TECHNICAL PAPER

01

Biodiversity development assessment report

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Biodiversity Development Assessment Report

N2NS Phase 2 Moree to Camurra North
September 2022

Project Number: 20-429

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BAM Certification

This Biodiversity Development Assessment Report has been prepared by an assessor accredited under the NSW Biodiversity Offset Scheme on the basis of the requirements and information provided under the Biodiversity Assessment Method (BAM). The table below details the submission date of this document, associated BAM-Calculator cases within the Biodiversity Offsets and Agreement Management System (BOAMS) and associated Geographic Information System (GIS) data.

Date	Document Title	BAM-C Case	Date Submitted	Signature
23/6/2021	Biodiversity Development Assessment Report Narrabri To North Star (N2NS) Phase 2 Moree to Camurra North	00017934/Revision 2 – Subject Land 00017934/Revision 3 – Development Footprint	28/09/2021	
19/08/2022	Biodiversity Development Assessment Report Narrabri To North Star (N2NS) Phase 2 Moree to Camurra North	Brigalow Belt South IBRA Bioregion - Case Number 00017933 – Assessment Case – 00017934 / Revision 14 – Subject Land / Revision 11 – Development Footprint Darling Riverine Plains – Case Number 00017933 – Assessment Case – 00032428 / Revision 0 – Brigalow Belt South IBRA Bioregion - Case Number 00017933 – Assessment Case – 00022515 / Scattered trees - Revision 2	23/08/2022	

Acronyms and Abbreviations

ARTC	Australian Rail Track Corporation
ASL	Above sea level
AWS	Automatic weather station
BAM	Biodiversity Assessment Method
BAM-C	BAM Calculator
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCS	(NSW) Biodiversity Conservation and Science Directorate
BDAR	Biodiversity Development Assessment Report
BS Act	*Biosecurity Act 2015* (NSW)
BOAMS	Biodiversity Offsets and Agreements Management System
BOM	Australian Bureau of Meteorology
BOS	Biodiversity Offset Scheme
CEEC	Critically endangered ecological community – as defined under relevant law applying to the proposal
CEMP	Construction Environment Management Plan
CSIRO	Commonwealth Scientific and Industrial Research
Cwth	Commonwealth
DAWE	(Cwth) Department of Agriculture, Water and the Environment [*former*]
DCCEEW	(Cwth) Department of Climate Change, Energy, the Environment and Water
DECC	(NSW) Department of Environment and Climate Change (Refer to BCD)
DoE	Department of the Environment (Cwth)
DPE	(NSW) Department of Planning and Environment
DPIE	(NSW) Department of Planning, Industry and Environment (Refer to DPE)
DPI	(NSW) Department of Primary Industries
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EIS	Environmental Impact Statement

EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
ESD	Ecologically Sustainable Development
FFMP	Flora and Fauna Management Plan
FM Act	*Fisheries Management Act 1994* (NSW)
GDE	Groundwater Dependent Ecosystem
GIS	Geographic Information System
ha	hectares
HBT	Hollow bearing tree
Heritage Act	*Heritage Act 1977* (NSW)
IBRA	Interim Biogeographic Regionalisation for Australia
KFH	Key Fish Habitat
km	kilometres
LEP	Local Environment Plan
LLS Act	*Local Land Services Act 2013* (NSW)
m	Metres
MNES	Matters of National Environmental Significance under the *EPBC Act* (c.f.)
N2NS	Narrabri to North Star Phase 2 Moree to Camurra North (the proposal)
NPW Act	*National Parks and Wildlife Act 1974* (NSW)
NSW	New South Wales
OEH	Formerly Office of Environment and Heritage, now BCS
PS SEPP	State Environmental Planning Policy (Planning Systems) 2021 (NSW)
REF	Review of Environmental Factors
RMAR	Rail maintenance access roads
SAII	Serious and Irreversible Impact
SEARs	Secretary's Environmental Assessment Requirements (NSW)
sp/spp	Species/multiple species
TBDC	Threatened Biodiversity Database Collection

TEC	Threatened Ecological Community
TSR	Travelling Stock Route
VIP	Vegetation Integrity Plot
VCS	Vegetation Classification System

Executive Summary

The Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narrabri to North Star (N2NS) Phase 2 Moree to Camurra North section of Inland Rail (the proposal). An environmental impact statement (EIS) for N2NS Phase 2 is being prepared and this Biodiversity Development Assessment Report (BDAR) has been prepared to support the EIS.

In 2017, an EIS was prepared for the entire N2NS section of Inland Rail. Since then, the alignment within what is now the N2NS Phase 2 area has changed. Specifically, modifications are required to upgrade a section of the corridor from Moree to the Camurra North hairpin, including the crossings of the Mehi and Gwydir Rivers. The upgrade involves changes to the vertical and horizontal alignment to manage flooding as well as a new greenfield section in the north to allow for a bypass of the current hairpin turn at Camurra (the Camurra Bypass). The original N2NS EIS did not assess these changes and, therefore, requires separate assessment.

This Biodiversity Development Assessment Report (BDAR) has been prepared by an accredited Biodiversity Assessment Method (BAM) Assessor employed by NGH on behalf of ARTC and engaged by the Inland Rail Design Joint Venture (IRDJV) to satisfy the assessment requirements of the NSW Biodiversity Offsets Scheme (BOS) and BAM 2020 as set out under the NSW *Biodiversity Conservation Act 2016* (BC Act) for the upgrade to N2NS Phase 2. This report follows the field work methodologies and assessment format required by the BAM. Comprehensive mapping and field surveys were completed in accordance with the requirements of the BAM.

In 2022, the BDAR was updated to separate development impacts on biodiversity into the two bioregions that occur within the N2NS Phase 2 proposal area, as classified by the Interim Biogeographic Regionalisation for Australia (IBRA). The two IBRA bioregions are the Brigalow Belt South and the Darling Riverine Plains. The Northern Outwash IBRA subregion occurs on the proposal area within the Brigalow Belt South IBRA bioregion, and the Castelreagh-Barwon IBRA subregion occurs on the proposal area within the Darling Riverine Plains bioregion.

The proposal involves the removal of the following native vegetation:

- Maximum clearing of approximately 7.15 hectares (ha) of Plant Community Type (PCT) 27 *Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion* woodland resulting in an offset calculation of 155 Ecosystem Credits. All of this PCT occurs within the Northern Outwash IBRA subregion.
    - Listed as Endangered under the BC Act - Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregion.
    - Listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) – Weeping Myall Woodlands
- Maximum clearing of approximately 12.35 ha of PCT 36 *River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion* resulting in an offset calculation of 237 Ecosystem Credits. All of this PCT occurs within the Northern Outwash IBRA subregion.
    - Not listed under the BC Act
    - Not listed under the EPBC Act
- Maximum clearing of approximately 77.76 ha of PCT 52 *Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion* resulting in an offset calculation of 3195 Ecosystem Credits. Most of this PCT (60.88 ha) occurs within the Castlereagh-Barwon IBRA subregion (2844 Ecosystem Credits) and 16.88 ha occurs within the Northern Outwash IBRA subregion (351 Ecosystem Credits).

  - Not listed under the BC Act
  - Listed as Critically Endangered under the EPBC Act – Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland and the Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin
- Maximum clearing of approximately 1.04 ha of PCT 78 *River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion* resulting in an offset calculation of 26 Ecosystem Credits. All of this PCT occurs within the Castlereagh-Barwon IBRA subregion
- Maximum clearing of approximately 0.77 ha of PCT 71 C*arbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion* resulting in an offset calculation of 21 Ecosystem Credits. All of this PCT occurs within the Northern Outwash IBRA subregion.
  - List as Endangered under the BC Act - Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands
- Maximum clearing of approximately 0.64 ha of PCT 56 *Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW* resulting in an offset calculation of 10 Ecosystem Credits. All of this PCT occurs within the Northern Outwash IBRA subregion.
  - List as Endangered under the BC Act - Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands
  - Listed as Endangered under the EPBC Act – Poplar Box Grassy Woodland on Alluvial Plains
- Removal of one scattered tree generating one (1) biodiversity credit. The scattered tree occurs within the Northern Outwash IBRA subregion and is associated with PCT 27 (Weeping Myall open woodland*)*.
- An offset calculation of 1369 species credits in the Northern Outwash IBRA subregion for the Koala, Bristle-faced Free-tailed Bat, Finger Panic Grass and Creeping Tick-trefoil that were observed onsite during surveys.
- An offset calculation of 4737 species credits in the Castlereagh-Barwon IBRA subregion for the Koala, Finger Panic Grass and Creeping Tick-trefoil that were observed onsite during surveys.
- An offset calculation of 360 species credits for the Little Eagle that has been assumed to be present in the Northern Outwash IBRA subregion
- An offset calculation of 4092 species credits for species that have been assumed to be present on the subject land in the Castlereagh-Barwon IBRA subregion and may be impacted by the proposal (Red-tailed Black-Cockatoo, Black-breasted Buzzard, Little Eagle, Winged Peppercress, Major Mitchell's Cockatoo, Braid Fern, Superb Parrot and Masked Owl)
- The removal of 35 habitat trees within or in close proximity to the development footprint, and, as such, may require removal by the proposal, however further avoidance of habitat trees is anticipated during further detailed design.

The subject land is a largely cleared and fragmented landscape. Riparian areas are generally in moderate condition and fundamental to the movement of fauna in the region, inclusive of the smaller, more ephemeral tributaries i.e., Duffys Creek. There is a Travelling Stock Route (TSR) (Camurra to Mia TSR), which links up the Mehi and Gwydir river systems and is an important corridor for the Koala and other species to move between the two rivers. The development footprint has been designed to reduce impacts to riparian areas as far as practicable. Disturbance or placement of facilities/stockpiles/compounds etc. within the Camurra to Mia TSR will be avoided if possible.

An additional assessment of impacts of N2NS Phase 2 on NSW listed entities also listed under the EPBC Act was completed. These impacts have been considered in accordance with the EPBC guidelines and are considered likely to be significant. Referral is considered necessary to the Commonwealth Environment

Minister where a significant impact is considered practicable or where a significant impact remains uncertain, and referral is recommended for abundant caution.

Avoidance and minimisation of impacts has been achieved via the following steps:

- The current proposal incorporates an upgrade of the existing rail line to accommodate the Inland Rail requirements for a 30-tonne axle load structural loading and improved flood immunity. Where practicable to do so, the design of the proposal has been sited within the existing rail corridor with a commitment to upgrading the existing rail line. As a result, the overall development footprint of the proposal is reduced through use of the existing corridor that is regularly subject to disturbances relating to the rail network and the surrounding agricultural activities.
- It is proposed as far as practicable, to house laydown areas, construction compounds and other ancillary facilities in areas containing wholly exotic flora (Category 1 - Exempt Land) or where impacts to biodiversity would be considered negligible.
- Biodiversity impacts have been considered as a worst-case scenario on a preliminary design, that will be revised in further detailed design, with a reduction of impacts to higher quality vegetation and habitat where practicable. Further design options will be considered against key environmental, social and economic criteria.
- Mitigation and management measures will be put in place to adequately address impacts associated with the proposal, both direct and indirect

Under the EPBC Act, a person must not take an action that has, will have or is likely to have a significant impact on any matters of national environmental significance (MNES) without approval from the Australian Government Minister for the Environment (the Minister). Proposed ‘actions’ that have the potential to significantly impact on matters of MNES must be referred to the Australian Minister for the Environment and Energy for assessment. The purpose of the referral process is to determine whether or not a proposed action will need formal assessment and approval under the EPBC Act. If the Minister determines that a referred project is a ‘controlled action’ under the EPBC Act, the approval of the Minister would be required.

An EPBC referral was undertaken for the Koala, Murray Cod and Five-claw Worm Skink due to unknown impacts or a perceived significant impact. A significant impact for the remaining species was not considered likely, however, EPBC Act referral for the species was undertaken for legal certainty. N2NS Phase 2 has been determined as a controlled action (EPBC 2020/8689), and requires approval by the Department of Climate Change, Energy, the Environment and Water (DCCEEW).

1. Introduction

The Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the N2NS Phase 2 Moree to Camurra North (N2NS Phase 2) section of Inland Rail (the proposal). An environmental impact statement (EIS) for N2NS Phase 2 is being prepared and this Biodiversity Development Assessment Report (BDAR) has been prepared to support the EIS.

In 2017, an EIS was prepared for the entire N2NS section of Inland Rail. Since then, the alignment within what is now the N2NS Phase 2 area has changed. Specifically, modifications are required to upgrade a section of the corridor from Moree to the Camurra North hairpin, including the crossings of the Mehi and Gwydir Rivers. The upgrade involves changes to the vertical and horizontal alignment to manage flooding as well as a new greenfield section in the north to allow for a bypass of the current hairpin turn at Camurra (the Camurra Bypass). The original N2NS EIS did not assess these changes and, therefore, separate assessment is required.

1.1. The Proposal

The proposal involves an upgrade of approximately 13.7 kilometres (km) of existing rail corridor between Moree and Camurra North, in addition to the construction of about 1.6 km of realigned rail corridor within a greenfield area.

The key features of the proposal are:

- enhancement of about 13.7 km of existing track through minor adjustments to the vertical and horizontal alignment, and the construction of about 1.6 km of new rail corridor, including rail embankments
- demolition and reconstruction of eight underbridges, at the Mehi River, Gwydir River, Skinners Creek, Duffys Creek and at four other un-named water courses
- installation of approximately 1,100 new flood relief box culverts along the formation
- three new signalised level crossings at Gwydirfield Road, the Rocks Road and Back Pally Road replacing the existing level crossings
- realignment and changes to six private level crossings (including closure of one private level crossing)
- new turnout between the Gwydir River and Back Pally Road, immediately north of the new Gwydir underbridge, to provide a connection to the Inland Rai l / North Star line to the east and the Weemelah line to the west
- decommissioning and removal of the Camurra hairpin and associated formation through the construction of the greenfield Camurra Bypass, providing connections to the existing rail lines to the east and the Weemelah line to the west
- reconstruction of a new rail spur for the Weemelah line.

Associated works would include installation of signalling systems, signage, fencing, drainage, the relocation of services and utilities where necessary and the formation of rail maintenance access roads (RMARs) within the rail corridor adjacent to the line. The construction and operation of the proposal would also require the following ancillary facilities:

- construction access and haul roads linking to the surrounding public road network
- construction storage and laydown areas
- associated earthworks for the construction of pads for piling rigs and cranes at underbridge locations.

Additional ancillary facilities could also include mobile batch plant, accommodation for construction workers and construction water supply and storage.

The proposal would require temporary occupation and permanent acquisition of land along the alignment. A total of 27 lots would be impacted by permanent land acquisition, including approximately 4 hectares (ha) of private land within 12 lots and 9 ha of Crown Land within 15 lots.

NGH Pty Ltd (NGH) was engaged by Inland Rail Design Joint Venture (IRDJV) on behalf of ARTC as the technical lead for delivery of the BDAR.

This BDAR has been prepared by an accredited Biodiversity Assessment Method (BAM) assessor employed by NGH on behalf of the proponent to satisfy the assessment requirements of the NSW Biodiversity Offsets Scheme (BOS) and BAM 2020, as set out under the *Biodiversity Conservation Act 2016* (BC Act).

The following terms are used in this document in accordance with BAM 2020:

- **Assessment area -** All land within 500 metres (m) of the outside edge of the boundary of the development footprint. This is the BAM 2020 buffer zone requirement for linear developments (in contrast to 1500 m buffer zone for non-linear developments).This equates to approximately 2746 hectares.
- **Development footprint** – The area of land that is directly impacted by the proposal. This includes the existing rail footprint, new rail realignment, replacement bridges and associated construction areas (i.e. compounds, stockpiles). The development footprint is approximately 143 ha.
- **Subject land** – the subject land is a 100 m wide corridor, within which, and following detailed design, the development footprint will be sited together with areas of land that are subject to potential direct and indirect impacts from the proposal. This equates to approximately 692 ha and is the study area for this BDAR. The subject land (including the development footprint) is the area where the BAM has been applied.

1.1.1. Site location

The proposal is described as the area north of Moree towards the Camurra locality, and generally within the existing rail corridor and adjacent to the Newell Highway, 15 km northeast of Moree and 60 km southwest of North Star, NSW. The proposal is located within the Moree Plains Local Government Area (Figure 1-1). As previously mentioned, the majority of the proposal is sited within the existing rail corridor, however, portions of the proposal will occur on Crown Land being Travelling Stock Routes (TSR), as well as the potential for ancillary facilities to be located on private landholdings.

1.1.2. Site description

The majority of the subject land has been cleared of native vegetation and cultivated for agriculture, which is the dominant land use in the area, with the vast majority consisting of irrigated cropping, horticulture and grazing of sheep and cattle. However, the proposal does cross and impact areas of native vegetation, including the following:

- Mehi and Gwydir Rivers and tributaries – Riparian areas dominated by River Red Gum *Eucalyptus camaldulensis.*
- TSR – Contains areas of natural grassland, Cooba *Acacia salicina* and Weeping Myall *Acacia pendula* woodlands, however, generally dominated by naturalised Mimosa *Vachellia farnesiana* and exotic species such as African Boxthorn *Lycium ferocissimum* and Tiger Pear *Opuntia aurantiaca.*
- Road reserve – Generally adjacent to the Newell Highway and other minor roads; includes a combination of native species and environmental weeds such as Johnson Grass *Sorghum halepense* and key emerging weed species in the region such as Coolatai Grass *Hyparrhenia hirta* and Sabi Grass *Urochloa mosambicensis*.
- Urban areas – Inclusive of the outer areas of the Moree township. Species dominated by planted natives and exotics such as Jacaranda *mimosifolia* and Silky Oak *Grevillea robusta*.

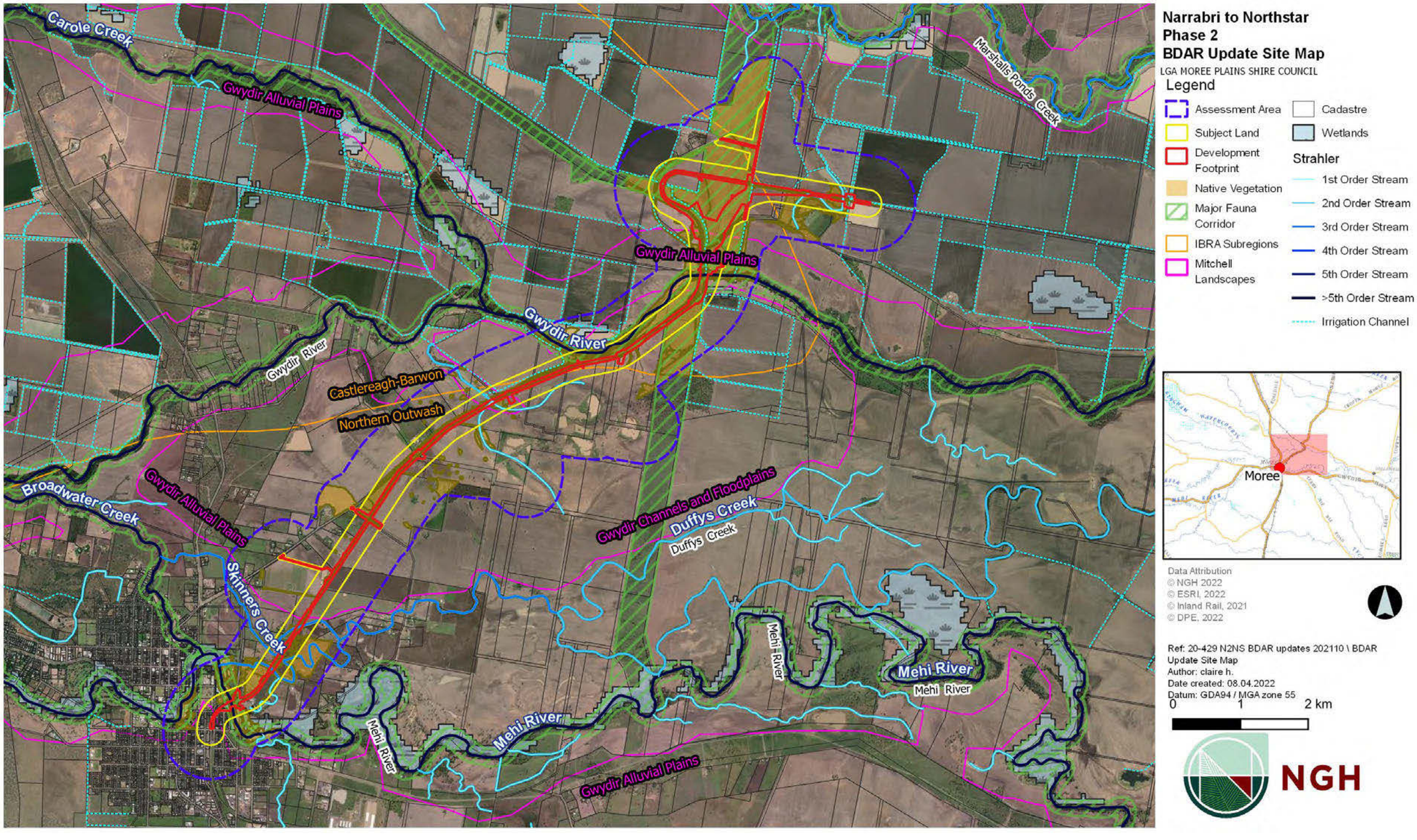


Figure 1-1 Site map

1.2. Study Aims

This BDAR assesses the proposal for potential impacts to biodiversity in accordance with the BAM. The aim of this BDAR is to address the requirements in accordance section 7.9 of the BC Act and the Secretary's Environmental Assessment Requirements (SEARs). As the proposal is classified as Critical State Significant Infrastructure (CSSI) in accordance with the State Environmental Planning Policy (Planning Systems) 2021 (PS SEPP), inclusion in the BOS is mandatory, and a BDAR is necessary to meet the requirements of the BC Act.

This BDAR also addresses the assessment requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), refer to Section 7.4.

1.3. Source of Information Used in the Assessment

The following information sources were used in the development of this BDAR:

- Proposal layers, construction methodology and concept designs provided by Inland Rail and WSP
- Australian Government's Species Profiles and Threats (SPRAT) database http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl
- NSW Threatened Species Profiles http://www.environment.nsw.gov.au/threatenedspeciesapp/ and www.environment.nsw.gov.au/AtlasApp/UI_Modules/
- Department of Primary Industries (DPI) profiles of threatened species, population, and ecological communities
- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) Protected Matters Search Tool

  Accessed online at http://environment.gov.au/epbc/protected-matters-search-tool
- Australia's Interim Biogeographic Regionalisation for Australia (IBRA) Bioregions and sub-bioregions. Accessed March 2022 http://environment.gov.au/land/nrs/science/ibra/australias-bioregions-maps
- Commonwealth Scientific and Industrial Research Organisation's (CSIRO) Atlas of Living Australia https://www.ala.org.au/
- Department of Environment and Climate Change NSW (DECC) (2002). Descriptions for NSW (Mitchell) Landscapes, Version 3
- Department of the Environment, Water Heritage and the Arts (DEWHA) (2009). Weeping Myall Woodlands. A nationally threatened ecological community *Environment Protection and Biodiversity Conservation Act 1999.* Policy Statement 3.17. Commonwealth of Australia.
- NSW Department of Planning and Environment (DPE) - Biodiversity Assessment Method (BAM) calculator (http://www.environment.nsw.gov.au/bbccapp/ui/mynews.aspx)
- Biodiversity Assessment Method Operational manual Stage 1 and Stage 2 (DPIE 2020)
- NSW BioNet threatened biodiversity database (DPE 2022e)

  Accessed online via login at http://www.bionet.nsw.gov.au/
- NSW BioNet Vegetation Classification Database (DPE 2022c)

  Accessed online via login at http://www.environment.nsw.gov.au/NSWVCA20PRapp/default.aspx
- Vegetation Classification System NSW (VCS) Mapping (DPE 2022f).

  Accessed online at https://www.seed.nsw.gov.au/
- NSW Biodiversity Assessment Method 2020 (DPIE 2020)

- NSW Government SEED Mapping

  Accessed online at https://www.seed.nsw.gov.au/
- NSW Biodiversity Values Map
  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=BVMap
- NSW Native Vegetation Regulatory Map
  https://www.lmbc.nsw.gov.au/Maps/index.html?viewer=NVRMap
- Aerial imagery of historical land use (Sourced from Google Earth and Spatial Services Delivery)
- 2017 Land Use Dataset v1.2, Australian Land Use and Management (ALUM) Classification Version 7 (DPIE, 2020)
- NSW Woody vegetation extent and Foliage Projective Cover (FPC) 2011 (DPIE 2015)
- Why do fish need to cross the road? Fish passage requirements for waterway crossings (Fairfull & Witheridge, 2003)
- Aquatic Ecology in Environmental Impact Assessment (Marcus Lincoln Smith 2003)
- NSW Guide to Surveying Threatened Plants (DPIE 2020)
- Species credit threatened bats and their habitats (OEH 2018)
- NSW Threatened Species Scientific Committee final determinations (DPE, 2022)

  Accessed online at: https://www.environment.nsw.gov.au/topics/animals-and-plants/threatened-species/nsw-threatened-species-scientific-committee/determinations/nsw-threatened-species-scientific-committee-final-determinations

1.4. Accredited Assessors

The following BAM accredited assessors conducted the assessments and / or undertook the reporting:

- Mitch Palmer - Principal Ecologist and Botanist (BAM Assessor BAAS 17051)
- Aleksei Atkin – Technical Lead - Ecology (BAM Assessor BAAS 17093)
- Claire Hewitt – Senior Ecologist – Ecology (BAM Assessor BAAS 20009)
- Julie Gooding – Senior Ecologist (BAM Assessor 18074)

2. Landscape Features

2.1. IBRA Bioregions and Subregion

Interim Biogeographic Regionalisation for Australia (IBRA) bioregions are large, geographically distinct areas of land with common characteristics such as geology, landform patterns, climate, ecological features, and flora and fauna communities. The majority of the subject land falls in the Northern Outwash subregion within the Brigalow Belt South bioregion, however, a portion of the subject land, nearer the northern (Camurra) end, falls in the Castlereagh-Barwon subregion within the Darling Riverine Plains bioregion. The Northern Outwash and Castlereagh-Barwon subregions are characterised by Tertiary and Quaternary alluvial fans, plains and stream terraces containing red loams and heavy brown clays. Dominant vegetation includes Poplar Box *Eucalyptus populnea*, Wilga *Geijera parviflora* and Budda *Eremophila mitchellii* on red soils, and Belah *Casuarina cristata*, Weeping Myall *Acacia pendula* and Brigalow *Acacia harpophylla* on brown clays. Riparian areas are dominated by River Red Gum *E. camaldulensis* and Coolabah *E. coolabah*, with Carbeen *Corymbia tessellaris* occurring on old sandy alluvial lenses of paleochannels.

Two separate cases were created in the BAM-Calculator (BAM-C):

- Northern Outwash subregion (00017933/BAAS20009/19/000017934)
- Castlereagh-Barwon subregion (00031835/BAAS20009/22/00031837).

This is due to technical issues in the Biodiversity Offsets and Agreement Management System (BOAMS) preventing additional BAM-C assessment cases from being created from the original BOAMS case (00017933) submitted with the N2NS Phase 2 BDAR in September 2021.

2.2. NSW Landscape Regions and Area

The subject land is located within the Gwydir Alluvial Plains and Gwydir Channels and Floodplains Mitchell Landscape in the Northern Outwash subregion. Gwydir Alluvial Plains has been used in the BAM-C as it is the Mitchell Landscape in which the largest proportion of impact will occur.

The subject land is located in the Croppa Clay Plains Mitchell Landscape in the Castlereagh-Barwon subregion.

2.3. Native Vegetation

As determined by Geographic Information System (GIS) mapping from available aerial imagery and Namoi / Border Rivers Gwydir NSW Vegetation Mapping, about 598.72 ha of native vegetation (woody and non-woody) occurs in the assessment area (Figure 2-1). Of this, 304.96 ha occurs in the Northern Outwash subregion and 294.10 ha occurs in the Castlereagh-Barwon subregion. The vegetation in the subject land includes riparian areas, grassy woodland communities, and natural grassland communities in varying condition classes.

2.4. Cleared Areas

Cleared areas in and adjacent to the subject land primarily consist of flat or slightly undulating agricultural land that has been historically and heavily modified, with sparse patches of fragmented vegetation remaining within riparian areas and TSRs.

Figure 2-1 Location map

2.5. Rivers and Streams

Four (4) rivers and streams within the subject land are listed as areas of high biodiversity value under the *Biodiversity Conservation Regulation 2017* (BC Regulation) – Mehi River, Gwydir River, Duffys Creek and Skinners Creek. Examples of these aquatic habitats are provided in Figure 2-2, Figure 2-3 and Figure 2-4. The Mehi and Gwydir Rivers are mapped as key fish habitat under the NSW *Fisheries Management Act 1994* (FM Act). In addition to this, a further five ephemeral tributaries, excluding irrigation channels, are within the subject land (Figure 2-1).

An aquatic assessment was undertaken by Freshwater Ecology for the proposal in order to inform the impact assessment and identification of mitigation strategies for the proposal. This is discussed further in Section 7.3.4 (refer Freshwater Ecology, 2020).

Tests of Significance and Assessments of Significance for relevant listed threatened species and ecological communities under the *Fisheries Management Act 1994 and* EPBC Act have been undertaken utilising data from the aquatic ecology assessment (Appendix H and H.1) and discussed further in Section 7.3.4 and Section 8.1.

Figure 2-2 Gwydir River aquatic habitat.

Figure 2-3 Mehi River riparian habitat.

Figure 2-4 Duffy Creek aquatic habitat.

2.6. Wetlands

Approximately five (5) irrigation dams, farm dams and irrigation channels occur within the subject land. The nearest important wetland listed under the EPBC Act is the Gingham and lower Gwydir Wetlands, which occur 30 – 40 km downstream of the subject land.

Wetland data was obtained during aquatic ecology surveys (Freshwater Ecology, 2020). An unnamed wetland occurs on site and was recorded to have a maximum water depth of 0.5m, low species diversity and low canopy cover of River Red Gums (Freshwater Ecology, 2020).

An ephemeral wetland with a mean water depth of 0.3 m was recorded on site, with a maximum riparian vegetation height of 30 m. The mesohabitat composition was noted as 100% shallow pool. Some detritus was noted (Freshwater Ecology, 2020). Wetlands and riparian corridors are shown on Figure 2-5 and Figure 2-6.

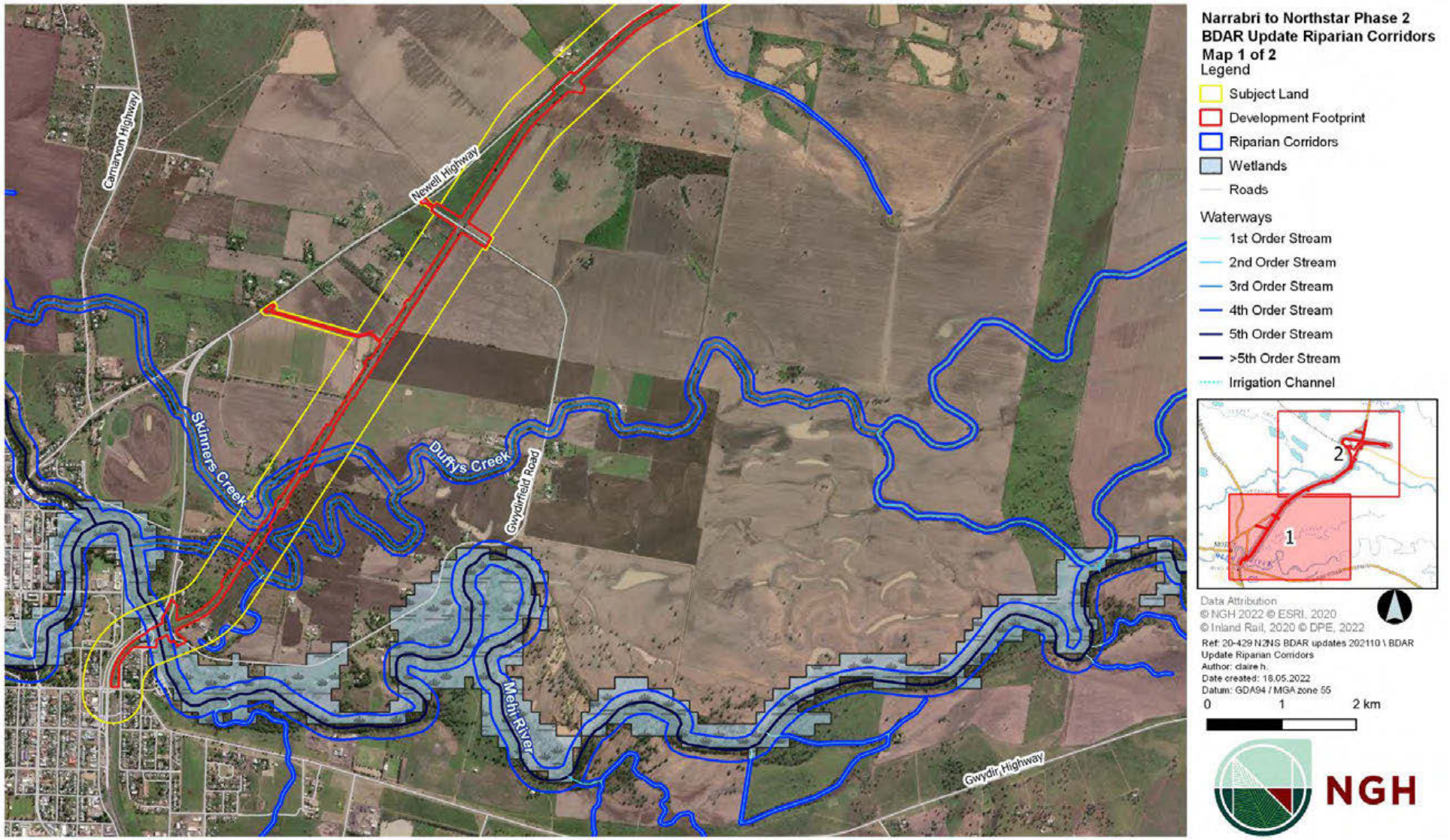


Figure 2-5 Riparian Corridors Map 1 of 2

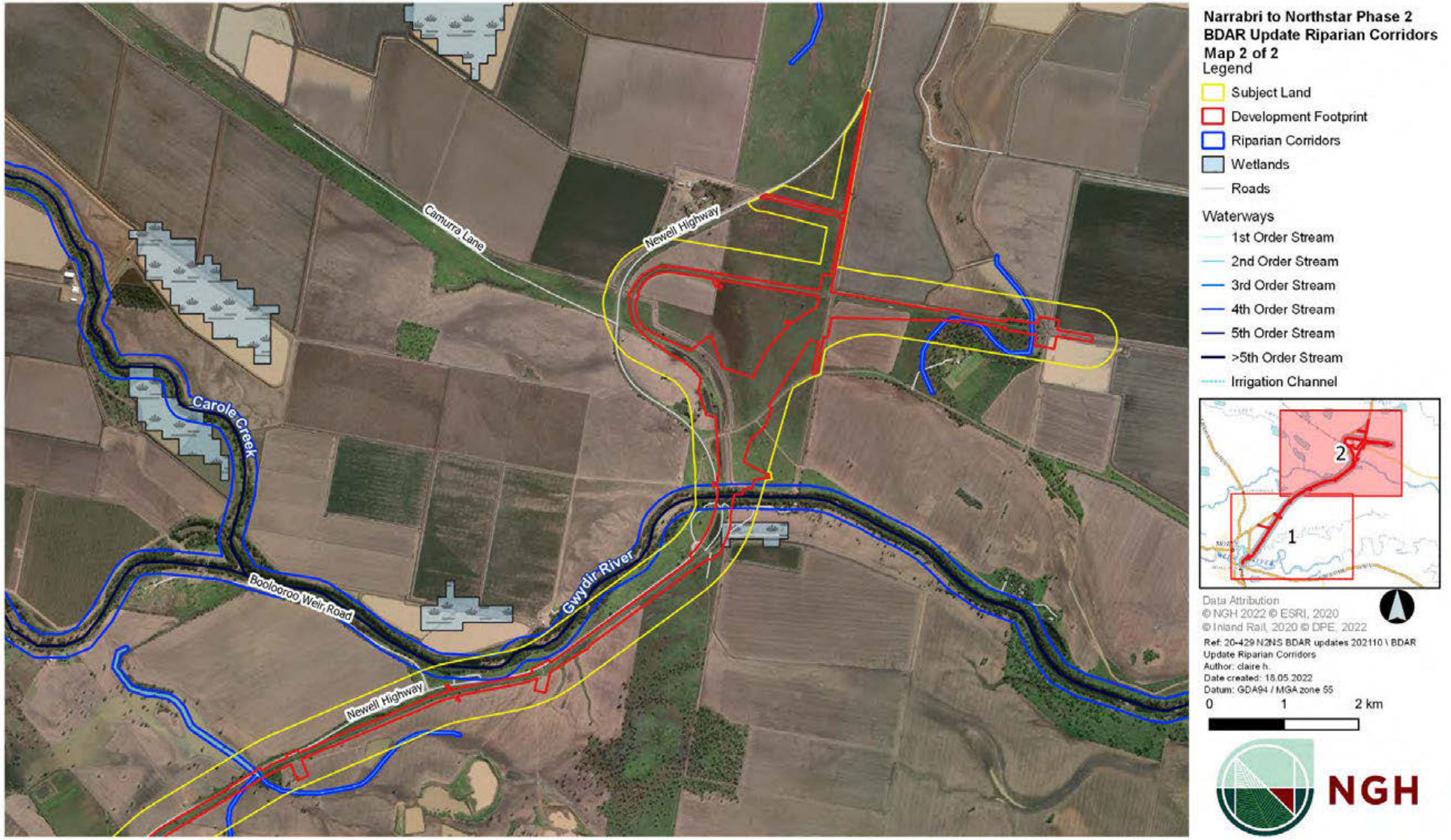


Figure 2-6 Riparian Corridors Map 2 of 2

2.7. Connectivity Features

Significant regional connectivity features occur within or adjacent to the subject land. Connectivity features and corridors identified in Figure 2-1 have been mapped by NGH based on site inspection by BAM accredited assessors, and utilising aerial photographic interpretation. Being a largely cleared and fragmented landscape, riparian areas including the Mehi and Gwydir Rivers are generally in reasonable condition and fundamental to the movement of fauna in the region, inclusive of the some of the smaller more ephemeral tributaries i.e., Duffys Creek. Additionally, a TSR (Camurra to Mia Mia) (Figure 2-1), which links up the two river systems, is an important corridor, and although some sections are sparse in terms of trees, is critical for the Koala and other common and threatened fauna species to move throughout the landscape. Outside of these areas, there are small pockets of remnant vegetation and grasslands within council land, private properties and road reserves that provide some habitat connectivity for more disturbance tolerant and mobile species to travel across the landscape.

2.8. Areas of Geological Significance

No karsts, caves, crevices or cliffs or other areas of geological significance occur in or adjacent to the subject land or assessment area.

2.9. Areas of outstanding biodiversity value

No areas of outstanding biodiversity value occur within the subject land or assessment area.

2.10. Site Context Components

Method applied

The proposal conforms to the definition of a linear-based development under the BAM. Therefore, the linear-based development assessment methodology has been used in this BAM assessment.

Percent Native Vegetation Cover

The percent of native vegetation cover within the 500 m native vegetation assessment area (Figure 2-1) surrounding the subject land was calculated to be 22%. This percentage is based on the area of native vegetation (woody and non-woody) within the 500 m native vegetation assessment area, as calculated using GIS mapping, aerial photography and site assessment. Site assessment of vegetation in February 2022 found that vegetation mapping closely aligned with Namoi / Border Rivers Gwydir NSW Vegetation Mapping.

The total area of the 500 m assessment area is 2746.32 ha, of which 304.96 ha (including scattered trees) occurs in the Northern Outwash subregion (11% percent native vegetation cover) and 294.10 ha (including scattered trees) occurs in the Castlereagh-Barwon subregion (11%). These values were entered into the BAM-C assessment cases for the proposal. This puts the percent native vegetation cover into the cover class of >10%-30% in each subregion.

3. Native Vegetation

3.1. Native Vegetation Extent

The subject land contains approximately 306 ha of native vegetation, including scattered trees. Of this, 112 ha occurs in the Northern Outwash subregion and 193 ha occurs in the Castlereagh-Barwon subregion. Of this, 99.71 ha of native vegetation falls within the development footprint and is subject to direct impacts from the proposal, with 37.79 ha situated within the Northern Outwash subregion and 61.92 ha in the Castlereagh-Barwon subregion. The remaining 386 ha in the subject land, and 43.3 ha in the development footprint, contains non-native and non-local native vegetation, urban and industrial areas subject to potential direct and indirect impacts from the proposal. Refer to Figure 3-1 and Figure 3-2 for the native vegetation extent within the assessment area and subject land.

The subject land is comprised of:

- 17.31 ha of PCT 27: Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (mapped as Weeping Myall Open Woodland) with the total area occurring in the Northern Outwash subregion.
- 39.48 ha of PCT 36: River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion (mapped as River Red Gum Forest) with the total area occurring in the Northern Outwash subregion.
- 220.28 ha of PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (mapped as Queensland Bluegrass and Mitchell Grass Grassland) with 39.83 ha occurring in the Northern Outwash subregion and 180.43 ha occurring in the Castlereagh-Barwon subregion.
- 6.94 ha of PCT 56: Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (mapped as Poplar Box Belah Woodland) with the total area occurring in the Northern Outwash subregion.
- 8.2 ha of PCT 71: Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion (mapped as Carbeen White Cypress Pine) with the total area occurring in the Northern Outwash subregion.
- 12.4 ha of PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (mapped as River Red Gum Riparian Woodland) with the total area occurring in the occurring in the Castlereagh-Barwon subregion.
- 0.34 ha of scattered trees of which 0.03 ha is best placed in PCT 27 (Weeping Myall Open Woodland), 0.157 ha is PCT 36 (River Red Gum Forest) and 0.16 ha is PCT 71 (Carbeen White Cypress Pine).

Large cropping areas were cleared or fallowed during the field assessment in 2019 and 2020, with persistent drought conditions limiting cropping opportunities. In 2022, following wetter conditions, the traditional crops of cotton and wheat dominated the land use within the subject land and broader region. Much of the more natural areas consist of the naturalised Mimosa, as well as exotic flora, such as such as African Boxthorn *Lycium ferocissimum*, Tiger pear *Opuntia aurantiaca* and environmental weeds such as such as Cathead *Tribulus terrestris,* Johnson grass *Sorghum halepense* and Buffel Grass *Cenchrus ciliaris* commonly occuring.

Figure 3-1 Native vegetation extent within the assessment area and subject land Map 1 of 2

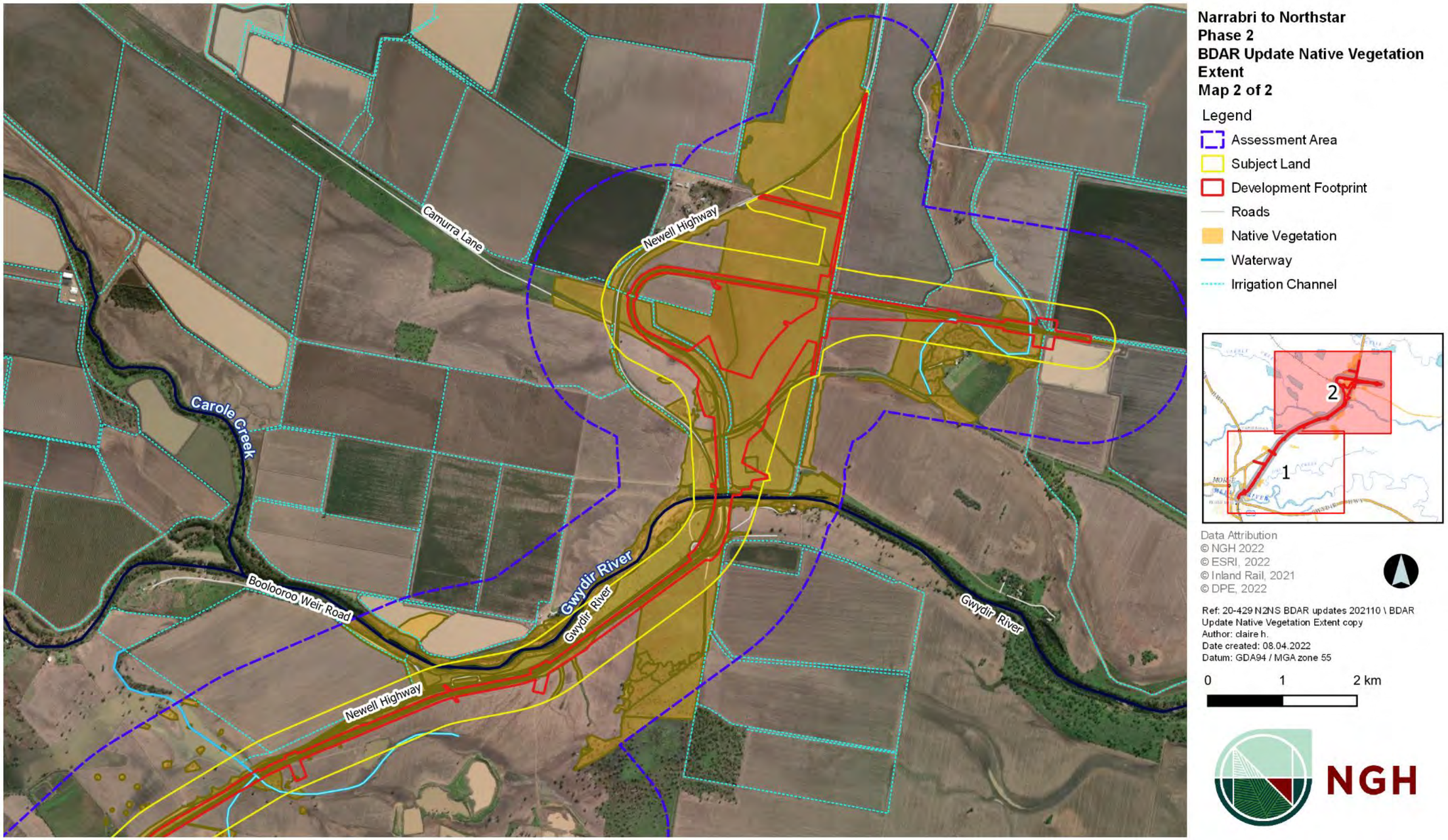


Figure 3-2 Native vegetation extent map within the subject land and assessment area Map 2 of 2

3.2. Land Category Assessment

In accordance with section 6.8(3) of the BC Act, the BAM excludes the assessment of any clearing of native vegetation and loss of habitat on Category 1 - Exempt Land (within the meaning of Part 5A of the *Local Land Services Act 2013* (LLS Act), except for any impacts prescribed by the regulations under section 6.3 of the BC Act. Additionally, under section 1.5.1 of the BAM, biodiversity values that do not need to be assessed under the BAM include: *(d) biodiversity values associated with the assessment of the impacts of any clearing of native vegetation and loss of habitat on category 1-exempt land (within the meaning of Part 5A of the LLS Act), other than the additional biodiversity impacts in accordance with clause 6.1 of the BC regulation*.

A land category assessment has been undertaken and is included in Appendix A. The land category assessment determined that the subject land consists of the following:

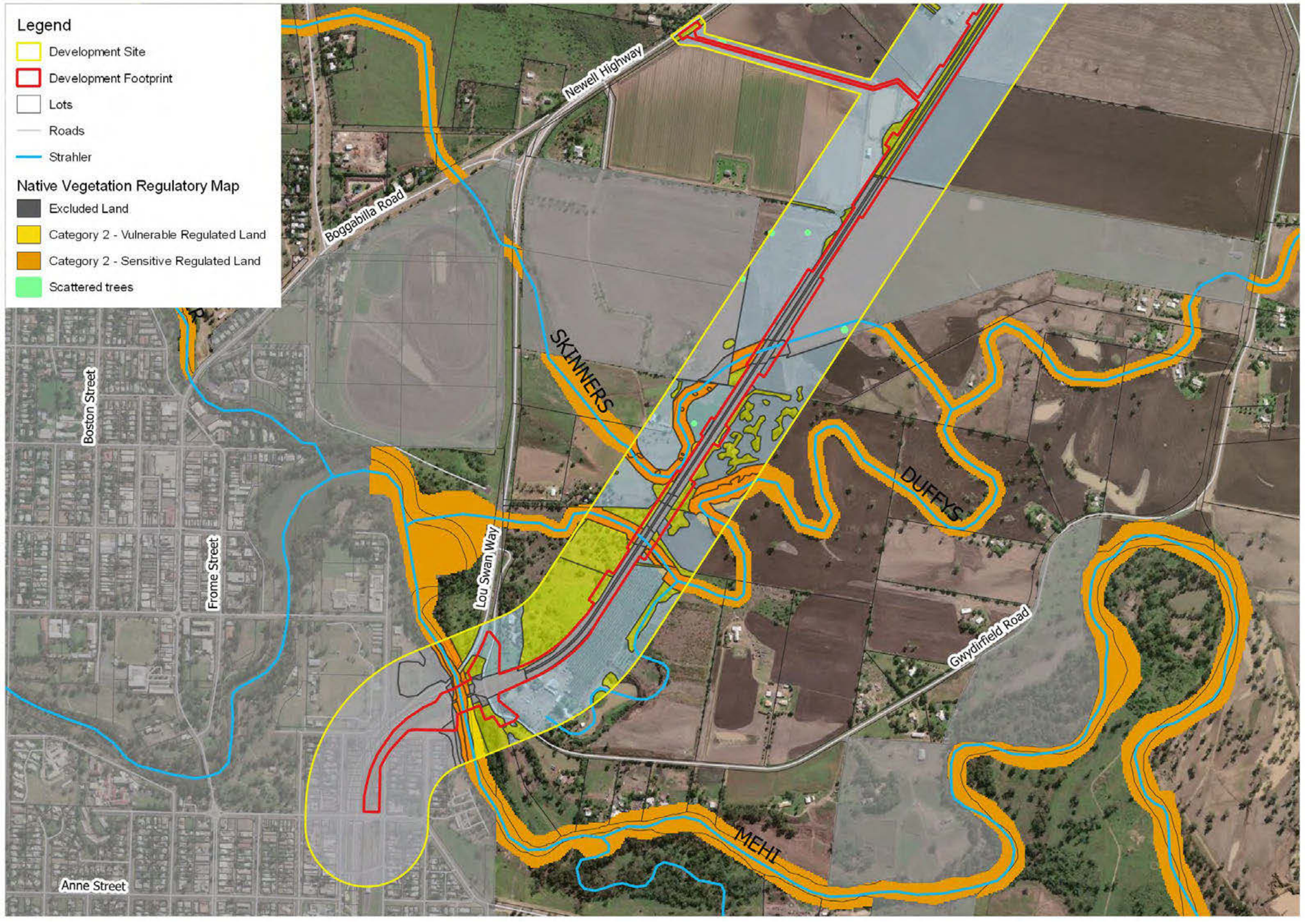
- 334.33 ha of Category 1 – Exempt Land (predominantly areas of cropping and modified grazing paddocks)
- 286.65 ha of Category 2 – Regulated Land (areas of native vegetation, TSRs, grazing native vegetation and planted native vegetation)
- 19.66 ha of Category 2 – Vulnerable Regulated Land (riparian areas and associated vegetation)
- 0.344 of Category 2 – Regulated Land (scattered trees)
- 51.38 ha of Excluded Land (urban and industrial areas)

Based on methods described in the land category assessment (Appendix A), there is evidence to suggest that large areas of the subject land have been under regular rotational cropping or pasture improvement since at least 1990, and these areas have been determined as Category 1 – Exempt land. This is supported by recent and historical imagery, 2017 Land Use Mapping data and site assessment. These areas include:

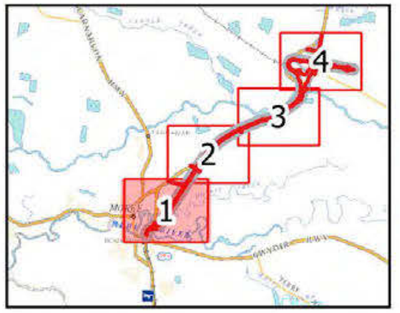
- Areas of cropping, modified grazing paddocks and horticultural plantings.
- Irrigation dams and constructed channels.
- Areas surrounding rural residences and farm buildings containing exotic plantings and non-local, native species.
- Infrastructure – roads, dwellings and agricultural infrastructure.

These Category 1 – Exempt Land areas, in addition to rivers including aquatic areas of the Mehi and Gwydir Rivers (except Murray Cod habitat), have been excluded from the BAM assessment, except where prescribed impacts are relevant and discussed in Section 7.3.

Areas of Category 2 – Regulated Land, including Category 2 – Vulnerable Regulated Land and areas of Excluded Land containing native vegetation have been assessed using the BAM. Refer to Figure 3-3.



