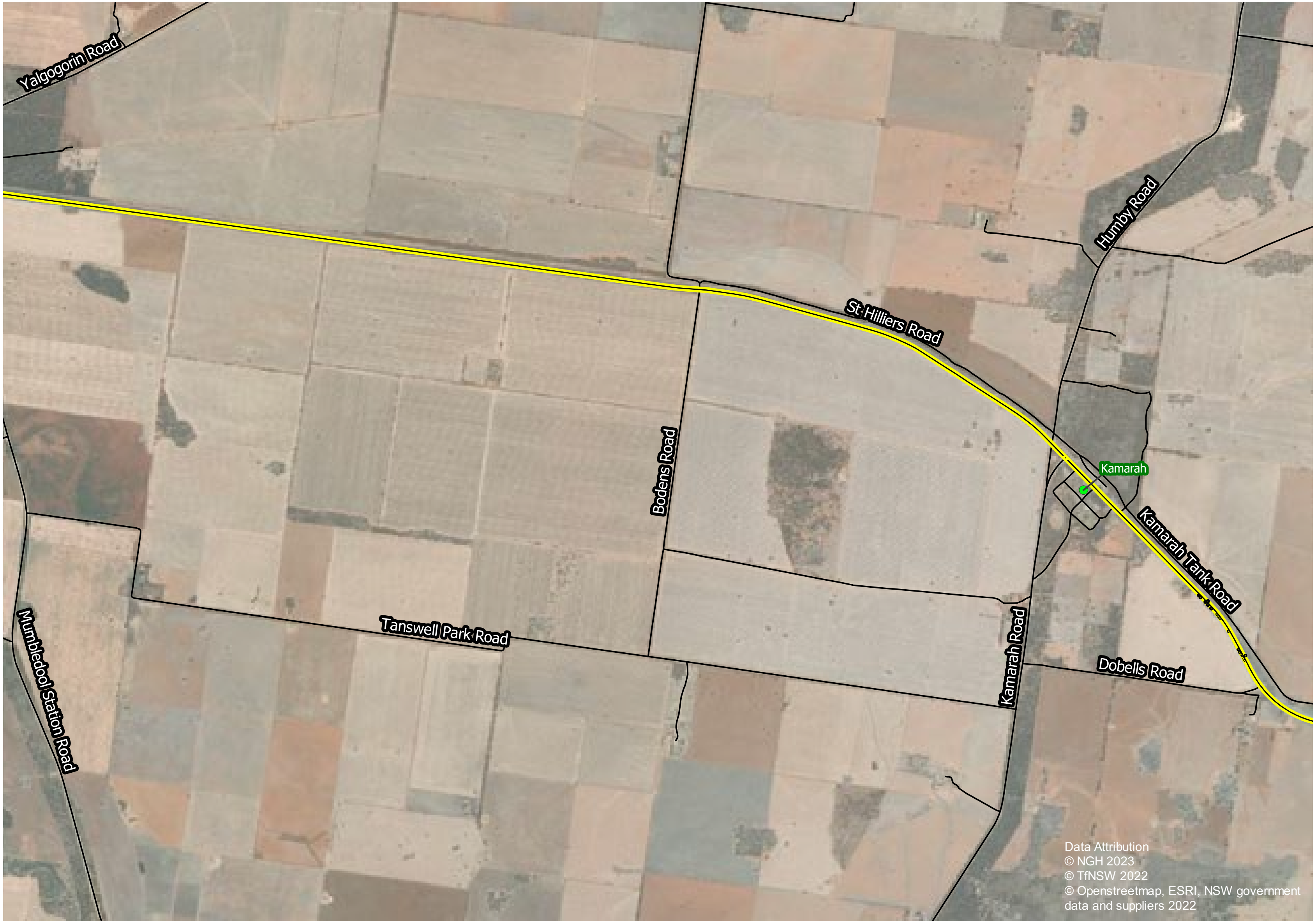
State and Local Non-Aboriginal heritage items



Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road

Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

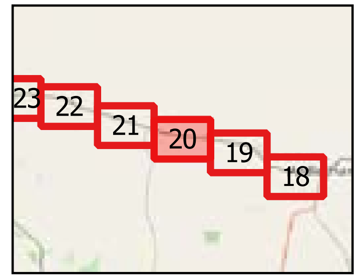
State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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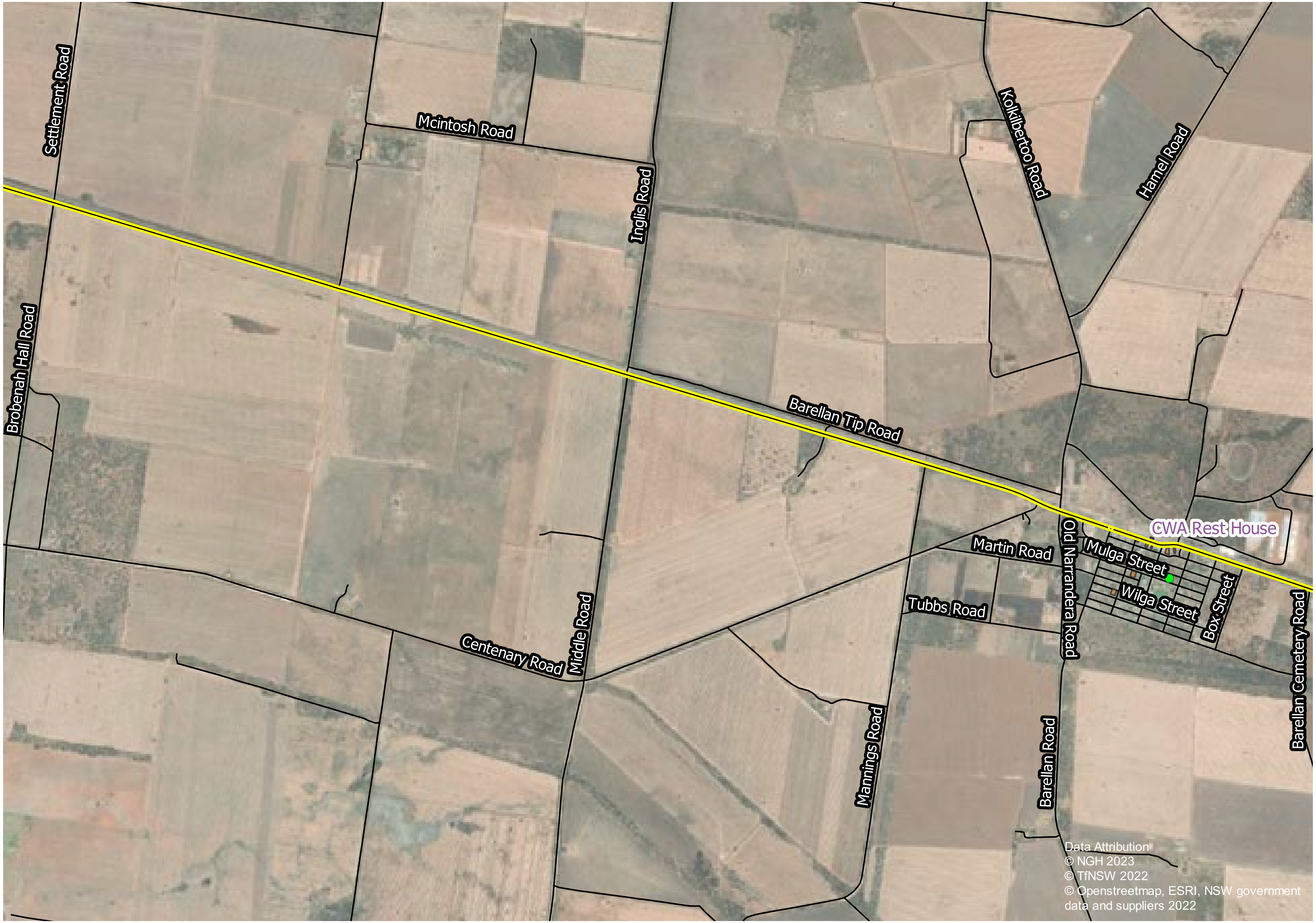
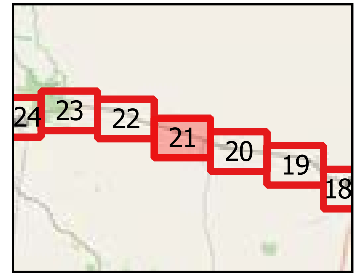
NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Major population centres
- Road
- Local Heritage
- State Heritage