Narrabri to Northstar
Phase 2
LCA Update - Proposed Land Categorisation Map 1 of 4



Data Attribution
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Ref: 20-429 N2NS BDAR updates 202110 \ LCA Update - Proposed Land Categorisation
Author: claire h.
Date created: 30.06.2022
Datum: GDA94 / MGA zone 55

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Figure 3-3 Proposed land categorisation of the subject land Map 1 of 4

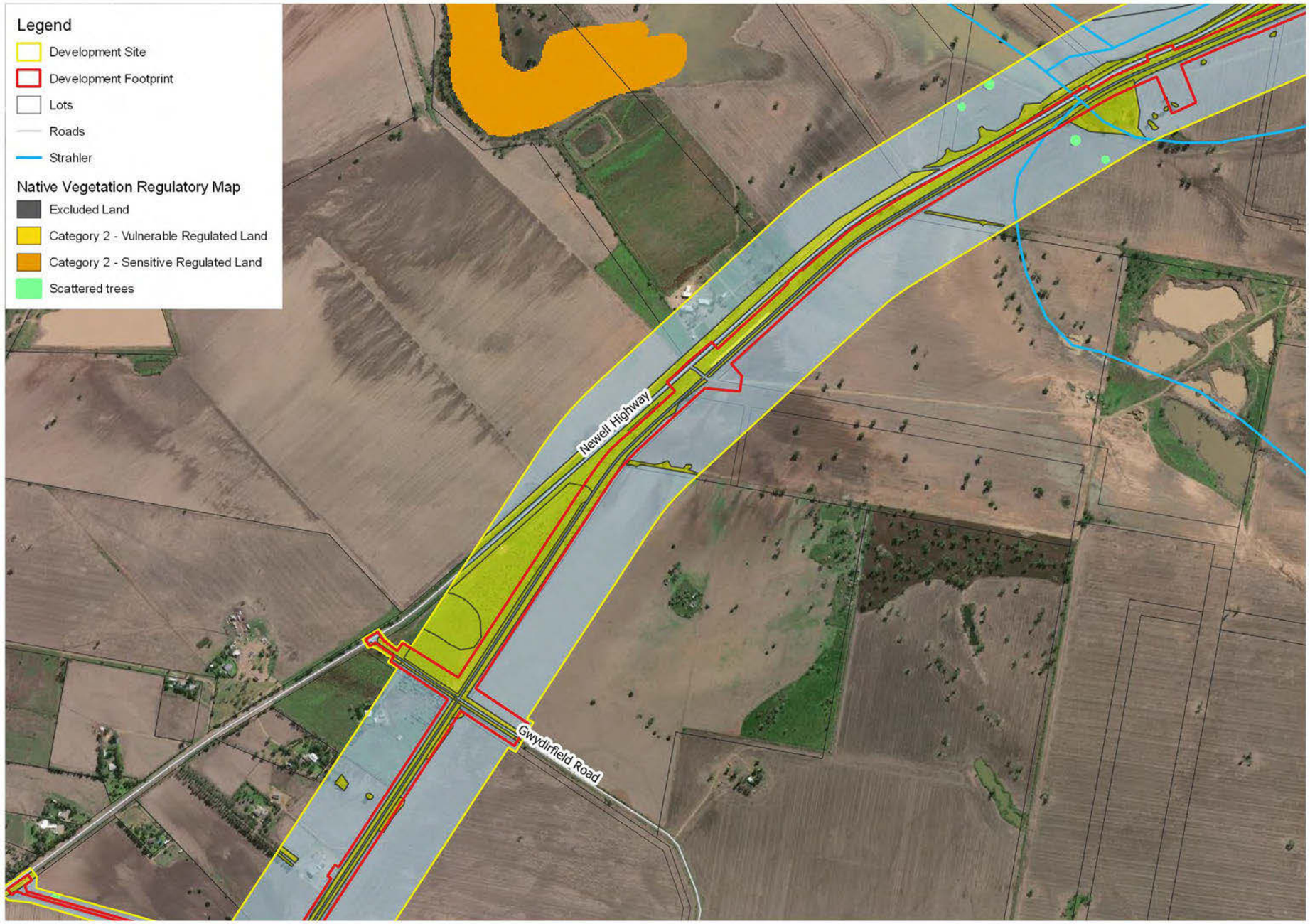


Figure 3-4 Proposed land categorisation of the subject land Map 2 of 4

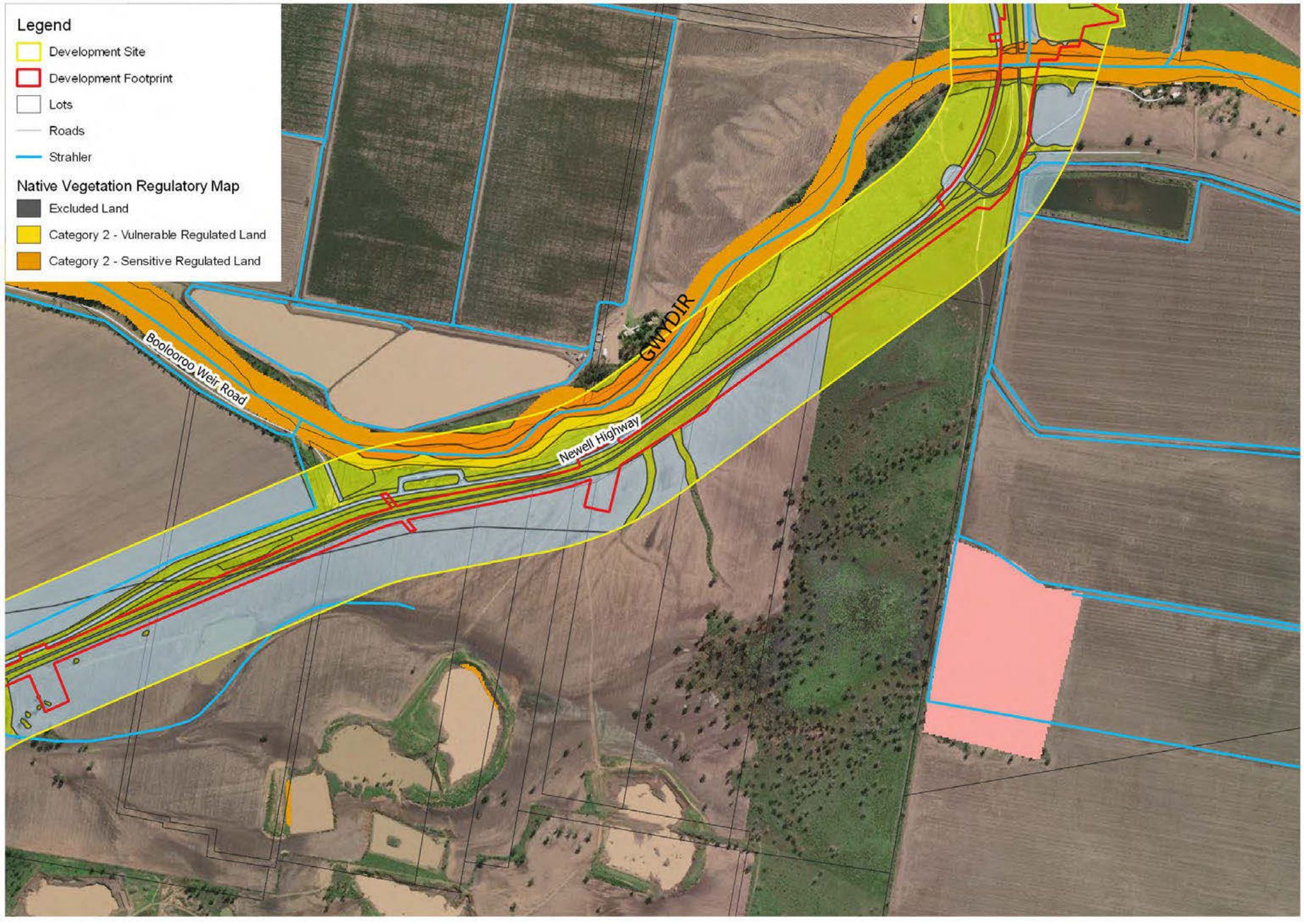


Figure 3-5 Proposed land categorisation of the subject land Map 3 of 4

Figure 3-6 Proposed land categorisation of the subject land Map 4 of 4

3.3. Plant Community Types (PCT)

3.3.1. Methods to assess PCTs

Review of existing information

A search was undertaken of the BioNet Vegetation Classification database (DPE, 2022c) and the NSW SEED Mapping Portal (DPE, 2022f) to assess existing vegetation mapping information within the subject land. Relevant mapping of the subject land included State Vegetation Type Map for Border Rivers Gwydir/ Namoi Region (DPIE 2015). This identified six (6) main Plant Community Types (PCTs) that may occur within, and surrounding, the subject land. These are summarised in Table 3-1.

Table 3-1 Mapped PCTs within the subject land

Mapped PCTS	Present within the subject land (DPIE 2015)
PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	*Yes*
PCT 36 River Red Gum tall to very tall open forest/woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	*Yes*
PCT 39 Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	*No*
PCT 40 Coolabah open woodland wetland with chenopod/grassy ground cover on grey and brown clay floodplains	*No*
PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	*Yes*
Candidate Native Grasslands	*Yes. As PCT 52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly in the northern-eastern Darling Riverine Plains Bioregion*

Field surveys and personnel

Vegetation mapping, BAM Vegetation Integrity Plots (VIPs) and targeted threatened flora and fauna surveys were undertaken by numerous ecologists in December 2019 and February 2020. These VIPs were repeated and added to in February 2022. Personnel involved in the surveys include:

- Mitch Palmer - Principal Ecologist and Botanist (BAM Assessor BAAS 17051)
- Aleksei Atkin – Senior Fauna Ecologist (BAM Assessor BAAS 17093)
- Phil Spark – Fauna Ecologist and regional subject matter expert
- Ainslee Roser – Ecologist
- Sarah Downey – Ecologist
- Giorginna Xu – Ecologist
- John Hunter – Botanist / Ecologist
- Rachael Buzio - Ecologist

Additionally, the proposal, as part of the broader N2NS proposal, was surveyed by ecologists from Umwelt in February and April 2016.

Floristic surveys

Detailed floristic surveys, inclusive of VIPs and targeted threatened species surveys, were undertaken by two ecologists between 3 December and 6 December 2019, with further VIPs and targeted species searches conducted between 2 - 5 February 2020, and repeated and additional VIPs conducted between 21-26 February 2022 (Appendix B). The surveys were undertaken using the methodology presented in BAM 2017 (in 2019 and 2020) and BAM 2020 (in 2022). Potential PCTs were identified using NSW BioNet (DPE, 2022e), and were based on the native species present, landform, physiography and location in the IBRA subregions. The PCTs were then stratified into areas of similar condition class to determine vegetation zones for each PCT. The required number of VIPs of 20 m by 50 m were established in each vegetation zone in accordance with the BAM. Data was collected on the composition, structure and function of the vegetation. Personnel undertaking the field work, as listed above, have been trained and accredited under the BAM or were supervised by those accredited under the BAM (Appendix C).

3.3.2. Limitations

Initial rapid assessment points, collection of VIPs and targeted threatened flora and fauna surveys were undertaken in December 2019, during a season of prolonged drought in the region. The dry conditions may have reduced the abundance and cover of forbs and grasses and presented difficult conditions for confirmation of many groundcover species, where they were present, with little or no floristic features or material evident for confident identification. Although abundance of native species may be affected in some instances, native cover was generally lower in comparison to average condition. However, as canopy species were largely unaffected by the drought conditions, and common, more readily identifiable shrub and groundcover species were evident, PCT determination and assessment of their overall condition, in conjunction with previous studies and surveys conducted by Umwelt in 2016, were considered to have a high confidence and considered adequate. A thorough search of the subject land was undertaken for threatened species in accordance with the BAM and relevant threatened flora and fauna guidelines. However, there was potential for some flora species not to be recorded during the survey due to its timing (outside optimal survey periods) and the prevailing dry conditions in 2019 and 2020. In particular, inconspicuous or geophytic species, which typically flower outside of the completed surveyed periods (i.e. December and February) may not have been recorded.

Additional VIPs and targeted threatened flora and fauna surveys were undertaken in February 2020 following substantial rainfall in the preceding month, increasing confidence in the representation of the data collected. Considering the above, a precautionary approach has been taken as to the likelihood of the presence of suitable habitat. The precautionary approach allows an emphasis on caution when scientific evidence is lacking. In this instance, to allow flora and fauna species unlikely to be detected during the time of survey and impacted by drought conditions appropriate consideration and assessed adequately. Details of these surveys are included in Section 4.2.4 below.

Repeated VIPs, in the same locations as previous VIPs (and with an additional 7 VIPs), undertaken in February 2022, after the La Nina events of 2021 and early 2022, demonstrated an increase in native species richness across most VIPs and confirmed the previously determined PCTs. The extent and condition state of some of the PCTs within the subject land had to be modified following analysis of the VIPs in the BAM-C. This meant that, in some cases, a representative numbers of VIPs were not undertaken during site assessment in February 2022, and representative plot data for a particular vegetation zone were duplicated in the BAM-C where necessary. The duplicated plots were considered those most representative of the vegetation zone within the subject land. The replicated plots are described in section 3.3.3 and listed in Table 3-8.

3.3.3. PCTs identified on the subject land

Following the surveys and analysis of the data collected, six (6) PCTs were identified within the subject land, these are:

- PCT 27: Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion (mapped as Weeping Myall Open Woodland)
- PCT 36: River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion (mapped as River Red Gum Forest)
- PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (mapped as Queensland Bluegrass and Mitchell Grass Grassland)
- PCT 56: Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW (mapped as Poplar Box Belah Woodland)
- PCT 71: Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion (mapped as Carbeen White Cypress Pine)
- PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion (mapped as River Red Gum Riparian Woodland)

Descriptions of the PCTs identified and their listings as threatened ecological communities (TEC) under the BC Act and EPBC Act (if any) are provided in Table 3-2 to Table 3-7. Representative photos for each PCT and its condition state(s) can be seen in Figure 3-7 to Figure 3-21. Detailed PCT and TEC mapping are depicted in Figure 3-22 to Figure 3-25.

Table 3-2 Description of PCT 27 within the subject land

PCT name			
Vegetation formation	Semi-arid Woodlands (Grassy sub-formation)		
Vegetation class	Riverine Plain Woodlands		
IBRA bioregion / subregion	Brigalow Belt South / Northern Outwash		
Vegetation type	PCT ID	27	
	Common Community Name	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	
Approximate extent within the subject land	17.31 ha - split between three condition classes: Moderate – 8.54 ha (vegetation zone N1) Low – 6.96 ha (vegetation zone N2) Very Low – 1.81 ha (vegetation zone N2A)		
Species relied upon for PCT identification	Species name		Relative abundance
	Weeping Lovegrass *Eragrostis parviflora*		833
	Early Spring Grass *Eriochloa pseudoacrotricha*		280
	Black Rolypoly *Sclerolaena muricata var.muricata*		140

PCT name		
	Thorny Saltbush *Rhagodia spinescens*	44
	Mimosa *Vachellia farnesiana*	37
	Weeping Myall *Acacia pendula*	21
	Emus' Foot *Cullen tenax*	20
	Queensland Bluegrass *Dichanthium sericeum*	20
	Fairy Grass *Sporobolus caroli*	20
	Climbing Saltbush *Einadia nutans*	13
	Verbena gaudichaudii	7.5
	Grey Mistletoe *Amyema quandang*	6.5
	Fuzzweed *Vittadinia cuneata*	5
	Windmill Grass *Chloris truncata*	5
	Ruby Saltbush *Enchylaena tomentosa*	4
	Cooba *Acacia salicina*	4
	Native Carrot *Daucus glochidiatus*	2
	Quena *Solanum esuriale*	1
	Curly Mitchell Grass *Astrebla lappacea*	1
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and the species were cross-referenced with the BioNet Vegetation Classification System. The NSW scientific determination for *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregion* and the Commonwealth Listing Advice on *Weeping Myall Woodlands* were used to determine threatened ecological community status. Occurs on the grey alluvial clays of the eastern portion of the Darling Riverine plains and western edge of the Brigalow Belt South. Overstorey was dominated by Weeping Myall with a groundcover consisting of Weeping Lovegrass, Early Spring Grass, Fairy Grass, Thorny Saltbush, Black Rolypoly, Queensland Bluegrass, Climbing Saltbush, Ruby Saltbush, Emus' Foot, *Verbena gaudichaudii,* Quena and Grey Mistletoe present. The naturalised Mimosa and the exotic African Boxthorn and Tiger Pear were all common. Six (6) vegetation integrity plots were undertaken within this PCT: • three (3) plots (IR1, IR15 and IR32) were collected within vegetation zone N1 (moderate condition) • two (2) plots (IR33 and IR35) were collected within vegetation zone N2 (low condition)	

PCT name	
	• one (1) plot (IR16) was collected in vegetation zone N2A (very low condition). **Plot replication in the BAM-C** Note that the minimum number of plots stipulated by the BAM for vegetation zone N2 with an area of 6.96 ha is three (3). However, the extent and condition state of PCT 27 within the subject land was modified following analysis of the VIPs in the BAM-C. This meant that a representative number of VIPs were not undertaken in zone N2 during site assessment in February 2022. Plot IR35 was duplicated in the BAM-C as it was considered the most representative plot of the vegetation zone based on compositional, structural and functional attributes and had the highest vegetation integrity score.
TEC Status	**Listed under BC Act** - *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregion* (Endangered). **Listed under EPBC Act** – *Weeping Myall Woodlands* (Endangered) Mapped as WM
Estimate of percent cleared within NSW	86%
Examples	 Figure 3-7 Example of PCT 27 in moderate condition

PCT name	
	 Figure 3-8 Example of PCT 27 in low condition

Table 3-3 Description of PCT 36 within the subject land.

PCT name			
Vegetation formation	Forested Wetlands		
Vegetation class	Inland Riverine Forests		
IBRA bioregion / subregion	Brigalow Belt South / Northern Outwash		
Vegetation type	PCT ID	36	
	Common Community Name	River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	
Approximate extent within the subject land	39.48 ha – split between two (2) landscapes and 2 condition classes: Moderate – 8.84 ha (vegetation zone N3) Low - 20.06 ha (vegetation zone N4) Moderate (on floodplain) – 8.21 ha (vegetation zone N5) Low (on floodplain) – 2.36 ha (vegetation zone N6)		
Species relied upon for PCT identification	Species name		Relative abundance
	River Red Gum *Eucalyptus camaldulensis*		9
	Cooba *Acacia salicina*		31
	Alectryon oleifolius		1

PCT name		
	Climbing Saltbush *Einadia nutans*	76
	Berry Saltbush *Einadia hastata*	50
	Thorny Saltbush *Rhagodia spinescens*	33
	Ruby Saltbush *Enchylaena tomentosa*	14
	Alternanthera denticulata	60
	Tarvine *Boerhavia dominii*	38
	Paspalidium jubiflorum	200
	Paspalidium gracile	75
	Marsilea drummondii	5
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and the species were cross-referenced with the BioNet Vegetation Classification System. Seven (7) vegetation integrity plots were undertaken within this PCT: • two (2) plots (IR2 and IR5) were collected within vegetation zone N3 – moderate condition • 2 plots (IR3 and IR4) were collected within N4 – low condition • 2 plots (IR17 and IR39) were collected within N5 - moderate condition (on floodplain) • one (1) plot (IR7) was collected within N6 low condition (on floodplain). PCT 36 on the floodplain (vegetation zones N5 and N6) contains small ephemeral tributaries and floodplain near the Mehi River that are dominated by River Red Gum and Cooba with occasional Quinine (not located in VIPs) and River Cooba. These areas are often disturbed by adjacent agricultural land use. The other areas of PCT 36 (vegetation zones N3 and N4) was identified along the banks of the permanent Mehi River and dominated by River Red Gum, Cooba, Quinine (not located in VIPs), Saltbushes and Tarvine. The Mehi River is influenced by exotic flora such as Willows, Johnsons Grass, Buffel Grass, Balloon Vine, Castor Oil Plant and African Boxthorn. This PCT varies from PCT 78 (refer to Table 3-7) due to the dominance of Cooba, River Cooba and Quinine within the midstorey. **Plot replication in the BAM-C** Note that the minimum number of plots stipulated by the BAM for vegetation zones N3 (8.84 ha), N4 (20.06 ha), N5 (8.21 ha) and N6 (2.36 ha) were not undertaken in February 2022 as the extent and condition state of PCT 36 within the subject land were modified following analysis of the VIPs in the BAM-C. The plot shortfall and replicated plots are listed below:	

PCT name	
	• N3 – shortfall of 1 plot – IR5 replicated in BAM-C • N4 – shortfall of 2 plots – IR3 and IR4 replicated in BAM-C • N5 – shortfall of 1 plot – IR39 replicated in BAM-C • N6 – shortfall of 1 plot – IR7 replicated in BAM-C. Plots IR5 and IR39 were replicated as they were considered the most representative plots of vegetation zones N3 and N5 respectively based on compositional, structural and functional attributes. Despite IR39 having a lower vegetation integrity score than IR17 (the other plot in vegetation zone N5), it was considered more representative in the landscape context. Plots IR3, IR4 were replicated as they were the only plots undertaken in vegetation zone N4 (which had a shortfall of 2 plots) and IR7 was replicated as it was the only plot undertaken in vegetation zone N6.
TEC Status	Not listed as a threatened ecological community
Estimate of percent cleared within NSW	53%
Examples	 Figure 3-9 Example of PCT 36 in moderate condition Figure 3-10 Example of PCT 36 in low condition

PCT name	
	 Figure 3-11 Example of PCT 36 (on floodplain) in moderate condition Figure 3-12 Example of PCT 36 (on floodplain) in low condition

Table 3-4 Description of PCT 52 within the subject land.

PCT name			
Vegetation formation	Grasslands		
Vegetation class	Semi-arid Floodplain Grasslands		
IBRA bioregion / subregion	Brigalow Belt South / Northern Outwash Darling Riverine Plains / Castlereagh-Barwon		
Vegetation type	PCT ID	52	
	Common Community Name	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly in the northern-eastern Darling Riverine Plains Bioregion	
Approximate extent within the subject land	220.28 ha – split between two (2) IBRA subregions* and five (5) condition classes: High – 18.62 ha (vegetation zone N7) Moderate – 0.30 ha (vegetation zone N7A) Low – 20.93 ha (vegetation zone N8) High (dominated by Mimosa) – 103.07 ha (vegetation zone C1) Moderate (dominated by Mimosa) – 17.33 ha (vegetation zone C1A) High – 24.44 ha (vegetation zone C2) Moderate – 18.46 ha (vegetation zone C3) Low – 17.14 ha (vegetation zone C4) *Note that vegetation zones commencing with 'N' are in the Northern Outwash IBRA subregion and vegetation zones commencing with 'C' are in the Castlereagh-Barwon subregion.		
Species relied upon for PCT identification	Species name		Relative abundance
	Cup Grass *Eriochloa crebra*		380
	Queensland Blue Grass *Dichanthium sericeum*		59
	Black Rolypoly *Sclerolaena muricata var. muricata*		73
	Climbing Saltbush *Einadia nutans*		62
	Nardoo *Marsilea drummondii*		50
	Paspalidium globoideum		50
	Yellow Burr Daisy *Calotis lappulacea*		30
	Lesser Joyweed *Alternanthera denticulata*		30
	Pigweed *Portulaca oleracea*		29
	Slender-fruited Saltbush *Atriplex leptocarpa*		20

PCT name		
	Mimosa *Vachellia farnesiana*	21
	Knotweed Goosefoot *Einadia polygonoides*	21
	Flat Spike-sedge *Eleocharis plana*	20
	Fairy Grass *Sporobolus caroli*	22
	New Zealand Spinach *Tetragonia tetragonioides*	13
	Native Millet *Panicum decompositum*	13
	Galvinised Burr *Sclerolaena birchii*	9
	Tarvine *Boerhavia omini*	8
	Plains Grass *Austrostipa aristiglumis*	8
	High Sida *trichopoda*	5
	Quena *Solanum esuriale*	1
	River Cooba *Acacia stenophylla*	2
	Bimble Box *Eucalyptus populnea subsp. bimbil*	2
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and species were cross-referenced with the BioNet Vegetation Classification System. The Commonwealth listing advice *on Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland* was used to determine the threatened ecological community status. PCT 52 is the most abundant PCT within the subject land. Low condition PCT 52 consists of heavily disturbed and degraded vegetation dominated by exotic flora and sporadic natives adjacent to the existing rail corridor and roadside edges. High and moderate condition areas of PCT 52 contained less exotic vegetation and more native diversity. Areas of PCT dominated by Mimosa (vegetation zones C1 and C1A) are largely confined to TSRs, road reserves and private land holdings where Mimosa is generally dominant, however, these areas also contained a higher abundance of natives including Black Rolypoly, Queensland Bluegrass, Cup Grass, native forbs and scattered shrubs indicative of this PCT. Some areas of PCT 52 meet the EPBC listing criteria for the TEC, even though shrub cover is upwards of 50%. *Desmodiopsis campylocaulon* (Plot IR 14) *and Digitaria porrecta* were recorded in PCT 52. Fifteen (15) vegetation integrity plots were undertaken within this PCT: • one (1) plot (IR38) was collected in vegetation zone N7 – high condition • 1 plot (IR13) was collected in vegetation zone N7A – moderate condition • 1 plot (IR36) was collected in vegetation zone N8 – low condition	

PCT name	
	• three (3) plots (IR23, IR28 and IR29) were collected in vegetation zone – C1 – high condition (dominated by Mimosa) • 1 plot (IR37) was collected in C1A – moderate condition (dominated by Mimosa) • 3 plots (IR14, IR20 and IR27) were collected in C2 – high condition • 3 plots (IR18, IR19 and IR25) were collected in C3 – moderate condition • two (2) plots (IR24 and IR26) were collected in C4 – low condition. **Plot replication in the BAM-C** Note that the minimum number of plots stipulated by the BAM for vegetation zones N7 (18.62 ha), N8 (20.93 ha), C1 (103.07 ha), C1A (17.33 ha), C2 (24.44 ha) and C4 (17.14 ha) were not undertaken in February 2022 as the extent and condition state of PCT 52 within the subject land were modified following analysis of the VIPs in the BAM-C. The plot shortfall and replicated plots are listed below: • N7 – shortfall of 2 plots – IR38 replicated in BAM-C • N8 – shortfall of 3 plots – IR36 replicated in BAM-C • C1 – shortfall of 3 plots – IR23, IR28 and IR29 replicated in BAM-C • C1A – shortfall of 2 plots – IR37 replicated in BAM-C • C2 – shortfall of 1 plot – IR27 replicated in BAM-C • C4 – shortfall of 1 plot – IR26 replicated in BAM-C. Plots IR27 was replicated as it was considered the most representative plot of vegetation zone C2 based on compositional, structural and functional attributes despite not having the highest vegetation integrity score, and IR26 was selected as representative of vegetation zone C4 based on compositional, structural and functional attributes and it had the highest vegetation integrity score. Plots IR38 was replicated twice as it was the only plot undertaken in vegetation zone N7 (with a shortfall of 2 plots); plot IR36 was replicated three times as it was the only plot undertaken in vegetation zone N8 (with a shortfall of 3 plots); IR23, IR28 and IR29 were all duplicated to cover the shortfall of three (3) plots in C1 and IR37 was replicated as it was the only plot undertaken in vegetation zone C1A.
TEC Status	Not listed under the BC Act **Listed under EPBC Act** – *Natural Grasslands on Basalt and Fine-textured Alluvial Plains of Northern New South Wales and Southern Queensland and the Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin* (Critically Endangered) Mapped as NG
Estimate of percent cleared within NSW	70%

PCT name	
Examples	 Figure 3-13 Example of PCT 52 in high condition Figure 3-14 Example of PCT 52 in moderate condition Figure 3-15 Example of PCT 52 in low condition

PCT name	
	 Figure 3-16 Example of PCT 52 in high condition (dominated by Mimosa) Figure 3-17 Example of PCT 52 in moderate condition (dominated by Mimosa)

Table 3-5 Description of PCT 56 within the subject land.

PCT name		
Vegetation formation	Grassy Woodlands	
Vegetation class	Floodplain Transition Woodlands	
IBRA bioregion / subregion	Brigalow Belt South / Northern Outwash	
Vegetation type	PCT ID	56
	Common Community Name	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

PCT name		
Approximate extent within the subject land	6.94 ha – in one condition class: Moderate condition (vegetation zone N9)	
Species relied upon for PCT identification	Species name	Relative abundance
	Poplar Box *Eucalyptus populnea*	1
	Climbing saltbush *Einadia nutans*	50
	Black Rolypoly *Sclerolaena muricata var. muricata*	15
	Thorny Saltbush *Rhagodia spinescens*	1
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and species were cross-referenced with the BioNet Vegetation Classification System. The NSW scientific determination for *Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands* and the Commonwealth conservation and listing advice on *Poplar Box Grassy Woodland on Alluvial Plains* were used to determine the threatened ecological community status. Occurs on the transition of the floodplain to more brown loamy soils and light clays. The overstorey is dominated by Poplar box with a groundcover consisting of Thorny Saltbush, Black Rolypoly, Windmill Grass (not found in 2022 VIPs), Tarvine (not found in 2022 VIPs) and Ruby Saltbush (not found in 2022 VIPs). Poplar Box was the dominant canopy species outside of the VIPs with the occasional Carbeen *Corymbia tessellaris* and Silver-leaf ironbark *Eucalyptus melanophloia* occuring where the PCT became ecotonal and graded into Carbeen woodland. Mimosa, African Boxthorn and Tiger Pear are all common. Initially in the 2019 and 2020 surveys three (3) VIPs were undertaken within this PCT. When these VIPs were repeated in February 2022, the increase in native species richness (increased from 14 to 24) for plot IR 11 was more closely aligned to PCT 71 and, as such, the area mapped for PCT 71 (refer to Table 3-6) has increased slightly and resulted in only two (2) plots (IR12 and IR21) being collected in PCT 56 in moderate condition (vegetation zone N9). **Plot replication in the BAM-C** Note that the minimum number of plots stipulated by the BAM for vegetation zone N9 with an area of 6.94 ha is three (3). However, as described above, the extent of PCT 56 within the subject land was modified following analysis of the collected vegetation integrity data. This meant that a representative number of VIPs were not undertaken in zone N9 during site assessment in February 2022. Plot IR21 was duplicated in the BAM-C as it was considered the most representative plot of the vegetation zone based on compositional, structural and functional attributes and it had the highest vegetation integrity score.	

PCT name	
TEC Status	**Listed under the BC Act** *Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands* (Endangered) **Listed under the EPBC Act** – *Poplar Box Grassy Woodland on Alluvial Plains* (Endangered) Mapped as PB
Estimate of percent cleared within NSW	78%
Examples	 Figure 3-18 Example of PCT 56 in moderate condition

Table 3-6 Description of PCT 71 within the subject land.

PCT name		
Vegetation formation	Semi-arid Woodlands (Shrubby sub-formation)	
Vegetation class	North-west Alluvial Sand Woodlands	
IBRA bioregion / subregion	Brigalow Belt South / Northern Outwash	
Vegetation type	PCT ID	71
	Common Community Name	Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion
Approximate extent within the subject land	8.2 ha in one condition class: Moderate condition (vegetation zone N10)	

PCT name		
Species relied upon for PCT identification	Carbeen *Corymbia tessellaris*	2
	Poplar Box *Eucalyptus populnea subsp. bimbil*	2
	Desert Jasmine *Jasminum lineare*	10
	Western Rosewood *Alectryon oleifolius*	2
	Cooba *Acacia salicina*	2
	Acacia salciformis	1
	Wilga *Geijera parviflora*	1
	Climbing Saltbush *Einadia nutans*	31
	Black Rolypoly *Sclerolaena muricata var. muricata*	21
	Thorny Saltbush *Rhagodia spinescens*	6
	Slender Flat-sedge *Cyperus gracilis*	175
	Weeping Lovegrass *Eragrostis parviflora*	202
	Slender Panic *Paspalidium gracile*	180
	Warrego Grass *Paspalidium jubiflorum*	132
	Early Spring Grass *Eriochloa pseudoacrotricha*	100
	Native Millet *Panicum decompositum*	40
	Native Carrot *Daucus glochidiatus*	7
	Tarvine *Boerhavia dominii*	7
	Pitted Bluegrass *Bothriochloa decipiens*	5
	Windmill Grass *Chloris truncata*	3
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and species were cross-referenced with the BioNet Vegetation Classification System. The NSW scientific determination for *Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands* was used to determine the threatened ecological community status. PCT 71 occurs on the gentle sandy rises in along the Mehi and Gwydir Floodplains.	

PCT name	
	The overstorey is dominated by Carbeen with sporadic Poplar Box. The midstorey consists of Cooba, Desert Jasmine with occasional Western Rosewood, Quinine and Wilga. The ground layer consisted of Climbing Saltbush, Slender Panic, Warrego Grass, Early Spring Grass and Slender Flat-sedge, Black Rolypoly, with occasional Tarvine and Windmill Grass. Mimosa, African Boxthorn and Tiger Pear are all common. PCT 71 becomes ecotonal and grades into PCT 56. Seven (7) vegetation integrity plots were undertaken within this PCT (vegetation zone N10): • IR8, IR9, IR10, IR11, IR22, IR30, IR40 **Plot replication in the BAM-C** Four additional plots were collected in vegetation zone N10 during site assessment in February 2022. As such, no replication of VIP data was required in the BAM-C.
TEC Status	**List under the BC Act** - *Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions - New England Tablelands* (Endangered) Mapped as CF
Estimate of percent cleared in NSW	78%
Examples	 Figure 3-19 Example of PCT 71 in moderate condition

Table 3-7 Description of PCT 78 within the subject land.

PCT name		
Vegetation formation	Forested Wetlands	
Vegetation class	Inland Riverine Forests	
IBRA bioregion / subregion	Darling Riverine Plains / Castlereagh-Barwon	
Vegetation type	PCT ID	78
	Common Community Name	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion
Approximate extent within the subject land	12.4 ha - present along the Gwydir River and occurs in two (2) condition classes: Moderate condition - 2.19 ha (vegetation zone C5) Low condition – 10.21 ha (vegetation zone C6)	
Species relied upon for PCT identification	Species name	Relative abundance
	River Red Gum *Eucalyptus camaldulensis*	3
	Weeping Bottlebrush *Callistemon viminalis*	1
	Desert Jasmine *Jasminum lineare*	5
	Stinging Nettle *Urtica incisa*	11
	Common Couch *Cynodon dactylon*	50
	Wheatgrass *Elymus scaber*	1
Justification of evidence used to identify the PCT	State Vegetation Mapping was used to assist PCT identification and species were cross-referenced with the BioNet Vegetation Classification System. This PCT is similar to PCT 36 and is dominated by River Red Gum *Eucalyptus camaldulensis*, however the midstorey consisted of Desert Jasmine and occasional Weeping Bottlebrush, more common in PCT 78. Exotic species included Willows *Salix* spp., African Boxthorn, Castor Oil *Ricinus communis,* as well as the native but not locally indigenous species White Cedar *Melia azedarach*, well established and likely a garden escapee, were also present. This community is at its western distribution limit and becomes ecotonal and merges downstream with PCT 36 when other midstorey species consistent with PCT 36 became more apparent and dominant.	

PCT name	
	Three (3) vegetation integrity plots were completed for this riparian PCT: • one (1) plot (IR6) was collected in vegetation zone C5 - moderate condition • two (2) plots (IR31, IR34) were collected in vegetation zone C6 – low condition. **Plot replication in the BAM-C** Note that the minimum number of plots stipulated by the BAM for vegetation zones C5 (2.19 ha) and C6 (10.21 ha) were not undertaken in February 2022 as the extent and condition state of PCT 78 within the subject land were modified following analysis of the VIPs in the BAM-C. The plot shortfall and replicated plots are listed below: • C5 – shortfall of 1 plot – IR6 replicated in BAM-C • C6 – shortfall of 1 plot – IR34 replicated in BAM-C. Plot IR6 was replicated as it was the only plot undertaken in vegetation zone C5. Plot IR34 was replicated as it was considered the most representative plot of vegetation zones C6 based on compositional, structural and functional attributes, despite it having a lower vegetation integrity score than IR31 (the other plot undertaken in zone C6).
TEC Status	Not listed as a threatened ecological community
Estimate of percent cleared in NSW	60%
Examples	 Figure 3-20 Example of PCT 78 in moderate condition

PCT name	
	 Figure 3-21 Example of PCT 78 in low condition

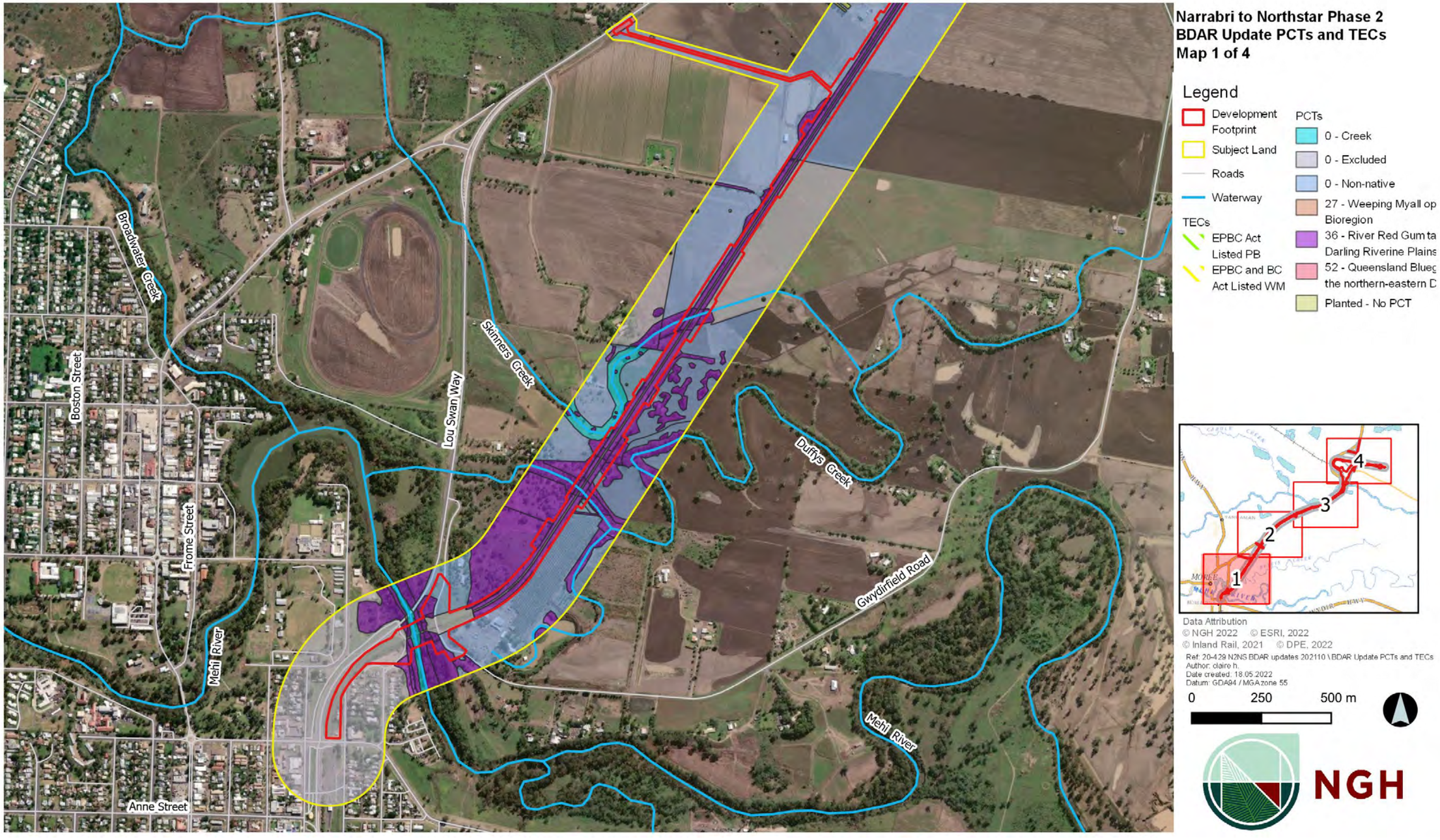


Figure 3-22 PCTs and TECs at the subject land Map 1 of 4

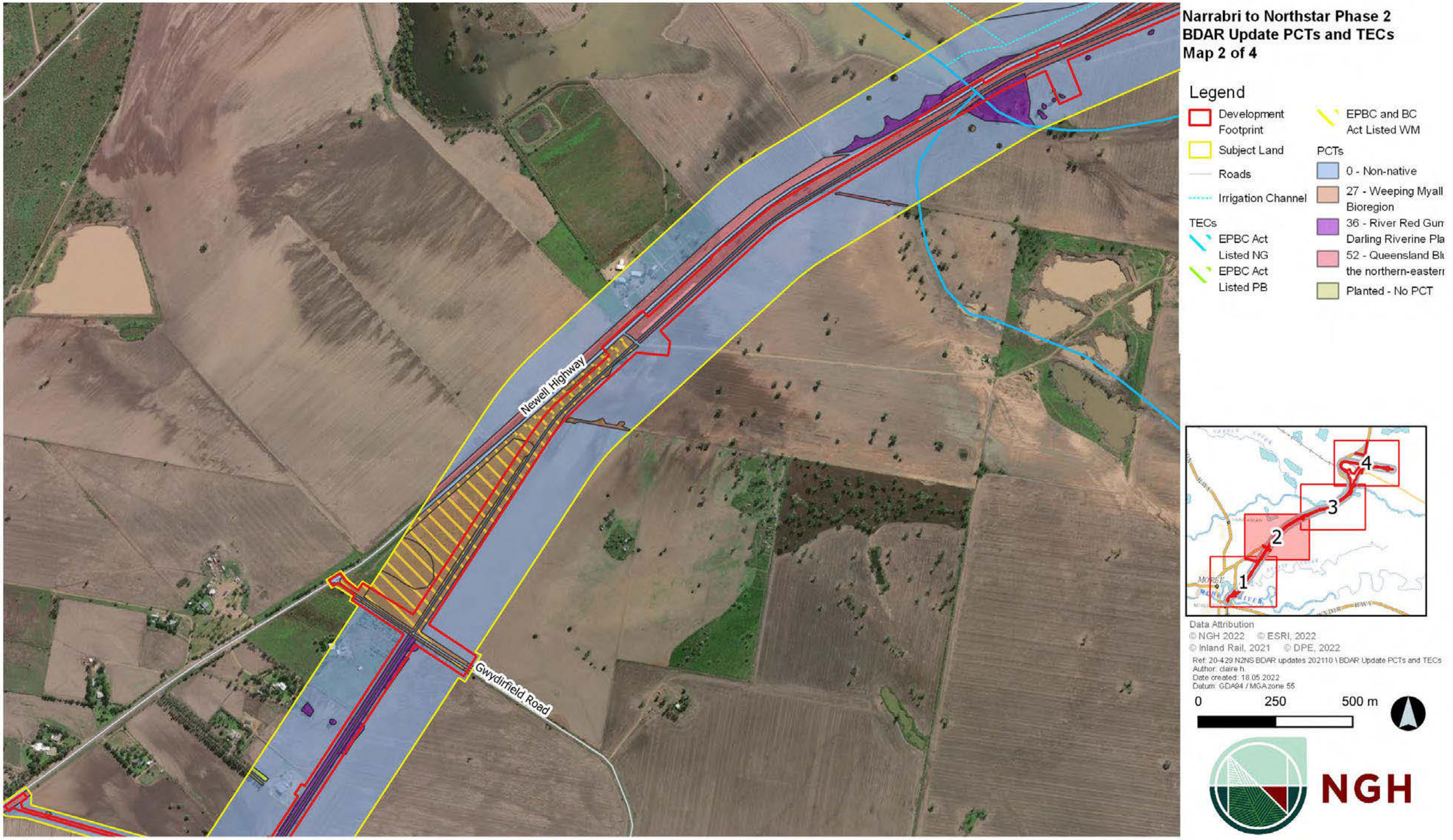


Figure 3-23 PCTs and TECs at the subject land Map 2 of 4

Figure 3-24 PCTs and TECs at the subject land Map 3 of 4

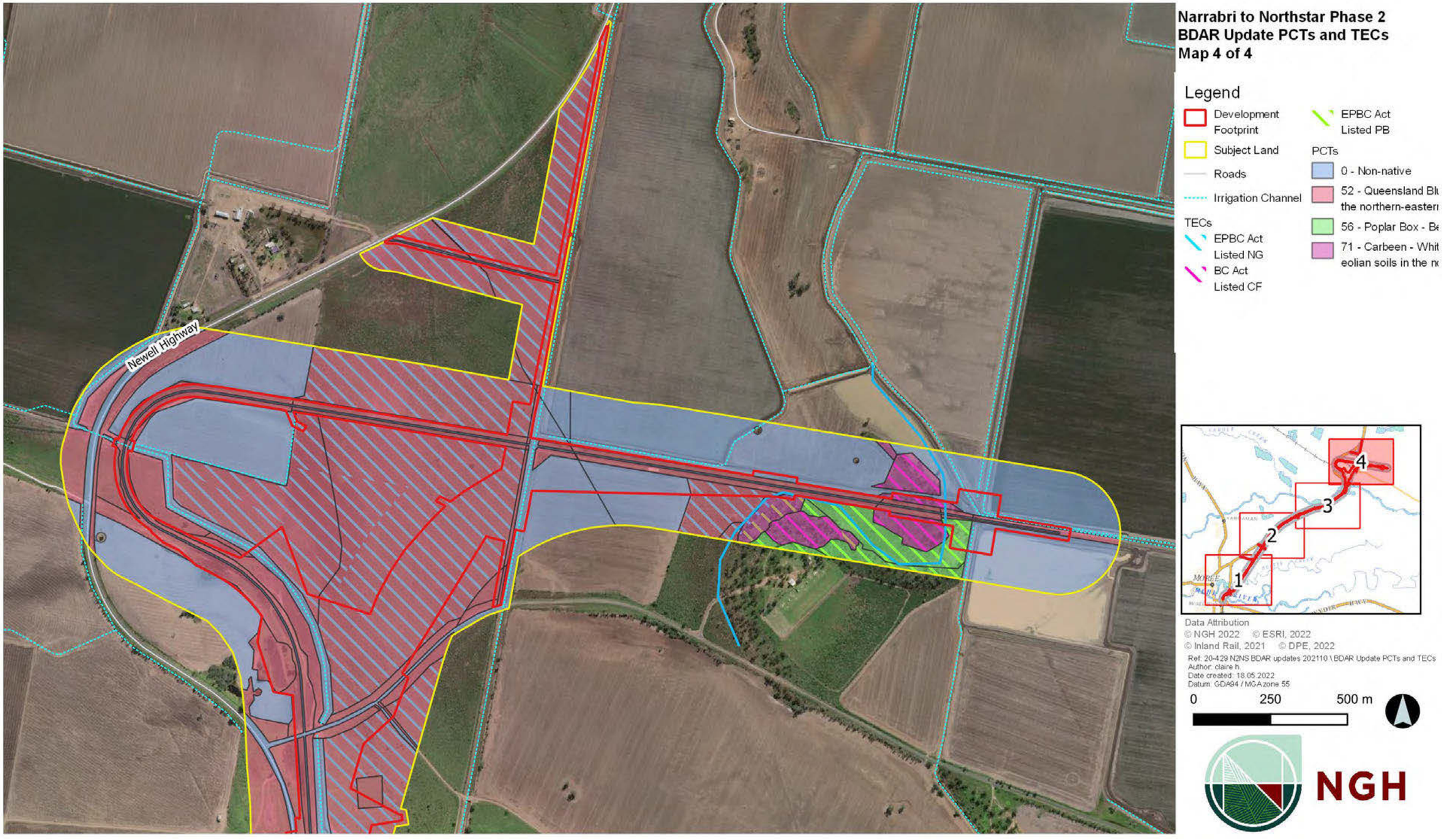


Figure 3-25 PCTs and TECs at the subject land Map 4 of 4

3.4. Vegetation Integrity Assessment

3.4.1. Vegetation zones and survey effort

Publicly available vegetation mapping, collection of rapid assessment points, and detailed floristic plots have been used to assist the delineation of vegetation zones. Six (6) PCTs were identified in the subject land. Each PCT was stratified into zones representing a similar broad condition state. These zones were based on the overstorey, midstorey and understorey condition, vegetation integrity scores generated by the BAM-C, and observed land management practices, as described in Table 3.8 and shown in Figure 3-26 to Figure 3-29. Where vegetation zones were identified as 'Very Low', or 'Low', these typically included exotic species in the understorey and lacked canopy coverage. Where zones were identified as 'Moderate', these were considered to be in an improved condition with greater native species diversity and typically contained native overstorey, and zones in 'High' condition were in the best condition throughout the subject land.

Thirty-two VIPs were undertaken during the initial field surveys in 2019 and 2020. All zones were entered into the BAM – C to generate the relevant ecosystem and species credit species requiring assessment (Case 00017934/Revision 2). Following completion of the field surveys, two zones within PCT 27 and PCT 78 were one (1) plot short of the requirement, therefore, an additional plot of an average of the relevant VIPs collected within those zones was also placed into the BAM-C. A new BAM case revision (Case 00017934/ Revision 3) reflects those zones and species impacted, with the relevant credit and offset obligation generated (Appendix D).

The consistency review led to the Biodiversity Conservation and Science Directorate (BCS) of DPE requesting a repeat of the BAM VIPs within the subject land due to the drought conditions in 2019 and 2020 when the original surveys were undertaken. Forty VIP plots were undertaken during the field surveys in February 2022 in the same locations as the VIPs undertaken in 2019 / 2020. BAM VIP plot data were entered into the BAM-C to generate the relevant ecosystem and species credit species requiring assessment for their associated IBRA subregions. The updated vegetation integrity scores for each VIP led to a refinement of the vegetation zones and a delineation of vegetation zones into the appropriate IBRA subregion. BAM VIP locations in February 2022 are shown in Figure 3-26 to Figure 3-29.

Due to unresolved technical difficulties experienced in BOAMS, two cases had to be created for the respective IBRA bioregion and associated subregion:

- Northern Outwash subregion (00017933/BAAS20009/19/000017934)
  Revision 13 – Subject land
  Revision 11 – Development footprint (direct impact)
- Castlereagh-Barwon subregion (00031835/BAAS20009/22/00031837)
  Revision 0 – Subject land
  Revision 3 – Development footprint (direct impact)

Vegetation zones are described according to which IBRA subregion they are situated in. Vegetation zones commencing with 'N' occur in the Northern Outwash IBRA subregion and vegetation zones commencing with 'C' occur in the Castlereagh-Barwon IBRA Subregion. Note that the numbers have been ordered to link to the development footprint PCT impact areas entered into the BAM-C hence the addition of 'A' in some subject land vegetation zone descriptors, e.g. 'C1A'.

The vegetation zones containing PCTs which have been entered into the BAM-C are N1 – N10 (Northern Outwash IBRA subregion) and C1 – C6 (Castlereagh-Barwon IBRA subregion). Refer to Figure 3-26 to Figure 3-29.

Due to the refinement of the vegetation zones following the 2022 field surveys and the delineation of vegetation zones into the appropriate IBRA subregion, some of the vegetation zones do not the minimum plot numbers for the vegetation zone area. In these instances, the most representative VIP of the zone has been duplicated in the BAM-C for the direct impact area in the development footprint to ensure that a

sufficient number of plots are used to generate vegetation integrity scores. The required and actual number of VIPs for each vegetation zone are detailed in Table 3-8. Note that some vegetation zones had more than the required number of VIPs undertaken within the zone, for example in N10.

New BAM-C case revisions (Case 00017933/BAAS20009/19/000017934 – Revision 13 (Northern Outwash IBRA subregion) and Case 00031835/BAAS20009/22/00031837 – Revision 3 (Castlereagh-Barwon IBRA subregion) reflect the updated vegetation zones and associated ecosystem and species credit species, with the associated credit and offset obligation (Appendix D).

3.4.2. Scattered trees

Numerous scattered trees were observed within the subject land. Species that would use the scattered trees are assumed to be the same threatened species predicted by the BAM-C to utilise the PCTs and vegetation zones identified within the subject land as described in Table 3-8. All scattered trees were mapped in the field using a handheld GIS Tablet and were visually assessed from the ground to determine whether any hollows were present. The Diameter at Breast Height (DBH) of the tree was assessed. Therefore, although targeted fauna surveys of scattered trees were included in the field surveys, where required in accordance with the BAM, the BAM-C scattered tree module has been utilised at this time. A total of one (1) scattered tree was entered into the BAM-C as being present within the development footprint.

The BOAMS case number of the scattered tree streamlined assessment module is:

- 00017933/BAAS20009/20/00022515
  Revision 2 – Scattered Trees (development footprint)

The vegetation zone containing 12 scattered trees within the Northern Outwash IBRA subregion is N12; one of which occurs within the development footprint. One (1) scattered tree occurs within the subject land in the Castlereagh-Barwon IBRA subregion in vegetation zone C10, and none in the development footprint. Refer to Table 3-8 Scattered tree locations on the subject land are shown in Figure 3-26 to Figure 3-29.

Note that this is a revision to the previous calculation of scattered trees (three) that will be impacted by the proposal. This is because areas of native vegetation (Category 2 – Regulated Land) increased between 2019 / 20 and 2022 due to an improvement in environmental conditions. Therefore, scattered trees that were previously determined as being surrounded by Category 1 – Exempt Land are now surrounded by native vegetation and cannot be classified as a scattered tree.

3.4.3. Other

Areas mapped in the subject land (Figure 3-26 to Figure 3-29) and not identified as a vegetation zone within the BAM-C include:

- Planted native vegetation
  Planted native vegetation consists of 0.13 ha in the Northern Outwash IBRA subregion (zone N11) and 0.50 ha in the Castlereagh-Barwon IBRA subregion (zone C7). No planted native vegetation occurs within the development footprint.
- Creek
  These areas do not constitute terrestrial biodiversity but only the water in the creeks; they have been assessed under the FM Act. There is 3.28 ha in the Northern Outwash IBRA subregion (zone N15) and 6.41 ha in the Castlereagh-Barwon IBRA subregion (zone C9).
- Non-native vegetation on Category 2 – Vulnerable Regulated Land.
  There is a 0.69 ha of highly modified, cropped non-native vegetation in the Northern Outwash IBRA subregion (zone N14).

- Category 1 – Exempt Land
  This includes highly modified or cropped non-native vegetation and infrastructure (including dams and irrigation channels) on rural land. There is 242.35 ha in the Northern Outwash IBRA subregion (zone N13) and 91.98 ha in the Castlereagh-Barwon IBRA subregion (zone C8).
- Excluded Land
  This includes infrastructure, industrial and residential areas on non-rural land which do not contain naturally occurring native vegetation. There is 42.13 ha in the Northern Outwash IBRA subregion (zone N16) and no areas in the Castlereagh-Barwon IBRA subregion.