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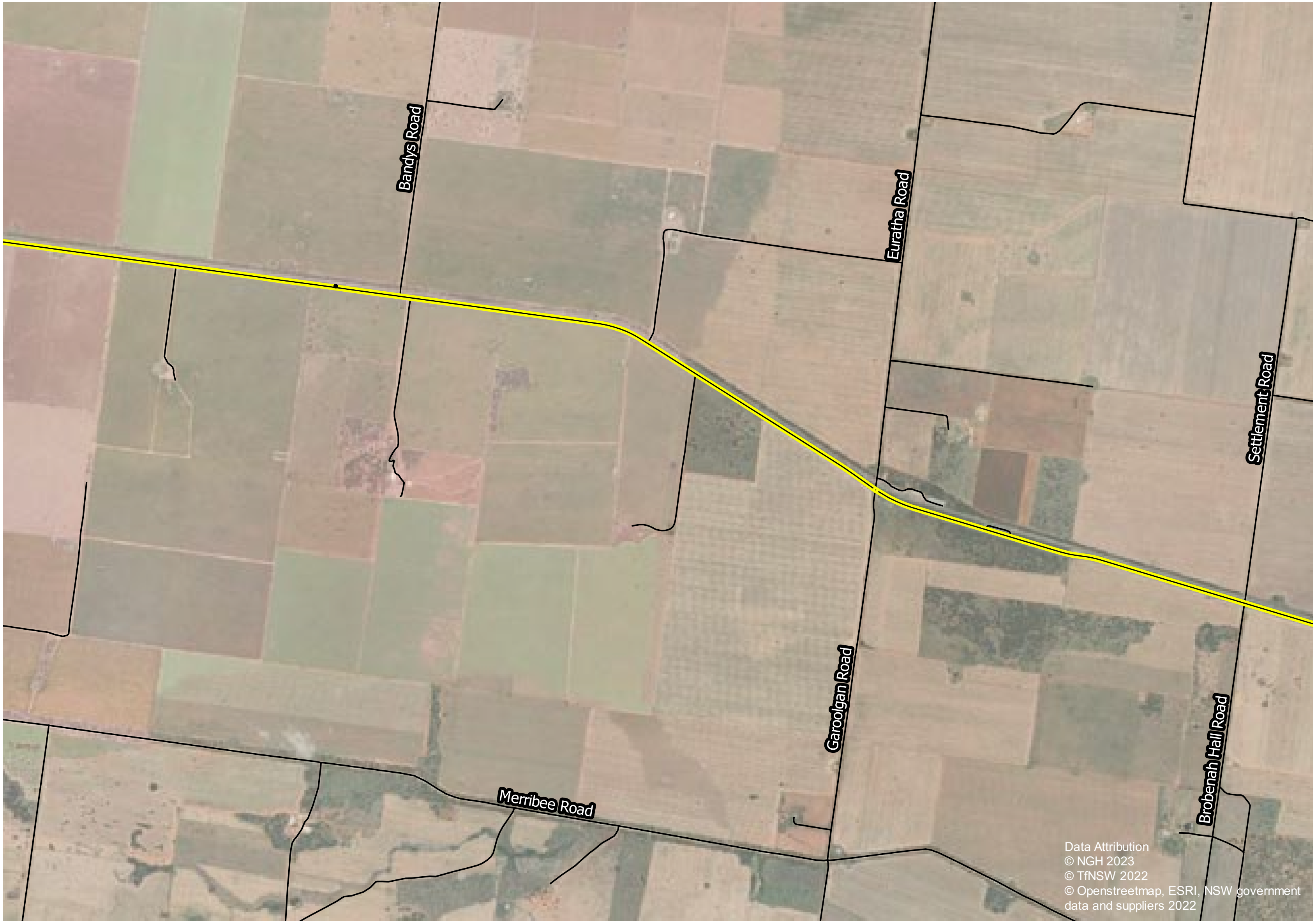


State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road

Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items

Author: kyle.m

Date created: 28.04.2023

Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

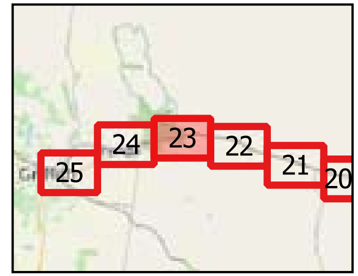
State and Local Non-Aboriginal heritage items

Legend

Proposal Area

Construction footprint

Road



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Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

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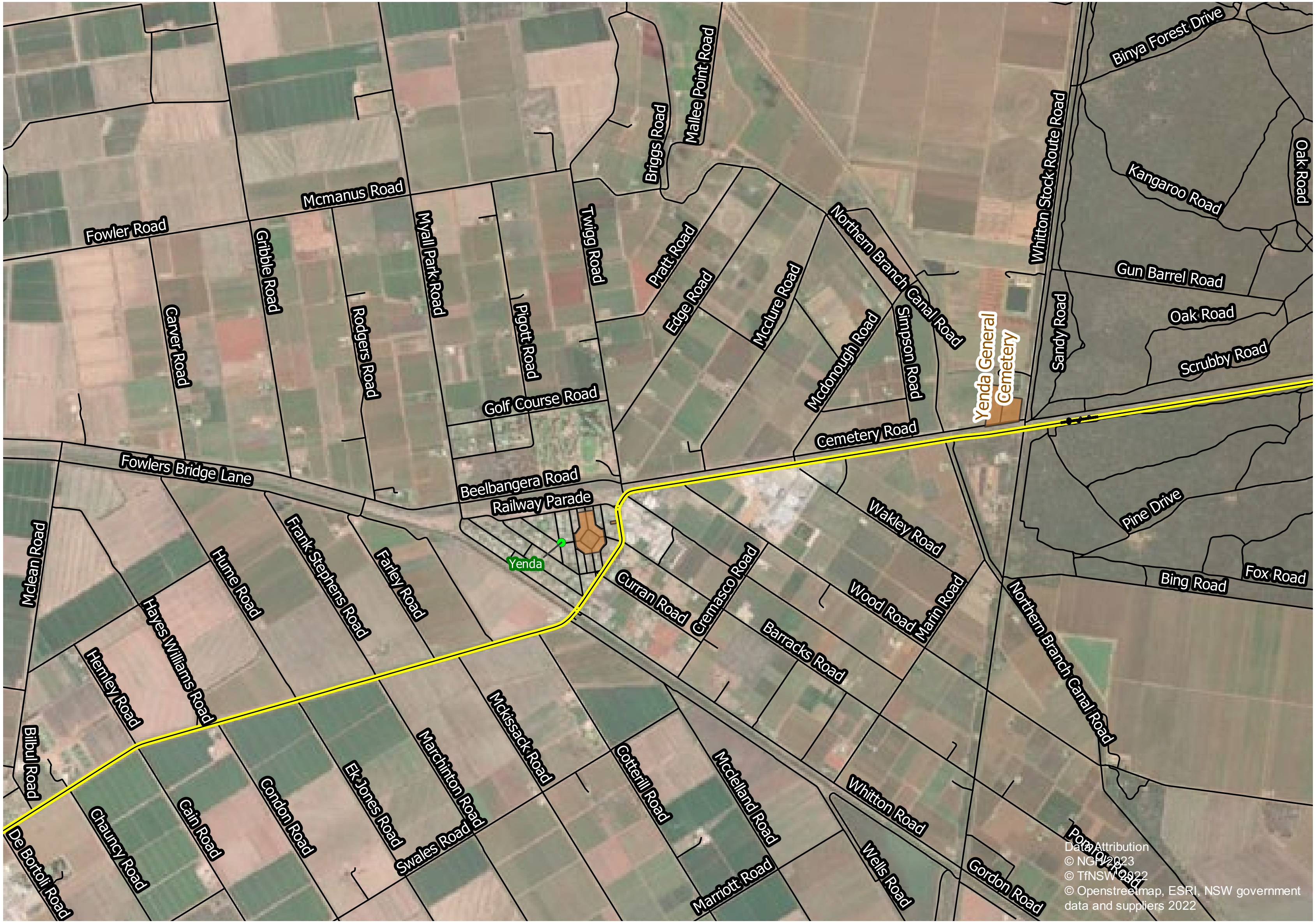
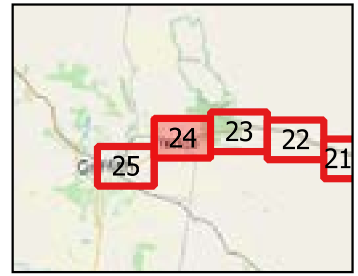
NGH