Table 3-8 Vegetation zones of the subject land

Zone ID	PCT ID	Condition description in BAM-C	Zone area on subject land (ha)	Plots required	Survey effort (# plots)	Replicated plots	Patch size (ha)
N1	27	Moderate	8.54	3	3	0	24
N2	27	Low	6.96	3	2	1 (IR35)	24
N2A	27	Very Low	1.81	1	1	0	24
N3	36	Moderate	8.84	3	2	1 (IR5)	>100
N4	36	Low	20.06	4	2	2 (IR3 & IR4)	>100
N5	36	Moderate_FV	8.21	3	2	1 (IR39)	>100
N6	36	Low_FV	2.36	2	1	1 (IR7)	>100
N7	52	High	18.62	3	1	2 (IR38 x 2)	>100
N7A	52	Moderate	0.30	1	1	0	>100
N8	52	Low	20.93	4	1	3 (IR36 x 3)	>100
N9	56	Moderate	6.94	3	2	1 (IR21)	50
N10	71	Moderate	8.20	3	7	0	50
N11	Planted	N/A	0.13	N/A	N/A	-	N/A
N12	Scattered Trees	N/A	0.26	N/A	N/A	-	N/A
N13	Non-native vegetation (on Category 1 - Exempt Land)	N/A	242.35	N/A	N/A	-	N/A
N14	Non-native vegetation (on Category 2 – Regulated Vulnerable Land)	N/A	0.69	N/A	N/A	-	N/A

Zone ID	PCT ID	Condition description in BAM-C	Zone area on subject land (ha)	Plots required	Survey effort (# plots)	Replicated plots	Patch size (ha)
N15	Creek (no terrestrial vegetation)	N/A	3.24	N/A	N/A	-	N/A
N16	Excluded Land (without native vegetation)	N/A	42.13	N/A	N/A	-	N/A
C1	52	High_Mimosa	103.07	6	3	3 (IR23, IR28, IR29)	>100
C1A	52	Moderate_Mimosa	17.33	3	1	2 (IR37 x 2)	>100
C2	52	High	24.44	4	3	1 (IR27)	>100
C3	52	Moderate	18.46	3	3	0	>100
C4	52	Low	17.14	3	2	1 (IR26)	>100
C5	78	Moderate	2.19	2	1	1 (IR6)	>100
C6	78	Low	10.21	3	2	1 (IR34)	>100
C7	Planted	N/A	0.50	N/A	N/A	-	N/A
C8	Non-native vegetation (on Category 1 – Exempt Land)	N/A	91.98	N/A	N/A	-	N/A
C9	Creek (no vegetation)	N/A	6.41	N/A	N/A	-	N/A
C10	Scattered Trees	N/A	0.08	N/A	N/A	-	N/A

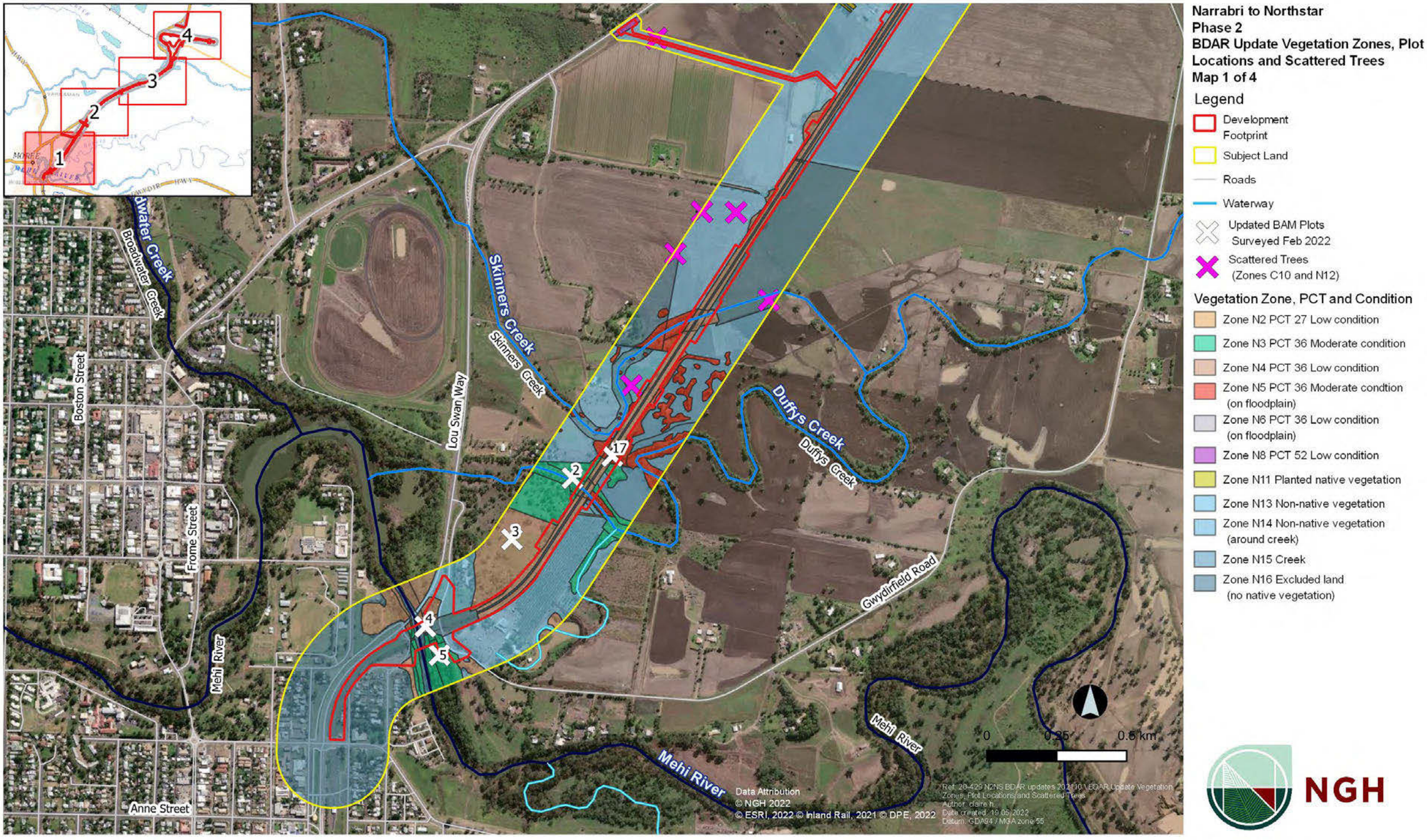


Figure 3-26 Vegetation zones, BAM plot locations (2022) and scattered trees on the subject land Map 1 of 4

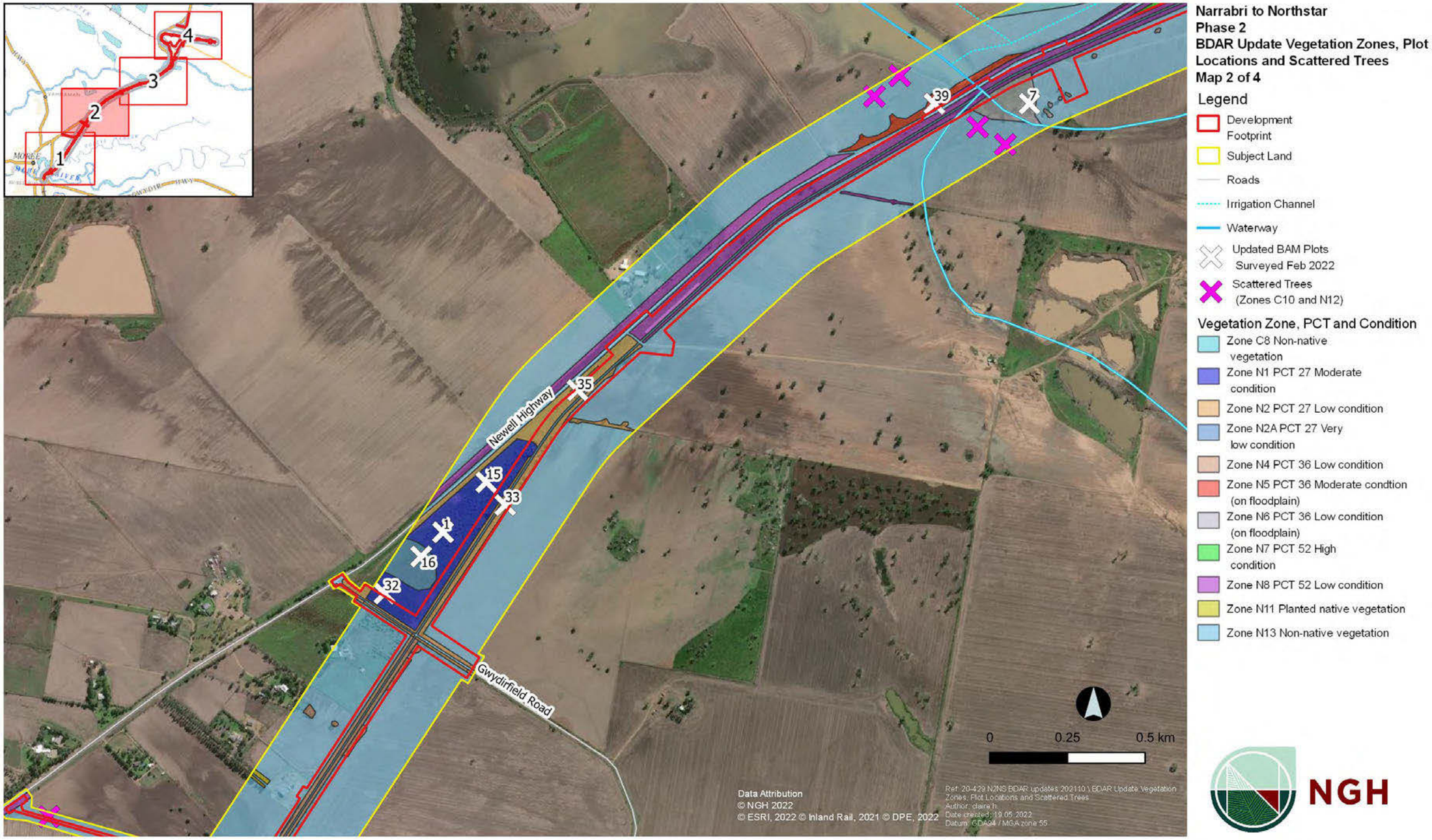


Figure 3-27 Vegetation zones, BAM plot locations (2022) and scattered trees on the subject land Map 2 of 4

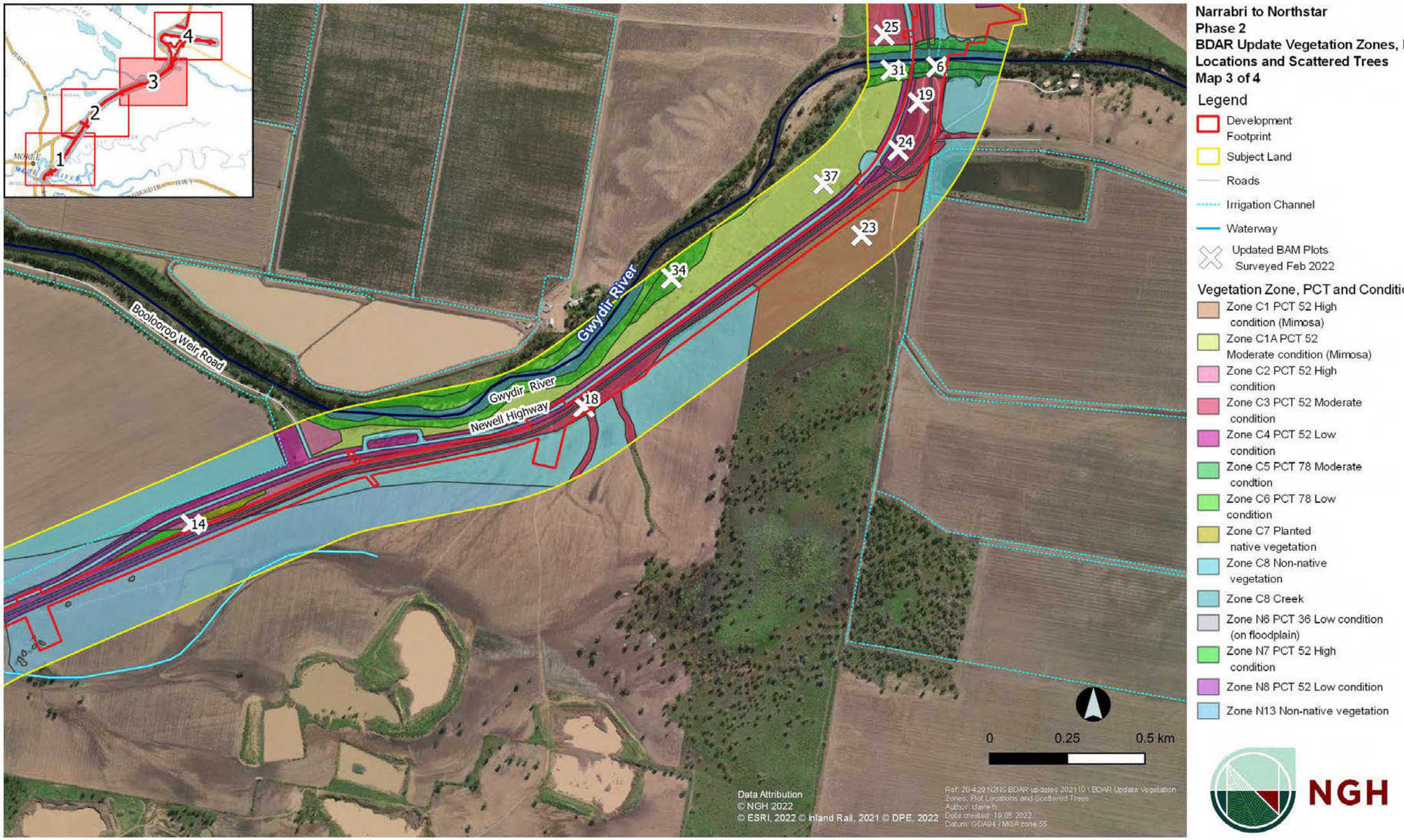


Figure 3-28 Vegetation zones, BAM plot locations (2022) and scattered trees on the subject land Map 3 of 4

Figure 3-29 Vegetation zones, BAM plot locations (2022) and scattered trees on the subject land Map 4 of 4

3.4.4. Vegetation integrity assessment results

The plot data from BAM vegetation integrity survey plots undertaken in February 2022 were entered into the BAM-C by an accredited assessor (Claire Hewitt – BAAS20009). Plot data for the 2022 surveys can be found in Appendix B-I. The results of the vegetation integrity assessment are provided in Table 3-9.

Table 3-9 Current vegetation integrity scores for each vegetation zone within the subject land

Zone ID	PCT & Condition	Composition score	Structure score	Function score	Vegetation Integrity Score (Subject Land)
N1	27 Moderate	72.9	99.9	44	68.4
N2	27 Low	20.8	71	19.3	30.6
N2A	27 Very Low	70.5	87.1	0.1	8.5
N3	36 Moderate	47.7	50.9	54.9	51.1
N4	36 Low	68.5	67.8	20	45.3
N5	36 Moderate_FV	65.6	51.7	30.6	47
N6	36 Low_FV	89.5	42.2	5.6	27.6
N7	52 High	75.9	84.3	-	80
N7A	52 Moderate	58.9	73.7	-	65.9
N8	52 Low	72	13.3	-	30.9
N9	56 Moderate	61.1	64	24.1	45.5
N10	71 Moderate	87.4	74.6	25.8	55.2
C1	52 High_Mimosa	94.9	100	-	97.4
C1A	Moderate_Mimosa	76.6	92.2	-	84
C2	52 High	97.8	100	-	98.9
C3	52 Moderate	95.1	100	-	97.5
C4	52 Low	49.3	93.4	-	67.8
C5	78 Moderate	38.4	62.3	83.4	58.4
C6	78 Low	13.5	62.5	26.9	28.3

4. Threatened Species

4.1. Ecosystem Credit Species

The ecosystem credit species listed in Table 4-1 were returned by the calculator as being associated with the PCTs present within the subject land. These species are assumed to occur on the subject land and contribute to ecosystem credits. Note that additional ecosystem credit species have been predicted to occur in the Castelreagh-Barwon IBRA subregion than were described in the N2NS BDAR submitted in September 2021.

Numerous ecosystem credit species were observed or detected within the subject land during field surveys. These include:

- Grey-headed Flying-fox *Pteropus poliocephalus*
- Koala *Phascolarctos cinereus*
- Little Pied Bat *Chalinolobus picatus*
- Yellow-bellied Sheathtail-bat *Saccolaimus flaviventris*
- Inland Forest Bat *Vespadelus baverstocki*
- Little Lorikeet *Glossopsitta pusilla*

The Inland Forest Bat and Little Lorikeet records are unique as they occur at their most eastern and western distributions respectively. These species were not predicted by the BAM-C, but as they were recorded onsite during surveys, they have been manually added into the assessment. All other species are assumed to occur within the subject land on occasion.

Table 4-1 Ecosystem credit species predicted by the BAM-C

Common Name	Associated PCT Northern Outwash Subregion	Associated PCT Castlereagh-Barwon Subregion	NSW Listing Status	National Listing Status
Fauna				
Anomalopus mackayi Five-clawed Worm-skink	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Endangered	Vulnerable
Anseranas semipalmata Magpie Goose	PCT 36 PCT 52	PCT 52 PCT 78	Vulnerable	Not Listed
Antechinomys laniger Kultarr		PCT 52	Endangered	Not Listed
Artamus cyanopterus Dusky Woodswallow	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Vulnerable	Not Listed

Common Name	Associated PCT Northern Outwash Subregion	Associated PCT Castlereagh-Barwon Subregion	NSW Listing Status	National Listing Status
Calyptorhynchus banksii samueli Red-tailed Black-Cockatoo (Inland sub-species) (foraging)		PCT 52 PCT 78	Vulnerable	Not Listed
Calyptorhynchus lathami Glossy Black Cockatoo (Foraging)	PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Chalinolobus picatus Little Pied Bat	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Vulnerable	Not Listed
Chthonicola sagittata Speckled Warbler	PCT 56	PCT 78	Vulnerable	Not Listed
Circus assimilis Spotted Harrier	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Vulnerable	Not Listed
Daphoenositta chrysoptera Varied Sittella	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Dasyurus maculatus Spotted-tailed Quoll		PCT 78	Vulnerable	Endangered
Ephippiorhynchus asiaticus Black-necked Stork	PCT 36	PCT 78	Endangered	Not Listed
Epthianura albifrons White-fronted Chat		PCT 52	Vulnerable	Not Listed
Falco hypoleucos Grey Falcon	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Endangered	Not Listed

Common Name	Associated PCT Northern Outwash Subregion	Associated PCT Castlereagh-Barwon Subregion	NSW Listing Status	National Listing Status
Falco subniger Black Falcon	PCT 27 PCT 36 PCT 56	PCT 78	Vulnerable	Vulnerable
Glossopsitta pusilla Little Lorikeet	PCT 36	PCT 78	Vulnerable	Not Listed
Grantiella picta Painted Honeyeater	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Vulnerable
Grus rubicunda Brolga		PCT 52 PCT 78	Vulnerable	Not Listed
Haliaeetus leucogaster White-bellied Sea-Eagle (Foraging)	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Hamirostra melanosternon Black-breasted Buzzard (Foraging)		PCT 78	Vulnerable	Not Listed
Hieraaetus morphnoides Little Eagle (Foraging)	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Vulnerable	Not Listed
Hirundapus caudacutus White-throated Needletail	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Not Listed	Vulnerable
Lophochroa leadbeateri Major Mitchell's Cockatoo (Foraging)		PCT 52 PCT 78	Vulnerable	Not Listed
Lophoictinia isura Square-tailed Kite (Foraging)	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed

Common Name	Associated PCT Northern Outwash Subregion	Associated PCT Castlereagh-Barwon Subregion	NSW Listing Status	National Listing Status
Melanodryas cucullata Hooded Robin (south-eastern form)	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Melithreptus gularis Black-chinned Honeyeater (eastern subspecies)	PCT 36 PCT 71	PCT 78	Vulnerable	Not Listed
Neophema pulchella Turquoise Parrot	PCT 36	PCT 78	Vulnerable	Not Listed
Ninox connivens Barking Owl (Foraging)	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Nyctophilus corbeni Corben's Long-eared Bat	PCT 27 PCT 36 PCT 56	PCT 78	Vulnerable	Vulnerable
Petroica boodang Scarlet Robin		PCT 78	Vulnerable	Not Listed
Phaps histrionica Flock Bronzewing		PCT 52	Endangered	Not Listed
Phascolarctos cinereus Koala (Foraging)	PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Vulnerable
Polytelis swainsonii Superb Parrot (foraging)		PCT 52 PCT 78	Vulnerable	Vulnerable
Pomatostomus temporalis Grey-crowned Babbler (eastern subspecies)	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Pteropus poliocephalus Grey-headed Flying-fox (Foraging)	PCT 36 PCT 56		Vulnerable	Vulnerable

Common Name	Associated PCT Northern Outwash Subregion	Associated PCT Castlereagh-Barwon Subregion	NSW Listing Status	National Listing Status
Rostratula australis Australian Painted Snipe		PCT 52 PCT 78	Endangered	Endangered
Saccolaimus flaviventris Yellow-bellied Sheathtail-bat	PCT 27 PCT 36 PCT 52 PCT 56 PCT 71	PCT 52 PCT 78	Vulnerable	Not Listed
Sminthopsis macroura Stripe-faced Dunnart	PCT 27 PCT 36 PCT 52 PCT 56	PCT 52	Vulnerable	Not Listed
Stagonopleura guttata Diamond Firetail	PCT 27 PCT 36 PCT 56 PCT 71	PCT 78	Vulnerable	Not Listed
Stictonetta naevosa Freckled Duck		PCT 78	Vulnerable	Not Listed
Tyto longimembris Eastern Grass Owl	PCT 52	PCT 52	Vulnerable	Not Listed
Tyto novaehollandiae Masked Owl		PCT 52 PCT 78	Vulnerable	Not Listed
Vespadelus baverstocki Inland Forest Bat	Associated with water bodies	Associated with water bodies	Vulnerable	Not Listed

4.2. Species Credit Species

4.2.1. Species credit species to be assessed

The BAM Calculator predicted 28 species credit species in total to occur at the subject land (19 in Northern Outwash IBRA subregion and 21 in Castlereagh-Barwon IBRA subregion), as presented in Table 4-2. Some of these species only occur in one or other of the IBRA subregions, and additional species credit species have been predicted to occur in the Castlereagh-Barwon IBRA subregion than were described in the N2NS BDAR submitted in September 2021.

A desktop assessment and field assessment were undertaken for habitat constraints and geographic restrictions to determine which species would be included or excluded for further targeted surveys in the subject land. The desktop assessment included interrogation of the NSW BioNet Threatened Species Profile

Database (DPE, 2022e) to identify habitat constraints and requirements of species, in addition to review of NSW BioNet records from the locality. Field validation was undertaken to confirm the suitability of habitat for most species credit species, which included assessment of microhabitat availability (hollow-bearing trees, coarse woody ground debris, suitable nest trees, etc.), in addition to an assessment of vegetation condition through collection of BAM VIPs which determined whether habitats were degraded. As the proposal is a linear-shaped development that crosses two IBRA bioregions and associated subregion, habitat suitability assessment has been undertaken for each IBRA subregion. Species were then excluded from assessment based on the absence of suitable habitat within the subject land. Consequently, two species were excluded:

- Slender Darling Pea (*Swainsona murrayana)*
- Squatter Pigeon (*Geophaps scripta scripta*)

All others were retained and all but eight (8) were subject to survey in accordance with relevant guidelines. *Hieraaetus morphnoides* (Little Eagle) was surveyed outside of the appropriate survey window and has therefore been included in this count and assumed present (refer to Section 4.2.4). Survey effort is described in Section 4.2.4 and the potential for direct and indirect impacts on all species is considered in Section 7.2.

Table 4-2 Candidate species credit species requiring assessment

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Fauna								
Ardeotis australis Australian Bustard	Northern Outwash, Castlereagh-Barwon	Tussock and hummock grasslands, low shrublands and low open grassy woodlands; occasionally pastoral and cropping country, golf courses and near dams.	High Sensitivity to Potential Gain	Endangered	Not Listed	Potential habitat in zones C1-5 and N8-N10 with non-optimal habitat within all other zones within subject land due to limited abundance of tussock grasses and shrublands.	Included	Survey required and undertaken
Burhinus grallarius Bush Stone-curlew	Northern Outwash, Castlereagh-Barwon	Fallen/standing dead timber including logs.	High Sensitivity to Potential Gain	Endangered	Not Listed	Small areas of suitable habitat where coarse woody debris is present	Included	Survey required and undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Calyptorhynchus banksii samueli Red-tailed Black-Cockatoo (Inland Sub-species) (Breeding)	Castlereagh-Barwon	Hollow-bearing trees greater than 15 cm diameter and greater than 2 m above ground and any trees within riparian zones.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Suitable Hollow-bearing Trees (HBTs) present within subject land	Included	Survey required but not undertaken. Survey planned for 2022.
Calyptorhynchus lathami Glossy Black Cockatoo (breeding)	Northern Outwash, Castlereagh-Barwon	Living or dead tree with hollows greater than 15 cm diameter and greater than 8 m above ground.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Suitable HBTs present within subject land	Included	Survey required and undertaken
Geophaps scripta Squatter Pigeon (Southern Sub-species)	Castlereagh-Barwon	Grassy woodlands and plains, preferring sandy areas and usually close to water.	High Sensitivity to Potential Gain	Critically Endangered	Vulnerable	Some grassy woodland present on-site close to water bodies.	Excluded	Further investigation into habitat constraints determined habitat within the subject land was unsuitable, using the NSW Scientific Determination and OEH Threatened Species profile for the Squatter Pigeon.

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Haliaeetus leucogaster White-bellied Sea-Eagle (breeding)	Northern Outwash, Castlereagh-Barwon	Living or dead mature trees within suitable vegetation within 1 km of a rivers, lakes, large dams or creeks, wetlands and coastlines.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Large waterbodies and riparian areas within the subject land	Included	Survey required and undertaken
Hamirostra melanosternon Black-breasted Buzzard (Breeding)	Castlereagh-Barwon	Water bodies and land within 40m of riparian woodland on inland water courses/water holes containing dead or dying eucalypts.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Large waterbodies and riparian areas within the subject land with some dead eucalypts.	Included	Survey not undertaken
Hieraaetus morphnoides Little Eagle (Breeding)	Northern Outwash, Castlereagh-Barwon	Nest trees – live (occasionally dead) large old trees within vegetation. Paddock trees can provide important breeding habitat.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Large waterbodies and riparian areas within the subject land present with large trees present alongside. Isolated trees also present.	Included	Survey not undertaken in correct survey window

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Hoplocephalus bitorquatus Pale-headed Snake	Northern Outwash, Castlereagh-Barwon	Loose bark and tree-trunks, or in hollow trunks and limbs of dead trees.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Mature woody vegetation present on site	Included	Survey required and undertaken
Lophochroa leadbeateri Major Mitchell's Cockatoo (Breeding)	Castlereagh-Barwon	Hollow-bearing trees, living or dead tree with hollows greater than 10cm diameter.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	HBTs and associated vegetation.	Included	Survey not undertaken
Lophoictinia isura Square-tailed Kite (breeding)	Northern Outwash, Castlereagh-Barwon	Timbered habitats including dry woodlands and open forests, particularly timbered watercourses. Known in subregion. Nest Trees.	Moderate Sensitivity to Potential Gain	Vulnerable	Not Listed	Potential nest trees present throughout subject land	Included	Survey required and undertaken
Ninox connivens Barking Owl (breeding)	Northern Outwash, Castlereagh-Barwon	Living or dead trees with hollows greater than 20 cm diameter and greater than 4m above the ground.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Potential breeding habitat present	Included	Survey required and undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Phascolarctos cinereus Koala (breeding)	Northern Outwash, Castlereagh-Barwon	Temperate, subtropical and tropical eucalypt woodlands and forests where suitable food trees grow, of which there are more than 70 eucalypt species and 30 non-eucalypt species that are particularly abundant on fertile clay soils. 21 Koala food trees identified within Western Slopes and Plains Koala Management Area (DPE, 2018). Known in subregion.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Suitable habitat and feed trees present for the region. **Recorded during surveys.**	Included	Survey required and undertaken
Polytelis swainsonii Superb Parrot (Breeding)	Castlereagh-Barwon	Hollow-bearing trees, living or dead E. *blakelyi, E. melliodora, E. albens, E camaldulensis, E. microcarpa , E. polyanthemos, E mannifera, E. intertexta* with hollows greater than 5cm in diameter, greater than 4m above ground or trees with a DBH of greater than 30cm.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Hollow-bearing *Eucalyptus camaldulensis* in the Castlereagh-Barwon riparian areas.	Included	Survey not undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Pteropus poliocephalus Grey-headed Flying-fox	Northern Outwash	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines. Known to roost in locality.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Potential breeding and roosting site present. One small camp nearby to the subject land.	Included	Survey required and undertaken
Setirostris eleryi Bristle-faced Free-tailed Bat	Northern Outwash	Depends on hollows and tree fissures for roosting sites. Important habitat predominantly 500m area surrounding riparian areas.	High Sensitivity to Potential Gain	Endangered	Not Listed	Habitat constraints present within and surrounding riparian areas. **Recorded during surveys.**	Included	Survey required and undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Tyto novaehollandiae Masked Owl (Breeding)	Castlereagh-Barwon	Hollow-bearing trees, living or dead trees with hollows greater than 20cm diameter.	High Sensitivity to Potential Gain	Vulnerable	Not Listed	Hollow-bearing trees with hollows greater than 20cm diameter in the Castlereagh-Barwon riparian areas.	Included	Survey not undertaken
Flora								
Cyperus conicus Cyperus conicus	Northern Outwash	Grows in open woodland on sandy soil, near waterholes and on the banks of streams in sandy soils. Associated with Callitris forest in broader locality.	High Sensitivity to Potential Gain	Endangered	Not Listed	Soil type and vegetation associations marginal	Included	Survey required and undertaken
Desmodiopsis campylocaulon Creeping Tick-trefoil	Northern Outwash, Castlereagh-Barwon	Grows on cracking black soils in the Narrabri, Moree and Walgett local government areas. Associated species include *Acacia harpophylla*, *Astrebla pectinate* and *Sorghum, Dichanthium* and *Panicum* species.	High Sensitivity to Potential Gain	Endangered	Not Listed	Habitat present within grassland areas.	Included	Survey required and undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Dichanthium setosum Bluegrass	Northern Outwash	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Pasture and grassland areas present, though highly disturbed	Included	Survey required and undertaken
Digitaria porrecta Finger Panic Grass	Northern Outwash, Castlereagh-Barwon	Common associated grasses and forbs in NSW sites include *Austrostipa aristiglumis, Enteropogon acicularis, Cyperus bifax, Hibiscus trionum* and *Neptunia gracilis*. Often found along roadsides and travelling stock routes where there is light grazing and occasional fire.	Moderate Sensitivity to Potential Gain	Endangered	Not Listed	Habitat present within grassland areas.	Included	Survey required and undertaken
Homopholis belsonii Belson's Panic	Northern Outwash, Castlereagh-Barwon	Grows in dry woodland (e.g., Belah, Weeping Myall) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils.	High Sensitivity to Potential Gain	Endangered	Vulnerable	Habitat restricted to areas of Weeping Myall and black soil. Marginal elsewhere.	Included	Survey required and undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Lepidium aschersonii Spiny Peppercress	Northern Outwash	Found on ridges of gilgai clays dominated by Brigalow *Acacia harpophylla*, Belah *Casuarina cristata,* Buloke *Allocasuarina luehmanii* and Grey Box *Eucalyptus microcarpa.*	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Marginal. Habitat restricted to areas of Weeping Myall and black soil.	Included	Survey required and undertaken
Lepidium monoplocoides Winged Peppercress	Castlereagh-Barwon	Occurs on seasonally moist to waterlogged sites, on heavy fertile soils. Predominant vegetation is usually an open woodland dominated by Buloke *Allocasuarina luehmannii* and/or eucalypts, particularly Black Box *Eucalyptus largiflorens* or Poplar Box *Eucalyptus populnea*, surrounded by tussock grasses.	High Sensitivity to Potential Gain	Endangered	Endangered	Habitat restricted to PCT 52 on-site in the Castlereagh-Barwon IBRA subregion	Included	Survey not undertaken

Species Credit Species	IBRA Subregion	Habitat components and geographic restrictions	Sensitivity to gain class	NSW Listing Status	National listing status	Habitat Components and abundance on site	Included or Excluded	Reason for Inclusion or exclusion
Platyzoma microphyllum Braid Fern	Castlereagh-Barwon	Grows in sandy or swampy soils, or in clay soils adjacent to streams and lagoons and subject to periodic flooding.	Moderate Sensitivity to Potential Gain	Endangered	Not Listed	Habitat restricted to PCT 78 on-site as this is the only PCT it is associated with.	Included	Survey not undertaken
Polygala linariifolia Native Milkwort	Northern Outwash	Sandy soils in dry eucalypt forest and woodland with a sparse understorey.	High Sensitivity to Potential Gain	Endangered	Not Listed	Marginal. Habitat restricted to areas of Poplar Box and Carbeen on sandy soil.	Included	Survey required and undertaken
Swainsona murrayana Slender Darling Pea	Northern Outwash, Castlereagh-Barwon	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 spp.	High Sensitivity to Potential Gain	Vulnerable	Vulnerable	Pasture and grassland areas marginal habitat, and highly disturbed	Excluded	General habitat constraints present, however, potential habitat highly degraded and dominated by exotic flora.

4.2.2. Exclusions based on habitat features

Two species credit species have been excluded from the assessment based on lack of habitat features. These species are described in Section 4.2.3.

4.2.3. Exclusions based on habitat quality

Under Section 5.2.3 of the BAM, a species credit species can be considered unlikely to occur on a subject land (or within specific vegetation zones) if, following field assessment, it is determined that the habitat is substantially degraded such that the species is unlikely to utilise the subject land (or specific vegetation zones). These species are identified in Table 4-3, along with justification regarding the habitats present and why it was excluded.

Table 4-3 Species credit species excluded based on habitat quality

Species credit species	Habitats present	Reason for exclusion
Swainsona murrayana **Slender Darling Pea**	• Associated further to the west of the subject land in more saltbush and Black Box dominated communities that are not present within the subject land • Distinct association with *Maireana* spp. and *Atriplex vesicaria* which are not present in high abundance within the subject land • Grassland areas with the subject land subject to high abundance of exotic flora reducing likelihood of presence • Previous surveys undertaken for the proposal in September 2014 by Umwelt, although >5 years to present, did not detect this species. • Surveys undertaken, although out of optimal survey period, did not detect evidence of any *Swainsona* spp.	Habitat degraded such that the species is unlikely to occur.
Geophaps scripta **Squatter Pigeon (southern subspecies)**	• Only associated with the Castlereagh-Barwon IBRA Subregion within the subject land, with a grassy understorey of open, dry sclerophyll woodland and sometimes savannas and occurs near water (within 3 km) (NSW Scientific Committee, 2016). • This species appears to favour areas with an open (<33% groundcover), patchy grass understorey and forages for seeds on the ground amongst sparse, low grasses. Their preferred habitat occurs on well-drained sandy or gravelly soils, which are not present on the subject land. It is less common on heavier soils with dense grass cover **(**NSW Scientific Committee, 2016**)**. • Grassland areas within the subject land are subject to a high abundance of exotic flora reducing likelihood of presence.	Habitat unsuitable and degraded such that the species is unlikely to occur in the IBRA subregion Castlereagh-Barwon with which it is associated. • Grassland vegetation was unsuitable habitat as the grasses present were in competition with a dense groundcover layer containing prickly shrubs, tall forbs and tall grasses. • Preferred soil type not present on the subject land. • last confirmed sightings in NSW occurred in 2001 in Yetman, NSW which is approximately 120 km

Species credit species	Habitats present	Reason for exclusion
	• Between 1975 and 1989 there were only seven confirmed and three unconfirmed records of the Squatter Pigeon (southern species) in NSW, mostly from the north-western slopes and, there were no confirmed records between 1980 and 1989, and only three confirmed records in NSW since 1989 all very close to the NSW/Queensland border (NSW Scientific Committee, 2016). This species may be sedentary or locally nomadic and there is no evidence of long-distance seasonal movements (NSW Scientific Committee, 2016).	away from the subject land (NSW Scientific Committee, 2016). Although no targeted surveys were done for this species, it can be surveyed for all year-round and flora and fauna surveys completed in 2019, 2020 and 2022 did not detect this species.

4.2.4. Candidate species requiring confirmation of presence or absence

The species listed in Table 4-4 are those that are considered to have habitats present at the subject land. Surveys have been conducted for most relevant species. The results are summarised in Table 4-4. Details of the survey methodologies and results are provided for those species surveyed. Targeted survey locations are mapped on Figure 4-1 to Figure 4-4. A complete list of fauna species observed on site is found in Appendix B.

Species assumed to occur are highlighted in yellow in Table 4-4. Note species assumed to occur will be surveyed for during the correct survey window later in 2022. Additional details have been provided in Table 4-4.

Species polygons have been defined for the species present on the site or assumed to occur in accordance with the BAM and NSW BioNet Threatened Species Profile Database (DPE, 2022e). Species polygons are mapped in Figure 4-5 to Figure 4-28. Sightings of Finger Panic Grass *Digitaria porrecta* and Creeping Tick-trefoil *Desmodiopsis campylocaulon* are mapped in Figure 4-31 and Figure 4-31.

Table 4-4 Summary of species credit species survey effort for the subject land and associated species' polygon area or count

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Fauna						
Ardeotis australis Australian Bustard	2	Year-round	Surveyed December 2019 and February 2020	Not recorded during surveys	N/A	N/A
Burhinus grallarius Bush Stone-curlew	2	Year-round	Surveyed December 2019 and February 2020	Not recorded during surveys	N/A	N/A
Calyptorhynchus banksii samueli Red-tailed Black-Cockatoo (Inland Sub-species) (Breeding)	2	May- July Sep- Dec	Assumed to occur	**Presence assumed as not surveyed.**	Area calculated by mapping habitat constraints on subject land in the form of living or dead trees with hollows greater than 12 cm diameter and greater than 2 m above ground, and trees within riparian zones, present within PCT 52 and 78. Castlereagh-Barwon: 12.62 ha	May to July or September to December
Calyptorhynchus lathami Glossy Black Cockatoo	2	Apr-Aug	Surveyed August 2020	No Not recorded during surveys	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Haliaeetus leucogaster White-bellied Sea-Eagle	2	Jul-Dec	Surveyed December 2019 and February 2020	Not recorded during surveys	N/A	N/A
Hamirostra melanosternon Black-breasted Buzzard	1.5	Sep-Nov	Assumed to occur	**Presence assumed as not surveyed for.**	Area calculated by mapping habitat constraints in the subject land in the form of land within 100 m of riparian areas. Castlereagh-Barwon: 14.85 ha	September to November
Hieraaetus morphnoides Little Eagle	1.5	Aug-Sep	Surveyed December 2019. Large tree and stick nest survey undertaken outside of peak breeding season.	**Presence assumed as surveyed outside of recommended survey period.**	Area calculated by mapping habitat constraints in the subject land in the form of a circular polygon with a 300 m radius around potential nest trees. Castlereagh-Barwon: 70.7 ha Northern Outwash: 243.19 ha "	August to October
Hoplocephalus bitorquatus Pale-headed Snake	2	Nov-Mar	Surveyed December 2019 and February 2020	Not recorded during surveys.	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Lophochroa leadbeateri Major Mitchell's Cockatoo	2	Sep-Dec	Assumed to occur	**Presence assumed as not surveyed for.**	Area calculated by mapping habitat constraints in the subject land by creating a circular polygon with a buffer 200m radius around scattered trees with hollows greater than 10 cm in diameter Castlereagh-Barwon: 46.51 ha	September to December
Lophoictinia isura Square-tailed Kite	1.5	Sep-Jan	Surveyed December 2019	Not recorded during surveys.	N/A	N/A
Ninox connivens Barking Owl	2	May-Dec	Surveyed December 2019	Not recorded during surveys.	N/A	N/A
Phascolarctos cinereus Koala	2	Year-round	Surveyed December 2019 and February 2020	**Yes. Recorded during surveys.**	Species polygon mapped for all applicable zones (in PCT 36, PCT 78).	N/A
Pteropus poliocephalus Grey-headed Flying-fox	2	Oct-Dec	Surveyed December 2019	No. Species recorded foraging during surveys but no breeding camps within the subject land	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Polytelis swainsonii Superb Parrot	2	Sep-Nov	Assumed to occur	**Presence assumed as not surveyed for**	Area calculated by mapping habitat constraints in in the form of a circular polygon with a 100m radius around potential nest trees (living or dead *Eucalyptus camaldulensis)* in the subject land. Castlereagh-Barwon: 17.62 ha	September to November
Setirostris eleryi Bristle-faced Free-tailed Bat	2	Oct-Mar	Surveyed December 2019 and February 2020	**Yes. Recorded as probable on anabat during surveys**	Associated vegetation (PCTs 36, 56, 71) within 500 m of waterbodies. Northern Outwash: 55.5 ha	N/A
Tyto novaehollandiae Masked Owl	2	May-Aug	Assumed to occur.	**Presence assumed as not surveyed for**	Area calculated by mapping habitat constraints in in the form of a circular polygon with a 100m radius around potential nest trees (living or dead trees with hollows greater than 20cm in diameter). Castlereagh-Barwon: 17.62 ha	May to August
Flora						
Cyperus conicus	2	Jan-May	Surveyed February 2020	Not recorded during surveys.	N/A	N/A

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Desmodiopsis campylocaulon Creeping Tick-trefoil	2	Dec-Apr	Surveyed December 2019 and February 2020 Also surveyed in previously recorded February 2022.	**Yes. Recorded during surveys**	Associated vegetation where the species was recorded (refer to Figure 4-30 and Figure 4-31), plus areas of suitable habitat in associated PCTs (PCTs 27, 36, 52) (as per NSW BioNet (DPE 2022e)), avoiding roads, road edges and cleared areas. Castlereagh-Barwon: 160.67 ha (PCT 52) Northern Outwash: 55.91 ha (PCTs 27, 36, 52)	N/A
Dichanthium setosum Bluegrass	2	Nov-May	Surveyed December 2019 and February 2020	Not recorded during surveys.	N/A	N/A
Digitaria porrecta Finger Panic Grass	2	Jan-Feb	Surveyed December 2019 and February 2020 Also surveyed February 2022.	**Yes. Recorded during 2019 and 2020 surveys**	Associated vegetation where it was recorded (refer to Figure 4-30 and Figure 4-31), plus areas of suitable habitat in associated PCTs (as per NSW BioNet (DPE 2022e)), avoiding roads, road edges and cleared areas. Castlereagh-Barwon: 160.67 ha (PCT 52) Northern Outwash: 56.99 ha (PCTs 27, 52, 56)	N/A

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Homopholis belsonii Belson's Panic	2	Dec-Apr	Surveyed December 2019 and February 2020	Not recorded during surveys.	N/A	N/A
Lepidium aschersonii Spiny Peppercress	2	Nov-Apr	Surveyed December 2019 and February 2020	Not recorded during surveys.	N/A	N/A
Lepidium monoplocoides Winged Peppercress	2	Sept – Dec	Assumed to occur	**Presence assumed as not surveyed for**	Area calculated by mapping habitat constraints in the subject land – on seasonally moist to waterlogged sites, on heavy fertile soils with predominant vegetation is usually an open woodland dominated by Buloke Allocasuarina luehmannii and/or eucalypts, particularly Black Box Eucalyptus largiflorens or Poplar Box Eucalyptus populnea, surrounded by tussock grasses. As this species was not surveyed for, a precautionary approach has been taken by creating a species polygon in mapped areas of PCT 52 in the floodplain. Castlereagh-Barwon: 156.95 ha (PCT 52)	September to December

Species Credit Species	Biodiversity risk weighting	Survey Period	Survey method	Present on site?	Species polygon area or count (in subject land)	To be surveyed (2022)
Platyzoma microphyllum Braid Fern	3	Jan-Dec	Assumed to occur	**Presence assumed as not surveyed for**	Area calculated by mapping habitat constraints in the subject land – swampy ground in associated vegetation (PCT 78). Castlereagh-Barwon: 3.91 ha (PCT 78)	All year
Polygala linariifolia Native Milkwort	2	Oct-Feb	Surveyed December 2019 and February 2020	Not recorded during surveys.	N/A	N/A

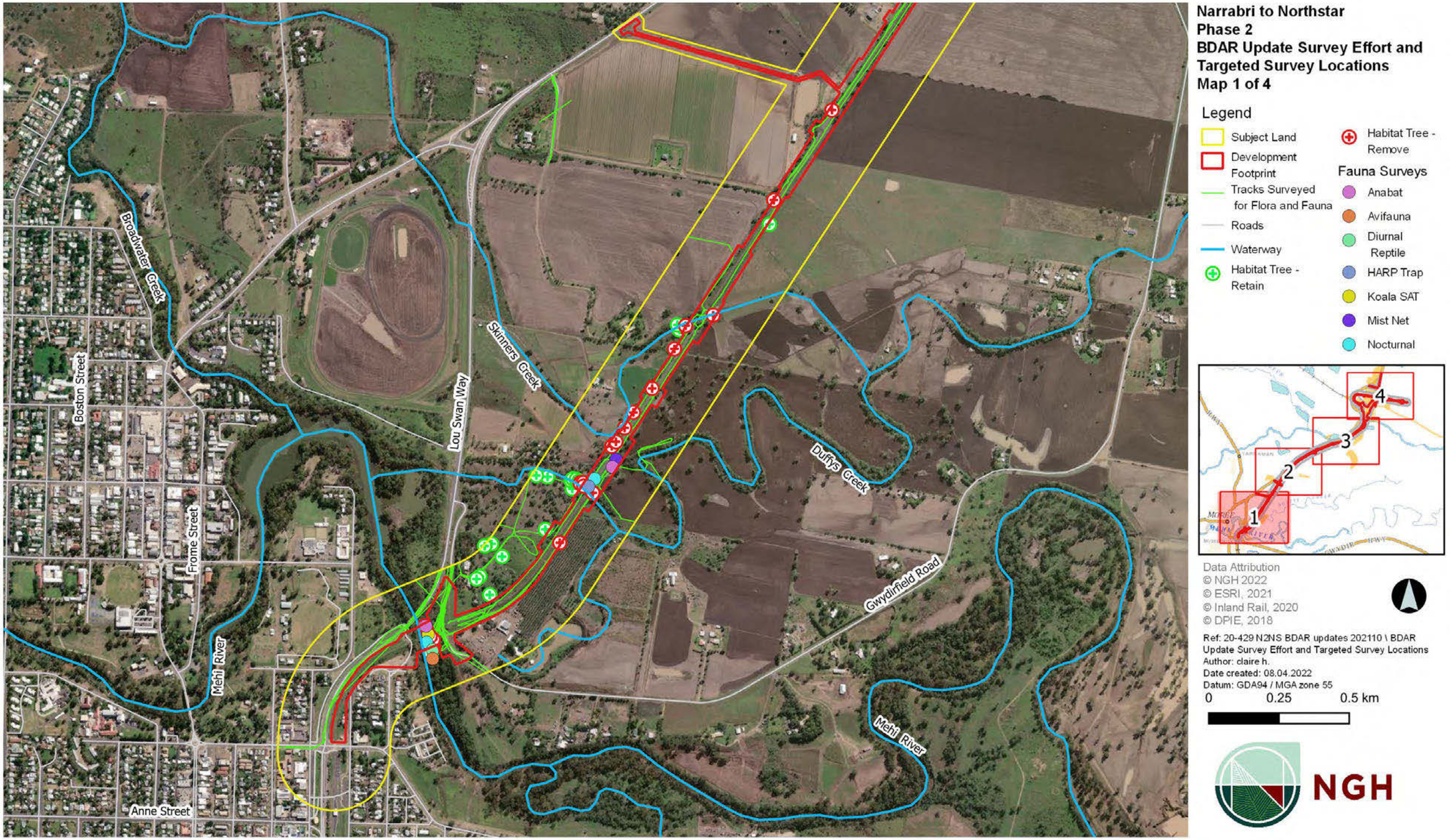


Figure 4-1 Survey effort and targeted survey locations Map 1 of 4

Figure 4-2 Survey effort and targeted survey locations Map 2 of 4

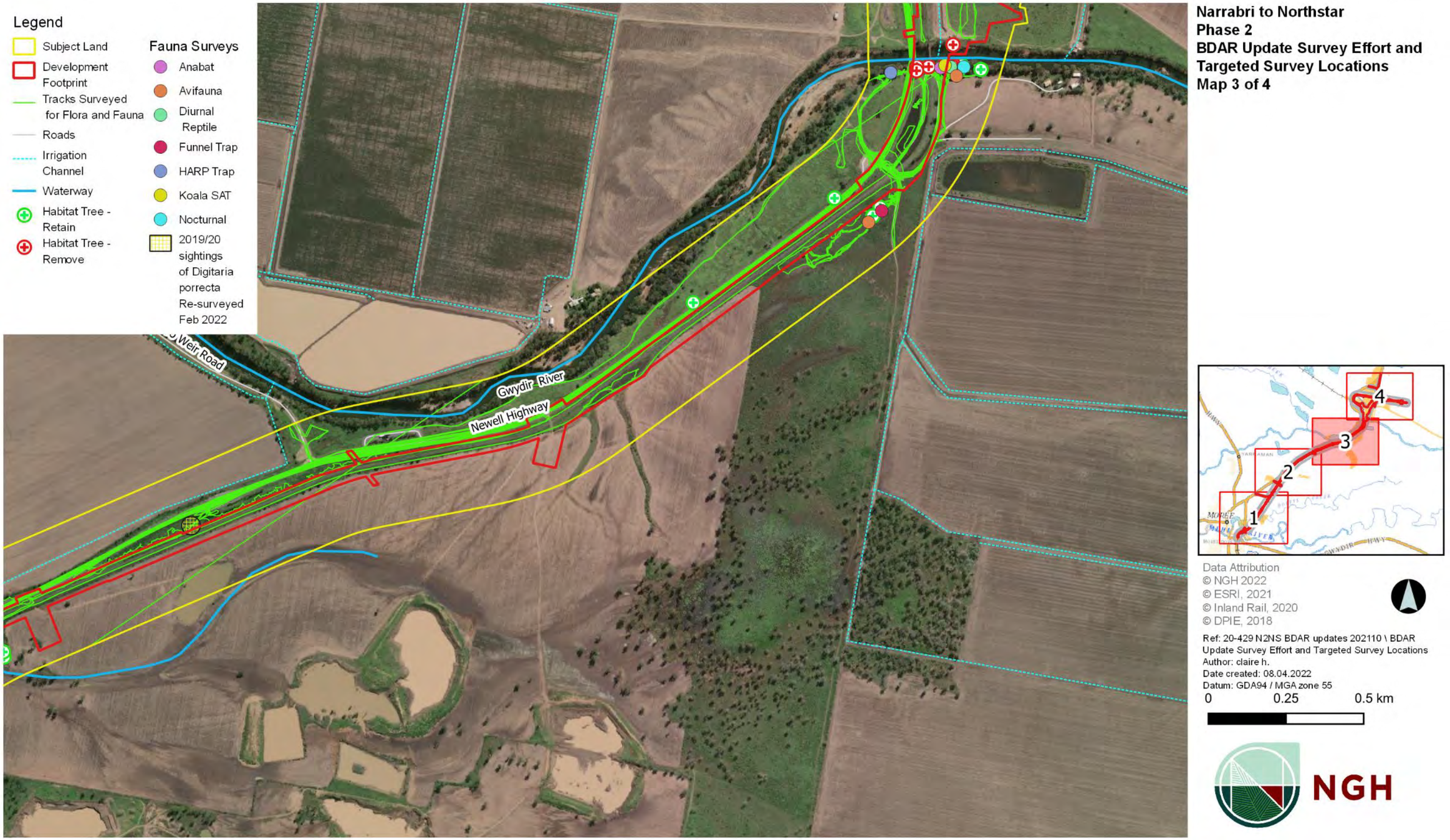
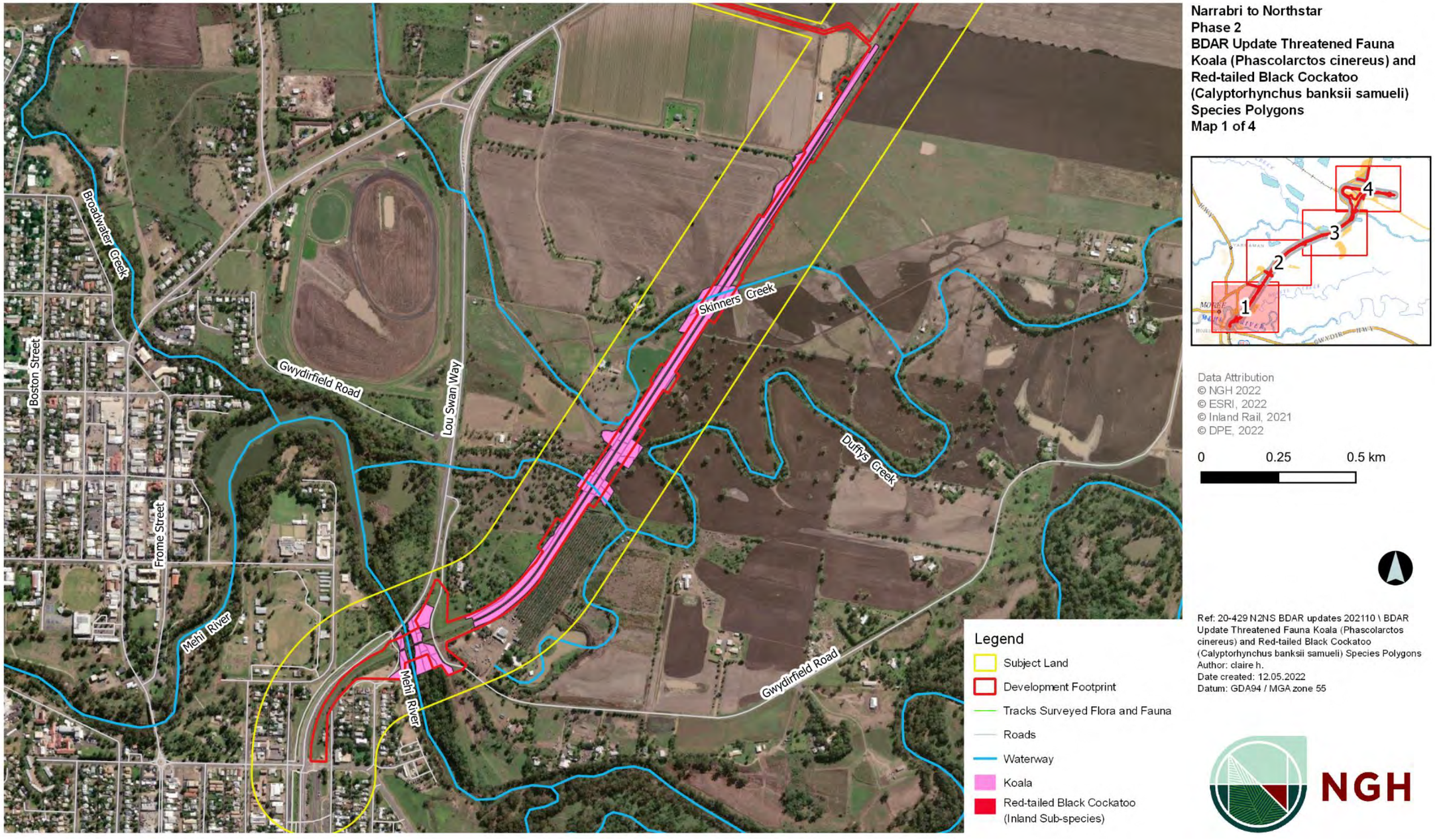