State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Construction footprint
- Major population centres
- Road
- Local Heritage





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Author: kyle.m
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Datum: GDA94 / MGA zone 55
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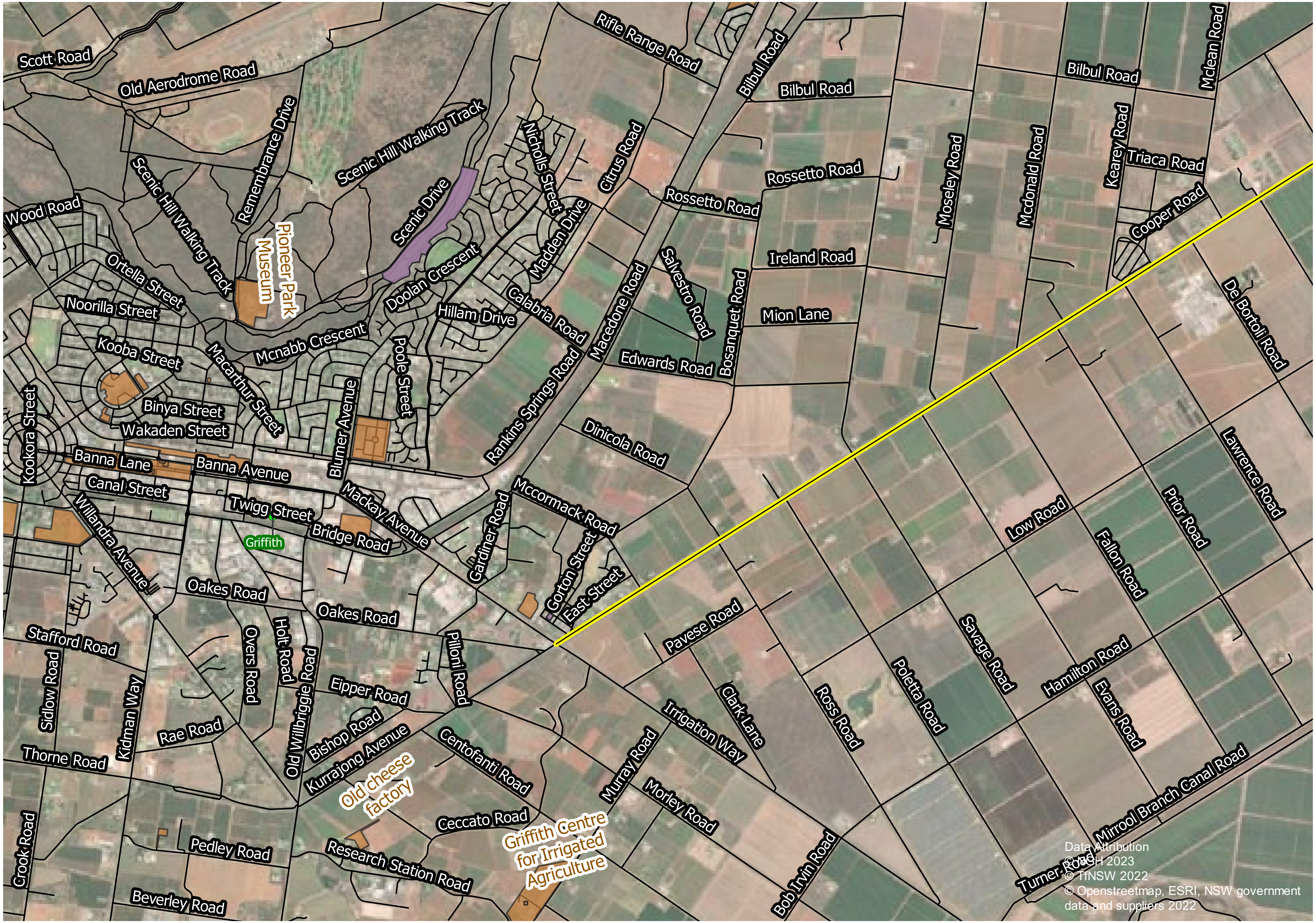
State and Local Non-Aboriginal heritage items

Legend

- Proposal Area
- Major population centres
- Road
- Local Heritage
- State Heritage



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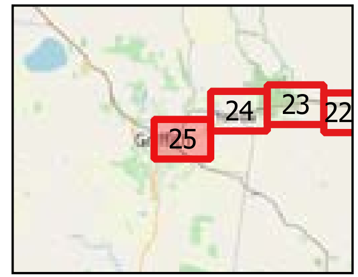

Ref: 21-251 Burley Griffin Way REF template workspace \ State and Local Non-Aboriginal heritage items
Author: kyle.m
Date created: 28.04.2023
Datum: GDA94 / MGA zone 55

0 500 1,000 m

NGH

Appendix I TISEPP consultation responses

Month Year
TfNSW XX.XXX
ISBN: XXX-X-XXXXXX-XX-X

From: Jesse Baaner
To: Tim O"Kelly
Cc: Stephen Cathcart; Sheila Lee; NPWS Area Mailbox - Riverina
Subject: RE: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation
Date: Wednesday, 26 April 2023 3:01:00 PM
Attachments: image010.png
image011.png
image012.png
image013.png
image014.png
image015.png
image016.png
image017.png
image018.png

Hi Tim,

Thank you for your email.

I can confirm that all works adjacent to Jindalee NP will be completed within the road reserve.

I can also confirm that there is no impact/works adjacent to Ingelba Nature Reserve.

Thanks

Kind Regards,

Jesse Baaner
Project/Contract Manager
Project Services South
Regional and Outer Metropolitan
Transport for NSW

M 0447 537 228 **E** jesse.baaner2@transport.nsw.gov.au
Level 2-3, 193 Morgan Street Wagga Wagga NSW 2650

From: Tim O'Kelly <Tim.Okelly@environment.nsw.gov.au>
Sent: Monday, 24 April 2023 11:49 AM
To: Jesse Baaner <Jesse.Baaner2@transport.nsw.gov.au>
Cc: Stephen Cathcart <Steve.Cathcart@environment.nsw.gov.au>; Sheila Lee <Sheila.Lee@environment.nsw.gov.au>; NPWS Area Mailbox - Riverina <npws.riverina@environment.nsw.gov.au>
Subject: FW: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation

Hi Jesse,

I notice that the only National Park that is listed in the impact area is Jindalee NP.

I am just double-checking whether Ingelba Nature Reserve (west of Temora) will be impacted? If the works are all within the road reserve, this should be OK.

Thanks

Tim

Tim O'Kelly
Area Manager, Riverina
West Branch
NSW National Parks & Wildlife Service

23 Neil Street, Moama NSW 2731
M 0400 258 232
W nationalparks.nsw.gov.au

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the traditional custodians of the land and we show our respect for elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

From: Stephen Cathcart <Steve.Cathcart@environment.nsw.gov.au>
Sent: Tuesday, 11 April 2023 10:34 AM
To: Tim O'Kelly <Tim.Okelly@environment.nsw.gov.au>
Subject: FW: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation

No issue from us for this one Tim. I will leave it to you to reply (unless I hear otherwise).