Figure 4-3 Survey effort and targeted survey locations Map 3 of 4

Figure 4-4 Survey effort and targeted survey locations Map 4 of 4



Narrabri to Northstar
Phase 2
BDAR Update Threatened Fauna Koala (Phascolarctos cinereus) and Red-tailed Black Cockatoo (Calyptorhynchus banksii samueli) Species Polygons
Map 1 of 4

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0 0.25 0.5 km

Ref: 20-429 N2NS BDAR updates 202110 \ BDAR Update Threatened Fauna Koala (Phascolarctos cinereus) and Red-tailed Black Cockatoo (Calyptorhynchus banksii samueli) Species Polygons
Author: claire h.
Date created: 12.05.2022
Datum: GDA94 / MGA zone 55

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Figure 4-5 Threatened Fauna Koala *Phascolarctos cinereus* and Red-tailed Black Cockatoo (inland subspecies) *Calyptorhynchus banksii samueli* Species Polygons Map 1 of 4

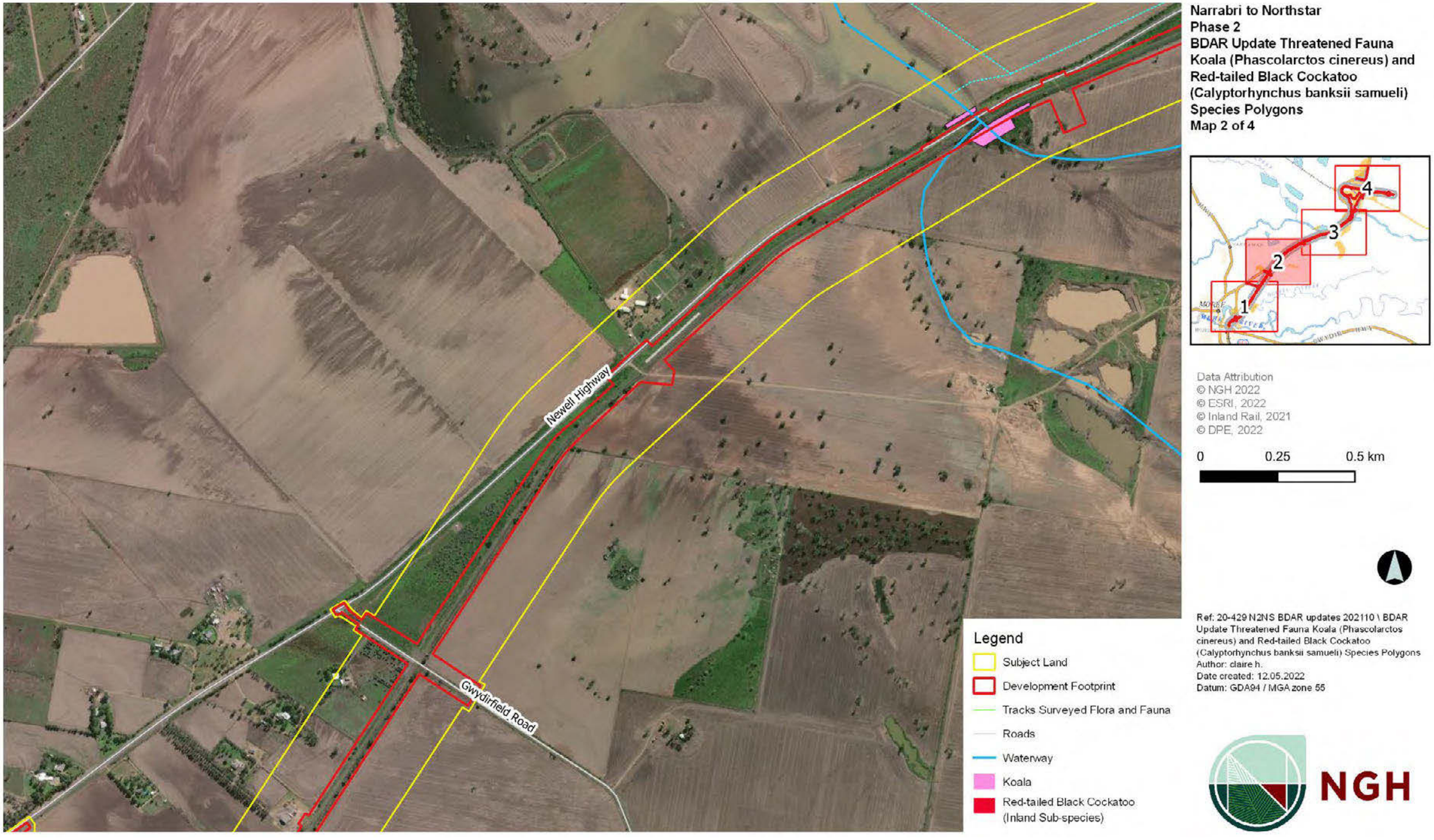


Figure 4-6 Threatened Fauna Koala *Phascolarctos cinereus* and Red-tailed Black Cockatoo (inland subspecies) *Calyptorhynchus banksii samueli* Species Polygons Map 2 of 4

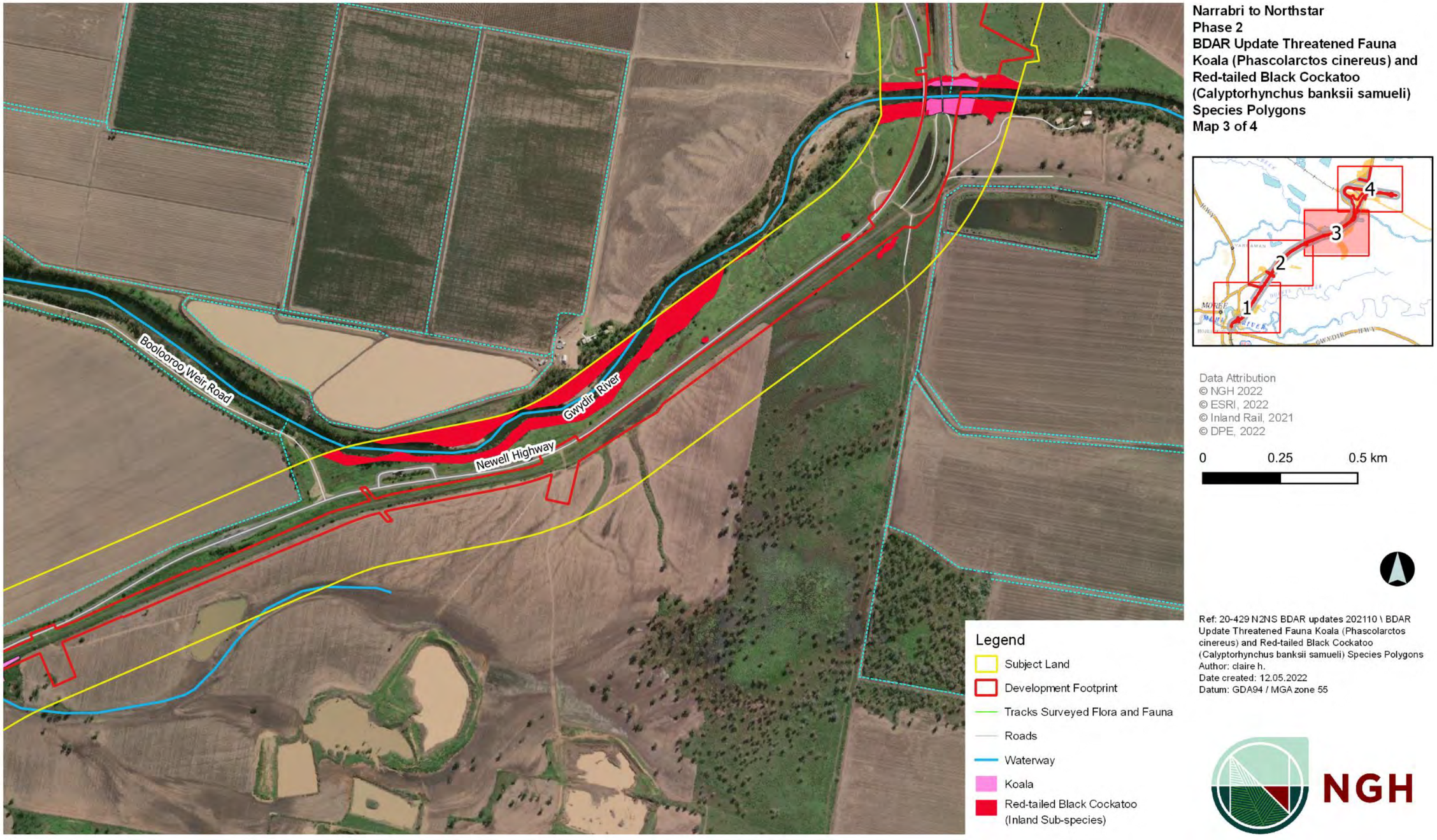


Figure 4-7 Threatened Fauna Koala *Phascolarctos cinereus* and Red-tailed Black Cockatoo (inland subspecies) *Calyptorhynchus banksii samueli* Species Polygons Map 3 of 4

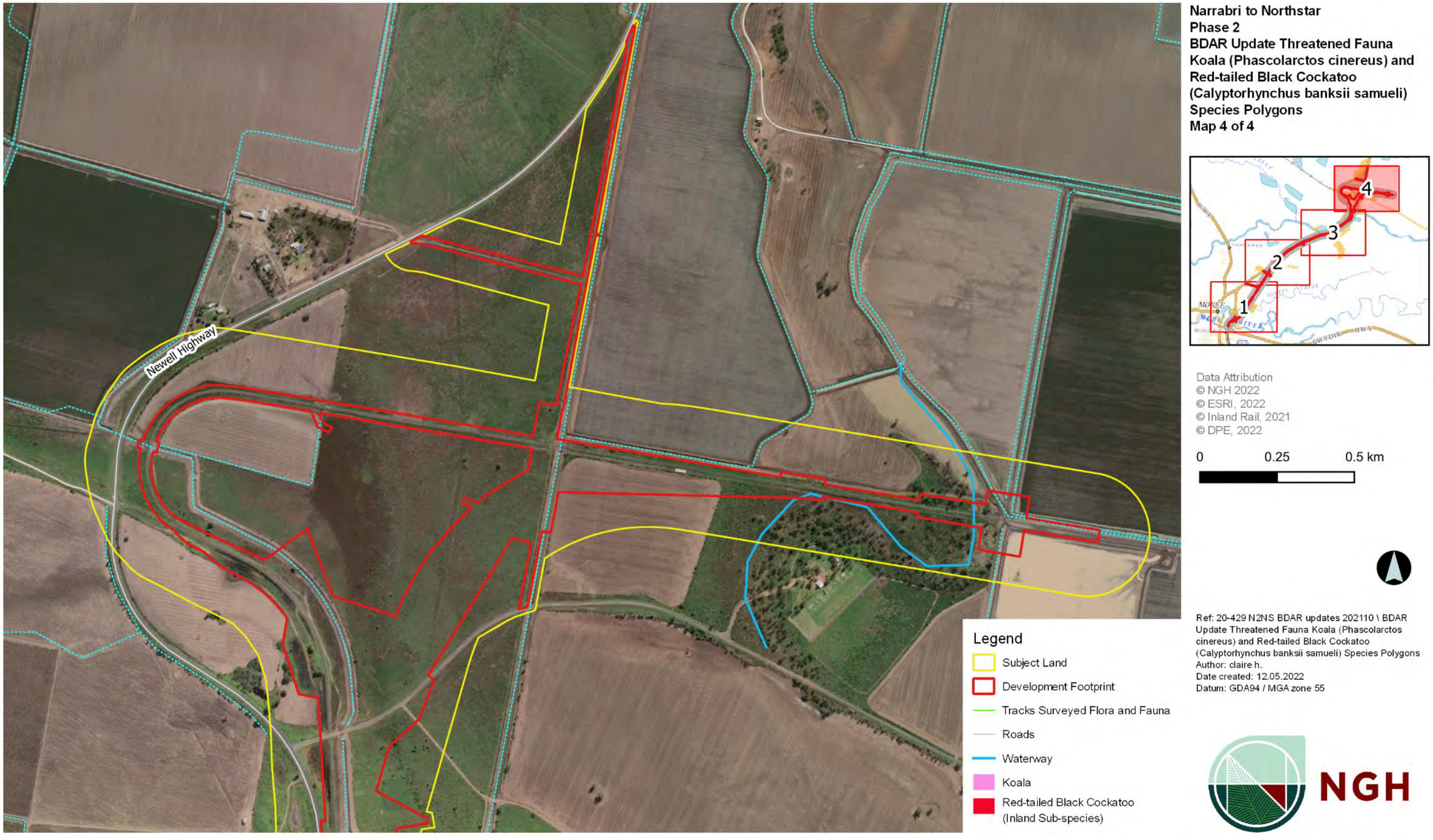


Figure 4-8 Threatened Fauna Koala *Phascolarctos cinereus* and Red-tailed Black Cockatoo (inland subspecies) *Calyptorhynchus banksii samueli* Species Polygons Map 4 of 4

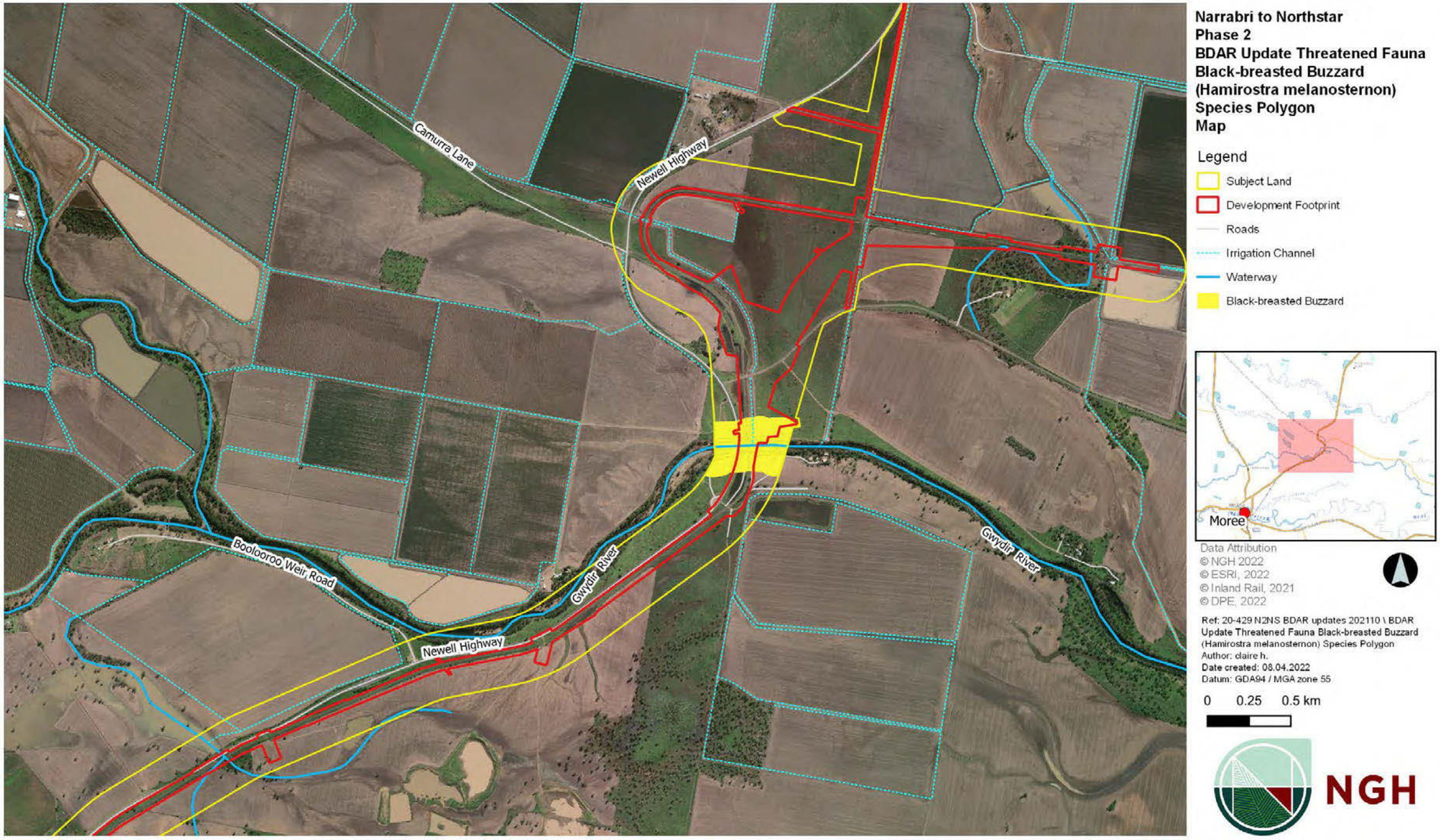


Figure 4-9 Threatened Fauna Black-breasted Buzzard *Hamirostra melanosternon* Species Polygon Map

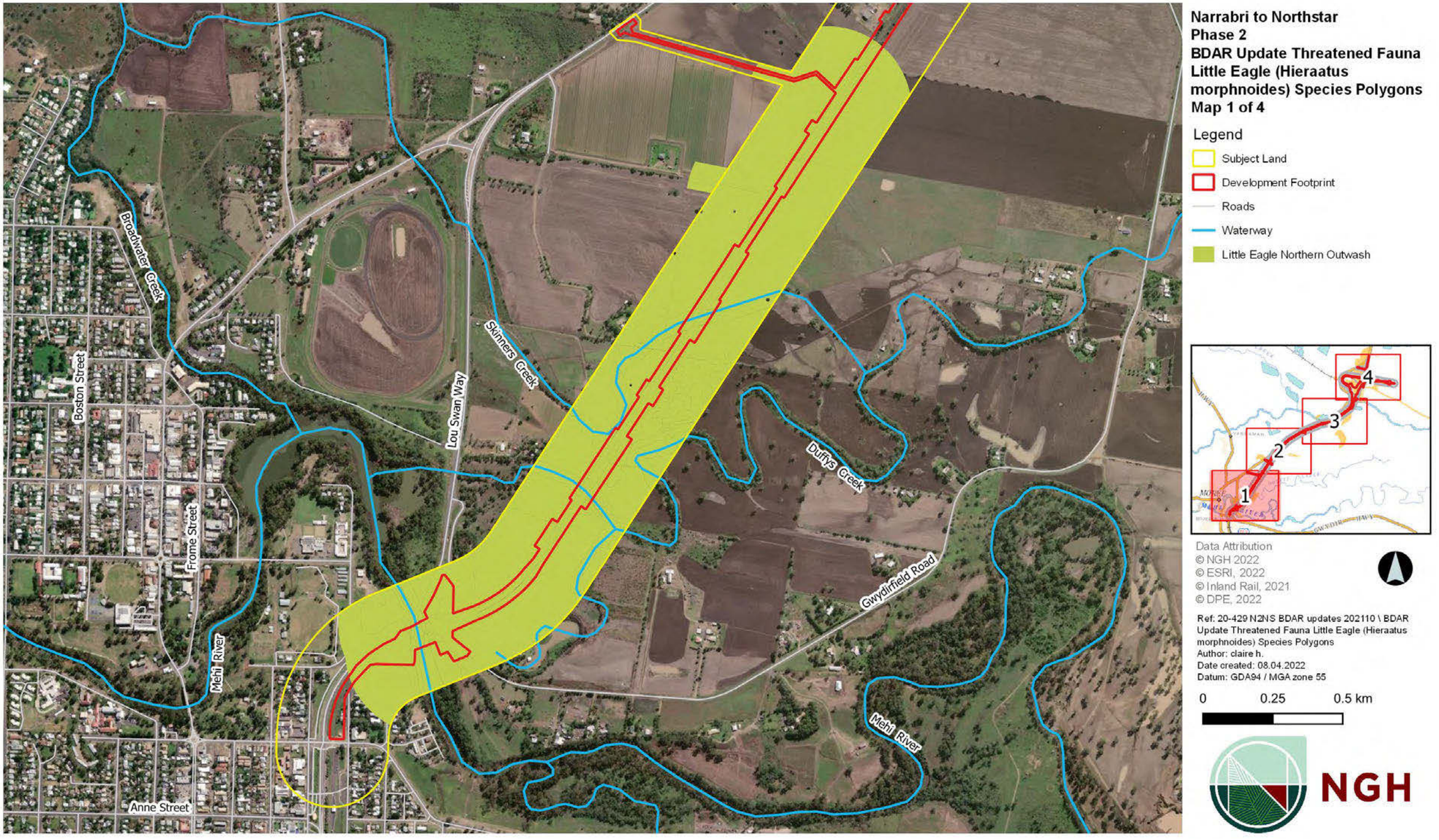


Figure 4-10 Threatened Fauna Little Eagle *Hieraatus morphnoides* Species Polygon Map 1 of 4

Figure 4-11 Threatened Fauna Little Eagle *Hieraatus morphnoides* Species Polygon Map 2 of 4

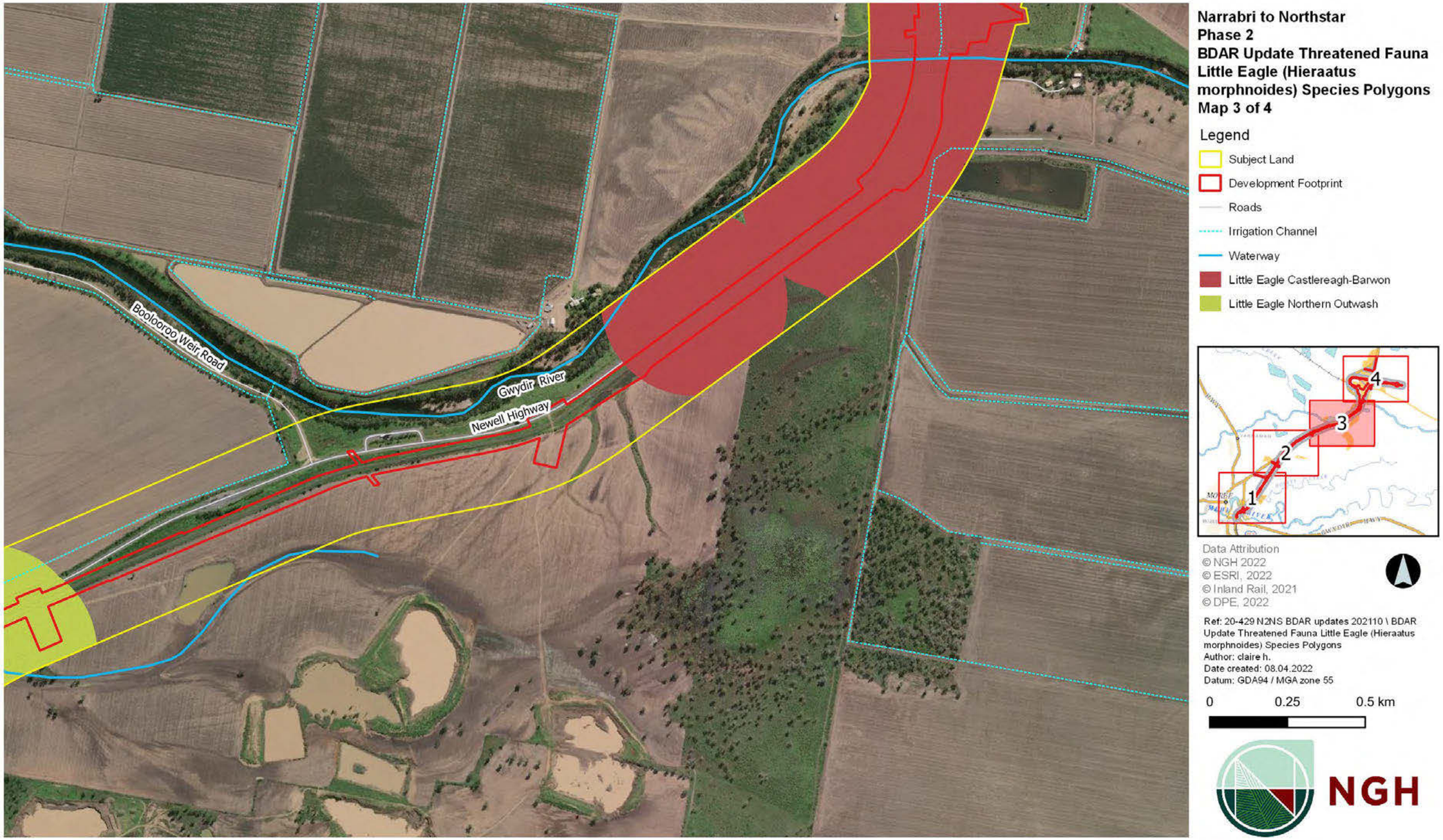


Figure 4-12 Threatened Fauna Little Eagle *Hieraatus morphnoides* Species Polygon Map 3 of 4

Figure 4-13 Threatened Fauna Little Eagle *Hieraatus morphnoides* Species Polygon Map 4 of 4

Figure 4-14 Threatened Fauna Major Mitchell's Cockatoo *Lophochroa leadbeateri* Species Polygon Map

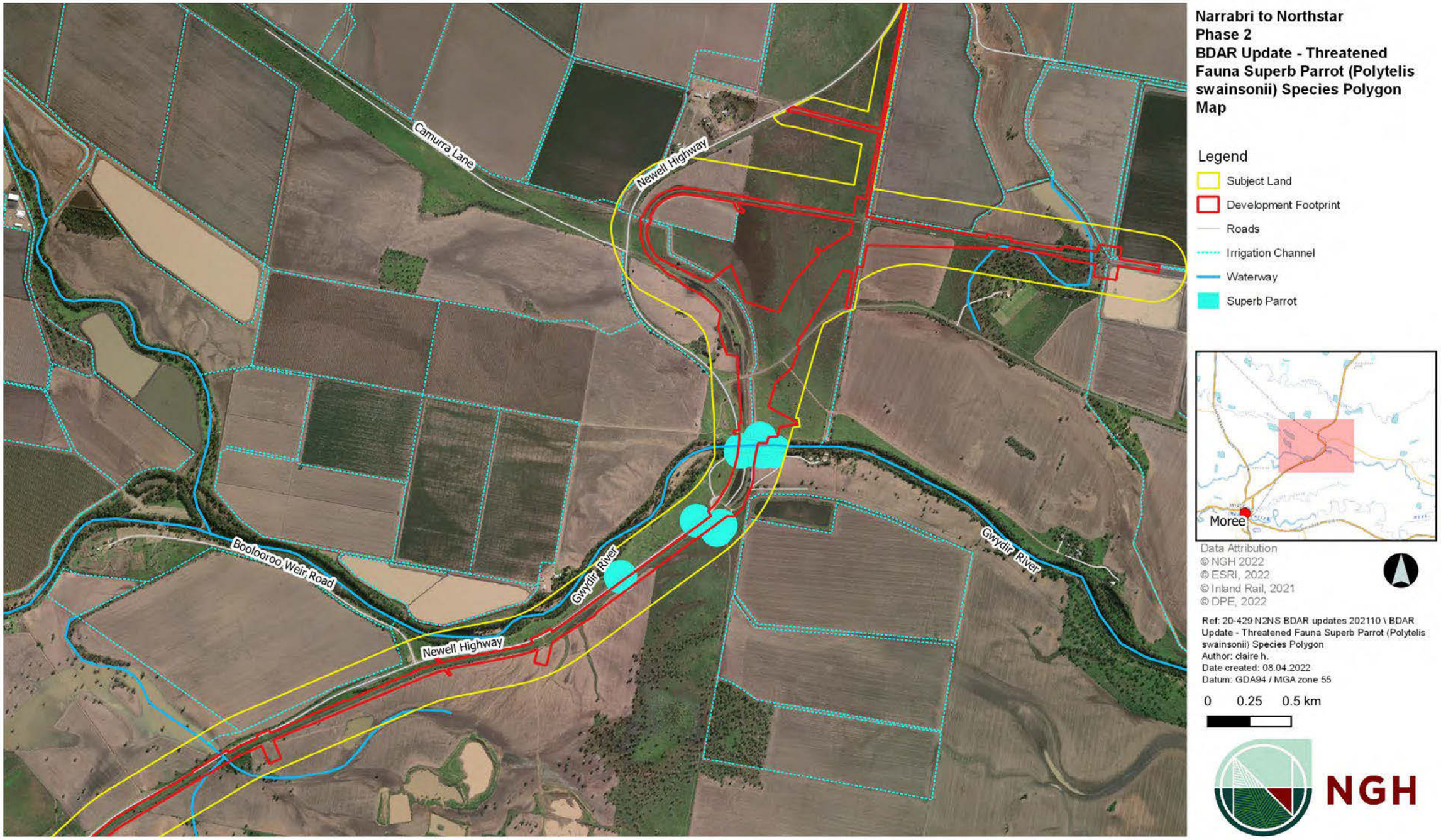


Figure 4-15 Threatened Fauna Superb Parrot *Polytelis swainsonii* Species Polygon Map

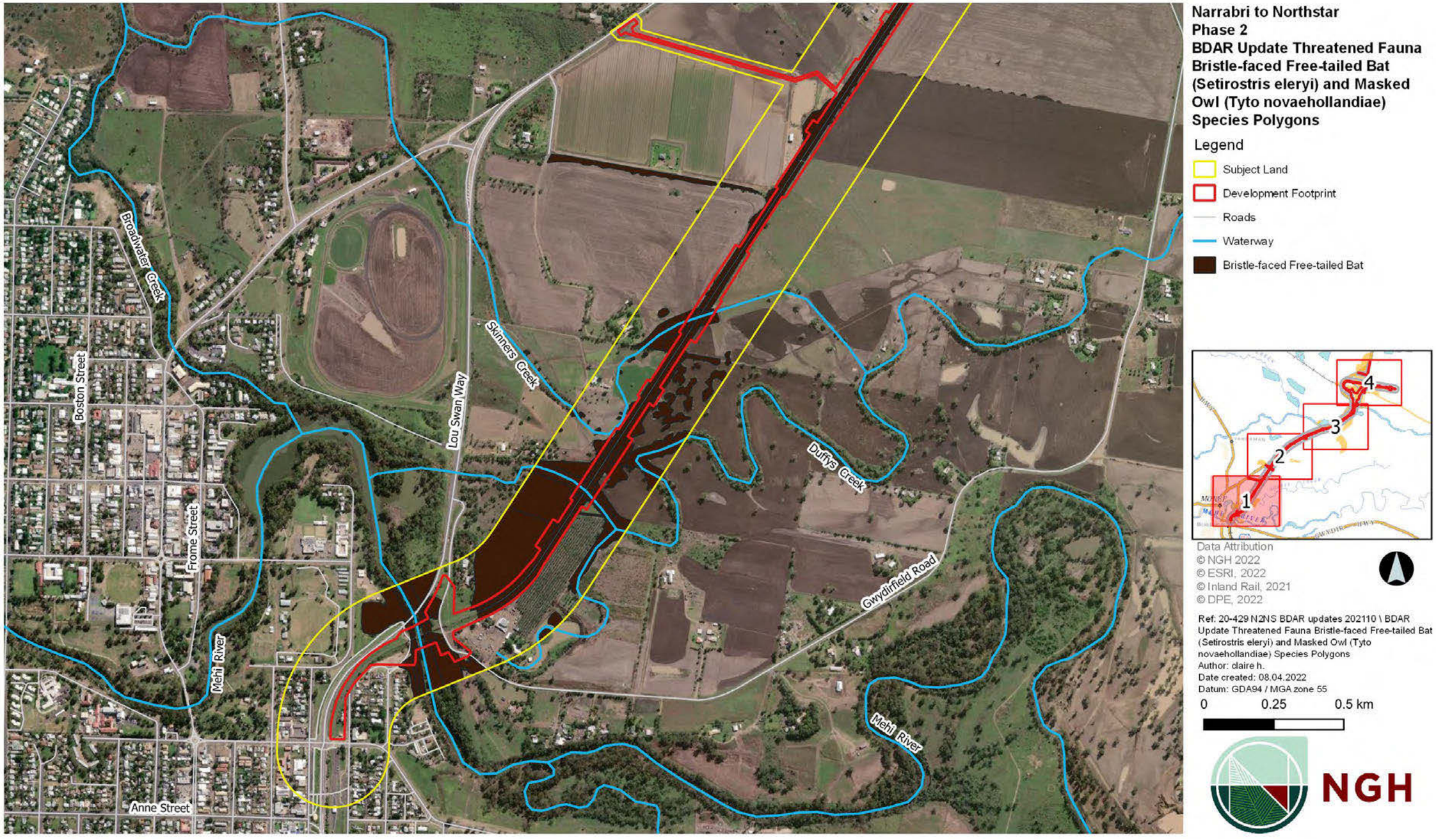


Figure 4-16 Threatened Fauna Bristle-faced Free-tailed Bat *Setirostris eleryi* and Masked Owl *Tyto novaehollandiae* Species Polygons Map 1 of 4

Figure 4-17 Threatened Fauna Bristle-faced Free-tailed Bat *Setirostris eleryi* and Masked Owl *Tyto novaehollandiae* Species Polygons Map 2 of 4

Figure 4-18 Threatened Fauna Bristle-faced Free-tailed Bat *Setirostris eleryi* and Masked Owl *Tyto novaehollandiae* Species Polygons Map 3 of 4

Figure 4-19 Threatened Fauna Bristle-faced Free-tailed Bat *Setirostris eleryi* and Masked Owl *Tyto novaehollandiae* Species Polygons Map 4 of 4

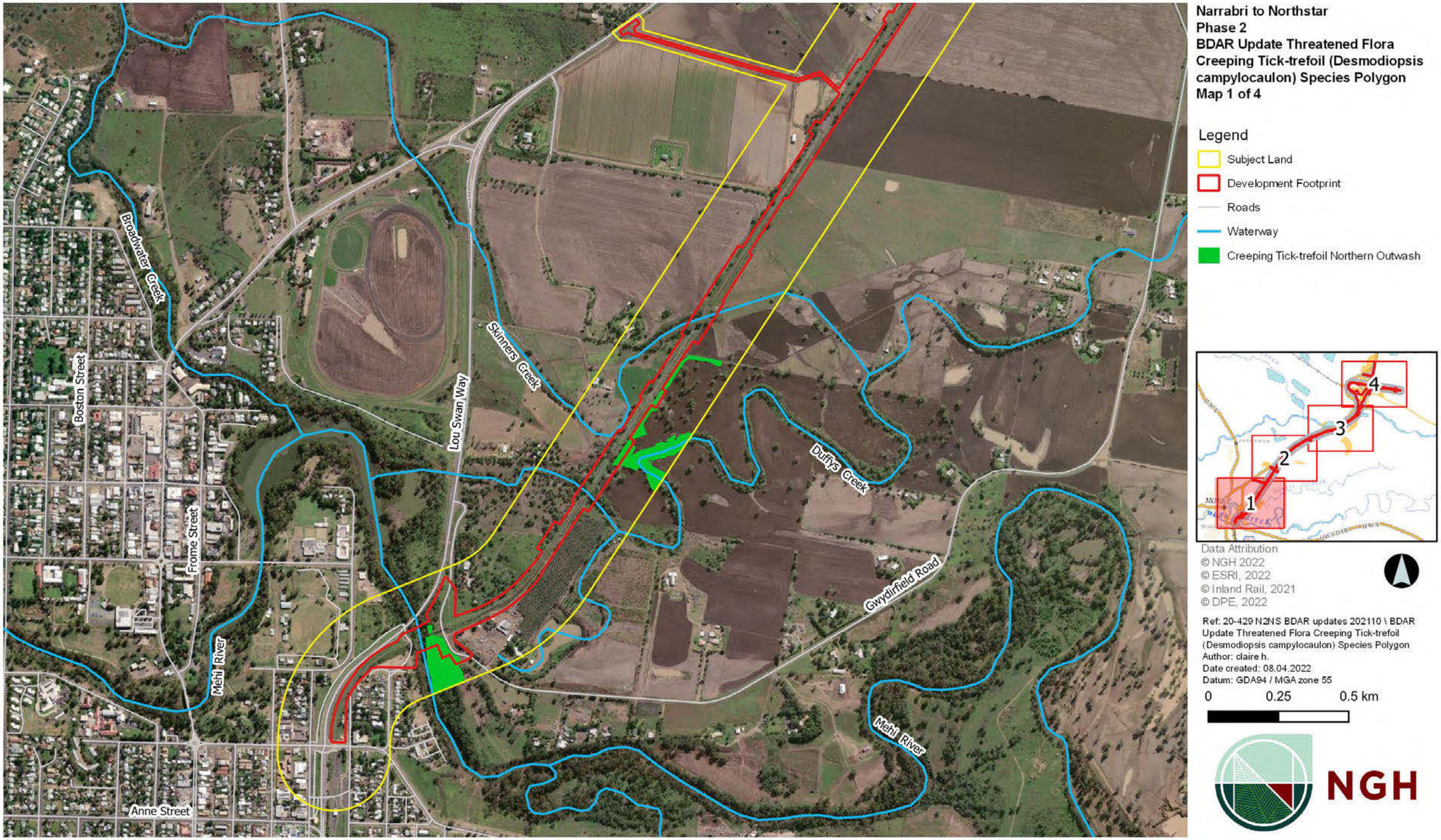
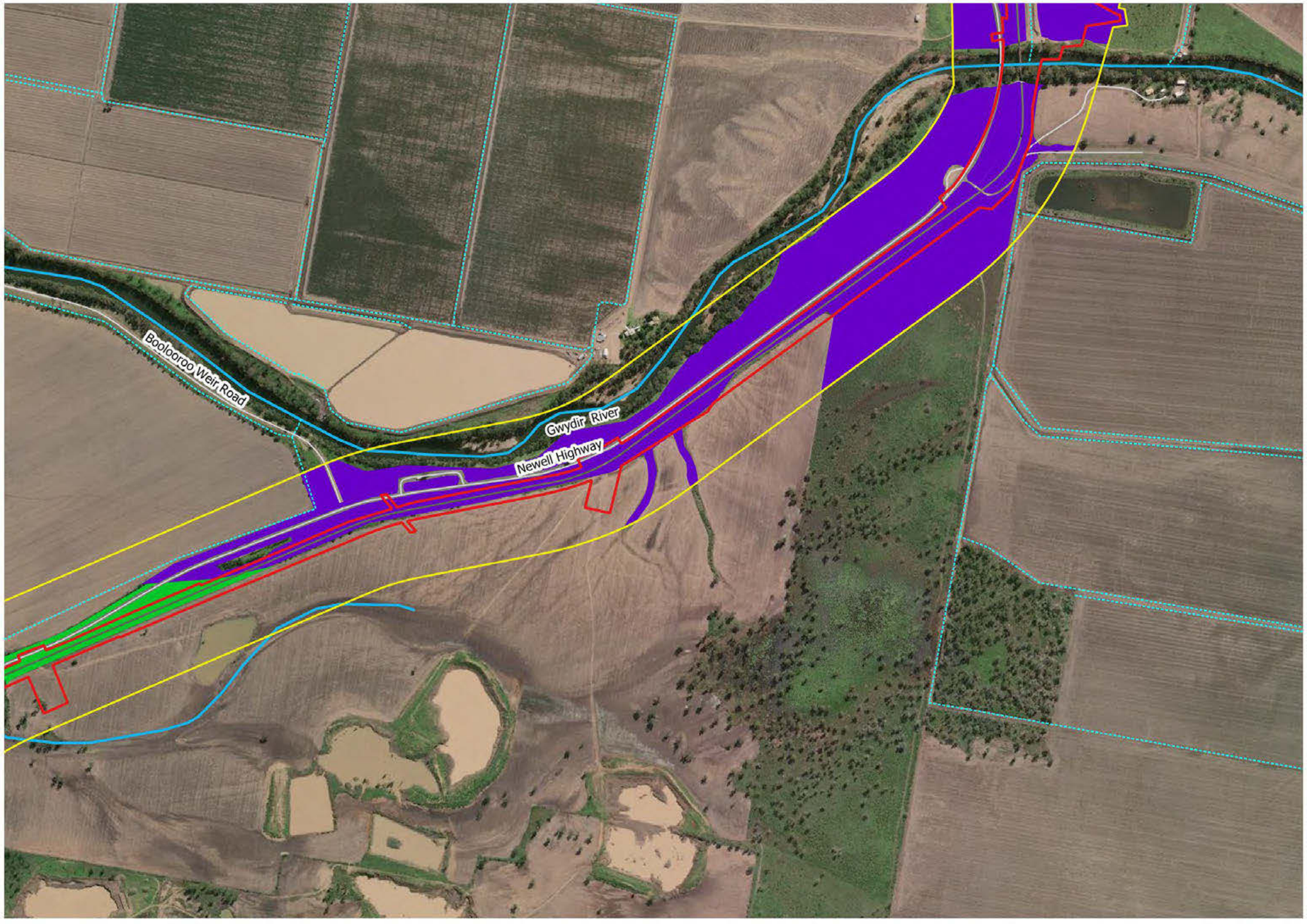


Figure 4-20 Threatened Flora Creeping Tick-trefoil *Desmodiopsis campylocaulon* Species Polygon Map 1 of 4

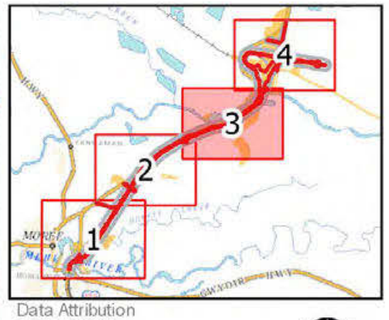
Figure 4-21 Threatened Flora Creeping Tick-trefoil *Desmodiopsis campylocaulon* Species Polygon Map 2 of 4



Narrabri to Northstar
Phase 2
BDAR Update Threatened Flora Creeping Tick-trefoil (Desmodiopsis campylocaulon) Species Polygon
Map 3 of 4

Legend

- Subject Land
- Development Footprint
- Roads
- Irrigation Channel
- Waterway
- Creeping Tick-trefoil Castlereagh-Barwon
- Creeping Tick-trefoil Northern Outwash



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Ref: 20-429 N2NS BDAR updates 202110 \ BDAR Update Threatened Flora Creeping Tick-trefoil (Desmodiopsis campylocaulon) Species Polygon
Author: claire h.
Date created: 08.04.2022
Datum: GDA94 / MGA zone 55

0 0.25 0.5 km

NGH

Figure 4-22 Threatened Flora Creeping Tick-trefoil *Desmodiopsis campylocaulon* Species Polygon Map 3 of 4

Figure 4-23 Threatened Flora Creeping Tick-trefoil *Desmodiopsis campylocaulon* Species Polygon Map 4 of 4

Narrabri to Northstar
Phase 2
BDAR Update Threatened Flora
Finger Panic Grass (Digitaria porrecta) Species Polygon
Map 1 of 4

Legend
- Subject Land
- Development Footprint
- Roads
- Finger Panic Grass Northern Outwash

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Ref: 20-429 N2NS BDAR updates 202110 \ BDAR Update Threatened Flora Finger Panic Grass (Digitaria porrecta) Species Polygon
Author: claire h.
Date created: 19.05.2022
Datum: GDA94 / MGA zone 55

0 0.25 0.5 km

NGH

Figure 4-24 Threatened Flora Finger Panic Grass *Digitaria porrecta* Species Polygon Map 1 of 4

Figure 4-25 Threatened Flora Finger Panic Grass *Digitaria porrecta* Species Polygon Map 2 of 4

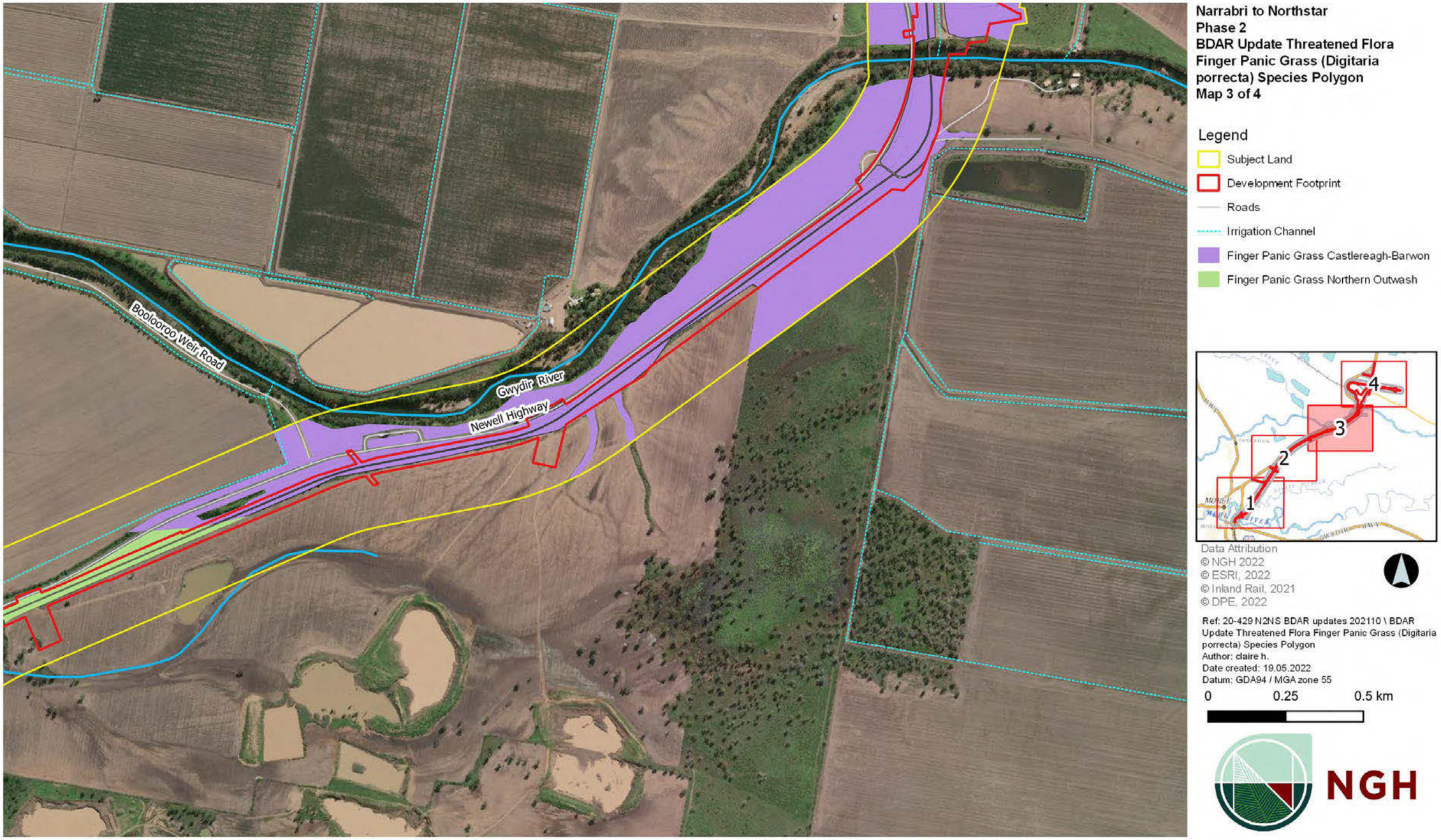


Figure 4-26 Threatened Flora Finger Panic Grass *Digitaria porrecta* Species Polygon Map 3 of 4

Figure 4-27 Threatened Flora Finger Panic Grass *Digitaria porrecta* Species Polygon Map 4 of 4

Figure 4-28 Threatened Flora Braid Fern *Platyzoma microphyllum* and Winged Peppercress *Lepidium monoplocoides* Species Polygons Map

Targeted *threatened species'* surveys were conducted in accordance with applicable guidelines, which were undertaken over a number of days in between 3 to 6 December 2019, 2 to 5 February 2020 and 17 to19 August 2020. General vegetation mapping, plot-based surveys and targeted threatened flora and fauna surveys, in accordance with relevant guidelines, where undertaken for relevant species in their suitable habitat. Survey methods included:

- NSW Guide to Surveying Threatened Plants (OEH 2018)
- Species credit threatened bats and their habitats (OEH 2018)
- Draft Threatened biodiversity survey and assessment (OEH 2004)
- Flora Species with Specific Survey Requirements (OEH2018)
- Survey guidelines for Australia's threatened birds (DEWHA, 2010)
- Survey guidelines for Australia's threatened reptiles (DSEWPaC, 2011)

As previously mentioned in Section 3.3.2, field surveys undertaken in December 2019 were completed during drought conditions, however, February 2020 surveys were conducted following improving conditions and substantial rainfall, increasing adequacy and representation of survey effort. On occasion, due to habitat constraints, strict compliance with the guidelines was not achievable due to dense infestations of Mimosa and site access. In order to ensure that these survey constraints were accounted for, a conservative approach to the mapping of any species polygons, assignment of TEC status to vegetation zones, and assumptions of species presence was undertaken where certainty that habitats were suitably degraded such that species were unlikely to occur could be shown. Additionally, random meander searches and opportunistic searches were also undertaken across the subject land, in conjunction with transects, to support adequacy of survey, in addition to the application of the precautionary principle. A review of completed surveys was undertaken within the subject land and broader study area conducted by Umwelt (Umwelt 2016b) as part of previous studies for the broader proposal. These were conducted in December 2015, February and April 2016.

Additional targeted surveys were undertaken in February 2022 for Finger Panic Grass *Digitaria porrecta* and Creeping Tick-trefoil *Desmodiopsis campylocaulon* in areas where the additional 40 BAM plots were completed and in locations where the species were recorded during the field surveys in February 2020 (as discussed in Survey Results below).

4.2.5. Weather

Weather conditions recorded for these dates from the Australian Bureau of Meteorology (BOM) at the Moree Weather (**ID:** 053115) Station are presented in Table 4-4.

Table 4-5 Weather Summary

Survey Date	Maximum temperature (°C)	Minimum temperature (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Survey
3rd December 2019	29.2	10.1	28	0 (30)	57	Plots Targeted flora and fauna survey Anabat Nocturnal Funnel traps

Survey Date	Maximum temperature (°C)	Minimum temperature (°C)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Survey
4th December 2019	33.1	11.4	34	0 (30)	37	Plots Targeted flora and fauna survey Anabat Nocturnal Funnel traps
5th December 2019	35	12.4	20	0 (30)	61	Plots Targeted flora and fauna survey Anabat Nocturnal
6th December 2019	38.5	16.1	9	0 (30)	39	Plots Targeted flora and fauna survey
2nd February 2020	39.4	26.6	24	0 (56.8)	39	Nocturnal HARP Trap Funnel traps
3rd February 2020	36.8	28.1	28	0 (56.8)	56	Plots Targeted flora and fauna survey HARP trap Nocturnal Funnel traps
4th February 2020	37.8	20.8	20	0 (56.8)	59	Plots Targeted flora and fauna survey HARP trap Nocturnal
5th February 2020	22.8	18.6	87	0.2 (57)	39	Targeted flora and fauna survey
17th August 2020	26.5	5.0	27	0	35	Targeted flora and fauna survey

Survey Date	Maximum temperature (ºC)	Minimum temperature (ºC)	Relative Humidity (RH)	Rainfall (mm) on survey date, preceding 14 days	Max wind gust (km/h)	Survey
18th August 2020	28.8	8.1	30	0	27	Targeted flora and fauna survey
19th August 2020	18.2	10.8	39	0	30	Targeted flora and fauna survey
21st February 2022	34.7	20.6	62	0 (0)	20	Plots Targeted flora and survey
22nd February 2022	33.5	20.1	58	0 (0)	13	Plots Targeted flora survey
23rd February 2022	31.6	19.4	83	30.8 (0)	11	Plots Targeted flora survey
24th February 2022	32.3	20.6	69	7.4 (0)	20	Plots Targeted flora survey

4.2.6. Threatened Species

Diurnal avifauna (Australian Bustard, Glossy Black Cockatoo, Little Eagle, Square-tailed Kite, White-bellied Sea-Eagle and Painted Honeyeater)

SURVEY EFFORT

A woodland bird census via vehicle and on-foot, as per with EPBC Act threatened bird survey guidelines, was completed during surveys in December 2019 and February 2020. Four (4) 20 minute – 2 ha diurnal avifauna surveys were undertaken during early mornings and on dusk. These surveys were undertaken within the higher condition vegetation within the subject land that contained more dense and connected vegetation including riparian areas (Mehi and Gwydir Rivers), Weeping Myall patch and Poplar Box/Carbeen woodland within the Moree Gun Club property. Counts of mistletoes were undertaken within BAM floristic plots.

Grasslands within the subject land were surveyed for Australian Bustard during daytime hours on 3 and 4 February 2020 in conjunction with threatened flora transects (approximately 32 person hours total).

Targeted hollow-bearing tree surveys were carried out within the subject land to identify trees with suitable breeding habitat. The species, number, size and height of hollows were recorded for each tree along with any evidence of use. Hollows were categorised as small (< 10 cm), medium (10 – 20 cm), and large (> 20 cm) (Appendix E). Additionally, surveys for large stick nests and evidence of use or occupancy were undertaken throughout the subject land. Targeted surveys including stag watches, riparian/dam observations

and for evidence of foraging for Glossy Black Cockatoo were undertaken during optimal survey periods (August 2020) during early evening and early morning survey periods.

Stag watching for relevant hollow bearing trees comprising suitable habitat for hollow dependent fauna within the subject land was undertaken during both survey periods. Stag watching was undertaken at dawn between the hours of 5:40 am to 7:35 am and at dusk between 7:15 pm and 8:35 pm.

Opportunistic sightings of birds were also recorded during all field surveys.

SURVEY RESULTS

None of the targeted candidate diurnal avifauna species or evidence of breeding (i.e., large stick nests for raptors) were observed during the surveys. One ecosystem credit species, the Little Lorikeet, was observed flying over the subject land near the Mehi River Bridge on 4 December 2019. Hollow-bearing trees were identified within the development footprint (Appendix E). Many of these trees, particularly along riparian areas were identified as potential breeding habitat for the Glossy Black Cockatoo. Suitable breeding habitat for this species includes living or dead trees with hollows greater than 20 cm diameter within trunks and upper limbs (BioNet 2018). No Glossy Black Cockatoos or evidence of were observed during any of the surveys undertaken. Foraging tree species for the Glossy Black Cockatoo i.e. *Casuarina cristata* were limited within the subject land, however, they occur frequently in the broader locality. Generally low numbers of mistletoes were present, with mistletoes present in only two of the BAM plots (both in PCT 27).

A full list of bird species observed during the surveys is shown in Appendix B.

Nocturnal avifauna (Bush Stone-curlew, Barking Owl)

SURVEY EFFORT

Nocturnal surveys were completed on the nights of 3 to 5 December 2019 (3 nights) and 2 to 3 February 2020 (2 nights) at three sites with the subject land including Mehi River, Gwydir River and the Poplar Box/Carbeen Woodland. Spotlighting was conducted over a minimum of one person-hour at each site per survey, in addition to call playback with a megaphone and Bluetooth speakers for a period of five minutes per species per survey, was used from the vehicle and whilst walking through the survey areas followed by a period of listening for responses in accordance with OEH threatened species guidelines (OEH, 2004).

SURVEY RESULTS

None of the targeted nocturnal avifauna, or evidence thereof, were detected during spotlighting or call playback surveys. Results of the call playback survey were minimal with only one (1) Tawny Frogmouth *Podargus strigoides* and one (1) Boobook *Ninox boobook* observed across all five (5) nights of survey. It is not considered that breeding of the surveyed species occurs within the subject land.

Nocturnal Mammals (Koala)

SURVEY EFFORT

Targeted diurnal and nocturnal searches, including call-playback and Spot Assessment Technique (SAT), for Koalas were undertaken during the December 2019 (2 days and 2 nights) and February 2020 (2 nights) surveys. Spotlighting was undertaken for a minimum of one person hour per survey, per site, and call playback was conducted for five minutes at points within the spotlighting survey. Mature feed trees identified via the SAT, were searched for signs of Koalas, such as scats and scratches at four (4) locations being the Mehi River, Gwydir River, Duffys Creek and Poplar Box/Carbeen Woodland.

SURVEY RESULTS

Koalas were observed at both the Mehi and Gwydir Rivers during nocturnal surveys on 5 December 2019. One Koala was a healthy female, whilst the other a juvenile male Koala. Additionally, a moderate abundance of Koala scat was recorded at all SAT survey locations. Recent or fresh scat was also recorded frequently along the Mehi and Gwydir Rivers, suggesting the corridor is frequently used for movement and residence of a local Koala population. SAT surveys undertaken at Duffys Creek and Poplar Box/Carbeen woodland

detected a moderate abundance of Koala scat; however, this was much older, suggesting these areas may be used on occasion by Koala individuals. A species polygon has been applied to areas of habitat within the subject land (Figure 4-5, Figure 4-6, Figure 4-7 and Figure 4-8)

Flying-foxes and Microbats (Bristle-faced Free-tailed Bat, Corben's Long-eared Bat Grey-headed Flying-fox)

SURVEY EFFORT

A combination of ultrasonic detection (Anabat survey), thermal camera, harp trapping and mist nets were utilised across both survey periods. Anabats were deployed for three (3) nights across three (3) locations in December (Mehi River, Gwydir River and Duffys Creek). Harp traps were set up for two (2) nights in February 2020 at the Mehi River, Gwydir River, Mehi River Billabong, Poplar Box/Carbeen woodland and a small patch of vegetation near the TSR and existing rails corridor. One (1) mist nest was deployed along Duffys creek on 4 February 2020; however, weather conditions were not ideal with gusty winds persisting for the evening.

SURVEY RESULTS

Calls were downloaded and converted from full spectrum calls to Zero-crossing calls using Wildlife Acoustics Kaleidoscope software, then analysed through AnalookW. Analysis was undertaken and assessed with reference to Bat Calls of New South Wales (Pennay, Law and Reinhold 2004). Reference calls were used for comparison and species confirmation, where available. In particular, NGH compared bat calls recorded on site to calls identified as "possible" Bristle-faced Free-tailed Bats by Glenn Hoye (Fly By Night Bat Survey), who has trapped the species previously and recorded reference calls.

Analysis of data revealed definite, probable, or possible presence of 14 microbat species, including 10 definite, two (2) probable and two (2) possible. Three (3) ecosystem credit species, Yellow-bellied Sheathtail Bat, Little Pied Bat and Inland Forest Bat were recorded as definite or probable as well as one (1) species credit species, Bristle-faced Free-tailed Bat, recorded as possible.

A total of six (6) species of microbat were caught during harp trapping surveys within the subject land. Of note, one (1) ecosystem credit species, the Inland Forest Bat, was caught along the Mehi River Billabong and is well outside of its normal easterly distribution (BioNet 2018). No candidate or threatened species were observed during harp trapping.

A precautionary approach has been taken to the presence of the Bristle-faced Free-tailed Bat, and it has been considered present on site. A species polygon buffer has been applied to potential roosting and foraging habitat within the subject land in accordance with Bionet, which states that:

"*All habitat on the subject land where the subject land is within 500m of a river, creek or riparian area must be mapped. Use aerial imagery to map river, creek or riparian areas (including dry creek channels, former creek channels, billabongs etc.) on or within 500m of the subject land. Species polygon boundaries should align with PCTs on the subject land to which the species is associated that are within 500m of waterbodies mapped*."

These areas are mapped in Figure 4-16, Figure 4-17, Figure 4-18 and Figure 4-19.

Grey-headed Flying-fox were observed foraging with the more dominant Little Red Flying-fox along both the Mehi and Gwydir Rivers in December 2019. A small Little Red Flying-fox camp was observed approximately 600 m northwest of the subject land along the Mehi River, with evidence of a small number of Grey-headed Flying-fox also present. No evidence of breeding or camp establishment was observed within the subject land, and survey was conducted within the correct survey period as per the BAM calculator. As such, the subject land is not considered to constitute breeding habitat for the species and does not generate species credits.

Reptiles (Pale-headed Snake, Five-clawed Work-skink)

SURVEY EFFORT

Diurnal and nocturnal surveys and funnel trap surveys were undertaken during December 2019 and February 2020 for both the Pale-headed Snake and Five-clawed Work-skink.

Active diurnal searches were undertaken for the Five-clawed Work-skink within suitable and marginal habitat, including raking of leaf litter and searching under coarse woody debris for a period of two person hour per site per survey, particularly partially buried logs. Funnel traps were also deployed across nights of 2 and 3 February 2020 within areas where woody debris or tussock grasses were present.

Nocturnal spotlighting of riparian areas and Poplar Box/Carbeen woodland for the Pale-headed Snake was undertaken across both the December 2019 and February 2020 survey periods. In total, five (5) nights of nocturnal survey were undertaken, with a minimum of two person hour per site undertaken. Both ground and tree survey were undertaken in areas were live and dead trees, loose bark and coarse woody debris was present. Funnel traps were also deployed across the nights of 2 and 3 February 2020. Diurnal survey of coarse woody debris and other potential sheltering sites where present in these areas were also surveyed opportunistically during all survey periods.

Due to 116 Five-clawed worm skink individuals being recorded during pre-clearing and post-clearing works between chainage 736 and 742 during Phase 1 of the North Star to Narrabri section of the Inland Rail project, further surveys for their habitat to determine likelihood of presence were undertaken in February 2022.

SURVEY RESULTS

No threatened species were observed during the targeted reptile surveys. Numerous common geckos and skinks and one (1) Shingleback Lizard *Tiliqua rugosa* were observed. No Five-clawed Worm Skinks were observed during the February 2022 habitat surveys, however due to the amount of appropriate habitat for this species present on-site, their cryptic nature and the high number of individuals recorded in Phase 1 of the North Star to Narrabri section of the Inland Rail Project, it is likely this species is present on site.

Threatened Flora (Dichanthium setosum, Cyperus conicus, Desmodiopsis campylocaulon, Digitaria porrecta, Homopholis belsonii, Lepidium aschersonii)

SURVEY EFFORT

Where possible to do so, areas of suitable habitat for the above-mentioned species within the development footprint and subject land were surveyed using the parallel field traverse survey technique during suitable survey periods in accordance with the NSW Guide to Surveying Threatened Plants (OEH 2016). Random meanders and opportunistic searches were also undertaken to support transect surveys, and in areas of non-optimal habitat. Two (2) ecologists undertook transects and random meander searches within suitable habitat of riparian areas and woodland habitats in December 2019, three (3) ecologists undertook transects and meander searches within grasslands occurring within TSRs and road reserves in February 2020. In February 2022, two (2) ecologists undertook transects and meander searches in areas where 40 BAM plots were completed and in locations where Finger Panic Grass *Digitaria porrecta* and Creeping Tick-trefoil *Desmodiopsis campylocaulon* were recorded during the field surveys in February 2020 (as discussed in Survey Results below).

SURVEY RESULTS

Habitat for all potential threatened flora species predicted is sub-optimal, and subject to invasion by naturalised and exotic flora, such as Mimosa, African Boxthorn and Tiger Pear. Nonetheless, both Finger Panic Grass *Digitaria porrecta* and Creeping Tick-trefoil *Desmodiopsis campylocaulon* were recorded during the field surveys in February 2020 within the development footprint. One Finger Panic Grass individual was recorded between the road reserve and existing rail corridor along the Newell Highway, and three (3) individuals of Creeping Tick-trefoil were observed within the TSR, north of Camurra-Warialda Road and within the development footprint. Species polygons consisting of 30 m buffers were originally applied for

these species in accordance with the BAM however the consistency review of this BDAR by BCS requested these polygons be updated to reflect all suitable habitat for the species that wasn't surveyed as seen in Figure 4-20 to Figure 4-23. Additional sightings of Creeping Tick-trefoil were observed in February 2022; thirty-eight (38) individuals east of the Mehi River, five (5) individuals between Skinners Creek and Duffys Creek and twenty (20) individuals between the road reserve and existing rail corridor along the Newell Highway. Photographs of Finger Panic Grass *Digitaria porrecta* and Creeping Tick-trefoil *Desmodiopsis campylocaulon* are available in Figure 4-29 and all sightings in February 2020 and 2022 are mapped in Figure 4-31 and Figure 4-31.

No other threatened flora was observed during the field surveys.

Figure 4-29 *Digitaria porrecta* (left and middle) and *Desmodiopsis campylocaulon* (far right) observed within the subject land

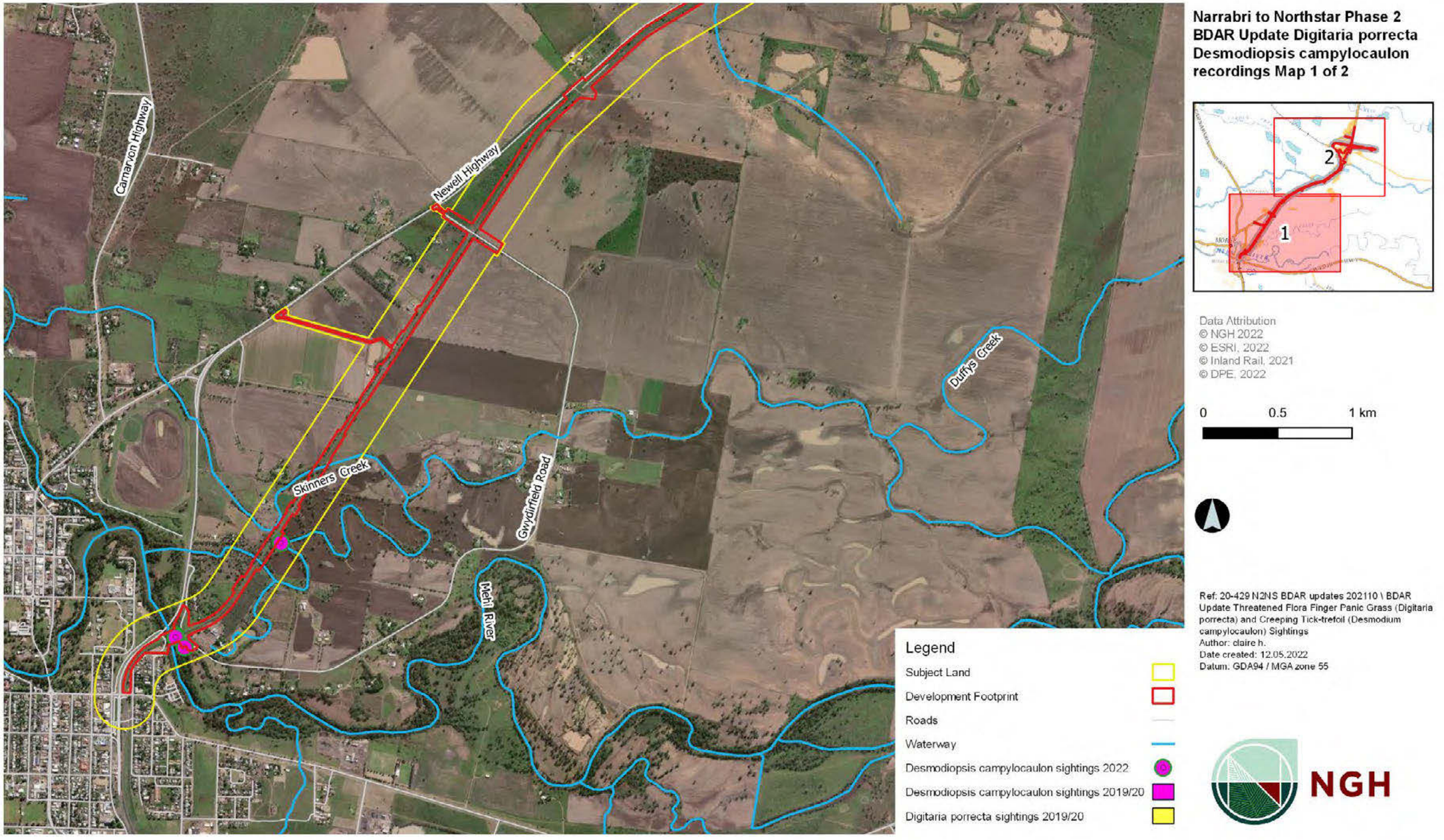


Figure 4-30 Threatened Species *Digitaria porrecta* and *Desmodiopsis campylocaulon* Sightings Map 1 of 2

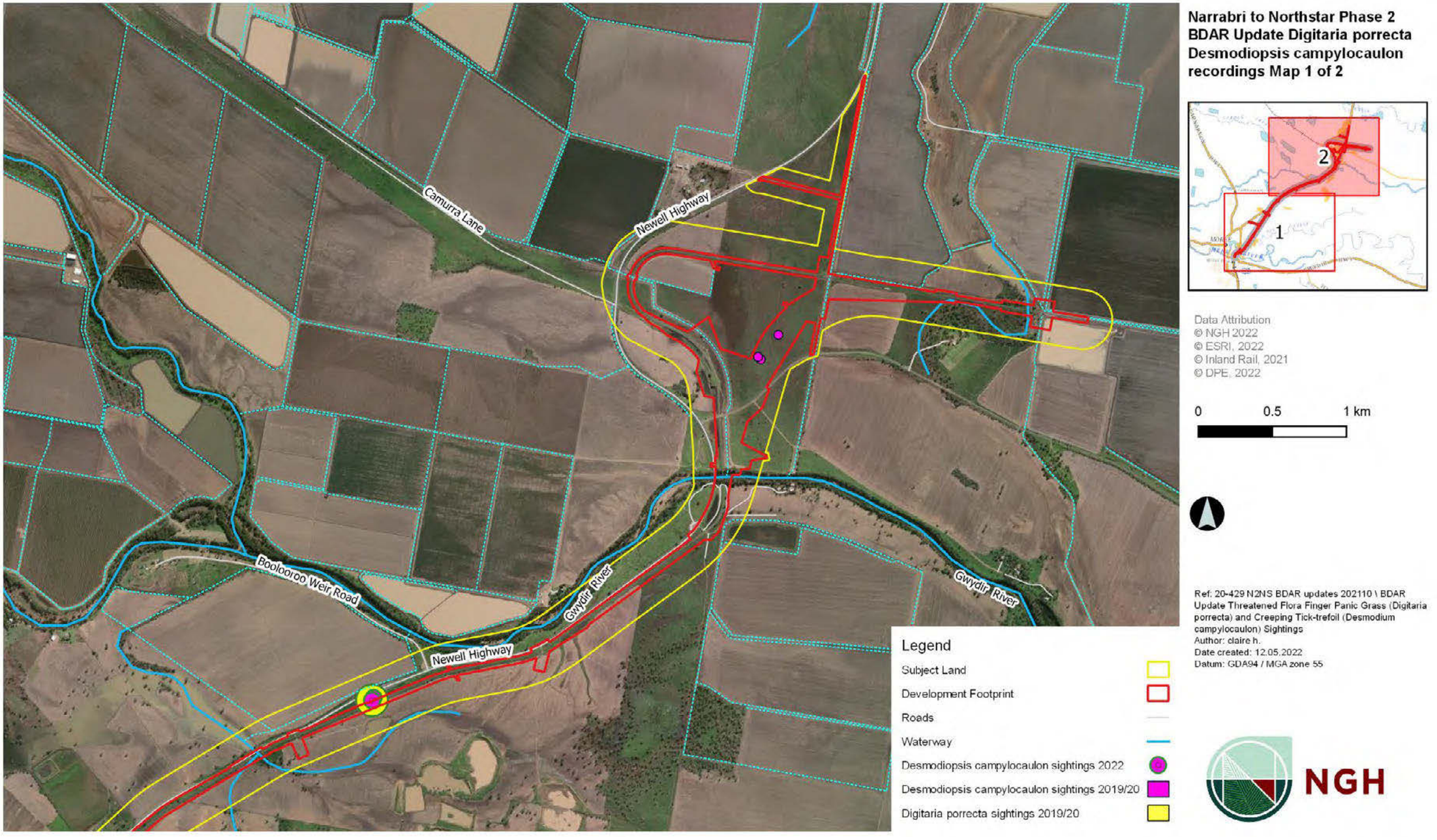


Figure 4-31 Threatened Species *Digitaria porrecta* and *Desmodiopsis campylocaulon* Sightings Map 2 of 2

4.3. Additional Habitat Features Relevant to Prescribed Biodiversity Impacts

4.3.1. Occurrences of karst, caves, crevices and cliffs

As verified by the field surveys, there are no occurrences of karst, caves, crevices, or cliffs in the subject land or development footprint.

4.3.2. Occurrences of rock

As verified by the field surveys, there are no occurrences of surface rock in the subject land or development footprint.

4.3.3. Occurrences of human made structures and non-native vegetation

Existing infrastructure such as rail bridges and culvert structures exist within the subject land. These include major bridges, such as those across the Mehi and Gwydir Rivers, lower bridges crossing Skinners and Duffys Creek, and numerous concrete pipe and corrugated pipe culverts. These were inspected visually, via thermal camera imagery, and ultrasonic detection to detect species that may be utilising these structures for roosting. Areas containing cavities and expansion joints were inspected. No evidence of utilisation of these structures by any fauna was observed during the surveys, though this does not discount their potential use seasonally.

Non-native vegetation within the subject land and subject land consists of both cleared paddocks and cropping areas, as well as areas used for horticultural purposes. Although these areas may allow for the movement of threatened fauna throughout the broader landscape, and potentially foraging habitat for threatened microbats on occasion, it is not considered that threatened fauna species would utilise areas of non-native vegetation regularly for foraging or breeding and would only be utilised for transient use. Native scattered trees were observed within areas of cropping that may be utilised by threatened fauna species, with one (1) scattered trees requiring removal. No threatened species are considered to rely solely on the non-native vegetation within the subject land.

4.3.4. Hydrological processes that sustain and interact with the rivers, streams and wetlands

As mentioned in section 4.3.3, numerous water crossings via bridges and culverts occur within the subject land and development footprint. Both major rivers, the Mehi and Gwydir Rivers, support River Red Gum *Eucalyptus camaldulensis* vegetation and contain a moderate abundance of exotic flora such as Willows *Salix* sp., Castor Oil Plant *Ricinus communis* and Balloon Vine *Cardiospermum grandiflorum*. This generally supports habitat for a range of commonly occurring waterbirds such as Spoonbills, Egrets as well as disturbance resistant turtle and amphibian species such Ornate Burrowing Frog *Platyplectrum ornatum*, Barking Frog *Limnodynastes fletcheri*, Desert Tree Frog *Litoria rubella* and Spotted Grass Frog *Limnodynastes tasmaniensis*.

Both river systems are considered key fish habitat (NSW Department of Primary Industries (Fisheries), undated). Native fish species of the lowland Gwydir River catchment include Golden Perch *Macquaria ambigua*, Spangled Perch *Leiopotherapon unicolor*, Murray Cod *Maccullochella peelii*, Freshwater Catfish *Tandanus*, Purple-spotted Gudgeon *Mogurnda adspersa*, Australian Smelt *Retropinna semoni*, Bony Bream *Nematalosa erebi*, Carp Gudgeon *Hypseleotris klunzingeri*, Unspecked Hardyhead *Craterocephalus stercusmuscarum* and Murray-Darling Rainbow Fish *Melanotaenia fluviatilis* (Spencer, Haegney and Porter, 2010). Exotic species are commonly encountered in the lowland sections of the Gwydir catchment, and include carp *Cyprinus carpio*, Mosquito Fish *Gambusia holbrooki* and Goldfish *Carassius auratus* (DPI 2013).

Fish passage upstream along the Mehi River is limited at the Moree Weir approximately two (2) kilometres downstream of the subject land, and at the Tarelaroi weir, located at the confluence of the Mehi and Gwydir Rivers upstream of Moree (DPI 2006). Despite this, it is noted that the Murray Cod (listed as vulnerable under the EPBC Act) is more common in the Mehi River compared to the Gwydir River (Spencer, Haegney and Porter, 2010). Ephemeral watercourses, such as Duffys Creek, Skinners Creek and the Mehi floodplain billabong are similarly fringed with River Red Gum, but due to their intermittent nature, contain minimal fish habitat features.

Following several years of drought conditions, and well below average rainfall, during the December 2019 surveys, water flow within both rivers was non-existent, and limited to stagnant shallow and deep pools of low to moderate water quality based on visual inspection. Following improved rainfall across the border region and upper catchments, surveys conducted in February 2020 noted water flow had returned to both river systems, however, water was heavily sediment laden likely as a result of high amounts erosion and bushfire impacts upstream. River systems were not inspected during February 2022 surveys, but water flow was present.

Groundwater Dependent Ecosystems (GDEs) are ecosystems in which species composition and ecological processes are determined by groundwater (DPE, 2022d). Ephemeral waterways are likely to be fed by both surface and groundwater, and the associated riparian vegetation is therefore likely to be dependent, at least in some part, on groundwater. Groundwater sources in the subject land include alluvial sediments associated with the Gwydir River and tributaries, where the alluvial sediments extend to over 40 m below ground level. Alluvial groundwater associated with the Gwydir River would be recharged by rainfall infiltration and surface flows. Shallow alluvial sediments of depth of less than 10 to 20 metres below ground level may be intercepted along creek lines within the subject land and development footprint. These perched shallow groundwater sources would be recharged by rainfall infiltration, with groundwater levels expected to rise following rainfall events. A search of the Atlas of GDEs identified the potential for GDEs to be present within the subject land, predominantly within watercourses and River Reg Gum riparian vegetation associated with the Gwydir River, Mehi River, Duffys, Creek, Skinners Creek and Mehi River Billabong.

An aquatic assessment undertaken to assess impacts of the proposal to aquatic ecology (Umwelt, 2017a) concluded that the proposal is not considered likely to impact on GDEs occurring within the subject land.

5. Matters of National Environmental Significance

An EPBC Act protected matters report was undertaken on the 20 October 2019 (10 km buffer of the subject land) and again on the 19th August 2022 to identify Matters of National Environmental Significance (MNES) that have the potential to occur within the subject land (Appendix F). Relevant to biodiversity these include:

- Wetlands of International Importance
- Threatened Ecological Communities
- Threatened species
- Migratory species

The potential for these MNES to occur at the site are discussed below.

5.1. Wetlands of International Importance

Four (4) wetlands of international importance were identified from the protected matters report. The nearest of these (30 to 40 km downstream) is the Gwydir wetlands: gingham and lower Gwydir (big leather) watercourses. The Gwydir wetland would interact with the Gwydir River and Mehi River, which intersect or are proximal to the subject land. All other wetlands returned from the search are over 900 km away.

5.2. Threatened Ecological Communities

Five (5) threatened ecological communities were identified from the protected matters report. Three (3) of these were confirmed as present within the subject land (Figure 3-22 to Figure 3-25):

- Weeping Myall Woodlands (Endangered)
- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered)
- Poplar Box Grassy Woodland on Alluvial Plains (Endangered)

Two (2) additional communities were not present within the site:

- White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland (Critically Endangered)
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions (Endangered)

5.3. Threatened Species

Outside of marine species, 16 threatened species encompassing Ten (10) birds, one (1) fish, three (3) mammals, six (6) plants, and one (1) reptile were identified from the protected matters report. Of these, six (6) are considered to have the potential to utilise the habitats at the subject land:

- Belson's panic *Homopholis belsonii* – Vulnerable
- Painted Honeyeater *Grantiella picta*– Vulnerable
- Koala *Phascolarctos cinereus*– Vulnerable (Recorded)
- Grey-headed flying-fox *Pteropus poliocephalus* – Vulnerable (Recorded)
- Murray Cod *Maccullochella peelii* – Vulnerable
- Five-clawed Worm-skink *Anomalopus mackayi* – Vulnerable

Following field survey and associated updates to the BAM-C in 2022, three (3) additional threatened species listed under the EPBC Act were identified as having the potential to utilise the habitats at the subject land:

- Superb Parrot *Polytelis swainsonii* – Vulnerable
- Winged Peppercress *Lepidium monoplocoides* – Endangered
- Corben's Long-eared Bat *Nyctophilus corbeni* – Vulnerable

Freshwater Ecology completed surveys for EPBC aquatic species likely to occur within the subject land in accordance with Survey Guidelines for Australia's Threatened Fish. The survey effort recorded the following species:

- Murray Cod *Maccullochella peelii* – Vulnerable

5.4. Migratory Species

Apart from marine species, nine (9) migratory species were identified from the protected matters report. A habitat assessment of these species is provided in APPENDIX G. Of these, one (1) is considered to have the potential to utilise the habitats and were observed within the subject land:

- *Myiagra cyanoleuca* Satin Flycatcher

6. Avoid and Minimise Impacts

6.1. Avoiding and Minimising Impacts on Native Vegetation and Habitat

6.1.1. Site selection – consideration of alternative locations/routes

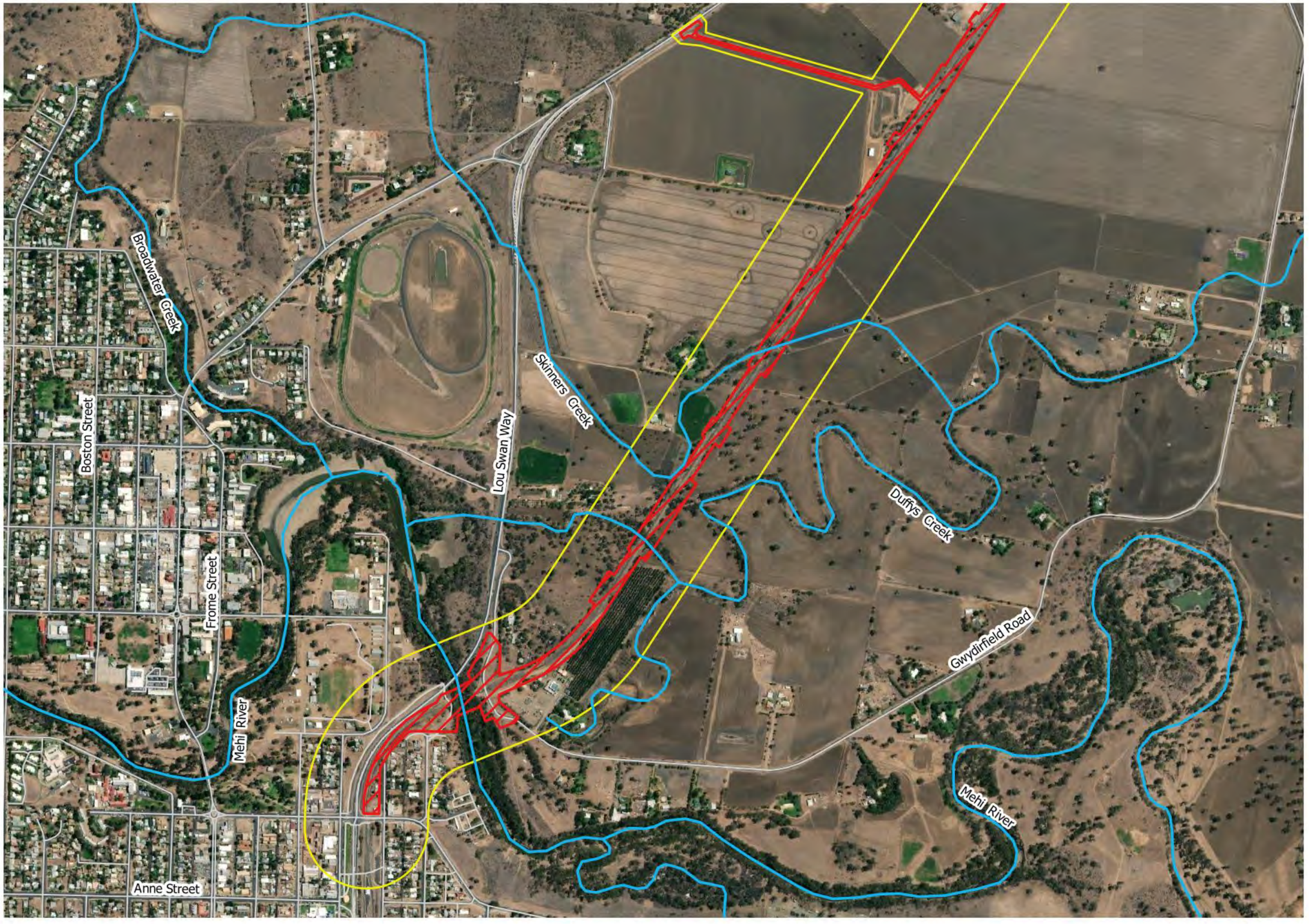
ARTC has commissioned a range of studies to guide the site selection for the proposal. The existing single bi-directional track was originally constructed for light traffic running a variety of freight, grain and passenger trains. Alternatives would be to construct a new rail line in its entirety, but this would be detrimental in regard to socio-economic and environmental aspects. The current proposal incorporates an upgrade of the existing rail line to accommodate the Inland Rail requirements for a 30-tonne axle load structural loading and improved flood immunity. Where practicable to do so, the design of the proposal has been sited within the existing rail corridor with a commitment to upgrading the existing rail line. As a result, the overall development footprint of the proposal is reduced through use of the existing corridor that is regularly subject to disturbances relating to the rail network and the surrounding agricultural activities. Additionally, it is proposed as far as practicable, to house laydown areas, construction compounds and other ancillary facilities in areas containing wholly exotic flora (Category 1 – Exempt Land) or where impacts to biodiversity would be considered negligible. However, due do the overall objectives of the proposal, additional sections of rail are required to be established to improve safety, efficiencies and associated flood management works. Safeguards are recommended in Section 8 to mitigate impacts where avoidance of impacts in their entirety was not practicable.

6.1.2. Proposal planning phase – detailed design

The development footprint is based on a ‘worse-case’ scenario. The development footprint has not been able to completely avoid all areas of biodiversity value. The current design footprint is detailed in Figure 6-1.

The *Biodiversity Conservation Regulation 2017* (clause 6.1) identifies actions that are prescribed as impacts to be assessed under the BOS.

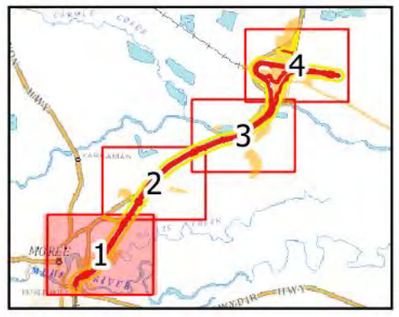
How these prescribed impacts have been avoided and minimised by the proposal is detailed in Section 7.3.



Narrabri to Northstar
Phase 2
Final Footprint
Map 1 of 4

Legend

- Subject Land
- Development Footprint
- Roads
- Waterway



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Ref: 20-429 N2NS BDAR updates 202110 \ Final Footprint
Author: sarah.d
Date created: 17.06.2021
Datum: GDA94 / MGA zone 55

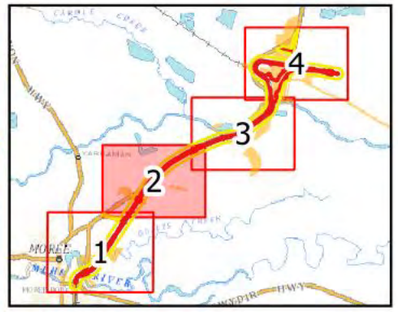
0 250 500 m

NGH

Figure 6-1 Final Footprint Map 1 of 4

Narrabri to Northstar
Phase 2
Final Footprint
Map 2 of 4

Legend
- Subject Land
- Development Footprint
- Roads
- Irrigation Channel
- Waterway



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Date created: 17.06.2021
Datum: GDA94 / MGA zone 55

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Figure 6-2 Final Footprint Map 2 of 4

Figure 6-3 Final Footprint Map 3 of 4

Figure 6-4 Final Footprint Map 4 of 4

7. Impacts Unable to be Avoided

7.1. Direct Impacts

The construction and operational phases of the proposal have the potential to impact biodiversity values and contribute to key threating processes at the site that cannot be avoided. This would occur through direct impacts, such as habitat clearing and the ongoing existence of infrastructure. These are summarised in Table 7-1.

Table 7-1 Potential direct impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Direct impacts					

Habitat clearing for permanent and temporary construction facilities (e.g., new rail line, replacement bridges, upgraded crossings, ancillary facilities)	99.71 ha containing native vegetation in various condition states, with 37.79 ha in the Northern Outwash subregion and 61.92 ha in the Castlereagh-Barwon Subregion.
	
	43.31 ha of non-native vegetation with 27.59 ha occurring in the Northern Outwash Subregion and 15.73 ha in the Castlereagh-Barwon Subregion.
		Permanent	Construction phase: long term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened species' habitat (ecosystem credit species), including the Inland Forest Bat, the Little Lorikeet (identified on the subject land)
				• Habitat for threatened species (species credit species) including:
				  ○ Black-breasted Buzzard
				  ○ Braid Fern
				  ○ Bristle-faced Free-tailed Bat
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
					• Direct loss of native flora and fauna habitat
					• Potential over-clearing of habitat outside proposed development footprint
					• Injury and mortality of fauna during clearing of fauna habitat and habitat trees
					• Disturbance to stags, fallen timber, and bush rock

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
				○ Koala ○ Little Eagle ○ Major Mitchell's Cockatoo ○ Masked Owl ○ Red-tailed Black Cockatoo (Inland Sub-species) ○ Superb Parrot ○ Winged Peppercress • Riparian areas • Aquatic habitat • Key Threatening Processes under FM Act • EPBC listed threatened species ○ Degradation of native riparian vegetation along NSW water courses; and ○ Removal of large woody debris from NSW rivers and streams	

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence

Displacement of resident fauna	Unknown	Regular	Construction phase: long term	• Inland Forest Bat and the Little Lorikeet (identified on the subject land)
				• Threatened species identified or assumed to be present on the subject land including:
				  ○ Black-breasted Buzzard,
				  ○ Bristle-faced Free-tailed Bat
				  ○ Koala
				  ○ Little Eagle
				  ○ Major Mitchell's Cockatoo
				  ○ Masked Owl
				  ○ Red-tailed Black Cockatoo (Inland Sub-species)
				  ○ Superb Parrot
					• Direct displacement of native fauna
					• Potential decline in local fauna populations

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence

Injury or death of fauna	Unknown	Irregular	Construction and operational phase: long Term	• Inland Forest Bat and the Little Lorikeet (identified on the subject land)
				• Threatened species identified or assumed to be present on the subject land including:
				  ○ Black-breasted Buzzard,
				  ○ Bristle-faced Free-tailed Bat
				  ○ Koala
				  ○ Little Eagle
				  ○ Major Mitchell's Cockatoo
				  ○ Masked Owl
				  ○ Red-tailed Black Cockatoo (Inland Sub-species)
				  ○ Superb Parrot
					• Direct loss of native fauna
					• Decline in local fauna populations

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Disruption to connectivity	Unknown	Regular	Construction and operational phase: Long Term	• Areas of native vegetation, used by threatened species, including the Inland Forest Bat, the Little Lorikeet (identified on the subject land) and the following threatened species: ○ Black-breasted Buzzard, ○ Bristle-faced Free-tailed Bat ○ Koala ○ Little Eagle ○ Major Mitchell's Cockatoo ○ Masked Owl ○ Red-tailed Black Cockatoo (Inland Sub-species) ○ Superb Parrot	• Direct loss of native fauna habitat • Reduction in ability for fauna to move across the landscape

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence
Removal of habitat features e.g., Hollow bearing trees (HBTs)	35 HBTs removed out of 94 recorded (~35%)	Permanent	Construction phase: long term	• Black-breasted Buzzard • Bristle-faced Free-tailed Bat • Koala • Major Mitchell's Cockatoo • Masked Owl • Red-tailed Black Cockatoo (Inland Sub-species) • Superb Parrot	• Direct loss of native fauna habitat • Injury and mortality of fauna during clearing of habitat features
Work in waterways	Approximately one (1) ha of aquatic habitat	Not permanent	Construction	Threatened aquatic flora and fauna: • Lower Darling River Endangered Ecological Community (EEC) • Eel-tailed Catfish • Olive Perchlet • Silver Perch	• Direct loss of riparian habitat • Injury and mortality of aquatic fauna during work in waterways

7.1.1. Changes in vegetation integrity scores

Approximately 99.71 ha of native vegetation would be cleared or significantly altered by the proposal within the development footprint. This constitutes native vegetation from the following condition states:

Northern Outwash IBRA subregion:

- 28.26 ha of low condition
- 5.89 ha of moderate condition
- 3.64 ha of high condition

Castlereagh-Barwon IBRA subregion:

- 8.5 ha of low condition
- 12.12 ha moderate condition
- 41.30 ha high condition.

The changes in vegetation integrity scores as a result of clearing are documented for each vegetation zone in Table 7 2. No direct impacts are predicted to occur in native vegetation of PCT 27 in very low condition (Zone N2A), PCT 52 in moderate condition (Zone N7A) and PCT 52 in moderate condition (dominated by Mimosa) (Zone C1A).

Table 7-2 Current and future vegetation integrity scores for each vegetation zone within the development footprint

Zone ID	PCT / Zone	Threatened species habitat	BC TEC	EPBC TEC	Area – Subject Land (ha)	Area of direct impact – Development Footprint (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score
N1	27 Moderate	Threatened species habitat	Weeping Myall Woodland	Weeping Myall Woodland	8.54	2.43	68.4	0
N2	27 Low	Marginal threatened species habitat	Weeping Myall Woodland	Weeping Myall Woodland	6.96	4.72	30.5	0
N3	36 Moderate	Threatened species habitat	-	-	8.84	1.21	50.7	0
N4	36 Low	Marginal threatened species habitat	-	-	20.06	9.94	43.2	0
N5	36 Moderate_FV	Threatened species habitat	-	-	8.21	0.84	49	0
N6	36 Low_FV	Marginal threatened species habitat	-	-	2.36	0.36	27.6	0
N7	52 High	Threatened species habitat	-	Natural Grasslands	18.62	3.64	80	0
N8	52 Low	Marginal threatened species habitat	-	Natural Grasslands	20.93	13.24	30.9	0
N9	56 Moderate	Threatened species habitat	Carbeen Open Forest	Poplar Box Woodland	6.94	0.64	43.7	0
N10	71 Moderate	Threatened species habitat	Carbeen Open Forest	-	8.2	0.77	55.2	0
C1	52 High_Mimosa	Threatened species habitat	-	Natural Grasslands	103.07	30.67	97.3	0
C2	52 High	Threatened species habitat	-	Natural Grasslands	24.44	10.63	98.1	0

Zone ID	PCT / Zone	Threatened species habitat	BC TEC	EPBC TEC	Area – Subject Land (ha)	Area of direct impact – Development Footprint (ha)	Current Vegetation Integrity Score	Future Vegetation Integrity Score
C3	52 Moderate	Threatened species habitat	-	Natural Grasslands	18.46	11.16	97.5	0
C4	52 Low	Marginal threatened species habitat	-	Natural Grasslands	17.14	8.42	67.8	0
C5	78 Moderate	Threatened species habitat	-	-	2.19	0.96	58.4	0
C6	78 Low	Threatened species habitat	-	-	10.21	0.08	32.8	0
Total					**285.17**	**99.71**	**-**	**-**

7.1.2. Loss of species credit species habitat or individuals

The loss of species credit species habitat or individuals as a result of clearing within the development footprint are documented in Table 7-3.

Table 7-3 Summary of species credit species loss at the development footprint

Species Credit Species	Biodiversity risk weighting	Area of habitat or count of individuals lost for IBRA subregion Northern Outwash (ha)	Area of habitat or count of individuals lost for IBRA subregion Castlereagh-Barwon (ha)
Black-breasted Buzzard *Hamirostra melanosternon*	1.5	N/A	4.44
Braid Fern *Platyzoma microphyllum*	3	N/A	1.04
Bristle-Faced Free-tailed Bat *Setirostris eleyeri*	2	13.73	N/A
Creeping Tick-trefoil *Desmodiopsis campylocaulon*	2	19.61	49.22
Finger Panic Grass *Digitaria porrecta*	2	18.68	49.22
Koala *Phascolarctos cinereus*	2	8.85	0.72
Little Eagle *Hieraaetus morphnoides*	1.5	24.17	14.66
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	2	N/A	10.73
Masked Owl *Tyto novaehollandiae*	2	N/A	4.55
Red-tailed Black-Cockatoo *Calyptorhynchus banksii samueli*	2	N/A	5.81
Superb Parrot *Polytelis swainsonii*	2	N/A	4.55
Winged Peppercress *Lepidium monoplocoides*	2	N/A	47.66

7.1.3. Loss of hollow-bearing trees

Hollow bearing tree (HBT) surveys were focused on areas within the development footprint, as such the total number of HBTs within the subject land may be underestimated. Ninety-four hollow-bearing trees were recorded in the subject land. Of these, 35 are located within or near the development footprint. As such, the proposal may require the removal of 35 HBTs. The majority of those to be removed are along riparian zones of the Mehi and Gwydir Rivers near existing rail bridges as well as along or within the existing rail corridor. Habitat trees to be removed are shown in Figure 4-1 to Figure 4-4. It is recommended that the development footprint be refined during detailed design to avoid HBTs where it is practicable to do so.

7.1.4. Loss of scattered trees

Numerous native scattered trees were recorded within the subject land, with only one (1) (Zone N12) falling in the development footprint (0.027 ha). This tree has been entered into the streamlined assessment scattered tree module within the BAM-C (Brigalow Belt South IBRA Bioregion – Case Number 00017933 – Assessment Case – 00022515 / Scattered trees – Revision 2).

7.1.5. Fisheries Management Act Impacts

Potential impacts to aquatic habitat and riparian vegetation include:

- Removal of riparian vegetation, instream vegetation and woody debris
- Potential increase in localised turbidity during construction
- Potential impacts associated with spills

Construction includes the removal of existing concrete piles as part of the bridge demolition, installation of crossing structures and clearing of adjoining riparian vegetation; this may cause significant impacts to key fish habitat in a small, localised area. Impacts may include loss of riparian vegetation, localised turbidity and associated spills. However, recommended mitigation measures would ensure risks associated with the above are managed adequately. A test of significance for the Lower Darling River Endangered Ecological Community (EEC), Eel-tailed Catfish *Tandanus*, Olive Perchlet *Ambassis agassizii* and Silver Perch *Bidyanus* in accordance with the Fisheries Management Act 1994 (NSW) concluded that a significant impact is unlikely (See Appendix I).

7.2. Indirect Impacts

Indirect impacts that contribute to key threatening processes from the proposal include soil and water contamination, invasion of key emerging weeds, cane toad movement, creation of barriers to fauna movement, or the generation of excessive dust, light or noise. Table 7-4 details the type, frequency, intensity, duration and consequence of the direct and indirect impacts of the proposal.

Table 7-4 Potential impacts to biodiversity during the construction and operational phases

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Indirect impacts (those listed below are included in the BAM)					

Inadvertent impacts on adjacent habitat or vegetation
 	
Accidental clearing or impacts to vegetation can occur where clearing boundaries are not delineated, or where machinery or materials are stockpiled within driplines of trees.
	Unknown	Irregular	Construction Phase: Short-term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened fauna species' habitat
				• Threatened flora habitat including:
				  ○ Braid Fern
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
					• Direct loss of native flora and fauna habitat
					• Potential for injury and mortality of fauna during clearing of fauna habitat and habitat trees
					• Disturbance to stags, fallen timber, and small bush rock
					• Increased edge effects
					The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence

Reduced viability of adjacent habitat due to edge effects
 	
Edge effects can occur where works and/or development occur in close proximity to vegetation, and can include shading, invasion by exotic species, and increase in edge ratios as a result of clearing patches.
	Unknown	Constant	Operational Phase: Long-term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened fauna species' habitat
				• Threatened flora habitat including:
				  ○ Braid Fern
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
					• Degradation of native vegetation and TECs
					• Loss of native flora and fauna habitat
					The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Reduced viability of adjacent habitat due to noise, dust or light spill Adjacent habitat has the potential to be impacted through increased vehicle traffic during construction and operation potentially diminishing the viability of adjacent habitats	Unknown	Rare	Construction Phase: Short-term	• Riparian and aquatic areas • Threatened fauna species habitat, including for the: ○ Grey-headed Flying-fox ○ Five-Clawed Worm Skink ○ Inland Forest Bat ○ Little Lorikeet ○ Black-breasted Buzzard, ○ Bristle-faced Free-tailed Bat ○ Koala ○ Little Eagle ○ Major Mitchell's Cockatoo ○ Masked Owl ○ Red-tailed Black Cockatoo (Inland Sub-species) ○ Superb Parrot • EPBC listed threatened species	• May alter fauna activities and/or movements • Minor loss of foraging or breeding habitat The combined impacts are likely to be minor in nature if they occur at all and would result in a negligible consequence for bioregional persistence

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence

Transport of weeds and pathogens from the site to adjacent vegetation
 	
Construction and operation involve the movement of machinery and personnel which have the potential to transfer weed seed, and soil containing pathogens.
	Unknown	Irregular	Construction & Operational Phase: Long-term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened fauna species' habitat
				• Threatened flora habitat including:
				  ○ Braid Fern
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
					• Further degradation of TECs and threatened species habitat through weed encroachment

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Increased risk of starvation, exposure and loss of shade or shelter Through vegetation removal and edge effects, potential exists for sheltering locations to be impacted.	Unknown	Rare	Construction & Operational Phase: Long-term	• Threatened fauna species habitat, including for the: ○ Grey-headed Flying-fox ○ Five-Clawed Worm Skink ○ Inland Forest Bat ○ Little Lorikeet ○ Black-breasted Buzzard, ○ Bristle-faced Free-tailed Bat ○ Koala ○ Little Eagle ○ Major Mitchell's Cockatoo ○ Masked Owl ○ Red-tailed Black Cockatoo (Inland Sub-species) ○ Superb Parrot • EPBC listed threatened species	• Loss of foraging habitat Impacts from this indirect impact considered unlikely as impacts to shelter habitat confined to development footprint.
Cumulative loss of breeding habitat and competition for remaining resources A reduction in the number of HBTs in the landscape leads to competition and resource stress within both threatened and non-threatened hollow-dependent fauna.	35 HBTs	Constant	Construction Phase: Long-Term	• Riparian areas • Koala habitat • Grey-headed Flying-fox and microbat habitat • Hollow dependent woodland bird habitat • EPBC listed hollow-dependent threatened species	• Loss of potential breeding habitat including fallen and hollow logs at height • Loss of vegetation close to water; and • Increased pressure and competition from cumulative loss for remaining HBT resources from native and exotic hollow dependent fauna.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Trampling of threatened flora species Potential for threatened flora species within or immediately adjacent to development footprint being avoided by the works to be trampled by site staff	Within and adjacent to development footprint	Rare	Construction Phase: Long-Term	• Braid Fern • Creeping Tick-trefoil • Finger Panic Grass • Winged Peppercress	• Further impact to threatened flora species beyond that identified within BDAR • Decreased genetic viability of populations of species across bioregion • Increase in distance required for pollination

Inhibition of nitrogen fixation and increased soil salinity
 	
Increased soil salinity has the potential to occur as a result of vegetation removal impacting groundwater, bringing salt to surface.
	Limited	Rare	Construction & Operational Phase: Long-term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened fauna species' habitat
				• Threatened flora habitat including:
				  ○ Braid Fern
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
					Unlikely – proposal is considered unlikely to impact

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Fertiliser drift Fertiliser drift is typically associated with agricultural activates and as such, the proposal is not considered likely to generate this impact.	Nil	Nil	Nil	Nil	Nil

Rubbish dumping
 	
Increased accessibility through construction and operational roads, in addition to establishment of public access compounds may allow for access and dumping of rubbish
	Limited	Rare	Construction & Operational Phase: Long term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened fauna species' habitat
				• Threatened flora habitat including:
				  ○ Braid Fern
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
					• Further degradation of TECs and threatened species habitat

Wood collection Increased accessibility through construction and operational roads, in addition to establishment of public access compounds may allow for access and collection of firewood	Limited	Rare	Construction & Operational Phase: Long term	• Weeping Myall Woodland • Carbeen Open Forest • EPBC Listed TECs • Native vegetation and other areas of threatened fauna species' habitat • Riparian areas	• Further degradation of TECs and threatened species habitat

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Removal and disturbance of rock, including bush rock Increased accessibility through construction and operational roads, in addition to establishment of public access compounds may allow for access and collection of rock and bushrock	Limited – minimal areas of bushrock occur within subject land	Rare	Construction & Operational Phase: Long term	• Five-clawed Worm Skink	• Further degradation of threatened species habitat
Increase in predatory species populations Increased accessibility in addition to potential food waste storage has potential to increase access for predators	Unknown	Rare	Construction & Operational Phase: Long-term	• Threatened fauna species habitat, including for the: o Grey-headed Flying-fox o Five-Clawed Worm Skink o Inland Forest Bat o Little Lorikeet o Black-breasted Buzzard, o Bristle-faced Free-tailed Bat o Koala o Little Eagle o Major Mitchell's Cockatoo o Masked Owl o Red-tailed Black Cockatoo (Inland Sub-species) o Superb Parrot • EPBC listed threatened species	• Further degradation of TECs and threatened species habitat

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence

Increase in pest animal populations inclusive of cane toad movement
 	
Increase in rail traffic moving across border has potential to increase invasive species transfer
	Unknown	Rare	Construction & Operational Phase: Long-term	• Riparian and aquatic areas
				• Threatened fauna species habitat, including for the:
				  ○ Grey-headed Flying-fox
				  ○ Five-Clawed Worm Skink
				  ○ Inland Forest Bat
				  ○ Little Lorikeet
				  ○ Black-breasted Buzzard,
				  ○ Bristle-faced Free-tailed Bat
				  ○ Koala
				  ○ Little Eagle
				  ○ Major Mitchell's Cockatoo
				  ○ Masked Owl
				  ○ Red-tailed Black Cockatoo (Inland Sub-species)
				  ○ Superb Parrot
				
				• EPBC listed threatened species
					• Further degradation of TECs and threatened species habitat
					• Inadvertent movement of cane toads from Queensland into the region via more frequent train services

Disturbance to specialist breeding and foraging habitat Removal of hollow-bearing trees, woody vegetation and woody ground debris has potential to reduce area of specialist breeding and foraging habitat	35 HBTs, woody vegetation	Constant	Construction Phase: long-Term	• Black-breasted Buzzard • Bristle-faced Free-tailed Bat • Koala • Major Mitchell's Cockatoo • Masked Owl • Red-tailed Black Cockatoo (Inland Sub-species) • Superb Parrot	• Loss of potential breeding habitat including fallen and hollow logs at height • Loss of vegetation close to water; and • Increased pressure and competition from cumulative loss for remaining HBT resources from native and exotic hollow dependent fauna.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence
Earthworks and mobilisation of sediments Increased sediment load within waterways and soil movement have potential to occur as a result of construction works	Unknown	Regular	Construction phase: short term	• Weeping Myall Woodland • Carbeen Open Forest • EPBC Listed TECs • Native vegetation and other areas of threatened species' habitat • Riparian areas • Aquatic habitat	• Erosion and sedimentation and/or pollution of soils, dams and downstream habitats. • Potential loss of ground cover resulting in unstable ground surfaces and sedimentation of adjacent waterways.