Cheers

Steve Cathcart
Manager (Murrumbidgee Area)
Southern Ranges Branch
NSW National Parks and Wildlife Service

PO Box 472, Tumut, NSW, 2720
T – 02 69477018
M – 0428 446510

From: Jesse Baaner <Jesse.Baaner2@transport.nsw.gov.au>
Sent: Tuesday, 11 April 2023 7:21 AM
To: Robin Mares <Robin.Mares@crownland.nsw.gov.au>
Cc: NPWS Area Mailbox - Riverina <npws.riverina@environment.nsw.gov.au>; Tim O'Kelly <Tim.Okelly@environment.nsw.gov.au>; Stephen Cathcart <Steve.Cathcart@environment.nsw.gov.au>
Subject: RE: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation

Thanks Robin, much appreciated.

Kind Regards,

Jesse Baaner
Project/Contract Manager
Project Services South
Regional and Outer Metropolitan
Transport for NSW

M 0447 537 228 **E** jesse.baaner2@transport.nsw.gov.au
Level 2-3, 193 Morgan Street Wagga Wagga NSW 2650

From: Robin Mares <Robin.Mares@crownland.nsw.gov.au>
Sent: Thursday, 6 April 2023 3:28 PM
To: Jesse Baaner <Jesse.Baaner2@transport.nsw.gov.au>

Cc: NPWS Area Mailbox - Riverina <npws.riverina@environment.nsw.gov.au>; Tim O'Kelly <Tim.Okelly@environment.nsw.gov.au>; Stephen Cathcart <Steve.Cathcart@environment.nsw.gov.au>
Subject: FW: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation

You don't often get email from robin.mares@crownland.nsw.gov.au. Learn why this is important

CAUTION: This email is sent from an external source. Do not click any links or open attachments unless you recognise the sender and know the content is safe.

Hi Jesse,

I am no longer working for National Parks, however I have forwarded on to the new area manager and the Riverian Area mailbox, along with the area manager for Riverina Highlands for them to respond.
Best of luck with the project, it sounds like a great outcome for the Riverina
Regards
Robin

Robin Mares *(he/him/his)*
Assistant Project Officer
Crown Lands
Department of Planning and Environment
M 0497 836 430 **E** robin.mares@crownland.nsw.gov.au

dpie.nsw.gov.au

Awabakal Country
6 Stewart Avenue, Newcastle NSW 2302
PO Box 2185, Dangar NSW 2309
www.crownland.nsw.gov.au www.dpie.nsw.gov.au

Working days Monday to Friday, 10:00am - 3:00pm. Outside of these hours I work flexibly.
I'm sending this message now because it's a good time for me, but I don't expect you to read, respond or action it outside your own regular working hours.

NSW GOVERNMENT

Department of Planning and Environment

NSW GOVERNMENT

I acknowledge the traditional custodians of the land and pay respects to Elders past and present. I also acknowledge all the Aboriginal and Torres Strait Islander staff working with NSW Government at this time.

Please consider the environment before printing this email.

From: Jesse Baaner <Jesse.Baaner2@transport.nsw.gov.au>
Sent: Thursday, April 6, 2023 3:15 PM
To: Robin Mares <Robin.Mares@crownland.nsw.gov.au>; NPWS Area Mailbox - Riverina <npws.riverina@environment.nsw.gov.au>
Subject: Burley Griffin Way RSR Safety Improvement - ISEPP Consultation

Good Afternoon Robin,

Transport for NSW is proposing to undertake road safety upgrade works along the Burley Griffin Way between Hume Highway and Irrigation Way and are currently preparing a Review of Environmental Factors (REF).
The proposed works would be adjacent to national parks and other areas reserved under the National Parks and Wildlife Act 1974.

I have attached an outline of the proposal and an ISEPP consultation letter for you review.

If you have any comments regarding the proposal please send them through to me by Friday 5th May 2023.

My contact details are found at the bottom of this email.

Kind Regards,

Jesse Baaner
Project/Contract Manager
Project Services South
Regional and Outer Metropolitan
Transport for NSW

M 0447 537 228 **E** jesse.baaner2@transport.nsw.gov.au
Level 2-3, 193 Morgan Street Wagga Wagga NSW 2650

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