Nature of impact	Extent	Frequency	Duration and timing	TEC, threatened species and habitats likely to be affected	Consequence for bioregional persistence

Increased risk of fire
 	
Access by additional persons during construction and operation has potential to inadvertently increase risk of fire.
	Unknown	Regular	Operational Phase: Long term	• Weeping Myall Woodland
				• Carbeen Open Forest
				• EPBC Listed TECs
				• Native vegetation and other areas of threatened species' habitat (ecosystem credit species), including the Inland Forest Bat, the Little Lorikeet (identified on the subject land)
				• Habitat for threatened species (species credit species) including:
				  ○ Black-breasted Buzzard,
				  ○ Braid Fern
				  ○ Bristle-faced Free-tailed Bat
				  ○ Creeping Tick-trefoil
				  ○ Finger Panic Grass
				  ○ Koala
				  ○ Little Eagle
				  ○ Major Mitchell's Cockatoo
				  ○ Masked Owl
				  ○ Red-tailed Black Cockatoo (Inland Sub-species)
				  ○ Superb Parrot
				  ○ Winged Peppercress
				• Riparian areas
				• Aquatic habitat
				  • EPBC listed threatened species
					• Slight increase in the unlikely event of component failure or damage that results in a bushfire resulting in biodiversity impacts

7.3. Prescribed Impacts

The following prescribed biodiversity impacts are relevant to the proposal:

- Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range.
- Impacts of development on the movement of threatened species that maintains their life cycle.
- Impacts of development on the habitat of threatened species or ecological communities associated with human made structures.
- Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities.
- Impacts of vehicle strikes on threatened species or on animals that are part of a TEC.
- Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation.

These are discussed in detail below, and the necessary information required by Section 9.2 of the BAM is provided.

7.3.1. Impacts of development on the connectivity of different areas of habitat of threatened species that facilitates the movement of those species across their range

The development footprint was selected and designed to avoid impacts to native vegetation as far as practicable and where impacts were unavoidable, to minimise those impacts as far as practicable. The majority of the proposal occurs within the existing rail corridor, with ancillary facilities, such as compound and stockpiles areas, generally restricted to areas of previous disturbance and areas dominated by exotic plant species. Barriers to movement would be created in proximity to threatened fauna movement corridors (typically riparian vegetation corridors) through the installation of fauna exclusion fencing to minimise the risk of fauna entering the transport corridor and being struck by trains. Fencing would be installed around fauna movement passages such as culverts and underbridges. While this would constitute a barrier to movement in the immediate vicinity of the fences, the exclusion fencing would ensure that fauna are funnelled into movement passages, thus connectivity between areas of adjacent habitat and along corridors would be maintained, and the fencing is not considered to impact on that connectivity.

Although the proposal requires the removal of small linear areas of grasslands, riparian vegetation and derived native grassland, and may cause temporary disturbance during construction, it is considered that the proposal would not impact the ability of threatened species to move across the landscape upon completion. The proposal is predominantly an upgrade of an existing rail easement; therefore, the connectivity is not considered to be significantly altered from its current state.

7.3.2. Impacts of development on the movement of threatened species that maintains their life cycle

As discussed in Section 7.3.1, the proposal is predominantly an upgrade of an existing railway easement, and therefore is not considered to significantly affect the existing landscape connectivity within the subject land. Fragmentation of vegetation across the landscape is minimised as the proposed upgrade route runs within the existing corridor with the change in the alignment occurring across an already heavily fragmented and disturbed landscape where land has been extensively modified. Connectivity throughout the landscape would be maintained through the design and installation of structures to allow for faunal movement such as culverts replacing underbridges containing fauna crossing structures, fencing around crossing points to funnel fauna into crossings and minimise risk of strike, and rehabilitation and enhancement of vegetation around those crossing points. As a result, threatened species, as well as migratory species that rely on

seasonal movements to maintain their lifecycle would not be significantly impacted. Areas containing hollow-bearing trees which provide threatened species habitat have been avoided by the proposal where practicable, with further refinements in the detailed design potentially minimising this further.

As being a largely cleared and fragmented landscape, riparian areas are generally in moderate condition and fundamental to the movement of fauna in the region, inclusive of the smaller, more ephemeral tributaries i.e., Duffys Creek. Outside of this, there is a TSR (Camurra to Mia TSR), which links up the Mehi and Gwydir river systems and is an important corridor, and although some sections are sparse in terms of trees, it is critical for Koala and other species to move between the two rivers. The development footprint has been designed to reduce impacts to riparian areas are far as practicable. Disturbance or placement of facilities/stockpiles/compounds etc within the Camurra to Mia TSR, where it becomes part of the subject land, would be avoided where possible.

7.3.3. Impacts of development on the habitat of threatened species or ecological communities associated with human made structures

Existing infrastructure, such as rail bridges and culvert structures, exist within the subject land. These include major bridges such as those across the Mehi and Gwydir Rivers, lower bridges crossing Skinners and Duffys Creek and numerous concrete pipe and corrugated pipe culverts. All structures provide marginal habitat, predominantly for microbat species, and will requirement replacement and upgrading. These structures within the subject land were all surveyed visually and via thermal imaging and no evidence of use was observed. However, it is possible that these structures may be occupied in future and therefore, mitigation measure such as pre-clearing inspections and clearing supervision is recommended to minimise any potential future impacts on these areas.

7.3.4. Impacts of development on water quality, water bodies and hydrological processes that sustain threatened species and threatened ecological communities

As mentioned in Section 4.3.4, numerous water crossings via bridges and culverts occur within the subject land. The proposal includes changes in engineering that include raising the existing rail embankment, and vertical alignment along the majority of the length of the proposal. This work will form a raised embankment across the floodplain, and result in upgrading the current structures to permit an appropriate flow, and to minimise adverse flooding impacts. The majority of watercourses along the existing rail line are first, second and third order ephemeral streams that contain intermittent flow following rain events, with little or poorly defined channels and minimal aquatic flora species. The watercourses and rivers have been modified by crossing structures for rail, road and agricultural land practices, and are all subject to a moderate to high abundance of exotic flora and environmental weeds. The exception to this being the two major rivers, the Mehi and Gwydir Rivers, although impacted by exotic flora, these contain important habitat features and are identified as Class 1 key fish habitat and type 1 highly sensitive. These sensitive aquatic ecosystems and key fish habitat will be subjected to temporary construction impacts.

Freshwater Ecology was commissioned to prepare an aquatic ecology assessment (Freshwater Ecology 2020) for N2NS Phase 2, in order to inform the impact assessment and identification of mitigation strategies for the proposal (refer Technical Paper 2 of the EIS). Desktop searches identified the following species as likely to occur on site:

- Murray Cod (*Maccullochella peelii*) (Vulnerable -EPBC Act)
- Bell's Turtle (*Wollumbinia belli*) (Vulnerable- EPBC Act)
- Murray-Darling Basin population of the eel-tailed catfish (*Tandanus tandanus*) (Endanagered- FM Act)
- Purple-spotted Gudgeon (*Morgurnda adspersa*) (Endangered- FM Act)

- Silver Perch (*Bidyanus bidyanus*) (Vulnerable- FM Act)
- Western New South Wales population of the Olive Perchlet (*Ambassis agassizii)* (Endangered- FM Act).

Freshwater Ecology completed surveys for the above species in accordance with Survey Guidelines for Australia's Threatened Fish. The survey effort recorded the following species:

- Murray Cod (*Maccullochella peelii*) (Vulnerable -EPBC Act)
- Murray-Darling Basin population of the eel-tailed catfish (*Tandanus tandanus*) (Endanagered – FM Act).

A test of significance for the Lower Darling River EEC, Eel-tailed Catfish *Tandanus tandanus*, Olive Perchlet *Ambassis agassizii* and Silver Perch *Bidyanus bidyanus* in accordance with the *Fisheries Management Act 1994* (H.15) as well an Assessment of Significance (H.7) of the Murray Cod *Maccullochella peelii* have been undertaken and concluded that a significant impact is unlikely, however, the proposal was referred to the Australian Government environmental minister was recommended for the latter to obtain commonwealth feedback and legal certainty. Mitigation and appropriate controls to minimise the potential for adverse water quality and fish habitat (including fish passage) impacts have been recommended (Section 8) and will be implemented. Clearing of riparian vegetation for proposed upgrading of bridges and culvert structures may occur where it is not possible to undertake works within the existing disturbance area. Temporary blockage of fish passage associated with bridge culvert works, and any vehicle access across watercourses have potential to occur, however, mitigation measures such as the installation of alternative watercourse structures to allow fish passage have been recommended and will be implemented. Ancillary facilities associated with replacement or upgrading of this infrastructure will be sited in areas already subject to disturbance, or within areas dominated by exotic flora, limiting impacts to riparian vegetation. It is not anticipated that the proposal will adversely alter local surface or groundwater flow regimes based on the nature of the project, and the proposal is not expected to impact on GDEs. Additionally, works on culverts and bridges is not expected to significantly change local flow regimes, block fish passage and will not disturb groundwater.

7.3.5. Impacts of vehicle strikes on threatened species or on animals that are part of a TEC

The majority of the proposal requires the upgrade to an existing rail line and, as such, the risk of vehicle strike is already present from trains utilising the network as well as from existing community and agricultural-related traffic currently using the Newell Highway and rural roads. Nonetheless, there will be an increase in the length of trains, height of trains and frequency of trains as a result of the proposal. As such, it is likely that there is a greater risk of train strike to threatened species as a result of the proposal.

An increase in vehicle traffic during construction, and required maintenance periods, may slightly increase the risk of vehicle strike on threatened species occurring in or near the subject land. However, this traffic would be predominantly during daylight hours, and is not considered likely to greatly increase the existing level of vehicle strike risk to fauna presented by rural traffic. It is recommended that site management actions be taken to enforce and reduce site speed limits and limiting traffic during dawn and dusk, which would minimise impacts of vehicle strikes.

The Inland Rail network, once operational, is likely to increase traffic on the network above what is currently experienced, which may increase train-related strikes on native fauna. Fauna exclusion fencing should be utilised where possible in and around areas of known Koala populations to reduce the risk of Koalas and other native fauna entering the rail corridor.

7.3.6. Impacts of development on the habitat of threatened species or ecological communities associated with non-native vegetation

The development footprint was designed to avoid impacts to higher condition, woody native vegetation as much as possible, and, where impacts were unavoidable, to minimise those impacts. As a result, the proposal will impact predominantly grassland communities and areas of non-native vegetation. Threatened fauna species are unlikely to rely on the non-native vegetation, and although they may utilise it for movement on occasion, it provides little foraging and breeding opportunities for native flora and fauna species within the region. As, discussed in Section 7.3.1, due to the linear areas being removed and amount of vegetation remaining around the subject land, it is considered that the proposal would not impact the potential habitat that that non-native vegetation may provide.

7.4. Impacts to Biodiversity Values that are Uncertain

Impacts to biodiversity values, such as the removal of foraging habitat or HBTs, are readily quantifiable. However, the level of impact resulting from vehicle and train strikes, as discussed in Section 7.3.5, as well as introduction of movement of cane toads into the areas are uncertain. As per Section 9.4.2.4 of the BAM, an adaptive management plan would be prepared to manage these impacts, and the components of that plan are detailed below in Section 8.2.

7.5. Impacts to Matters of National Environmental Significance

An EPBC Act habitat assessment (Appendix G) evaluation was undertaken for species predicted to occur within the broader study locality (10 km radius). An EPBC Act Assessments of Significance (AoS) (Appendix H) was completed for each species and for TECs that have a moderate to high likelihood of presence within the subject land or were recorded during the surveys.

7.5.1. Threatened Ecological Communities

Three (3) EPBC Act listed TECs occur within the subject land. These are:

Weeping Myall Woodlands (Endangered)

This TEC occurs on the inland alluvial plains west of the dividing range in NSW and QLD. Weeping Myall Woodland TEC now only exists as small remnants within its broad range. The ecological community generally occurs on flat areas, shallow depressions or gilgais on raised alluvial plains. These areas are not associated with active drainage channels and are rarely, if ever, flooded. The ecological community occurs on black, brown, red-brown or grey clay or clay loam soils. Most areas remaining in the best condition are in lightly-grazed, uncropped sites, such as road reserves and TSRs and Reserves.

Areas within the development qualify as Weeping Myall Woodlands (Department of the Environment, Water, Heritage and the Arts, 2009):

- Where Weeping Myall are present, and the community has a predominantly native understorey.
- Where at least 5% tree canopy exists, or at least 25 dead/defoliated mature Weeping Myalls still stand, and the community is dominated by Weeping Myall.
- Where the patch is greater than 0.5 ha.
- Where the patch has two layers of regenerating Weeping Myall.

The proposal will reduce the current extent of Weeping Myall Woodland in the subject land by 7.15 ha, from 17.31 ha to 10.16 ha. Additionally, the proposed action disturbs a portion of this community which is currently degraded and is of poor quality, that being absent of canopy cover and invasion of weeds, compared to the portion which will remain. It has few mature trees and other species in a healthy and valuable condition. The extent of the 24 ha patch in the landscape beyond the subject land would be reduced by 30%, however the

majority of this removal is fragmented, subject to edge effects, and is adjacent to the existing rail corridor. The proposed action, as it stands given current understanding, would result in a reduction of the extent of the community within the subject land by 41% overall. A referral decision has determined that the proposal constitutes a controlled action, and impacts to EPBC listed entities are to be assessed under the assessment bilateral agreement with NSW.

Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered)

This TEC is highly reliant on soil types as it is associated with fine texture, cracking clays. It generally occurs on flat to low slopes of no more than 5%. It is present in northern NSW and South QLD. It is distributed in three major, but disjunct, occurrences where climate, soils and landform are conducive to the development of tussock grasslands.

A precautionary approach has been undertaken in assessing against the criteria listed within the EPBC Act guidance considering drought conditions that were occurring during the field surveys. The majority of the areas identified contain infestations of Mimosa, which is dense in some areas and moderately spaced in others. Areas within the development qualify as this community where:

- Patches occur within or near to the Moree Plains of NSW, on flat to very low slopes.
- Trees are absent or sparse such that the projective foliage cover of trees in the patch is 10% or less.
- There are at least 200 native grass tussocks in the patch.
- Patch size is greater than 2 ha.
- Perennial foliage cover of shrubs is generally less than 50%.
- Perennial non-woody introduced species generally make up less than 30% of the total perennial projective foliage cover across the patch.

The proposal will result in linear disturbance or removal of 77.76 ha of this community, of a total of approximately 220.28 ha, which exists in the subject land. This means 35% of this existing community would be disturbed; some of which exists on either side of the current rail alignment and will be subjected to clearing for construction works, whereas another portion will be removed to allow for a new portion of rail alignment. Many of the areas consist of naturalized or exotic flora such as Mimosa and Tiger pear. The community occurs in five forms, low, moderate and high condition vegetation and one moderate and high condition dominated by Mimosa. The low, moderate and high condition form consists of heavily disturbed and degraded vegetation dominated by exotic flora and sporadic natives adjacent to the existing rail corridor and roadside edges. The form of the community dominated by Mimosa is largely confined to TSRs, road reserves and private land holdings where Mimosa is generally dominant, however it also contains a higher abundance of natives including Thorny Saltbush, White Speargrass, Tarvine and Native Sensitive Plant. Further description of the condition of this community is presented in Table 3-4.

The proposal, as it stands, would result in a reduction of the extent of the community within the subject land by 77.76 ha (or 35%) This is a substantial reduction and considered a significant impact. A referral decision has determined that the proposal constitutes a controlled action, and impacts to EPBC listed entities are to be assessed under the assessment bilateral agreement with NSW.

Poplar Box Grassy Woodland on Alluvial Plains (Endangered)

This newly listed TEC is found on soils that are fine textured, often cracking clays which are derived from either basalt or alluvium on flat to low slopes (<1 degree). A tree canopy is usually sparse, but when present comprises >10% (Department of the Environment and Energy, undated).

Areas within the subject land qualifying as this community have a large patch with low native cover but retain good native understorey diversity and habitat features of mature trees.

The community does not contain a Derived Native Grassland component, however patches lacking canopy cover are considered to be a component of the community where they occur within 50 m of the community. The proposal would impact predominantly on an area of a low condition form of grassland associated with

the TEC, however approximately 0.64 ha area impacted would conform to the EPBC Act listing of the TEC, where a total of 6.94 ha exists in the subject land. This means that approximately 9% of the existing community within the subject land would be removed, modified and directly impacted. As such, the TEC is not considered significantly impacted by the proposal. A precautionary approach has been taken and an Assessment of Significance prepared, which found that a significant impact on the community was unlikely.

7.5.2. Threatened Species

Three EPBC-listed species were recorded during the field surveys, the Murray Cod, Koala and Grey-headed Flying-fox. Additionally, the following species were considered to have potential to occur due to the presence of suitable habitat within the subject land and may be impacted. These include:

- Belson's Panic *Homopholis belsonii*
- Painted Honeyeater *Grantiella picta*
- Five-clawed Worm-skink *Anomalopus mackayi*
- Superb Parrot *Polytelis swainsonii*
- Corben's Long-Eared Bat – *Nyctophilus corbeni*
- Winged Peppercress – *Lepidium monoplocoides*

The EPBC Act Referral Guidelines for the Koala (DoE 2014) documents the 'Koala habitat assessment tool' to assist proponents in determining if a proposal may impact on habitat critical to the survival of the Koala. The tool is utilised in Table 7-5 as it applies to the proposal. Impact areas that score five or more using this tool contain habitat critical to the survival of the Koala. The assessment in Table 7-5 resulted in a score of 9 and, as such, habitat within the subject land is critical to the survival of the Koala and an assessment of significant impact according to the EPBC Act significant impact criteria is required and has been undertaken. Approximately, 12.54 ha of critical habitat would be adversely affected.

A referral decision has determined that the proposal constitutes a controlled action, and impacts to EPBC listed entities are to be assessed under the assessment bilateral agreement with NSW.

The Koala referral guidelines (ibid) were rescinded in February 2022. As the project has been determined a controlled action there is no need to revise assessments and the old provisions apply.

Table 7-5 Koala habitat assessment tool for inland areas (DoE 2014)

Attribute	Score	Inland	Applicable to the proposal?
Koala occurrence	+2 (high)	Evidence of one or more koalas within the last 5 years.	✓ Recorded during the surveys
	+1 (medium)	Evidence of one or more koalas within 2 km of the edge of the impact area within the last 10 years.	
	0 (low)	None of the above.	
Vegetation composition	+2 (high)	Has forest, woodland or shrubland with emerging trees with 2 or more known koala food tree species, **OR** 1 food tree species that alone accounts for >50% of the vegetation in the relevant strata.	✓ Woodland and riparian areas contain several Koala feed tree species including River Red Gum *Eucalyptus camaldulensis*.

Attribute	Score	Inland	Applicable to the proposal?
	+1 (medium)	Has forest, woodland or shrubland with emerging trees with only 1 species of known koala food tree present.	
	0 (low)	None of the above.	
Habitat connectivity	+2 (high)	Area is part of a contiguous landscape ≥ 1000 ha.	✓ Some areas that would be impacted are connected to outside bushland that exceeds 1000 ha.
	+1 (medium)	Area is part of a **contiguous landscape** < 1000 ha, but ≥ 500 ha.	
	0 (low)	None of the above.	
Key existing threats	+2 (high)	Little or no evidence of koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence. Areas which score 0 for koala occurrence and have no dog or vehicle threat present	✓ Infrequent or irregular koala mortality from vehicle strike
	+1 (medium)	Evidence of infrequent or irregular koala mortality from vehicle strike or dog attack at present in areas that score 1 or 2 for koala occurrence, **OR** Areas which score 0 for koala occurrence and are likely to have some degree dog or vehicle threat present.	
	0 (low)	Evidence of frequent or regular koala mortality from vehicle strike or dog attack in the study area at present, **OR** Areas which score 0 for koala occurrence and have a significant dog or vehicle threat present.	
Recovery value	+2 (high)	Habitat is likely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	✓ Supports important connectivity
	+1 (medium)	Uncertain whether the habitat is important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	

Attribute	Score	Inland	Applicable to the proposal?
	0 (low)	Habitat is unlikely to be important for achieving the interim recovery objectives for the relevant context, as outlined in Table 1.	
Total	**9**	**Decision: Habitat critical to the survival of the Koala—assessment of significance required**	

An EPBC Act assessment of significance was completed for each of above-mentioned species. A EPBC referral was undertaken for the Koala, Murray Cod and Five-claw Worm Skink due to unknown impacts or a perceived significant impact. The Five-clawed Worm Skink has been repeatedly found during earthworks on the Narrabri to North Star Phase 1. Similar measures proposed for the Five-Clawed Worm Skink in the Construction Biodiversity Management Sub-Plan for N2NS Phase 1 by Trans4M Rail will be adopted for this project. These measures will be stipulated in the Contractor's Construction Environment Management Plan (CEMP) / Flora and Fauna Management Plan (FFMP) and informed by the Species Management Plan which is under development by ARTC with DPE for the Five-clawed Worm Skink.

A referral decision has determined that the proposal constitutes a controlled action, and impacts to EPBC listed entities are to be assessed under the assessment bilateral agreement with NSW.

Significant impact as a result of the proposal was also considered likely for the Superb Parrot and Winged Peppercress *Lepidium monoplocoides.* Additional referral to the Commonwealth Government may be required for these species.

Significant impact was not considered likely for the Grey-headed Flying-fox, Belson's Panic *Homopholis belsonii*, the Painted Honeyeater and the Corben's Long-Eared Bat.

7.5.3. Migratory Species

One EPBC-listed migratory species was considered to have a potential to occur due to the presence of suitable habitat within the subject land and may be impacted:

- Satin Flycatcher *Myiagra cyanoleuca*

An EPBC Act assessment of significance was completed for the species. A significant impact for the species was not considered likely, however, EPBC Act referral for the species is recommended for legal certainty.

7.6. Assumptions and Predictions

Climatic conditions may influence the species present within the subject land at any one time. The drought conditions described in Section 3.3 also have the effect of limiting habitat suitability within the subject land for candidate species credit species where water is a key limiting factor.

Where survey has been undertaken for candidate species requiring confirmation of presence or absence, this has been done employing appropriate methods and timing. Nevertheless, it is an unavoidable limitation that not all species that utilise an area will be detected. This is generally due to their cryptic nature or mobility and unpredictable movement throughout their habitat and prevailing drought conditions. The calculation of HBTs, in particular the size and number of hollows, was made from ground level. It is possible that some hollows are present that were not visible from ground level, which may result in underestimates of the number of hollows (Gibbons and Lindenmayer 2000).

Where survey for candidate species requiring confirmation of presence or absence was not undertaken, this is stated explicitly in the assessment, and measures identified to address the limitation are identified, i.e., assumption of occurrence of the species.

8. Mitigating and Managing Impacts

8.1. Mitigation Measures

A general summary of the key measures required to mitigate the impacts of the proposal are provided below. Mitigation measures proposed to manage impacts, including proposed techniques, timing, frequency, responsibility for implementing each measure, risk of failure, and an analysis of the consequences of any residual impacts are provided in Table 8-1.

8.1.1. Habitat clearing for permanent and temporary construction facilities (e.g., new Rail line, replacement bridges, upgraded crossings, ancillary facilities)

- Time works to avoid critical life cycle events
    - All practical measures must be taken to avoid removal of hollow-bearing trees during breeding and hibernation season (June to January) to mitigate impacts
    - If clearing outside of this period cannot be achieved, detailed pre-clearing surveys shall be undertaken by an ecologist in first instance where possible or suitably qualified person to ensure the nests are not active, and no adverse impacts to fauna would occur
- Implement clearing protocols during tree clearing works, including pre-clearing surveys, daily surveys and staged clearing, with the presence of a trained ecological or wildlife handler

Note that following the identification of the Five Clawed Work Skink within the N2NS SP1 Project alignment, it is anticipated that the Five-clawed Worm-Skink will likely be encountered within the N2NS SP2 Project alignment. As such, Five-clawed Worm-Skink specific measures will be included within the Contractor's Construction Environment Management Plan (CEMP) / Flora and Fauna Management Plan (FFMP) including, but not limited to:

- mapping areas of potential Five-clawed Worm-Skink habitat
- survey requirements / techniques
- monitoring techniques / protocols
- pre-clearing / clearing protocols
- a handling and relocation procedure
- an encounter and reporting protocol
- provision for the periodic review of the effectiveness of the management and impact mitigations measures implemented
- any other management and impact mitigation measures, as required.

ARTC notes the ongoing development of a dedicated Five-clawed Worm-Skink Species Management Plan (by ARTC with DPE). Where relevant, the Species Management Plan will inform the Contractor's CEMP/FFMP including the above measures and any other measures it requires.

8.1.2. Displacement of resident fauna

- Undertake staged clearing, with the presence of a trained ecological or wildlife handler
- Rehabilitate vegetation to increase habitat availability
- Include aquatic fauna salvage of work areas

8.1.3. Injury or death of fauna

- Time works to avoid critical life cycle events
- Undertake staged clearing, with the presence of a trained ecological or wildlife handler

8.1.4. Disruption to connectivity

- Implement rehabilitation in areas of retained vegetation to enhance connectivity
- Implement fauna (terrestrial and aquatic) connectivity structures

8.1.5. Removal of habitat features e.g., HBTs

- Where possible, relocate habitat features (fallen timber, hollow logs) from within the subject land to an adjacent area.

8.1.6. Indirect impacts

- Implement clearing protocols that identify vegetation to be retained, prevent inadvertent damage, and reduce soil disturbance; for example, removal of native vegetation by hand-held chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed.
- Implement adaptive dust monitoring programs to control air quality.
- Erect temporary fencing to protect significant environmental features and threatened species habitat.
- Implement hygiene protocols to prevent the spread of weeds (key emerging and priority weeds) or pathogens between infected areas and uninfected areas.
- Employ staff training and site briefing to communicate environmental features to be protected and measures to be implemented.
- Increase in pest animal populations inclusive of Cane toad movement

8.1.7. Prescribed impacts

- Sediment barriers and spill management protocols to control the quality of water runoff from the site into the receiving environment.
- Enforce speed limits, restrict dawn and dusk driving and install signage during construction to reduce impacts of vehicle strikes on threatened and other fauna.
- Implement monitoring of train strike rates, and fence hotspots
- Protect via clearly surveying and marking (flagging) environmental no-go areas during construction to prevent clearing within unauthorised areas and where threatened species habitat occurs.
- Fencing to deter Koala and other terrestrial fauna from entering the subject land during construction, and rail corridor in areas of suitable habitat.
- Use of non-barbed wire fencing for permanent fencing where practicable.
- Installation of artificial connectivity measures to allow traversal of species such as Koala between areas of habitat surrounding the subject land post construction.
- Staff training and site briefing to communicate environmental features to be protected and measures to be implemented.

Table 8-1 Mitigation measures proposed to avoid and minimise impacts on native vegetation and habitat

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Displacement of resident fauna through vegetation clearing and habitat removal						
Preparation of Flora and Fauna Management Plan (FFMP) within Construction Environment Management Plan (CEMP)	• FFMP to include the following: ○ Pre-clearing procedure ○ Clearing Protocol ○ Habitat relocation procedure ○ Unexpected threatened species find procedure ○ Dedicated management actions for the Five-clawed Worm Skink which will be informed by the Species Management Plan which is under development by ARTC with DPE. ○ Dedicated management actions for the Braid Fern in the form of a protective buffer between the development footprint and the remaining suitable habitat for the Braid Fern in zones C5 and C6:: - Maintain natural drainage near areas of habitat - Protect existing assumed populations from stock and feral animals (for example, by fencing residual suitable habitat within the subject land) - Seasonal monitoring of populations - No further loss of extant populations - Report any additional records to DPE - Survey for species in potential habitat to identify any additional populations. ○ Waterway crossing design ○ Identify and include provisions for compliance with all relevant statutory requirements applicable to flora, fauna and fish management, the EIS and SPIR commitments and mitigation measures,	Construction	One-off	Inland Rail/Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	ARTC guidelines, conditions of approval and industry best practice ○ Protocols and procedures for the use of suitably qualified, licenced and experienced fauna handlers/ spotter catchers, including: A. Communication of controls and protective measures at pre-start and toolbox meetings, with all project personnel subject to a Five-clawed Worm Skink induction and other species, as appropriate. B. A risk-management basis for fauna handler attendance during land disturbing activities e.g.: ○ damage to any trees 3 metres or greater in height ○ where arboreal fauna has been identified in or adjacent to the clearing front ○ known and potential habitat trees, log piles, burrows, stags and nests areas identified as containing threatened fauna species, habitat and mapped PCT/TECs. ○ Demarcation (flagging) of no-go zones, vegetation for retention, habitat trees and habitat features ○ Where practicable, relocation of relevant habitat features (e.g., hollow logs etc.) ○ Implementation of controls and protective measures to prevent injury or death to wildlife, such as directional or staged clearing, fauna relocation, exclusions zones and temporary fencing. ○ Recording of information to document above ○ Work statements, considering methodologies and equipment requirements, for:					

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ removal of habitat trees/hollow bearing trees/stags ○ When trenches cannot be covered adequately, trench/deep excavation inspections for entrapped fauna ○ fauna rescue and release, including fauna escape ramps or escape devices ○ unexpected threatened species finds, addressing: A. stop work arrangements in the immediate area of the threatened species B. notification and communication protocol – in the case of the Five-Clawed Worm Skink, regular updates will be provided to DPE and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) within 48 hours of the client becoming aware of a Five-clawed Worm-skink encounter. C. consultation with the specialists to assess the significance of the find D. a list of approvals, licences or permits that may need to be obtained before the works can recommence. ○ Adaptive management strategy					

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Timing works to avoid critical life cycle events such as breeding or nursing	• All practical measures must be taken to avoid removal of hollow-bearing trees during breeding and hibernation season (June to January) to mitigate impacts • If clearing outside of this period cannot be achieved, detailed pre-clearing surveys shall be undertaken by an ecologist in first instance where possible or suitably qualified person to ensure the nests are not active, and no adverse impacts to fauna would occur	Construction	Regular	Inland Rail/Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Pre-clearing Check	• Prior to commencement of clearing, a detailed pre-clearing check of all areas of potential fauna habitat to be impacted undertaken • Habitat features to include trees containing hollows and/or nests, logs, bushrock and burrows • All habitat features to be clearly marked with >1m spray painted in a highly visual colour (i.e. pink) “H” on all sides of feature • All features to be mapped using GPS or equivalent portable GIS software • Each feature to be flagged with pink flagging tape, with unique identifying number written on tape • Areas of potential Five-clawed Worm-skink habitat to be mapped • Report to be prepared including detailed maps of habitat features, and locations to be incorporated into sensitive area plans	Construction	Regular	Inland Rail/Contractor	Moderate	Species and their habitat not detected during pre-clearing surveys may be impacted.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Tree Clearing Procedure to be developed	• Clearing to be undertaken as close as is practical following pre-clearing survey so as to minimise chance of missing newly created habitat (such as nests or possum dreys) • Where the pre-clearing survey was completed more than 48 hours before the commencement of clearing, a re-inspection of the work area shall be undertaken by the ecologist/licensed fauna handler to ensure fauna has not moved back into the area • Where sub optimal or low condition habitat is to be cleared, confirm any potential habitat feature locations with clearing contractor • Clearing within wooded vegetation, PCTs, TECs and in locations of threatened species identified to be supervised by ecologist/fauna spotter at all times • Habitat features to be isolated and left overnight to allow for fauna relocation • A second pre-clearing survey will be undertaken the morning of clearing to ensure no fauna have moved back in the interim • Habitat features to be cleared following day in the presence of a trained ecological or licensed wildlife handler • Known and potential habitat trees to be felled with minimal impact – this shall include use of arborists to section and lower hollow sections from trees, or use of excavators with grabs to avoid uncontrolled felling of trees • All hollows, fissures, logs and rocks to be checked by ecologist/spotter catcher post felling or impacts, and any fauna present	Construction	Regular	Inland Rail/Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	caught and safely housed in a well- ventilated area. Habitat features to be moved to allow all hollows to be inspected. • Where practicable, hollows to be inspected by ecologists using torch and/or borescope within deeper fissures. Crowbar to be used to crack open sections of dead limbs and check under bark • Uninjured fauna to be released in adjacent suitable habitat on day of clearing • Injured fauna to be euthanised on site if by a suitably experienced ecologist in accordance with OEH Code of Practice for Injured, Sick and Orphaned Protected Fauna if severely injured, or taken to vet or wildlife carer for assessment • Records to be kept of number of hollows, number and species of individuals captured, and outcome of capture to incorporate into monthly environmental reporting					
Cave and structure dependent microbat habitat clearing protocol developed	• A protocol for the survey and exclusion of cave-dependent microbats which may be utilising bridge structures is to be developed as part of the FFMP • Protocol to include identification during pre-clearing survey, followed by inspection day prior to disturbance of habitat (if identified) • Where roosting bats identified, bats to be captured and relocated at or after dusk. Survey to confirm any bats not captured have left roost for the night	Construction	Regular	Inland Rail/Contractor	Moderate	Any bats not identified during surveys potentially impacted

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	• Once bats have left roost, roost habitat to exclude re-entry. Measures such as using shade cloth, geofabric or expanding foam may be suitable to exclude bats • Survey report to be prepared detailing species, number, and relocation and/or other actions undertaken to discourage occupancy					
Five-clawed Worm-skink habitat clearing protocol to be developed	• Measures will be stipulated in the Contractor's Construction Environment Management Plan (CEMP) / Flora and Fauna Management Plan (FFMP) and informed by the Species Management Plan which is under development by ARTC with DPE for the Five-clawed Worm Skink	Construction	Regular	Inland Rail/Contractor	Low	None
Relocation of habitat features (fallen timber, hollow logs) from within the development footprint to retained areas within the subject land	• Tree-clearing procedure including relocation of habitat features to adjacent area for habitat enhancement where practicable	Construction	Regular	Inland Rail/Contractor	Low	None
Impacts to aquatic fauna and their habitat						
Minimise damage to aquatic fauna and their habitat	• Consider construction methods that do not block fish passage • Consider installation of alternative watercourse structures to allow fish passage • Include aquatic fauna salvage of work areas • Ancillary facilities associated with replacement or upgrading of infrastructure to be sited in areas already subject to disturbance, or within areas dominated by exotic flora, limiting impacts to riparian vegetation.	Construction	Regular	Inland Rail/Contractor	Low	Fish passage is blocked regardless of alternative construction methods and watercourse structures.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Indirect impacts on native vegetation and habitat						
Clearing protocols that identify vegetation to be retained, prevent inadvertent damage and reduce soil disturbance; for example, removal of native vegetation by hand-held chainsaw, rather than heavy machinery, is preferable in situations where partial clearing is proposed	• Approved clearing limits to be clearly delineated with temporary fencing or similar prior (flagging/bunting) to construction commencing. • No stockpiling or storage within dripline of any mature trees • In areas to clear that are adjacent to areas to be retained, chainsaws would be used rather than heavy machinery to minimise risk of unauthorised disturbance	Construction	Regular	Inland Rail/Contractor	Low	None
Noise barriers or daily/seasonal timing of construction and operational activities to reduce impacts of noise	• CEMP will include measures to avoid noise encroachment on adjacent habitats such as avoiding night works as much as practicable.	Construction	Regular	Inland Rail/Contractor	Low	None
Light shields or daily/seasonal timing of construction and operational activities to reduce impacts of light spill	• Avoid night works • Direct lights away from vegetation as far as practicable	Construction/Operation	Regular	Inland Rail/Contractor	Low	None
Adaptive dust monitoring programs to control air quality	• Regular monitoring of dust generated by construction and operation activities • Construction would cease if excessive dust or wind conditions observed being blown from site until control measures were implemented • All activities relating to the proposal would be undertaken with the objective of preventing visible dust emissions from the subject land	Construction	Regularly	Inland Rail/Contractor	Moderate	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Programming construction activities to avoid impacts; for example, timing construction activities for when migratory species are absent from the site, or when particular species known to or likely to use the habitat on the site are not breeding or nesting	• Where practicable, time construction activities outside Koala breeding season • Where practicable, avoid clearing during winter to avoid the risk of injuring hibernating or torpid reptiles and mammals • Where practicable, avoid clearing in spring and early summer to avoid nesting birds • Ideally, program clearing for late summer – early autumn • If clearing outside of this period is not practicable, pre-clearing surveys would be undertaken by an ecologist to ensure no impacts to fauna would occur	Construction	Regular	Inland Rail/Contractor	Moderate	Clearing occurs within breeding/torpor periods, species impacted.
Temporary fencing to protect significant environmental features such as riparian zones	• Fencing or bunting from buffer of riparian zones and drainage lines	Construction	Regular	Inland Rail/Contractor	Low	None

Hygiene protocols to prevent the spread of weeds or pathogens between infected areas and uninfected areas	• A weed management procedure would be developed for the proposal to prevent and minimise the spread of weeds. This would include:
	  ○ Management protocol for declared priority weeds under the *Biosecurity Act 2015* during and after construction
	  ○ Weed hygiene protocol in relation to plant, machinery, and fill
	• The weed management procedure would be incorporated into the relevant CEMP sub-plan.
		Construction, Operation	Regular	Inland Rail/Contractor	Moderate	Weed encroachment

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Site induction • Toolbox talks • At the commencement of the proposal, pre-starts or kick off meetings to be conducted with relevant personnel by ecologist/environmental advisor prior to clearing	Construction	Regular	Inland Rail/Contractor	Moderate	Impacts to native vegetation or threatened species for Staff training not being followed
Preparation of a Flora and Fauna Management Plan to regulate activity in vegetation	• Preparation of a FFMP that would include protocols for: o Where practicable, protection of native vegetation to be retained through mapping in sensitive area plans, and physical fencing through the use of star-pickets with helicopter tape and environmental exclusion zone signage o Best practice removal and disposal of vegetation including separation and stockpiling of declared weeds, incorporation of recovered habitat features into revegetation, and identification of mulch stockpile locations and structure to avoid tannin leaching o Staged removal of hollow-bearing trees and other habitat features such as fallen logs with attendance by a suitably trained fauna handler though the implementation of the clearing protocol	Construction	One-off	Inland Rail/Contractor	Moderate	Impacts to native vegetation or threatened species from Flora and Fauna Management Plan not being followed.

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ Weed management throughout the lifespan of the proposal to ensure that no increase to weed load occurs as a result of the works ○ Unexpected threatened species finds • Rehabilitation of disturbed areas ○ Plan to incorporate planting out of disturbed areas to restore native vegetation ○ Pallets of locally endemic species, targeted to the structure and plant community type of the original landscape ○ Plantings to include complex mid-stratum to increase habitat for woodland birds and support small faunal movement ○ Rehabilitation to be targeted around any fauna furniture or rail corridor crossing structures – dense mid stratum of vegetation and connectivity with larger patches to be enhanced ○ Rehabilitation used to enhance fauna habitat connectivity along movement corridor ○ Incorporation of felled timber and recovered habitat features in rehabilitation to enhance small mammal, reptile and invertebrate habitat ○ Installation of nest boxes or assisted hollow augmentation					

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ Incorporation of any provisions from the dedicated Species Management Plan for the Five-clawed Worm Skink under development by ARTC with DPE.					
Prescribed biodiversity impacts						
Instigating clearing protocols including pre-clearing surveys, daily surveys and staged clearing, the presence of a trained ecological or licensed wildlife handler during clearing events for rocks, human made structures and non-native vegetation	• Pre-clearing checklist • Tree clearing procedure • Staged habitat removal • Unexpected threatened species finds procedure	Construction	Regular	Contractor	Moderate	Species not detected during pre-clearing surveys may be impacted.
Installing artificial connectivity measures to re-establish connections between habitat and favoured movement pathways	• Prepare fauna crossings sub-plan within Flora and Fauna Management Plan to include detailed design of fauna crossing structures. Plan to include the following: ○ Where practical to do so and structures large enough (e.g., under bridges, culverts) incorporate fauna crossing structures including timber logs with connection to adjacent vegetation to account for arboreal fauna movement, and woody ground debris to allow for terrestrial fauna movement, in accordance with NSW RMS guidelines	Post construction	One-off	Contractor	Low	Fauna movement reduced across landscape, potential for fauna to be trapped and injured within corridor

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
	○ In areas of high vegetative connectivity, include installation of fauna fencing (to RMS specifications) to exclude fauna from entering rail corridor, with inclusion of fauna escape devices to allow any fauna within corridor to escape. This may include earthen ramps and/or escape poles from within the corridor • Rural barbed wire fencing in areas of limited connectivity to have plain wire top and bottom strands, to avoid impacts to native fauna movement • Security fencing to be used in township areas to incorporate measures to prevent entanglement of flying foxes/gliders where there is adjacent vegetation • Fencing adjacent to areas of the subject land that are connected to areas of bushland outside the subject land are to include Koala friendly structures to aid traversal of Koala across their range, particularly around the Gwydir and Mehi Rivers					
Temporary fencing to protect significant environmental features such as, rocks and water bodies	• Fencing or bunting from buffer of riparian zones and drainage lines • Fencing and demarcation of environmentally sensitive areas • Spray painting and flagging of habitat features	Construction	Regular	Contractor	Low	None

Mitigation measure	Proposed techniques	Timing	Frequency	Responsibility	Risk of failure	Risk and consequences of residual impacts
Sediment barriers or sedimentation ponds to control the quality of water released from the site into the receiving environment	• An erosion and sediment control plan would be prepared within the CEMP and/or soil/water management plan in conjunction with the final design and implemented • Spill management procedures would be implemented.	Construction	Regular	Contractor	Moderate	Indirect impacts may occur to waterways if erosion and sedimentation control plan not implemented.
Staff training and site briefing to communicate environmental features to be protected and measures to be implemented	• Awareness training during site inductions regarding enforcing site speed limits. • Site speed limits to be enforced to minimise fauna strike.	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles
Fencing or other measures to control animal and vehicle interactions	• Subject land to be fenced/flagging/bunting entirely during construction • No use of barbed wire fencing	Construction and Operation	Regular	Contractor	Moderate	Fauna strikes from vehicles
Monitoring pest animal populations inclusive of Cane toad movement and key emerging priority weeds	• Incorporate adaptive management strategy inclusive of operational monitoring for transport of cane toads and key emerging weeds into the region	Construction and Operation	Regular	Inland Rail/Contractor	Low	Increase in invasive pests and key emerging weeds into the region

8.2. Adaptive Management Strategy

Adaptive management during construction and operation will be receptive to any new and relevant data that may arise through ongoing assessment and monitoring and is key to the successful implementation of the relevant management plans. This will allow ongoing flexibility to manage objectives, allow for relevant feedback and modifications. Construction management plans will contain management plans for flora and fauna, which will have an adaptive management component. This includes measures to monitor predicted impacts of vehicle/train strikes, thresholds for species mortality, based on relevant literature, which will trigger adaptive management actions, and any measures proposed to mitigate potential impacts.

A Flora and Fauna Management Plan would be implemented demonstrating adaptive management strategies to ensure key milestones are achieved including:

- Fauna monitoring and management protocol including identification and reporting of fauna mortalities to the relevant BCS office
- Protecting vegetation and fauna habitat (including instream habitat) outside the approved disturbance areas and managing the remaining remnant vegetation and fauna habitat (including instream habitat) within the Proposal toward a benchmark state
- Ensuring no increase in baseline data of key emerging weeds or invasive pests (i.e., cane toads)
- Next box monitoring and reporting
- Monitoring criteria
- Clear performance targets
- Corrective actions
- Timing and responsibilities.

Measures to protect the Five-clawed Worm Skink will be informed by the Species Management Plan which is under development by ARTC with DPE for the Five-clawed Worm Skink.

A recommended outline of the FFMP is provided below with further details demonstrated within the mitigation measures listed in Table 8-1:

- Introduction
    - Purpose and objectives
    - Description of the proposal
- Planning Requirements
- Existing environments
    - Flora and fauna values
    - Soils
    - Weeds and pests (i.e., key emerging weeds and priority weed, cane toads)
- Environmental Impacts
- Construction and Operational activities
- Management Zones
    - Protocols, actions, and procedures
- Performance criteria, triggers, and responses
- Five Clawed Worm Skink targeted actions
    - Encounter Protocol
    - Additional Mitigation Measures
    - Environmental Management Measures
    - Regular Notification and Reporting Requirements
- Compliance Management
- Review and Improvement

8.3. Predicted effectiveness

The mitigation measures provided above are based on industry best practices and are known to effectively mitigate impacts where implemented in accordance with approved management plans. It is considered highly likely that should these mitigation measures be implemented, and their implementation monitored and adapted where required, the risk of failure of measures is generally considered to be low.

9. Serious and Irreversible Impacts (SAII)

The principles used to determine if a development will have serious and irreversible impacts, include impacts that:

- Will cause a further decline of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to be in a rapid rate of decline, or
- Will further reduce the population size of the species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very small population size, or
- Impact on the habitat of a species or ecological community that is currently observed, estimated, inferred, or reasonably suspected to have a very limited geographic distribution, or
- Impact on a species or ecological community that is unlikely to respond to measures to improve habitat and vegetation integrity and is therefore irreplaceable.

9.1. Potential Serious and Irreversible Impact Entities

9.1.1. Threatened ecological communities

There are no serious and irreversible impact (SAII) TECs recorded at the subject land.

9.1.2. Threatened species

No SAII threatened species have been recorded or were assumed present on the subject land. Note that Braid Fern *Platyzoma microphyllum* is currently listed as a SAII candidate species in NSW BioNet (DPE, 2022e) but advice to NGH from BCS on 11th May 2022 stated that the Braid Fern is no longer to be considered a SAII candidate species and thus has not been discussed here.

9.1.3. Additional potential entities

No further species or ecological communities were considered potential SAII entities.

10. Requirement to Offset

10.1. Impacts Requiring an Offset

10.1.1. Ecosystem credits

An offset is required for all impacts of development footprint on PCTs that are associated with:

a) a vegetation zone that has a vegetation integrity score ≥15 where the PCT is representative of an endangered or critically endangered ecological community, or

b) a vegetation zone that has a vegetation integrity score of ≥17 where the PCT is associated with threatened species habitat (as represented by ecosystem credits), or is representative of a vulnerable ecological community, or

c) a vegetation zone that has a vegetation integrity score ≥20 where the PCT is not representative of a TEC or associated with threatened species habitat.

The PCTs and vegetation zones requiring offset, and the ecosystem credits required, are documented in Table 10-1 and mapped on Figure 10-1 to Figure 10-4.

Table 10-1 PCTs and vegetation zones that require offsets

Zone ID	PCT ID	PCT name	HBTs	Zone area (ha) – Development Footprint	Vegetation integrity score	Ecosystem credits required
Northern Outwash IBRA subregion						
N1	27 Moderate	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	No	2.43	68.4	83
N2	27_Low	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Yes	4.72	30.5	72
N2A	27_Very_Low	Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	No	0 (Present within subject land not development footprint)	8.5	0
N3	36 Moderate	River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Yes	1.21	50.7	27
N4	36 Low	River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Yes	9.94	43.2	188

Zone ID	PCT ID	PCT name	HBTs	Zone area (ha) – Development Footprint	Vegetation integrity score	Ecosystem credits required
N5	36 Moderate_FV	River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Yes	0.84	49	18
N6	35 Low_FV	River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Yes	0.36	27.6	
N7	52 High	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	No	3.64	80	146
N7A	52 Moderate	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	No	0 (Present within subject land not development footprint)	65.9	0
N8	52 Low	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	13.24	30.9	205
N9	56 Moderate	Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	No	0.64	43.7	14
N10	71 Moderate	Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and aeolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion	No	0.77	55.2	21
Subtotal (Northern Outwash IBRA subregion)						**778**

Zone ID	PCT ID	PCT name	HBTs	Zone area (ha) – Development Footprint	Vegetation integrity score	Ecosystem credits required
Castlereagh Barwon IBRA subregion						
C1	52 High_ Mimosa	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	30.67	97.3	1493
C1A	52 Moderate_ Mimosa	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	0 (Present within subject land not development footprint)	84	0
C2	52 High	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	10.63	98.1	521
C3	52 Moderate	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	11.16	97.5	544
C4	52 Low	Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	No	8.42	67.8	286
C5	78 Moderate	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Yes	0.96	58.4	25
C6	78 Low	River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Yes	0.08	32.8	1
Subtotal (Castlereagh Barwon IBRA subregion)						**2870**
Total						**3648**

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix D.

10.1.2. Scattered tree credits

Offsets are required for the clearing of Class 2 and Class 3 scattered trees. One (1) scattered tree forming part of PCT 27 Low (N2) requires removal; it is a Class 2 tree. The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix D. Note that any discrepancies in areas are due to rounding errors.

Table 10-2 Scattered tree credits that require offsets

Class of scattered tree being cleared	PCT	Hollows Present	Number of scattered trees to be cleared	Credits generated per tree	Ecosystem credits required
Acacia salicina (Class 2)	27 (low condition)	No	1	0.5	1
Total					**1**

10.1.3. Species credits

An offset is required for the threatened species impacted by the development that require species credits. These species and the species credits required are documented in Table 10-3.

Table 10-3 Species credit species that require offsets

Species Credit Species	IBRA Subregion	Biodiversity risk weighting	Area (Ha)	Species credits required
Black-Breasted Buzzard *Hamirostra melanosternon*	Castlereagh-Barwon	1.5	4.44	146
Braid Fern *Platyzoma microphyllum*	Castlereagh-Barwon	3	1.04	44
Bristle-faced Free-tailed Bat *Setirostris eleyi*	Northern Outwash	2	13.73	307
Creeping Tick-trefoil *Desmodiopsis campylocaulon*	Northern Outwash Castlereagh-Barwon	2	Northern Outwash: 19.61 Castlereagh-Barwon: 49.22	445 2358
Finger Panic Grass *Digitaria porrecta*	Northern Outwash Castlereagh-Barwon	2	Northern Outwash: 18.68 Castlereagh-Barwon: 49.22	422 2358

Species Credit Species	IBRA Subregion	Biodiversity risk weighting	Area (Ha)	Species credits required
Koala *Phascolarctos cinereus*	Northern Outwash Castlereagh-Barwon	2	Northern Outwash: 8.85 Castlereagh-Barwon: 0.72	195 21
Little Eagle *Hieraatus morphnoides*	Northern Outwash Castlereagh-Barwon	1.5	Northern Outwash: 21.17 Castlereagh-Barwon: 14.66	360 497
Major Mitchell's Cockatoo *Lophochroa leadbeateri*	Castlereagh-Barwon	2	10.73	477
Masked Owl *Tyto novaehollanadiae*	Castlereagh-Barwon	2	4.55	193
Red-tailed Black Cockatoo (Inland Sub-species *Calyptorhynchus banksii samueli*	Castlereagh-Barwon	2	5.81	257
Superb Parrot *Polytelis swainsonii*	Castlereagh-Barwon	2	4.55	193
Winged Peppercress Lepidium monoplocoides	Castlereagh-Barwon	2	47.66	2285
Subtotal (Northern Outwash IBRA subregion)				**1729**
Subtotal (Castlereagh-Barwon IBRA subregion)				**8829**
Total				**10558**

The full Biodiversity Credit Report generated by the BAM Calculator is provided in Appendix D.

10.1.4. Offsets required under the EPBC Act

Assessment of Significance for the Koala, Five-clawed Worm Skink, Weeping Myall Woodlands and Natural grasslands on basalt CEEC determined the potential for these species to be significantly impacted by the proposal. The proposal has been determined by the Minister for the Environment to constitute a controlled action. The requirement to settle an EPBC offset obligations will be undertaken in accordance NSW offset rules where applicable to do so and consistent with the endorsed bilateral agreement. The following entities require offsetting for residual impacts, and will be offset through the generation of ecosystem credits associated with the following vegetation zones:

- Weeping Myall Woodland – N1 – PCT 27 Low, N2 – PCT 27 Moderate
- Poplar Box Woodland – N9 - PCT 56 Moderate

- Native Grasslands on Basalt – N7 and C2 - PCT 52 High, C3 – PCT 52 Moderate, N8 and C4 – PCT 52 Low, C1 – PCT 52 High – Mimosa.

Impacts to two species, the Five-clawed Worm-skink and Koala have been generated through the use of the BAM-C. The Five-clawed Worm Skink has been included as an ecosystem credit associated with all associated vegetation zones impacted by the development, while species polygons have been generated for the Koala within the following vegetation zones:

- N2 – Low PCT 27 – Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion – 0.01 ha
- N5 – PCT 36 Moderate_FV and N6 – PCT 36 Low_FV - River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion – Floodplain Vegetation – 0.96 ha
- N3 – PCT 36 Moderate and N4 – PCT 36 Low - River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion – 7.8 ha
- C5 - PCT 78 Moderate and C6 - PCT 78 Low - River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion – Gwydir - 0.72 ha

The Superb Parrot has been assumed to be present, impacts have been calculated in the BAM-C, and species polygons have been generated for the species within the following vegetation zones:

- C1 - PCT 52 High_Mimosa - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (dominated by Mimosa) – 1.2 ha
- C3 - PCT 52 Moderate - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 1.8 ha
- C4 - PCT 52 Low - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 1.2 ha
- C5 - PCT 78 Moderate - River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion – 0.96 ha
- C6 - PCT 78 Low River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion – 0.08 ha

The Winged Peppercress has been assumed to be present, impacts have been calculated in the BAM-C, and species polygons have been generated for the species within the following vegetation zones:

- C1 - PCT 52 High_Mimosa - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion (dominated by Mimosa) – 30.5 ha
- C2 - PCT 52 High - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 4.8 ha
- C3 - PCT 52 Moderate - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 9.8 ha
- C4 - PCT 52 Low - Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion – 2.5 ha

10.2. Impacts not Requiring an Offset

Impacts to PCTs that do not meet the thresholds identified in Section 10.1.1 of the BAM do not require offsets. There are no areas within the development footprint that do not require offset.

10.3. Areas not Requiring Assessment

Identification of areas not requiring assessment in accordance with BAM Section 9.3, i.e., areas of Excluded Land that do not contain native vegetation and Category 1 – Exempt Land. These areas include:

- Exotic vegetation – areas of cropping and horticultural plantings
- Irrigation dams and channels
- Urban – fringing areas of the Moree township containing exotic plantings and non-local indigenous native species
- Infrastructure – Roads, dwellings and agricultural infrastructure
- River – aquatic areas of the Mehi and Gwydir Rivers (exception to Murray Cod habitat)

Impacts requiring an offset, not requiring an offset and areas not requiring assessment are mapped on Figure 10-1 to Figure 10-4.

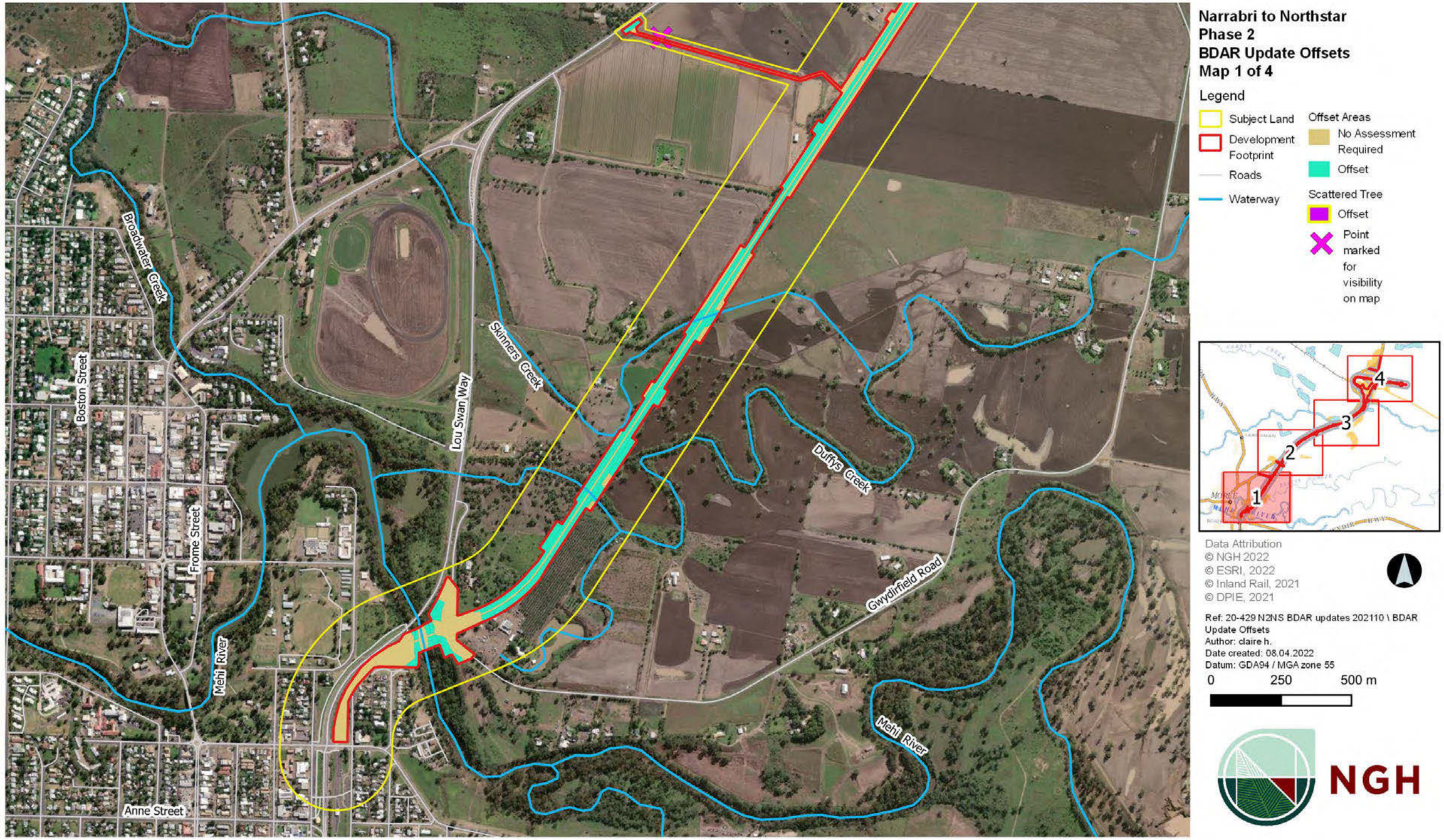

Figure 10-1 Offset Areas Map 1 of 4

Figure 10-2 Offset Areas Map 2 of 4

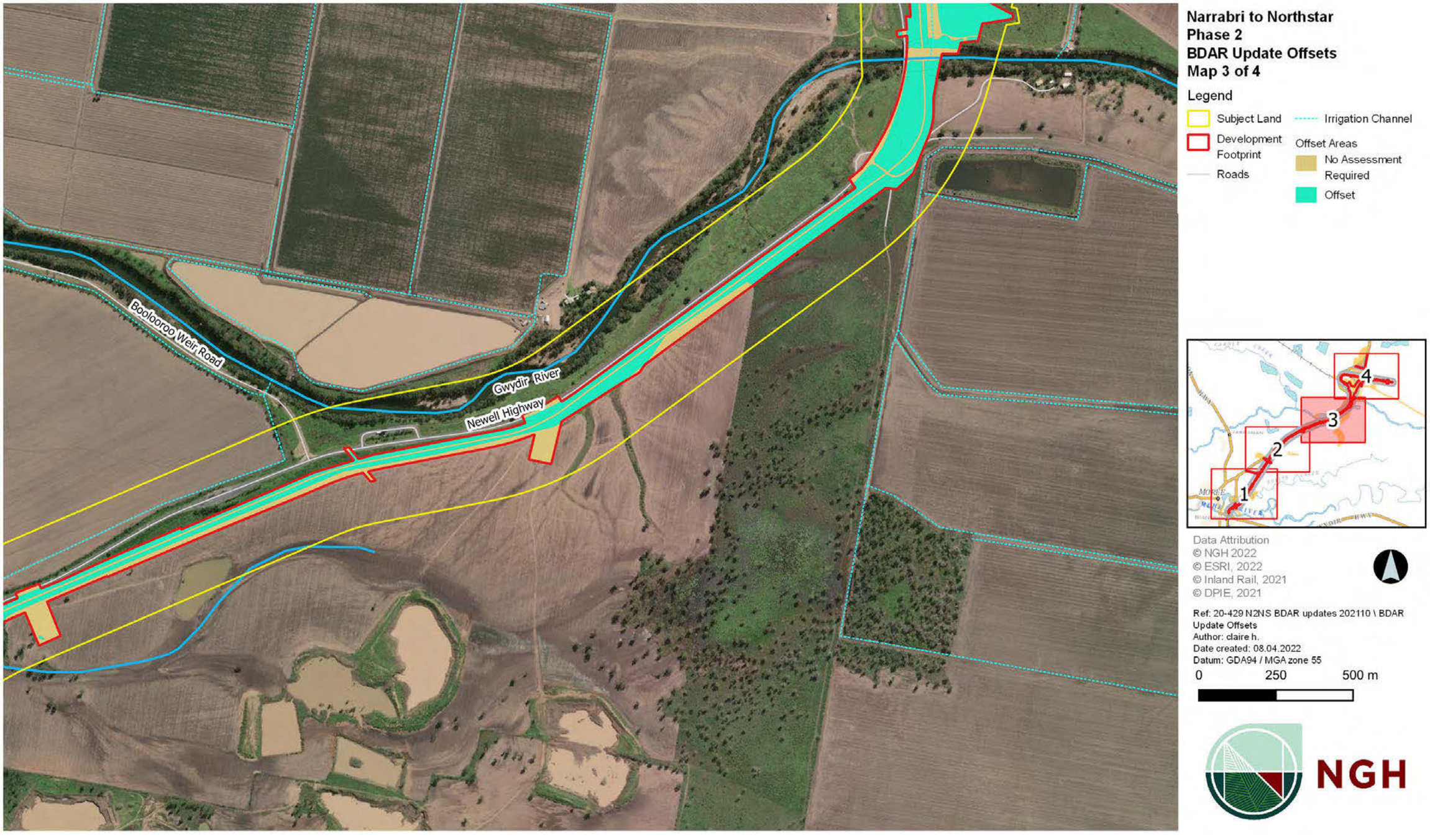

Figure 10-3 Offset Areas Map 3 of 4

Figure 10-4 Offset Areas Map 4 of 4

11. Conclusion

An accredited BAM Assessor employed by NGH has prepared this BDAR on behalf of ARTC for N2NS Phase 2. The purpose of this BDAR was to address the requirements of the BAM, and to address the biodiversity matters raised in the SEARs. In this BDAR:

- Biodiversity impacts have been assessed through comprehensive mapping and assessment completed in accordance with the BAM.
- Biodiversity impacts have been assessed at a worst-case scenario, based on an indicative easement (development footprint) which may be reduced upon final design.
- Mitigation measures have been outlined to reduce impacts to terrestrial and aquatic biodiversity.
- The credit requirement has been split into the two IBRA Bioregions – Darling Riverine Plains (Castlereagh-Barwon IBRA subregion) and Brigalow Belt South (Northern Outwash IBRA subregion), and can be defined as:
    - **Northern Outwash IBRA subregion**
    - 155 Ecosystem Credits for impacts to PCT 27 Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion
    - 237 Ecosystem Credits for impacts to PCT 36 River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion
    - 351 Ecosystem Credits for impacts to PCT 52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion
    - 14 Ecosystem Credits for impacts to PCT 56 Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW.
    - 21 Ecosystem Credits for impacts to PCT 71 Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion.
    - One (1) biodiversity credit for the removal of one (1) Class 2 scattered tree within PCT 27 (Weeping Myall open woodland*)* using the streamlined scattered tree module.
    - 195 species credits for the Koala recorded within the subject land.
    - 307 species credits for the Bristle-faced Free-tailed Bat recorded within the subject land.
    - 422 species credits for *Digitaria porrecta* that was recorded within the subject land.
    - 445 species credits for *Desmodiopsis campylocaulon* that was recorded within the subject land.
    - 360 species credits for the Little Eagle that was assumed to be present within the subject land.
    - **Castlereagh-Barwon IBRA subregion**
    - 2844 Ecosystem Credits for impacts to PCT 52 Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion.
    - 26 Ecosystem Credits for impacts to PCT 78 River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.
    - 21 species credits for the Koala recorded within the subject land.
    - 2358 species credits for *Digitaria porrecta* that was recorded within the subject land.
    - 2358 species credits for *Desmodiopsis campylocaulon* that was recorded within the subject land.
    - 257 species credits for the Red-tailed Black-Cockatoo that was assumed to be present within the subject land
    - 146 species credits for the Black-breasted Buzzard that was assumed to be present within the subject land
    - 497 species credits for the Little Eagle that was assumed to be present within the subject land

- 2285 species credits for the *Lepidium monoplocoides* that was assumed to be present within the subject land
- 477 species credits for the Major Mitchell's Cockatoo that was assumed to be present within the subject land
- 44 species credits for the *Platyzoma microphyllum* that was assumed to be present within the subject land
- 193 species credits for the Superb Parrot that was assumed to be present within the subject land
- 193 species credits for the Masked Owl that was assumed to be present within the subject land

The retirement of these credits must be carried out in accordance with the NSW BOS, and will be achieved by:

- Retiring credits under the BOS if accepted in accordance with the BC Act
- making payments into the Biodiversity Conservation Fund using the offsets payment calculator, or
- funding a biodiversity action that benefits the threatened entity(ies) impacted by the development.

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TECHNICAL PAPER 01

Biodiversity development assessment report

Appendix A Land category assessment

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Land Category Assessment

N2N2 SP2

April 2022

Project Number: 20-429

NSW • ACT • QLD • VIC
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Table 1 – Summary of data sources and interpretation of land category within the development site 1

Acronyms and abbreviations

ALUM	Australian Land Use and Management Classification
BAM	Biodiversity Assessment Method
BC Act	*Biodiversity Conservation Act 2016* (NSW)
BCD	Biodiversity Conservation Division, Division of DPIE (formerly OEH)
BDAR	Biodiversity Development Assessment Report
BOS	Biodiversity Offsets Scheme
Cwth	Commonwealth
DBH	Diameter at breast height (for woody vegetation)
DCS SS	Spatial Services, a business unit of the NSW Department of Customer Service (NSW)
DPIE	Department of Planning, Industry and Environment (NSW)
EEC	Endangered ecological community – as defined under relevant law applying to the proposal
EP&A Act	*Environmental Planning and Assessment Act 1979* (NSW)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cwth)
FPC	Foliage Projective Cover
ha	hectares
IGGAM	Interim Grasslands and other Groundcover Assessment Method
km	kilometres
LLS	Local Land Services
LLS Act	*Local Land Services Act 2013* (NSW)
LLS Regulation	Local Land Services Regulation 2014 (NSW)
m	metres
NV Act	*Native Vegetation Act 2003* (NSW)
NVR Map	Native Vegetation Regulatory Map
OEH	(Former) Office of Environment and Heritage (NSW) (now EES)
PCT	Plant Community Type
PVP	Property Vegetation Plan
SEPP	State Environmental Planning Policy
TSR	Travelling Stock Reserve
Vegetation SEPP	State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017

Introduction

NGH has been engaged to prepare a Biodiversity Development Assessment Report (BDAR) update for part of the proposed Narrabri to North Star (N2NS) section of Inland Rail which is primarily an upgrade of the existing rail corridor between Narrabri and North Star. The N2NS Project has been modified to seek a separate approval for the section across the Mehi-Gwydir floodplain, known as Phase 2. This section covers approximately 15 kilometres (km) from Moree to the Camurra Bypass over the Mehi and Gwydir Rivers of which the majority is within existing rail corridors but it also includes a 1.6 km greenfield re-alignment to remove the existing Camurra hairpin turn. The project is subject to an Environmental Impact Assessment (EIS) assessed under the Part 5 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) and must satisfy the requirements of the NSW *Biodiversity Conservation Act 2016* (BC Act).

Please note that feedback from the Biodiversity, Conservation and Science Directorate (BCS) of the Department of Planning and Environment (DPE) on the original N2NS Phase 2 BDAR included a request for additional information to confirm areas of Category 1 – exempt land and Category 2 – regulated land within the development site. This updated Land Category Assessment Report provides the required evidence for land category determination. Please note that the proposed land categorisation within the N2NS Phase 2 development site, as outlined below, has not previously been approved by DPE. It is anticipated that the proposed land categorisation will be approved as part of the N2NS Phase 2 BDAR update.

Section 6.8(3) of the BC Act determines that the Biodiversity Assessment Method (BAM) is to exclude the assessment of the impacts of clearing of native vegetation on Category 1 - Exempt Land (within the meaning of Part 5A of the NSW *Local Land Services Act 2013* (LLS Act)). Boundaries mapping Category 1 - Exempt Land on the Native Vegetation Regulatory Map are not yet publicly available. During the transitional period, accredited assessors may establish the categorisation of land for the agency head to consider, following the method utilised to develop the Native Vegetation Regulatory Map.

Category 1 - Exempt Land is defined under the LLS Act (Part 5A Division 2 Section 60H) as:

- *Land cleared of native vegetation at 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017*
- *Low Conservation Grasslands*
- *Land containing only low conservation groundcover (not being grasslands)*
- *Native vegetation identified as regrowth in a Property Vegetation Plan under the repealed Native Vegetation Act 2003*
- *Land biodiversity certified under the BC Act.*

Under Section 60J of the LLS Act, matters relating to the determination of mapped Category 1 - Exempt Land or Category 2 - Regulated Land include:

- *60J (2) - Native vegetation that comprises grasslands or other non-woody vegetation is taken to have been cleared if the native vegetation was significantly disturbed or modified. The regulations may make provision for the purposes of determining whether native vegetation has been significantly disturbed or modified for the purposes of this Division.*

The clearing of native vegetation after 1990 must have been done legally, and the vegetation must have been cleared as of 1 January 1990 or between 1 January 1990 and 25 August 2017. Satellite imagery may be used to determine the native vegetation clearing.

Section 114 of the Local Land Services Regulation 2014 (LLS Regulation) outlines how to determine whether native vegetation has been significantly disturbed or modified.

(1) Native vegetation that comprises grasslands or other non-woody vegetation is taken to have been significantly disturbed or modified (and therefore cleared) only if—

- *(a) there has been a detectable variation (from information obtained from aerial or satellite imagery) in the structure or composition, or both, of non-woody vegetation, and*
- *(b) that variation is consistent with management of pasture or crops for agricultural purposes, and*
- *(c) that variation has been sustained for at least 12 months on more than one occasion before the commencement of Part 5A of the Act, and*
- *(d) that variation has not been caused only by grazing on the land, and*
- *(e) that variation occurred (from information obtained from aerial or satellite imagery) between 1 January 1990 and the date of commencement of Part 5A of the Act.*

Using the Section 60H, 60J of Part 5A of the LLS Act and Section 114 of the LLS Regulation, this Land Category Assessment Report establishes the methodology, results and conclusions to evaluate the land categorisation for the development site. It is requested that DPE review the proposed methodology, endorse it if considered appropriate, and provide comment where required for the land categorisation of the development site.

Methodology

Desktop assessment and a literature review of previous studies were undertaken over the development site to determine the ecological constraints and native vegetation communities on site. Assessment of the development site for Category 1 - Exempt Land, Category 2 - Regulated Land (including Category 2 – Sensitive Regulated Land and Category 2 – Vulnerable Regulated Land) and Excluded Land was undertaken using the following data sources:

- Aerial imagery of historical land use (sourced from Spatial Services, a business unit of the Department of Customer Service NSW, 2022)
- Transitional Native Vegetation Regulatory (NVR) Map (DPE, 2021)
- NSW Landuse 2017 v1.2 dataset (Australian Land Use and Management (ALUM) Classification Version 8 (DPE, 2020)
- NSW Woody vegetation extent and Foliage Projective Cover (FPC) 2011 (DPE, 2015)
- NSW ePlanning Spatial Viewer, DPE 2021
- State Vegetation Type Map: Border Rivers Gwydir / Namoi Region Version 2.0. VIS_ID 4467 (DPE, 2015)
- Existing Vegetation of Moree Plains Shire 2002. VIS_ID 928 (DPE, 2013)
- Satellite imagery accessed through Environmental Systems Research Institute, Inc. (Esri), 2022

Desktop analysis has been verified through field assessment across the whole development site. Biodiversity Assessment Method (BAM) plots to determine vegetation integrity and confirm plant community type (PCT) selection were undertaken in February 2022, in addition to rapid assessment of landscape features, vegetation, land use and threatened species habitat. Previous BAM plots had been undertaken in December 2019 and February 2020 but the dry conditions meant that vegetation integrity scores were not reflective of the plant community type and thus the same plots were done again in February 2022.

1. Results

The analysis of the above sources and aerial imagery, in conjunction with field assessment, demonstrates that a high proportion of the rural land adjacent to the existing rail corridor within the development site has been used continuously for cropping and grazing on modified pastures in from 1990 onwards and the land and is consistent with the definition of Category 1 – Exempt Land in the LLS Act as '*land cleared of native vegetation at 1 January 1990 or lawfully cleared of vegetation between 1 January 1990 and 25 August 2017*', and significantly disturbed or modified land as described in Section 114 of the LLS Regulation.

The following table (

Table 1) and Figure 1 to Figure 24 demonstrate how the data sources and field assessment were used in determining land category.

Table 1 – Summary of data sources and interpretation of land category within the development site

Data Source	Proposed Category 1 – Exempt Land	(Proposed) Category 2– Regulated Land	Excluded Land	Notes
Transitional NVR Map (Figure 1)	• N/A	• All areas identified as Category 2 - Vulnerable Regulated Land • Bands of native vegetation which cross the northern section of the development site (Travelling Stocks Reserves)	• Areas identified as Excluded Land, such as urban land within Moree	• No Category 2 - Sensitive Regulated Land occurs within development site
NSW Environmental Planning Instrument - Land Zoning (Figure 2)	• Most of the development site is zoned rural (RU1 – Primary Production) therefore Part 5A of the LLS Act applies and land categorisation can be determined		• Land categorisation cannot be determined for areas of excluded land as Part 5A of the LLS Act does not apply (B2 – Local Centre, B6 – Enterprise Corridor, IN2 – Light Industrial, R1 – General Residential, R5 – Large Lot Residential, RE1 – Public recreation, SP2 – Infrastructure)	
1991 and 1996 Aerial Imagery Moree Locality (Figure 3 to Figure 10)	• Areas with clear evidence of significant groundcover modification and disturbance, suggesting cropping and / or modified pastures, demonstrated by machinery lines, bare ground and bright green vegetation	• Woody vegetation present in 1990 and 1996, including scattered trees • Areas with no evidence of significant groundcover modification and disturbance in 1990 and 1996 • Natural riparian areas	• Urban and industrial areas	• Historical aerial imagery is not available for 1990 for the Moree area. Historical aerial imagery from 1991 has been assumed

Data Source	Proposed Category 1 – Exempt Land	(Proposed) Category 2– Regulated Land	Excluded Land	Notes
	• Areas where groundcover modification and disturbance were present in 1990 and were also present in 1996.			to indicate land use in 1990.
NSW Landuse 2017 v1.2 (Figure 11 to Figure 14)	Land use identified as: • Cropping • Irrigated cropping • Irrigated perennial horticulture • Grazing modified pastures (excluding woody vegetation) where clear evidence of significant groundcover modification has occurred in 1990 and 1996 • Plantation forests • Residential and farm infrastructure • Mining • Manufacturing and industrial • Transport and communication • Services • Channel/aqueduct • Reservoir/dam	Land use identified as: • Managed resource protection • Grazing native vegetation • Grazing modified pastures where evidence of significant groundcover modification is absent (precautionary principle applied) • River	• Cropping • Grazing native vegetation • Residential and farm infrastructure • Transport and communication • Services	• Note that areas of the 'grazing native vegetation' land use occur within Excluded Land that is now urbanised or contains rail infrastructure.
NSW Woody Vegetation Extent & FPC 2011	• Areas of woody vegetation regrowth that has occurred after 1990 following previous clearing events	• Woody vegetation present in 1990, identified in conjunction with 1991 and 1996 historical aerial imagery, inclusive of scattered (native) trees.	• Urban and industrial areas	

Data Source	Proposed Category 1 – Exempt Land	(Proposed) Category 2– Regulated Land	Excluded Land	Notes
(Figure 15)				
NSW State Vegetation Mapping, 2015 (Figure 16)	• Areas without native vegetation mapping	• Areas mapped as containing native vegetation communities • Scattered (native) trees • Natural riparian areas	• Urban and industrial areas	
NGH Vegetation Assessment, 2022 (Figure 17 to Figure 20)	• Areas without native vegetation mapping	• Areas mapped as PCT 27, 36, 52, 56, 71 and 78 (including areas which do not meet the definition of a scattered tree under the BAM) • Scattered (native) trees • Natural riparian areas	• Urban and industrial areas	• BAM plot positions are indicated on Figure 17 to Figure 20. Rapid assessment was also undertaken to confirm PCT extent and areas of non-native vegetation.
Proposed land categorisation (**Figure** 21Figure 24)	• Areas with clear evidence of significant groundcover modification and disturbance due to agricultural activities, present in 1990 and which continued to be present in 1996 • Areas where evidence of disturbance is supported by land uses consistent with intensive agriculture, such as cropping, and lack of mapped woody vegetation.	• Areas containing native or non-native vegetation where evidence of significant groundcover modification and disturbance is not present. • Scattered (native) trees • Category 2 - Vulnerable Regulated Land as mapped on the transitional NVR Map • Areas where PCTs, as determined by NGH, are supported by publicly available vegetation mapping and	• Excluded land as mapped on the transitional NVR Map	• No Category 2 - Sensitive Regulated Land occurs within development site

Data Source	Proposed Category 1 – Exempt Land	(Proposed) Category 2– Regulated Land	Excluded Land	Notes
		areas mapped as containing woody vegetation.		

A determining feature of intensive agricultural use within the development site is a lack of woody vegetation regrowth in most areas, as represented in the historical (Figure 3 to Figure 10) and current aerial images (Figure 1). However, the 2011 Woody Vegetation extent does identify scattered trees in the development site which are still present and have been mapped as Category 2 - Regulated Land. In areas where it is not 100% conclusive whether the grassland areas have been previously cropped or significantly modified, and some native vegetation is present, as identified through field assessment, a precautionary approach has been applied and the land mapped as Category 2 – Regulated land.

The Transitional NVR Map identifies areas of Category 2 - Vulnerable Regulated Land within the development site but no Category 2 - Sensitive Regulated Land. Areas mapped as Excluded Land on the Transitional NVR Map have not been included within the proposed land categorisation, as these areas are not covered by Part 5A of the LLS Act.

2. Conclusion

Based on the above data sources and field assessment, there is sufficient evidence to suggest that large rural areas of the development site have been under regular rotational cropping, pasture improvement or other intensive agricultural uses since 1990 and which remain in place today. These areas have been significantly disturbed or modified and are thus consistent with the land categorisation of Category 1 – Exempt Land.

This analysis is supported by recent and historical imagery, the 2017 landuse mapping, woody vegetation and foliage projective cover mapping, publicly available vegetation mapping and NGH field assessment. Where in doubt, or where data sources are conflicting, a precautionary approach has been implemented for areas deemed inconclusive in terms of significant disturbance.

Category 2 – Regulated Land is proposed for the areas containing native or non-native vegetation where evidence of significant groundcover modification and disturbance is not present, scattered (native) trees and mapped Category 2 - Vulnerable Regulated Land on the transitional NVR Map.

Proposed land categorisation for Category 1 – Exempt Land and Category 2 – Regulated Land is produced in Figure 21 to Figure 24.

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Figure 1 Development Site overview and land categorisation (publicly available layers)

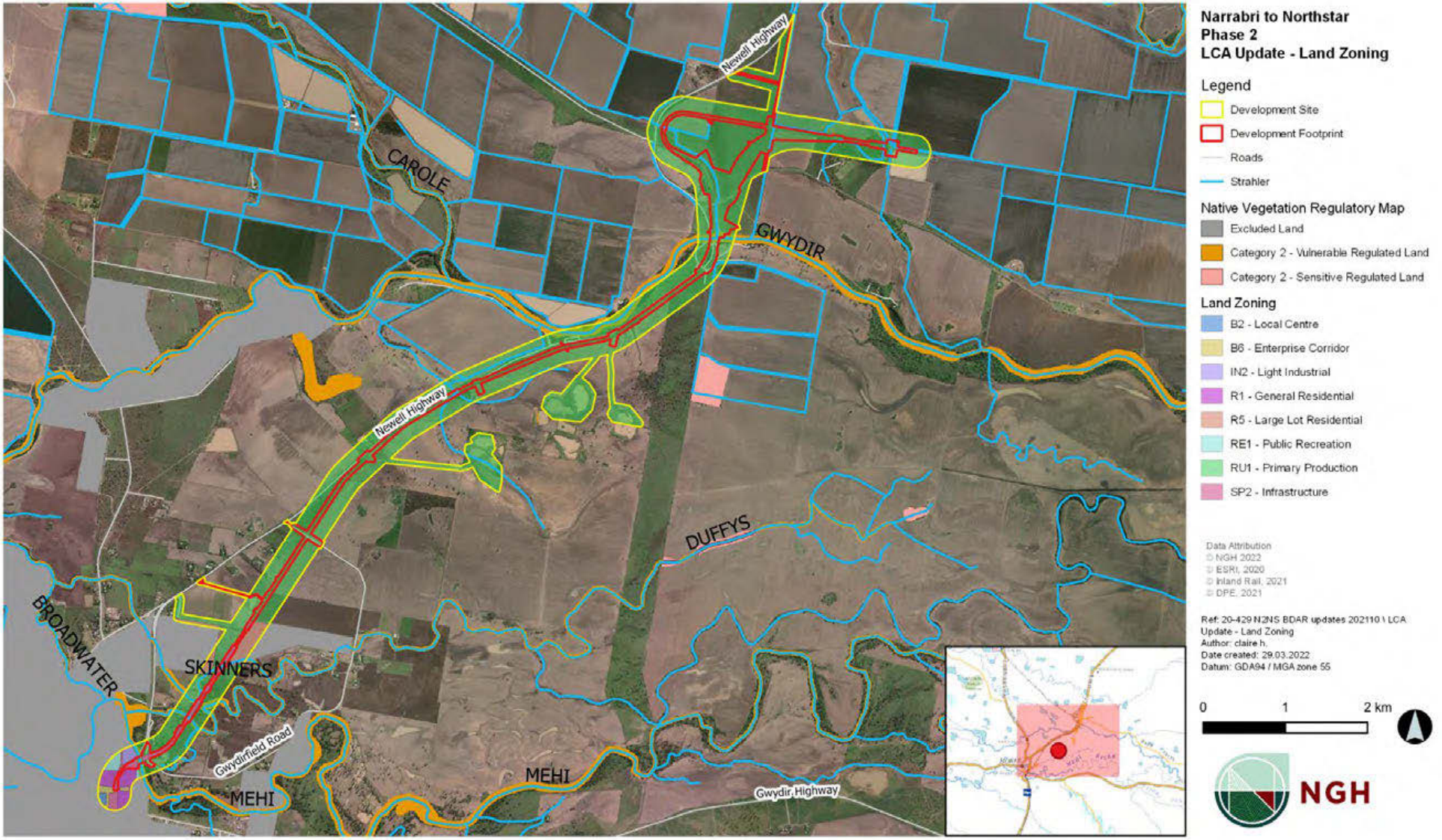


Figure 2 Land zoning

Figure 3 Historical aerial imagery (1991) – Map 1

Figure 4 Historical aerial imagery (1991) – Map 2

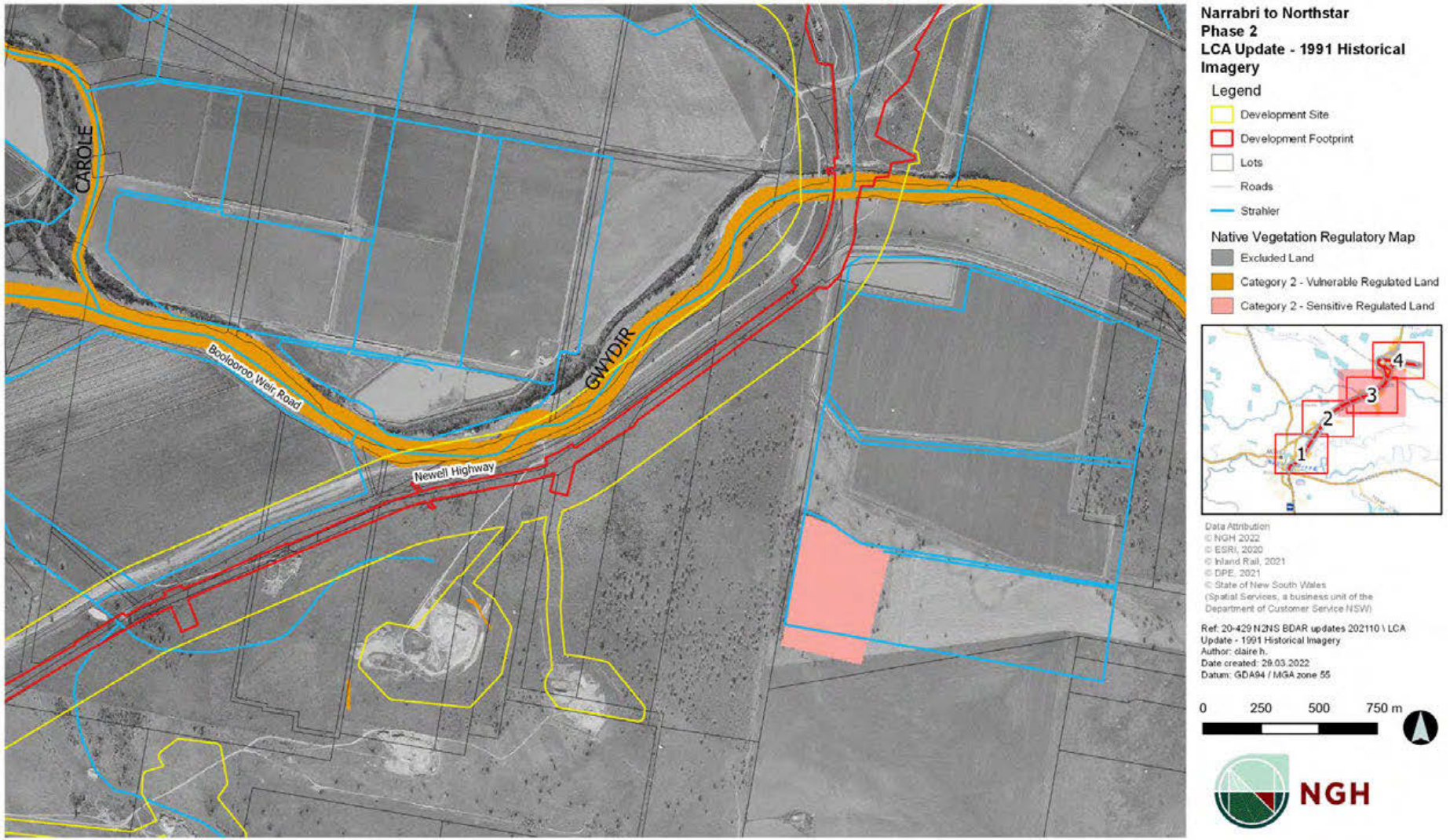


Figure 5 Historical aerial imagery (1991) – Map 3

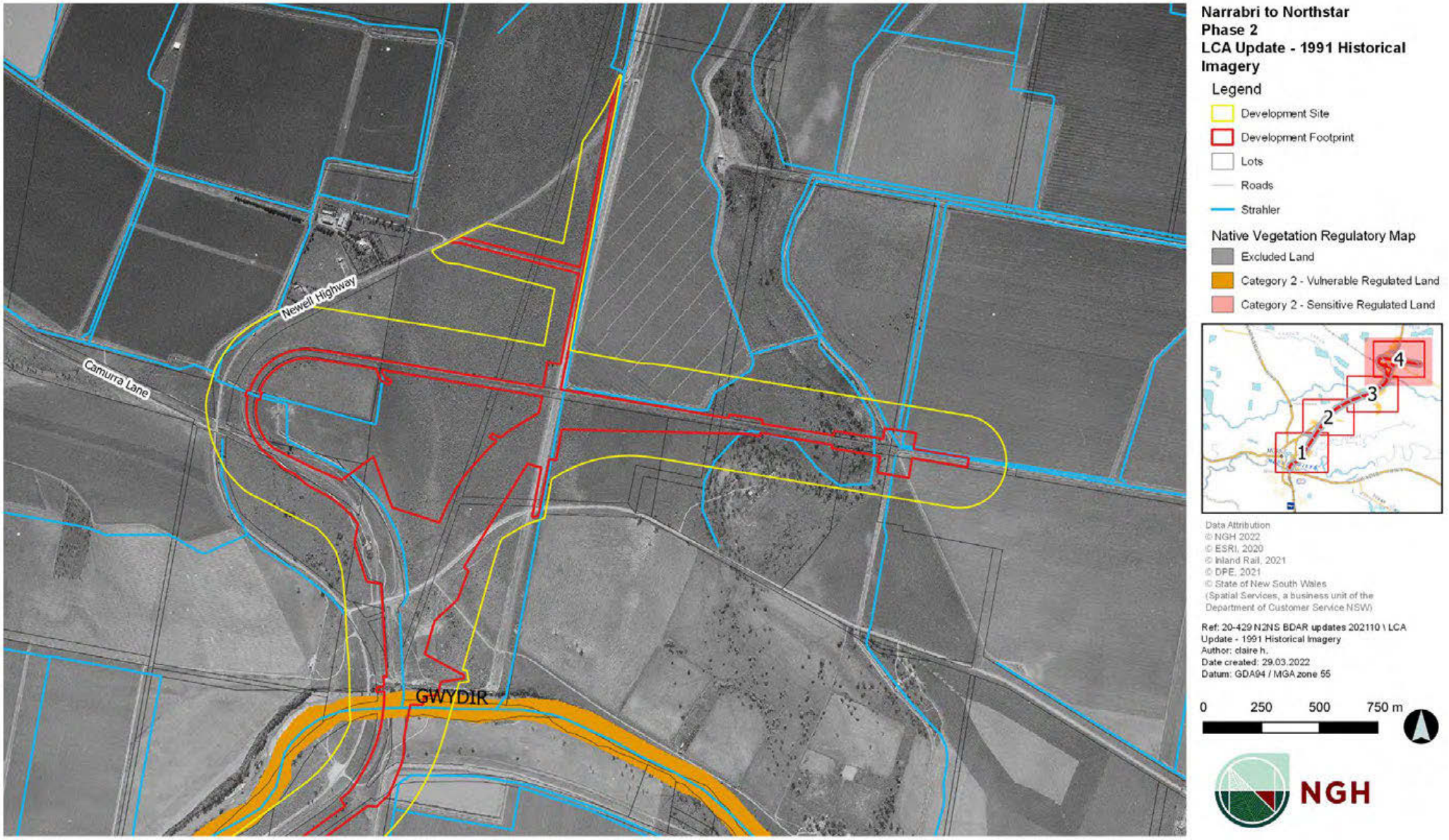


Figure 6 Historical aerial imagery (1991) – Map 4

Figure 7 Historical aerial imagery (1996) – Map 1

Figure 8 Historical aerial imagery (1996) – Map 2

Figure 9 Historical aerial imagery (1996) – Map 3

Figure 10 Historical aerial imagery (1996) – Map 4

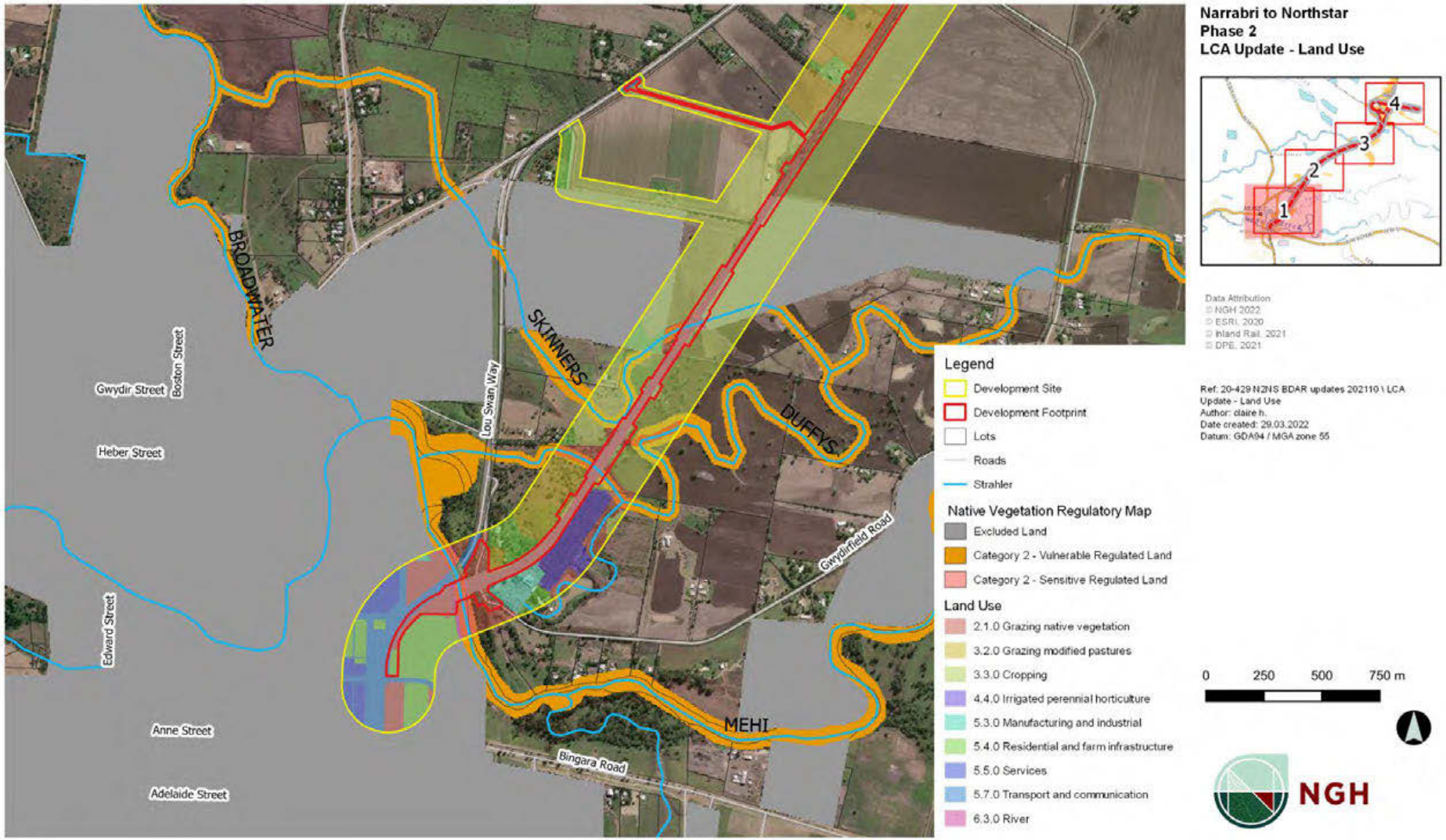


Figure 11 Landuse (2017) - Map 1

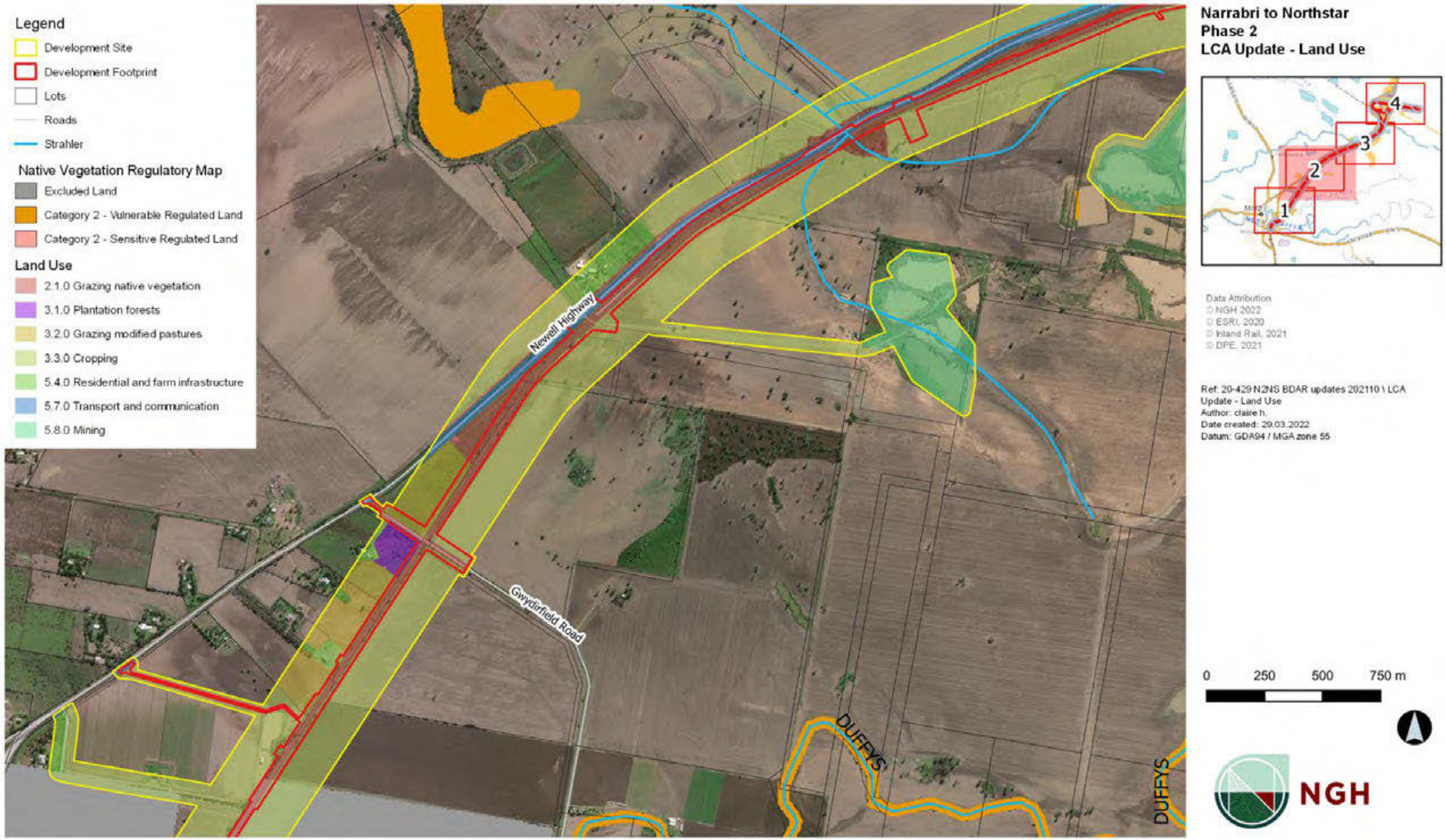


Figure 12 Landuse (2017) - Map 2

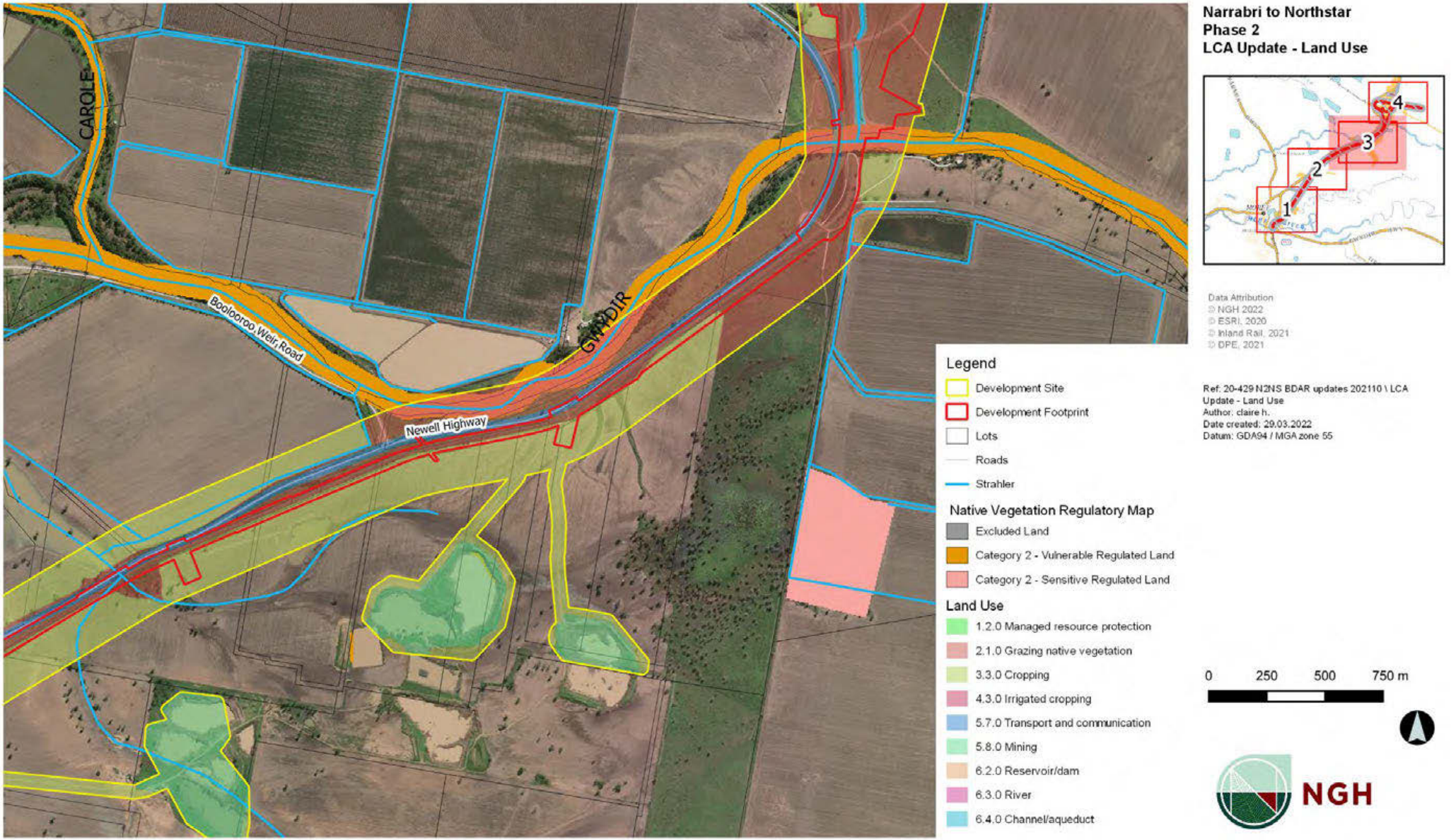


Figure 13 Landuse (2017) - Map 3

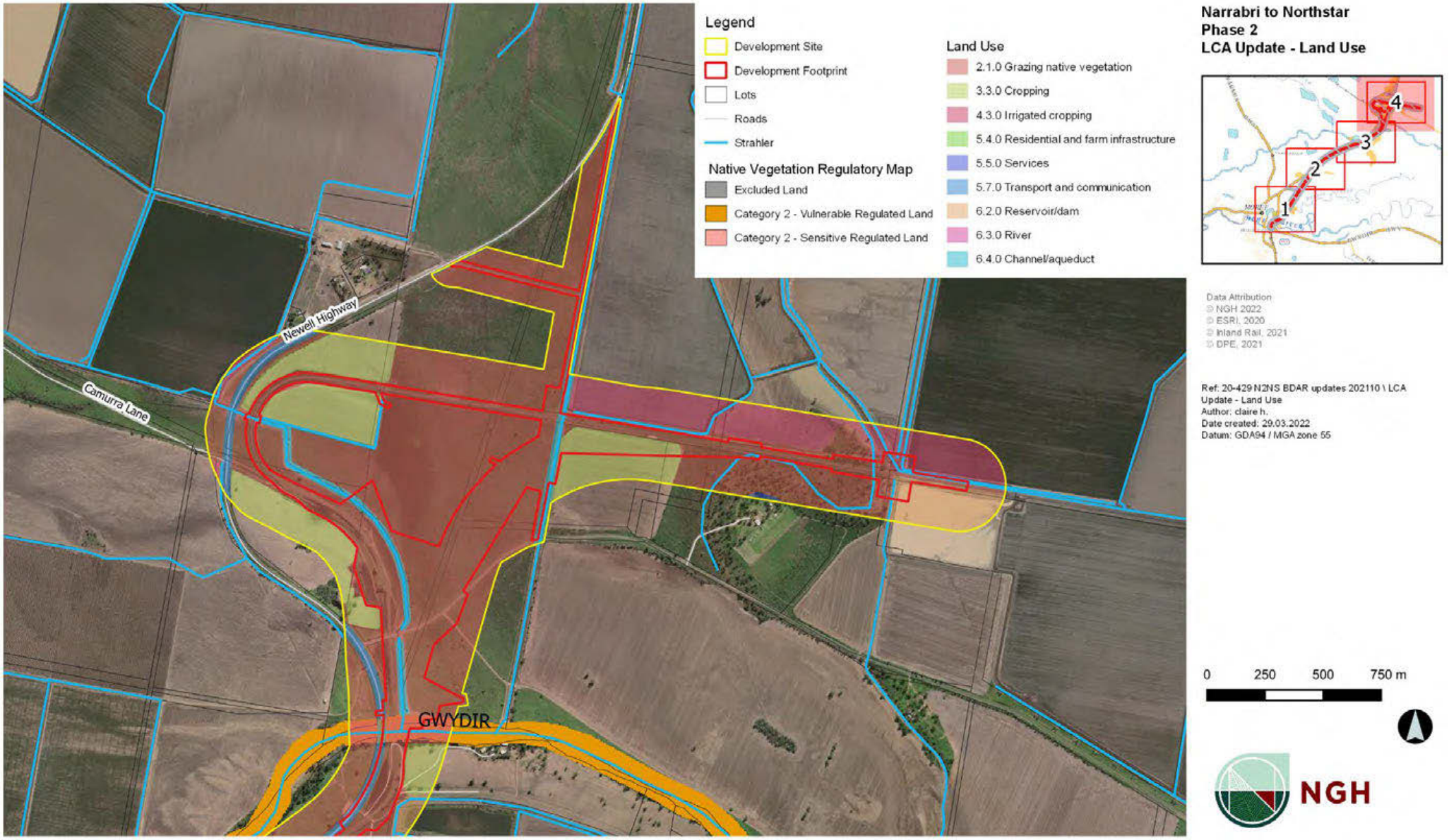


Figure 14 Landuse (2017) - Map 4

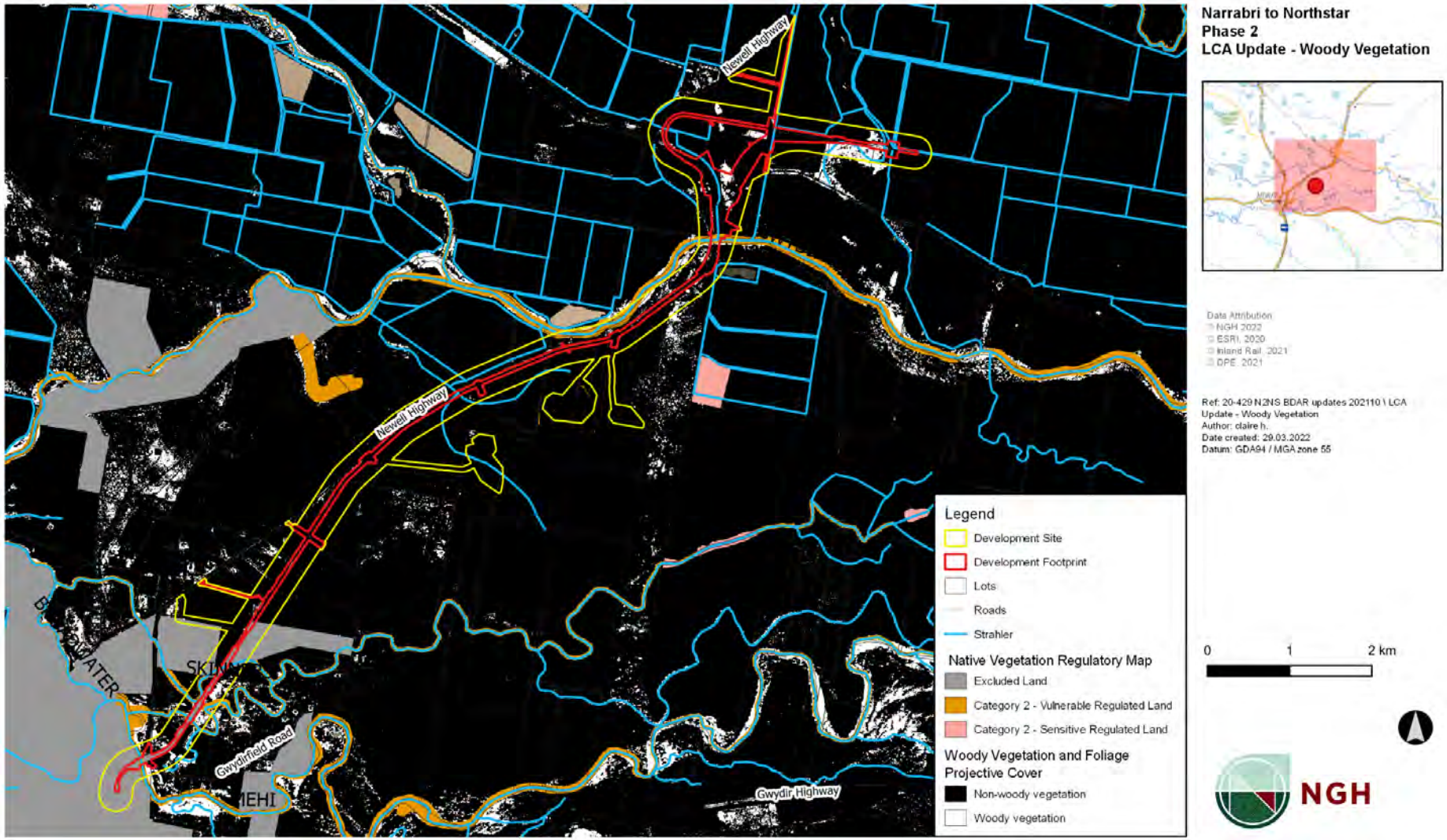


Figure 15 NSW Woody vegetation extent and FPC (2011)

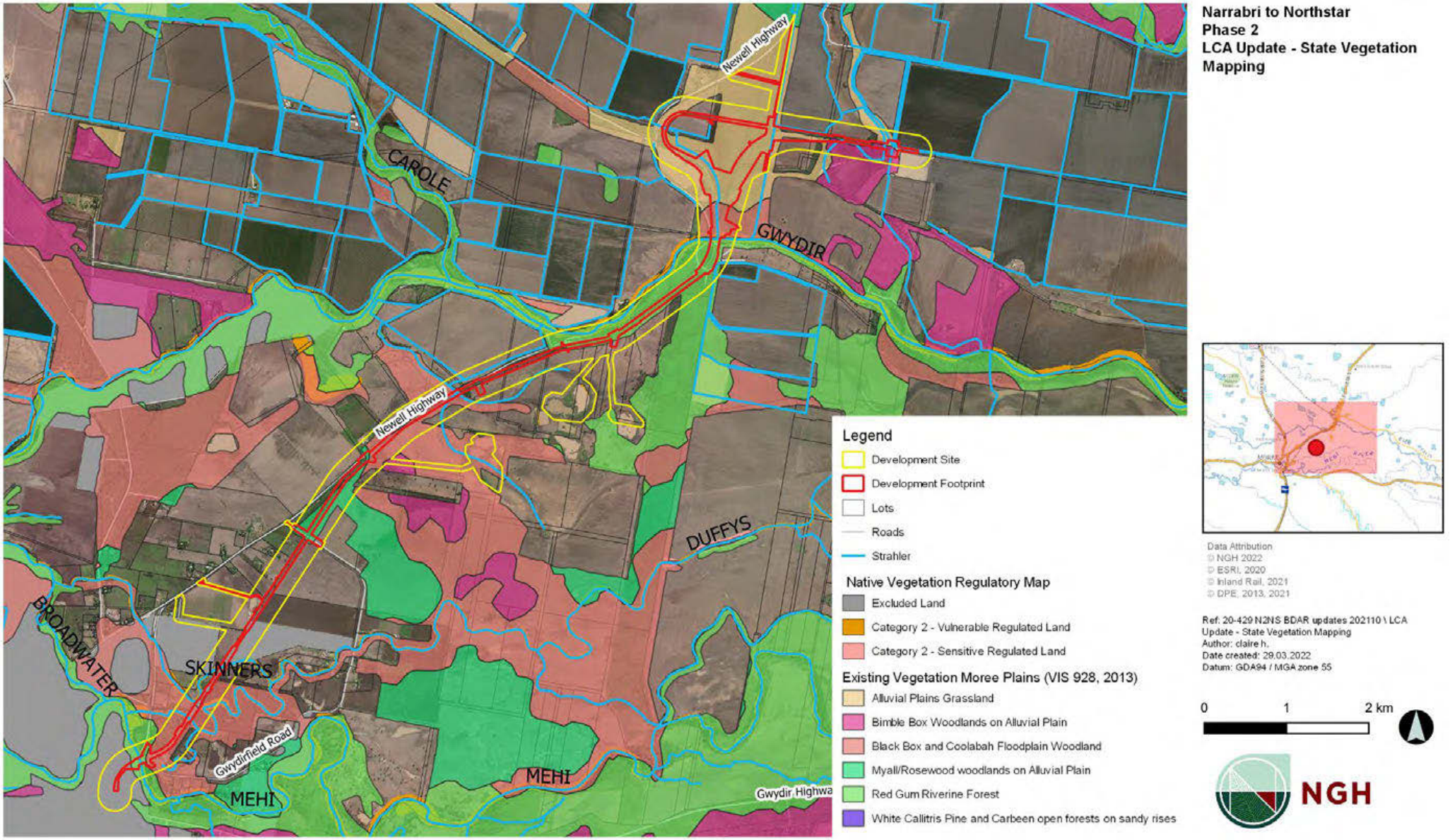


Figure 16 Moree Plains Vegetation Mapping (2013)

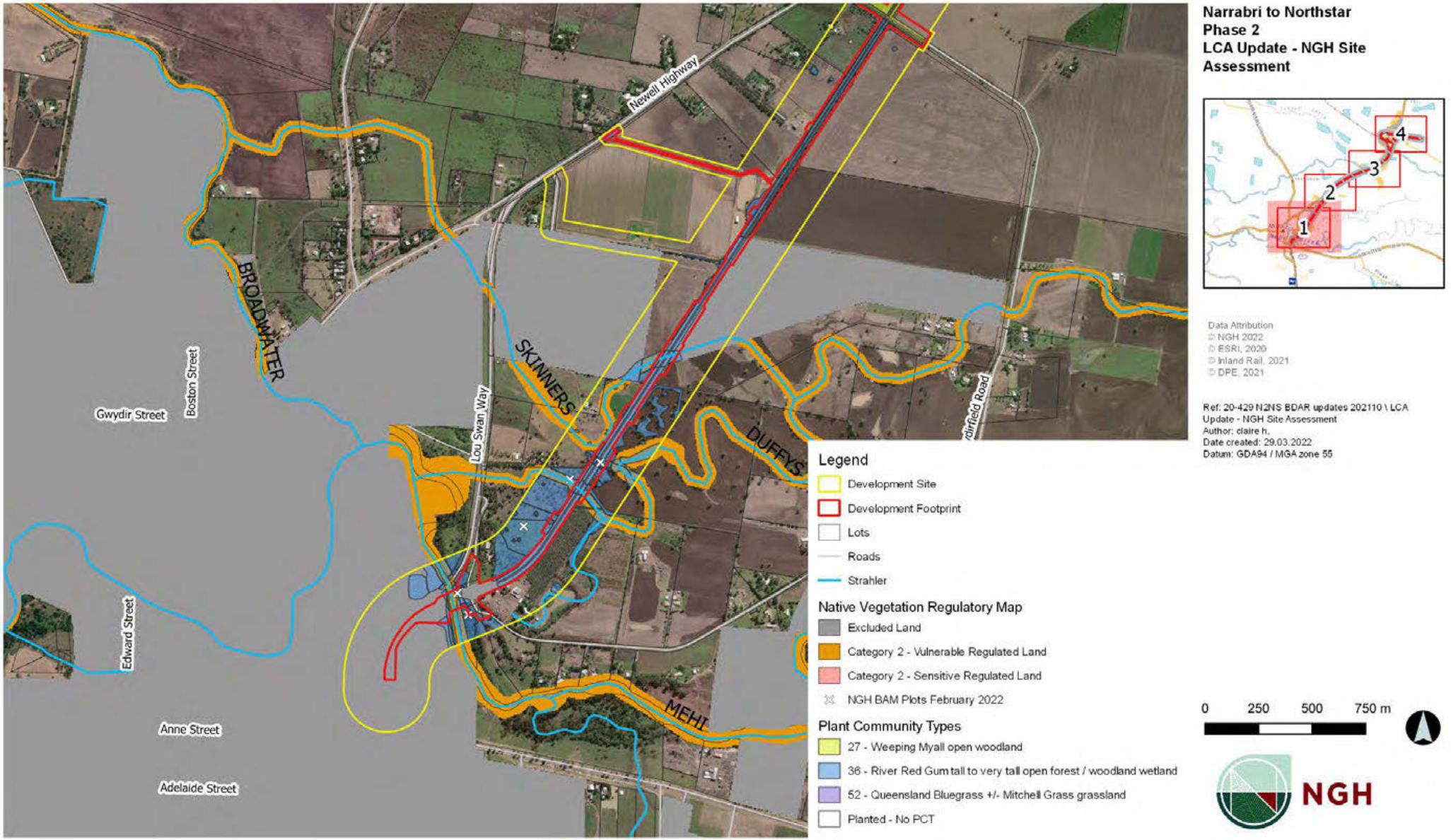


Figure 17 NGH Vegetation Assessment - Map 1

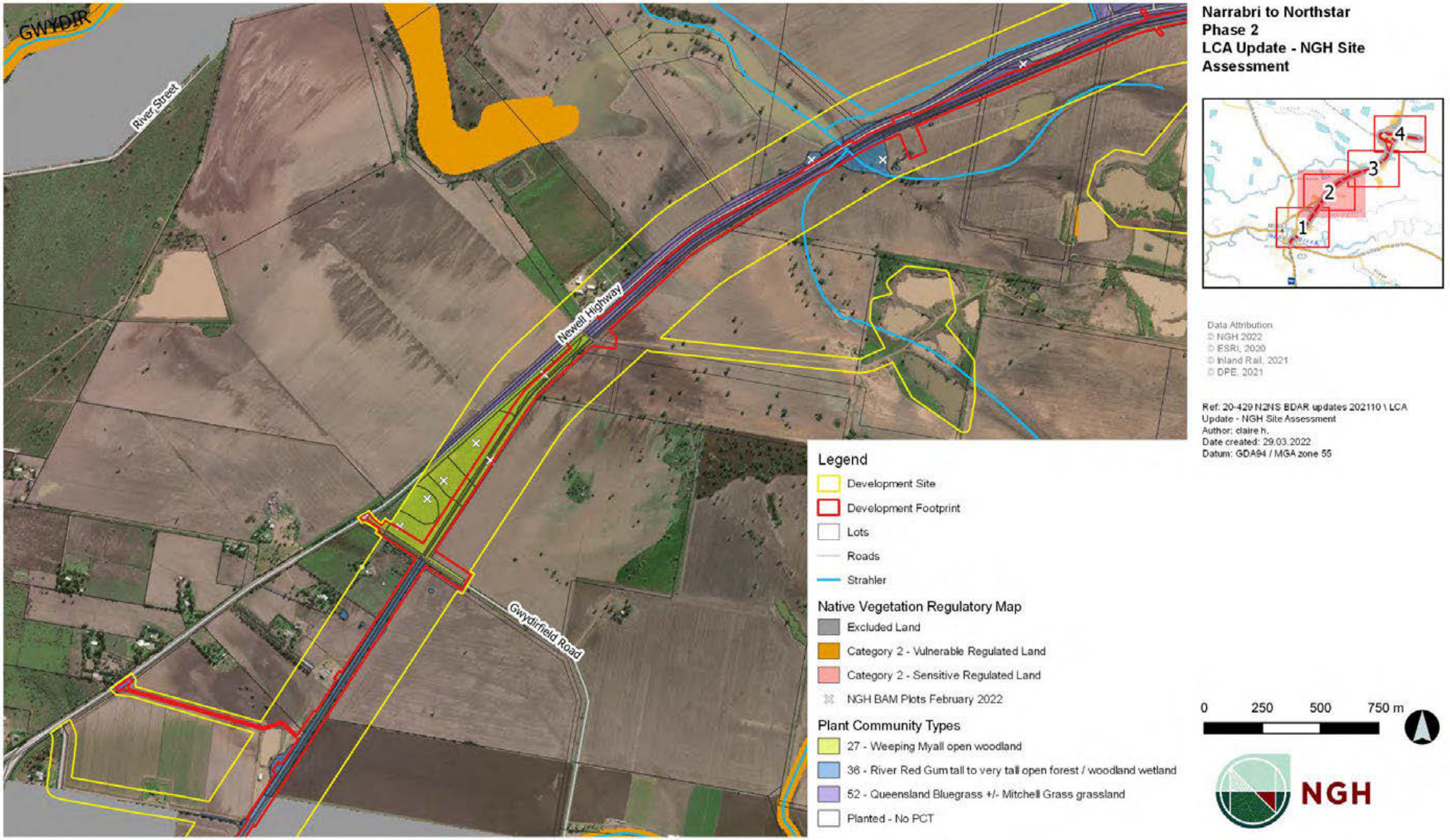


Figure 18 NGH Vegetation Assessment - Map 2

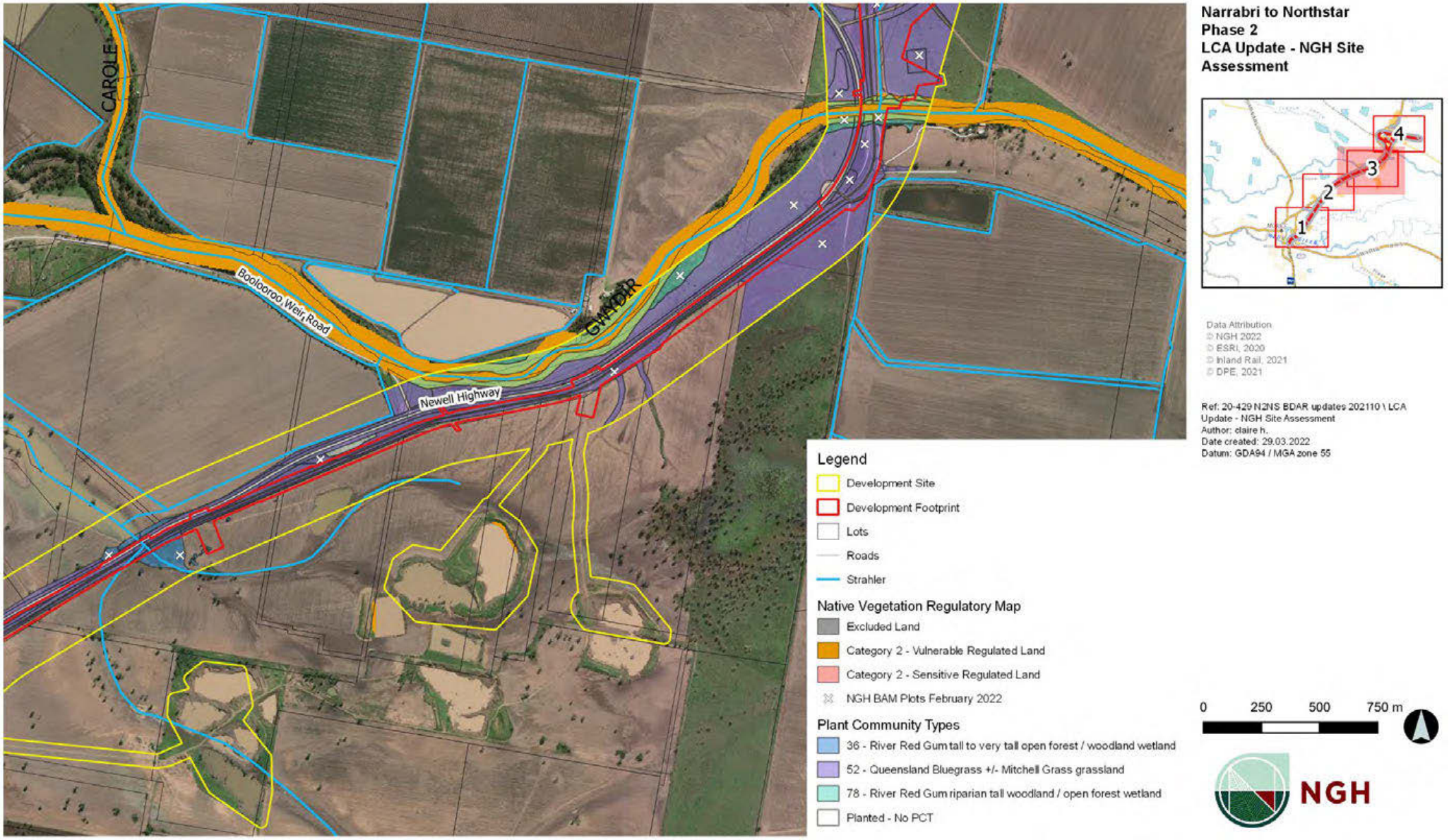


Figure 19 NGH Vegetation Assessment - Map 3

Figure 20 NGH Vegetation Assessment - Map 4

Figure 21 Proposed Land Categorisation - Map 1

Figure 22 Proposed Land Categorisation - Map 2

Figure 23 Proposed Land Categorisation - Map 3

Figure 24 Proposed Land Categorisation - Map 4

TECHNICAL PAPER 01

Biodiversity development assessment report

Appendix B Survey data

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Appendix B Survey Data

B.1 Plot data 2019 and 2020

FUNCTION

Function attributes for	IR 1

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	6
	Forb (FG)	5
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	1
	TOTAL	13

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	25
	Shrub (SG)	17.1
	Forb (FG)	10.4
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	52.6
	TOTAL 'HTE'	13

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	45.00%	
	15m	70%		
	25m	90%		
	35m	35%		
	45m	25%		
Bare ground cover	5m	90%	52%	
	15m	30%		
	25m	10%		
	35m	60%		
	45m	70%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19		6	
5-9		16	
<5		5	N/A
Length of logs (m)		2	

COMPOSITION & STRUCTURE

Species recorded for IR 1

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Weeping Myall, Bore	Fabaceae (Mi	25			Tree (TG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.5	3		Shrub (SG)	No		

ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.5	5		Shrub (SG)	No		
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiac	1			Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	3		*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5			Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10			Shrub (SG)	HTE		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	0.1	5		Shrub (SG)	No		
amye quan	*Amyema quandang*	Grey Mistletoe	Loranthaceae	0.1	1		Other (OG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	1		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	10			Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 2

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	3
	Shrub (SG)	2
	Forb (FG)	2
	Grass & grasslike (GG)	0
	Fern (EG)	1
	Other (OG)	1
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	40.1
	Shrub (SG)	1.1
	Forb (FG)	0.2
	Grass & grasslike (GG)	0
	Fern (EG)	0.1
	Other (OG)	0.1
	TOTAL Native	41.6
	TOTAL 'HTE'	22

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79			
30-49		2	
20-29		4	
10-19		7	
5-9		3	
<5		1	N/A
Length of logs (m)		5	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	6.20%	
	15m	1%		
	25m	5%		
	35m	15%		
	45m	5%		
Bare ground cover	5m	95%	92%	
	15m	95%		
	25m	95%		
	35m	85%		
	45m	90%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 2									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	20			Tree (TG)	No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	20			Tree (TG)	No		

lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	20		*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
acac sten	*Acacia stenophylla*	River Cooba	Fabaceae (Mi	0.1			Tree (TG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
amye camb	*Amyema cambagei*	Needle-leaf Mistleto	Loranthaceae	0.1	1		Other (OG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	10		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	1		*		HTE		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	4		Fern (EG)	No		
scle diva	*Sclerolaena divaricata*	Tangled Copperburr	Chenopodiac	0.1	1		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 3

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	5
	Forb (FG)	3
	Grass & grasslike (GG)	1
	Fern (EG)	0
	Other (OG)	0
	TOTAL	11

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	7
	Shrub (SG)	16.6
	Forb (FG)	5.2
	Grass & grasslike (GG)	0.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	28.9
	TOTAL 'HTE'	11

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19		1	
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	25%	34.00%	
	15m	30%		
	25m	35%		
	35m	50%		
	45m	30%		
Bare ground cover	5m	75%	65%	
	15m	70%		
	25m	60%		
	35m	50%		
	45m	70%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 3									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.5	20		Shrub (SG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	5			Forb (FG)	No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiac	5			Shrub (SG)	No		

vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10			Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	1			Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	5		Forb (FG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	20	*		No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	5		Forb (FG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiace	0.1	1		Shrub (SG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	2			Tree (TG)	No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	5			Tree (TG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 4

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	1
	Forb (FG)	4
	Grass & grasslike (GG)	4
	Fern (EG)	1
	Other (OG)	3
	TOTAL	15

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	50
	Shrub (SG)	5
	Forb (FG)	0.4
	Grass & grasslike (GG)	0.5
	Fern (EG)	0.1
	Other (OG)	0.4
	TOTAL Native	56.4
	TOTAL 'HTE'	60.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	2		2
50-79	3		
30-49		2	
20-29		2	
10-19		2	
5-9			
<5			N/A
Length of logs (m)		26	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	80%	79.00%	
	15m	80%		
	25m	80%		
	35m	75%		
	45m	80%		
Bare ground cover	5m	0%	5%	
	15m	5%		
	25m	5%		
	35m	10%		
	45m	3%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	2%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for IR 4

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	30			Tree (TG)	No		
acac sali	*Acacia salicina*	Cooba	Fabaceae (Mi	20			Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5			Shrub (SG)	HTE		

jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	0.1	2		Other (OG)	No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	10		*		HTE		
aust vert	*Austrostipa verticillata*	Slender Bamboo Gras	Poaceae	0.2	5		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	5		Forb (FG)	No		
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	5		*		HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	10		*		HTE		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	5		Fern (EG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.1	10		Grass & grasslike (GG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	3		Forb (FG)	No		
seta parv	*Setaria parviflora*		Poaceae	0.1	5	*		No		
cype bifa	*Cyperus bifax*	Downs Nutgrass	Cyperaceae	0.1	1		Grass & grasslike (GG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	2		Forb (FG)	No		
both	*Bothriochloa spp.*	Redgrass, Bluegrass	Poaceae	0.1	3	*	Grass & grasslike (GG)	No		
ehrh erec	*Ehrharta erecta*	Panic Veldtgrass	Poaceae	0.1	5	*		HTE		
pasp dila	*Paspalum dilatatum*	Paspalum	Poaceae	30		*		HTE		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	5	*		No		
bras	*Brassica spp.*	Brassica	Brassicaceae	0.1	2	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	0.1	2		Other (OG)	No		
clem micr	*Clematis microphylla*	Small-leaved Clemati	Ranunculacea	0.2	3		Other (OG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 5

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	4
	Shrub (SG)	3
	Forb (FG)	4
	Grass & grasslike (GG)	3
	Fern (EG)	1
	Other (OG)	1
	TOTAL	16

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	55.1
	Shrub (SG)	1.2
	Forb (FG)	1.3
	Grass & grasslike (GG)	5.2
	Fern (EG)	0.1
	Other (OG)	3
	TOTAL Native	65.9
	TOTAL 'HTE'	24.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	2		1
50-79	3		
30-49		5	
20-29		5	
10-19		2	
5-9			
<5			N/A
Length of logs (m)		34	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	40%	46.00%	
	15m	30%		
	25m	70%		
	35m	50%		
	45m	40%		
Bare ground cover	5m	30%	23%	
	15m	15%		
	25m	0%		
	35m	30%		
	45m	40%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 5									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	40			Tree (TG)	No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	5			Tree (TG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	10			Tree (TG)	No		

rici comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	5		*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1		*	Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	3		*		HTE		
card gran	*Cardiospermum grandifl*	Balloon Vine	Sapindaceae	5		*		HTE		
pasp dila	*Paspalum dilatatum*	Paspalum	Poaceae	0.1		*		HTE		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	10		*		HTE		
aris vaga	*Aristida vagans*	Threeawn Speargrass	Poaceae	5			Grass & grasslike (GG)	No		
glyc taba	*Glycine tabacina*	Variable Glycine	Fabaceae (Fal	3			Other (OG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1			Forb (FG)	No		
chlo gaya	*Chloris gayana*	Rhodes Grass	Poaceae	0.1	10	*		HTE		
eina trig	*Einadia trigonos*	Fishweed	Chenopodiac	0.1	1		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	5		Fern (EG)	No		
lach fili	*Lachnagrostis filiformis*		Poaceae	0.1	1		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	2		Forb (FG)	No		
acac dean	*Acacia deanei*	Green Wattle	Fabaceae (Mi	0.1	1		Shrub (SG)	FALSE		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	3	*		No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No		
acac sten	*Acacia stenophylla*	River Cooba	Fabaceae (Mi	0.1	1		Tree (TG)	No		
sida	*Sida spp.*		Malvaceae	0.1	3	*		No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.1	10		Grass & grasslike (GG)	No		
myop mont	*Myoporum montanum*	Western Boobialla	Myoporaceae	0.1	1		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 6

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	4
	Shrub (SG)	2
	Forb (FG)	2
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	11

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	45
	Shrub (SG)	0.2
	Forb (FG)	0.2
	Grass & grasslike (GG)	0.6
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	46.1
	TOTAL 'HTE'	26.1

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	40%	46.00%	
	15m	30%		
	25m	70%		
	35m	50%		
	45m	40%		
Bare ground cover	5m	30%	23%	
	15m	15%		
	25m	0%		
	35m	30%		
	45m	40%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	2		2
50-79	1	2	
30-49		3	
20-29		5	
10-19		3	
5-9		2	
<5		1	N/A
Length of logs (m)		58	

COMPOSITION & STRUCTURE

Species recorded for	IR 6									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	25			Tree (TG)	No		

casu cunn cunn	*Casuarina cunninghamia*	River Oak	Casuarinacea	5			Tree (TG)	No		P
call vimi	*Callistemon viminalis*	Weeping Bottlebrush	Myrtaceae	5			Tree (TG)	No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	25		*		HTE		
meli azed	*Melia azedarach*	White Cedar	Meliaceae	10		*	Tree (TG)	No		
Sali	*Salix spp.*		Salicaceae	1		*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	1		Shrub (SG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	0.1	1		Shrub (SG)	HTE		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	0.1	1		Other (OG)	No		
elym scab	*Elymus scaber*	Common Wheatgrass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.5	20		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 7

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	6
	Forb (FG)	5
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	13

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	1.1
	Shrub (SG)	24.6
	Forb (FG)	2.2
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	27.9
	TOTAL 'HTE'	35

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79	1		1
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		9	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	15%	11.00%	
	15m	10%		
	25m	5%		
	35m	5%		
	45m	20%		
Bare ground cover	5m	70%	75%	
	15m	75%		
	25m	85%		
	35m	80%		
	45m	65%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	1%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for IR 7

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	1			Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	20			Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	15		*		HTE		

trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	1		*		No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	0.5	5		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	1			Shrub (SG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	1			Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.5	10		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	1			Shrub (SG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiace	0.5	5		Shrub (SG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	10		Forb (FG)	No		
sida	*Sida spp.*		Malvaceae	0.1	2	*		No		
scle diac	*Sclerolaena diacantha*	Grey Copperburr	Chenopodiace	0.1	5		Shrub (SG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	5		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	2			Shrub (SG)	No		
acac sali	*Acacia salicina*	Cooba	Fabaceae (Mi	0.1	1		Tree (TG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 8

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	4
	Shrub (SG)	7
	Forb (FG)	5
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	19

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	45
	Shrub (SG)	7.8
	Forb (FG)	6.3
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.5
	TOTAL Native	59.8
	TOTAL 'HTE'	16.2

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	57.00%	
	15m	50%		
	25m	80%		
	35m	75%		
	45m	50%		
Bare ground cover	5m	0%	4%	
	15m	0%		
	25m	0%		
	35m	15%		
	45m	5%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	5%	1%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79	1		1
30-49	3		2
20-29	3		
10-19			
5-9			
<5			N/A
Length of logs (m)		19	

COMPOSITION & STRUCTURE

Species recorded for	IR 8									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
Cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	15			Tree (TG)	No		
Euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	15			Tree (TG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	10			Tree (TG)	No		

alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	5			Tree (TG)	No		
geij parv	*Geijera parviflora*	Wilga	Rutaceae	1			Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	5			Shrub (SG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	1			Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	5			Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	15		*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	0.5	1		Other (OG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	0.5	10		Shrub (SG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiace	0.1	2		Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	10		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.2	3	*		HTE		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
oxal	*Oxalis spp.*		Oxalidaceae	0.1	1		Forb (FG)	No		
aris ramo	*Aristida ramosa*	Purple Wiregrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
peta pube	*Petalostigma pubescens*	Bitter Bark	Euphorbiacea	0.1	1		Shrub (SG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	2		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	4
	Forb (FG)	2
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	26
	Shrub (SG)	15.2
	Forb (FG)	5.1
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	46.3
	TOTAL 'HTE'	1.5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79	3		1
30-49	3		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		8	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	75%	69.00%	
	15m	75%		
	25m	65%		
	35m	70%		
	45m	60%		
Bare ground cover	5m	20%	13%	
	15m	10%		
	25m	15%		
	35m	15%		
	45m	5%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 9									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	25			Tree (TG)	No		
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	1			Tree (TG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	5			Forb (FG)	No		

rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	5			Shrub (SG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	10			Shrub (SG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiace	0.1	10		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.5	3	*		HTE		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiace	0.1	1		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 10

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	2
	Forb (FG)	4
	Grass & grasslike (GG)	2
	Fern (EG)	1
	Other (OG)	0
	TOTAL	11

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	15.1
	Shrub (SG)	20
	Forb (FG)	5.3
	Grass & grasslike (GG)	0.2
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	40.7
	TOTAL 'HTE'	1

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	15%	39.00%	
	15m	20%		
	25m	50%		
	35m	20%		
	45m	90%		
Bare ground cover	5m	50%	42%	
	15m	70%		
	25m	15%		
	35m	70%		
	45m	5%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79	1		
30-49			
20-29	2		
10-19	3		
5-9			
<5			N/A
Length of logs (m)		1	

COMPOSITION & STRUCTURE

Species recorded for	IR 10									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	15			Tree (TG)	No		

euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	0.1			Tree (TG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	5			Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	10			Shrub (SG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	10			Shrub (SG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	3		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	3		Forb (FG)	No		
care	*Carex spp.*		Cyperaceae	0.1	15		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	3		Fern (EG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	0.1	2		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 11

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	4
	Forb (FG)	4
	Grass & grasslike (GG)	3
	Fern (EG)	1
	Other (OG)	0
	TOTAL	14

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	20
	Shrub (SG)	16.1
	Forb (FG)	1.3
	Grass & grasslike (GG)	0.3
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	37.8
	TOTAL 'HTE'	2.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79	1		1
30-49			
20-29	3		2
10-19			
5-9			
<5			N/A
Length of logs (m)		12	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	45%	42.00%	
	15m	65%		
	25m	15%		
	35m	70%		
	45m	15%		
Bare ground cover	5m	45%	48%	
	15m	20%		
	25m	80%		
	35m	15%		
	45m	80%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 11									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	15			Tree (TG)	No		
acac sali	*Acacia salicina*	Cooba	Fabaceae (Mi	5			Tree (TG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	10			Shrub (SG)	No		

eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1			Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5			Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
aust scab	*Austrostipa scabra*	Speargrass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	2		Forb (FG)	No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiac	0.1	1		Shrub (SG)	No		
opun	*Opuntia spp.*		Cactaceae	0.2	1	*		HTE		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	2		Fern (EG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
care	*Carex spp.*		Cyperaceae	0.1	2		Grass & grasslike (GG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	0.1	1		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 12

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	2
	Forb (FG)	2
	Grass & grasslike (GG)	2
	Fern (EG)	1
	Other (OG)	0
	TOTAL	7

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	2
	Forb (FG)	1.1
	Grass & grasslike (GG)	1
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	4.2
	TOTAL 'HTE'	1.1

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%	23.00%	
	15m	15%		
	25m	30%		
	35m	25%		
	45m	35%		
Bare ground cover	5m	80%	68%	
	15m	75%		
	25m	60%		
	35m	65%		
	45m	60%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for	IR 12									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
care inve	*Carex inversa*	Knob Sedge	Cyperaceae	0.5	50		Grass & grasslike (GG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		

eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	1			Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	3	*		No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	10	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	3		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	1			Shrub (SG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	0.1	1	*		HTE		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 13

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	4
	Forb (FG)	1
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0.2
	Shrub (SG)	60.3
	Forb (FG)	0.1
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	60.8
	TOTAL 'HTE'	51

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	15%	26.00%	
	15m	15%		
	25m	25%		
	35m	30%		
	45m	45%		
Bare ground cover	5m	75%	63%	
	15m	75%		
	25m	65%		
	35m	55%		
	45m	45%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 13									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	50			Shrub (SG)	HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	10			Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	1		*		HTE		

mair deca	*Maireana decalvans*	Black Cotton Bush	Chenopodiac	0.1	1		Shrub (SG)	No		
pani	*Panicum spp.*	Panicum	Poaceae	0.1	3		Grass & grasslike (GG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	0.1	1		Tree (TG)	No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	0.1	1		Tree (TG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	3	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	2		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.2	4		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 14

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	5
	Forb (FG)	8
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	16

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	12.2
	Forb (FG)	1.2
	Grass & grasslike (GG)	0.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	13.7
	TOTAL 'HTE'	20

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	30.00%	
	15m	15%		
	25m	50%		
	35m	15%		
	45m	40%		
Bare ground cover	5m	40%	32%	
	15m	5%		
	25m	15%		
	35m	50%		
	45m	50%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	7%	
	15m	10%		
	25m	0%		
	35m	25%		
	45m	0%		

Species recorded for	IR 14									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10			Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	5		*		HTE		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	1			Shrub (SG)	No		

sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	5		*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	1			Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	3		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	10		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	5		Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	5		Forb (FG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	0.1	3		Other (OG)	No		
care inve	*Carex inversa*	Knob Sedge	Cyperaceae	0.1	7		Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	3		Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	0.5	5		Forb (FG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	10	*		No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiace	0.1	1		Shrub (SG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegras	Poaceae	0.1	1		Grass & grasslike (GG)	No		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	0.1	3		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	10	*		No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fal	0.1	1		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 15

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	5
	Forb (FG)	2
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	1
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	35
	Shrub (SG)	13.2
	Forb (FG)	1.1
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	1
	TOTAL Native	50.3
	TOTAL 'HTE'	6

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	28.00%	
	15m	60%		
	25m	5%		
	35m	10%		
	45m	35%		
Bare ground cover	5m	40%	45%	
	15m	20%		
	25m	80%		
	35m	80%		
	45m	5%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	2%	
	15m	5%		
	25m	0%		
	35m	3%		
	45m	2%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19	5		
5-9	16		
<5	5		N/A
Length of logs (m)		31	

COMPOSITION & STRUCTURE

Species recorded for	IR 15									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Weeping Myall, Boree	Fabaceae (Mi	35			Tree (TG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	1			Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	3			Shrub (SG)	No		

ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	5		Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	1	5	*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5	3		Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5	1		Shrub (SG)	HTE		
amye quan	*Amyema quandang*	Grey Mistletoe	Loranthaceae	1	10		Other (OG)	No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiac	0.1	5		Shrub (SG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 16

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	2
	Grass & grasslike (GG)	1
	Fern (EG)	1
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	55.1
	Forb (FG)	0.2
	Grass & grasslike (GG)	0.1
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	55.5
	TOTAL 'HTE'	45

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%	18.00%	
	15m	15%		
	25m	25%		
	35m	10%		
	45m	30%		
Bare ground cover	5m	80%	78%	
	15m	85%		
	25m	75%		
	35m	80%		
	45m	70%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	1%	
	15m	0%		
	25m	0%		
	35m	3%		
	45m	2%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for	IR 16									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	40			Shrub (SG)	HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5			Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	5		*		HTE		

rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	10			Shrub (SG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	5		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	3		Forb (FG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	10	*		No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiace	0.1	1		Shrub (SG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	3		Fern (EG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 17

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	3
	Shrub (SG)	4
	Forb (FG)	7
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	17

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	60.1
	Shrub (SG)	10.5
	Forb (FG)	2
	Grass & grasslike (GG)	0.6
	Fern (EG)	0
	Other (OG)	2
	TOTAL Native	75.2
	TOTAL 'HTE'	1.6

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	70%	51.00%	
	15m	50%		
	25m	50%		
	35m	60%		
	45m	25%		
Bare ground cover	5m	10%	31%	
	15m	25%		
	25m	30%		
	35m	20%		
	45m	70%		
Cryptogam cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			
Rock Cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	1		1
50-79	11		1
30-49	111		
20-29			
10-19	1		
5-9	111		
<5			N/A
Length of logs (m)		110	

COMPOSITION & STRUCTURE

Species recorded for	IR 17									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	30			Tree (TG)	No		
acac sali	*Acacia salicina*	Cooba	Fabaceae (Mi	30			Tree (TG)	No		
clem micr	*Clematis microphylla*	Small-leaved Clematis	Ranunculacea	2			Other (OG)	No		

rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.2	3		Shrub (SG)	No		
erag	*Eragrostis spp.*	A Lovegrass	Poaceae	0.1	1	*	Grass & grasslike (GG)	No		
aust vert	*Austrostipa verticillata*	Slender Bamboo Grass	Poaceae	0.5	5		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.5	10		Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1			Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	10			Shrub (SG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	2		Forb (FG)	No		
acac sten	*Acacia stenophylla*	River Cooba	Fabaceae (Mi	0.1			Tree (TG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1	20	*		HTE		
chlo gaya	*Chloris gayana*	Rhodes Grass	Poaceae	0.5	20	*		HTE		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.2	2		Shrub (SG)	No		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiac	0.1	5		Shrub (SG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	5	*		No		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	0.1	3		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	5		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	3	*		No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	5	*		HTE		
cham drum	*Chamaesyce drummond*	Caustic Weed	Euphorbiacea	0.1	3		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 17

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	5
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	8

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	3.2
	Forb (FG)	0.5
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	3.7
	TOTAL 'HTE'	1.2

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	70%	51.00%	
	15m	50%		
	25m	50%		
	35m	60%		
	45m	25%		
Bare ground cover	5m	10%	31%	
	15m	25%		
	25m	30%		
	35m	20%		
	45m	70%		
Cryptogam cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			
Rock Cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			

COMPOSITION & STRUCTURE

Species recorded for	IR 17									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	1		Forb (FG)	No		

scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	2			Shrub (SG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiace	0.1	1		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	10	*		No		
sida spin	*Sida spinosa*		Malvaceae	0.1	3	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	10		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	5		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	100		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		HTE		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	0.2	10		Shrub (SG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 19

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	3
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	10

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	6.2
	Forb (FG)	1.2
	Grass & grasslike (GG)	1.2
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	8.7
	TOTAL 'HTE'	1.1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	37.00%	
	15m	20%		
	25m	70%		
	35m	40%		
	45m	25%		
Bare ground cover	5m	60%	58%	
	15m	70%		
	25m	25%		
	35m	60%		
	45m	75%		
Cryptogam cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			
Rock Cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			

COMPOSITION & STRUCTURE

Species recorded for	IR 19									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5			Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1			Forb (FG)	No		

sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	10		Forb (FG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	5	*		No		
conv erub	*Convolvulus erubescens*	Pink Bindweed	Convolvulace	0.1	1		Other (OG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	10		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.2	2		Shrub (SG)	No		
care inve	*Carex inversa*	Knob Sedge	Cyperaceae	0.1	5		Grass & grasslike (GG)	No		
chlo gaya	*Chloris gayana*	Rhodes Grass	Poaceae	0.1	1	*		HTE		
pani deco	*Panicum decompositum*	Native Millet	Poaceae	1	50		Grass & grasslike (GG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegras	Poaceae	0.1	1		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 20

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	8
	Forb (FG)	4
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL	12

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0
	Forb (FG)	0
	Grass & grasslike (GG)	0
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	0
	TOTAL 'HTE'	0

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	60%	40.00%	
	15m	40%		
	25m	20%		
	35m	40%		
	45m	40%		
Bare ground cover	5m	40%	48%	
	15m	50%		
	25m	50%		
	35m	50%		
	45m	50%		
Cryptogam cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			
Rock Cover	5m		#DIV/0!	
	15m			
	25m			
	35m			
	45m			

COMPOSITION & STRUCTURE

Species recorded for	IR 20									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mimosoideae)				Shrub (SG)	HTE		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiaceae				Shrub (SG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiaceae				Forb (FG)	No		

port oler	*Portulaca oleracea*	Pigweed	Portulacaceae			Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae		*		HTE		
mair micr	*Maireana microphylla*	Small-leaf Bluebush	Chenopodiaceae			Shrub (SG)	No		
mair aphy	*Maireana aphylla*	Cotton Bush	Chenopodiaceae			Shrub (SG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiaceae			Shrub (SG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae			Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginaceae			Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiaceae			Shrub (SG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae			Shrub (SG)	No		
sals kali kali	*Salsola kali var. kali*	Buckbush	Chenopodiaceae			Shrub (SG)	No		
	#N/A	#N/A	#N/A		#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 21

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	3
	Grass & grasslike (GG)	1
	Fern (EG)	1
	Other (OG)	0
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	0.8
	Forb (FG)	5.6
	Grass & grasslike (GG)	0.5
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	7
	TOTAL 'HTE'	2.1

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	4.40%	
	15m	10%		
	25m	1%		
	35m	1%		
	45m	5%		
Bare ground cover	5m	50%	50%	
	15m	40%		
	25m	80%		
	35m	20%		
	45m	60%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)			

COMPOSITION & STRUCTURE

Species recorded for	IR 21									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.5	10		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	5		*		No		

scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	0.5	2		Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	5			Forb (FG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	1		*		HTE		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.1	2		Shrub (SG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	0.5	16		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	0.1	1		Shrub (SG)	HTE		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	3	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	5		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 22

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	5
	Forb (FG)	8
	Grass & grasslike (GG)	2
	Fern (EG)	1
	Other (OG)	1
	TOTAL	19

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	11
	Shrub (SG)	23.2
	Forb (FG)	6.6
	Grass & grasslike (GG)	0.2
	Fern (EG)	0.1
	Other (OG)	0.1
	TOTAL Native	41.2
	TOTAL 'HTE'	30.3

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49	1		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		2	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	1%	33.20%	
	15m	40%		
	25m	50%		
	35m	70%		
	45m	5%		
Bare ground cover	5m	70%	41%	
	15m	40%		
	25m	20%		
	35m	5%		
	45m	70%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 22									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	20			Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	10		*		HTE		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	2			Shrub (SG)	No		

cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	10			Tree (TG)	No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	1			Tree (TG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	5		*		No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	0.1	2	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	5			Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1			Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.2	2	*		HTE		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1			Forb (FG)	No		
ajug aust	*Ajuga australis*	Austral Bugle	Lamiaceae	0.1	1		Forb (FG)	No		
oxal	*Oxalis spp.*		Oxalidaceae	0.1	3		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	2		Shrub (SG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	5		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	5		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	3		Shrub (SG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	0.1	7	*		HTE		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	3		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	20		Grass & grasslike (GG)	No		
glyc taba	*Glycine tabacina*	Variable Glycine	Fabaceae (Fa	0.1	1		Other (OG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 23

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	6
	Grass & grasslike (GG)	5
	Fern (EG)	1
	Other (OG)	0
	TOTAL	15

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	42.1
	Forb (FG)	6.4
	Grass & grasslike (GG)	10.4
	Fern (EG)	0.1
	Other (OG)	0
	TOTAL Native	59
	TOTAL 'HTE'	40

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49	0		
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%	15.00%	
	15m	30%		
	25m	10%		
	35m	20%		
	45m	5%		
Bare ground cover	5m	85%	82%	
	15m	70%		
	25m	85%		
	35m	75%		
	45m	95%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 23									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	40			Shrub (SG)	HTE		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	1		*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	5			Forb (FG)	No		

rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.1	2		Shrub (SG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2			Shrub (SG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1			Forb (FG)	No		
lept digi	*Leptochloa digitata*	Umbrella Canegrass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	2		Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	10			Grass & grasslike (GG)	No		
cype bifa	*Cyperus bifax*	Downs Nutgrass	Cyperaceae	0.1	5		Grass & grasslike (GG)	No		
aris lept	*Aristida leptopoda*	White Speargrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	0.1	1		Forb (FG)	No		
pani deco	*Panicum decompositum*	Native Millet	Poaceae	0.1	1		Grass & grasslike (GG)	No		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	0.1	1		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	2		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	4		Fern (EG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 24

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	3
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	0
	TOTAL	9

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	12.2
	Forb (FG)	2.1
	Grass & grasslike (GG)	0.7
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	15
	TOTAL 'HTE'	17

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		15	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	32.00%	
	15m	40%		
	25m	15%		
	35m	40%		
	45m	60%		
Bare ground cover	5m	90%	62%	
	15m	45%		
	25m	80%		
	35m	50%		
	45m	45%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 24									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10			Shrub (SG)	HTE		
mega maxi	*Megathyrsus maximus*		Poaceae	0.5	5	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2			Shrub (SG)	No		

port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	1			Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.5	50		Grass & grasslike (GG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	3		Forb (FG)	No		
aris lept	*Aristida leptopoda*	White Speargrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1			Forb (FG)	No		
glyc lati lati	*Glycine latifolia subsp. la*		Fabaceae (Fal	0.1	5			No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	2		*		HTE		
cype bifa	*Cyperus bifax*	Downs Nutgrass	Cyperaceae	0.1	10		Grass & grasslike (GG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	3		Shrub (SG)	No		
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	5		*		HTE		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 25

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	4
	Forb (FG)	7
	Grass & grasslike (GG)	3
	Fern (EG)	0
	Other (OG)	1
	TOTAL	15

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	3.6
	Forb (FG)	1.1
	Grass & grasslike (GG)	0.3
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	5.1
	TOTAL 'HTE'	71.5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	35%	28.00%	
	15m	30%		
	25m	30%		
	35m	20%		
	45m	25%		
Bare ground cover	5m	20%	18%	
	15m	30%		
	25m	10%		
	35m	20%		
	45m	10%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	2%	3%	
	15m	5%		
	25m	5%		
	35m	0%		
	45m	3%		

COMPOSITION & STRUCTURE

Species recorded for IR 25

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	70		*		HTE		
mega maxi	*Megathyrsus maximus*		Poaceae	2		*		No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.5	2	*		HTE		

tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	5		Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	2		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	7		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2			Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.5	1		Shrub (SG)	No		
conv erub	*Convolvulus erubescens*	Pink Bindweed	Convolvulace	0.1	2		Other (OG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	10		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	20	*		No		
care	*Carex spp.*		Cyperaceae	0.1	5		Grass & grasslike (GG)	No		
aust vert	*Austrostipa verticillata*	Slender Bamboo Gras	Poaceae	0.1	2		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.5	20		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	2		Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
uroc mosa	*Urochloa mosambicensis*	Sabi Grass	Poaceae	0.1	2	*		No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	1		Shrub (SG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 26

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	1
	Forb (FG)	2
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	0
	TOTAL	5

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	1
	Forb (FG)	5.5
	Grass & grasslike (GG)	2.1
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	8.6
	TOTAL 'HTE'	1

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	5%	4.00%	
	15m	5%		
	25m	10%		
	35m	0%		
	45m	0%		
Bare ground cover	5m	95%	94%	
	15m	90%		
	25m	90%		
	35m	100%		
	45m	95%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 26									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	2			Grass & grasslike (GG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1			Shrub (SG)	HTE		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	1		*		No		

atri sube	*Atriplex suberecta*		Chenopodiac	5			Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.5	50		Forb (FG)	No		
sida	*Sida spp.*		Malvaceae	0.1	2	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 27

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	2
	Forb (FG)	5
	Grass & grasslike (GG)	4
	Fern (EG)	0
	Other (OG)	1
	TOTAL	12

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	1.5
	Forb (FG)	1.5
	Grass & grasslike (GG)	0.8
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	3.9
	TOTAL 'HTE'	5

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	6.00%	
	15m	0%		
	25m	0%		
	35m	15%		
	45m	15%		
Bare ground cover	5m	30%	72%	
	15m	95%		
	25m	85%		
	35m	80%		
	45m	70%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for	IR 27									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	5		*		HTE		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.5	10		Grass & grasslike (GG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	0.5	7		Shrub (SG)	No		

cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.1	5		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	3		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1			Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	1		*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.2	6		Forb (FG)	No		
atri sube	*Atriplex suberecta*		Chenopodiac	0.1	3		Forb (FG)	No		
conv erub	*Convolvulus erubescens*	Pink Bindweed	Convolvulace	0.1	4		Other (OG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	1			Shrub (SG)	No		
uroc mosa	*Urochloa mosambicensis*	Sabi Grass	Poaceae	2		*		No		
glyc lati lati	*Glycine latifolia subsp. la*		Fabaceae (Fa	0.1	5			No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.1	1	*		No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
care inve	*Carex inversa*	Knob Sedge	Cyperaceae	0.1	3		Grass & grasslike (GG)	No		
erag	*Eragrostis spp.*	Consol Lovegrass	Poaceae	0.1	5	*	Grass & grasslike (GG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	3		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 28

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	5
	Forb (FG)	7
	Grass & grasslike (GG)	1
	Fern (EG)	1
	Other (OG)	1
	TOTAL	15

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	45.4
	Forb (FG)	1.7
	Grass & grasslike (GG)	0.1
	Fern (EG)	0.1
	Other (OG)	0.1
	TOTAL Native	47.4
	TOTAL 'HTE'	41

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	30%	18.00%	
	15m	5%		
	25m	30%		
	35m	10%		
	45m	15%		
Bare ground cover	5m	60%	79%	
	15m	95%		
	25m	70%		
	35m	90%		
	45m	80%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 28									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	40			Shrub (SG)	HTE		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	20		Fern (EG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	50	*		No		

boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1			Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5			Shrub (SG)	No		
oxal	*Oxalis spp.*		Oxalidaceae	0.1	3		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.2	20		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	5		Shrub (SG)	No		
sola	*Solanum spp.*		Solanaceae	0.1	1	*	Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	1		*		HTE		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	2		Forb (FG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.1	3		Other (OG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	1		Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.2	10		Shrub (SG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	1		Forb (FG)	No		
abut oxyc	*Abutilon oxycarpum*	Consol Lovegrass	Malvaceae	0.1	1		Shrub (SG)	FALSE		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 29

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	0
	Shrub (SG)	3
	Forb (FG)	6
	Grass & grasslike (GG)	4
	Fern (EG)	0
	Other (OG)	0
	TOTAL	13

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	0
	Shrub (SG)	41.5
	Forb (FG)	3.9
	Grass & grasslike (GG)	0.4
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	45.8
	TOTAL 'HTE'	42

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19			
5-9			
<5			N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%	23.00%	
	15m	20%		
	25m	15%		
	35m	40%		
	45m	30%		
Bare ground cover	5m	85%	65%	
	15m	70%		
	25m	50%		
	35m	60%		
	45m	60%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 29									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	40			Shrub (SG)	HTE		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	3			Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.5			Forb (FG)	No		

chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1			Grass & grasslike (GG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.5		*		No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	2		*		HTE		
ente acic	*Enteropogon acicularis*	Curly Windmill Grass	Poaceae	0.1			Grass & grasslike (GG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1			Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.5			Shrub (SG)	No		
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgr	Poaceae	0.1			Grass & grasslike (GG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1			Forb (FG)	No		
cype bifa	*Cyperus bifax*	Downs Nutgrass	Cyperaceae	0.1			Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1			Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1			Forb (FG)	No		
sola	*Solanum spp.*		Solanaceae	0.1		*	Forb (FG)	No		
uroc mosa	*Urochloa mosambicensis*	Sabi Grass	Poaceae	0.1		*		No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 30

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	4
	Shrub (SG)	6
	Forb (FG)	6
	Grass & grasslike (GG)	4
	Fern (EG)	0
	Other (OG)	0
	TOTAL	20

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	26.5
	Shrub (SG)	32.4
	Forb (FG)	3
	Grass & grasslike (GG)	1.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	63.2
	TOTAL 'HTE'	45

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	15%	50.40%	
	15m	60%		
	25m	25%		
	35m	70%		
	45m	82%		
Bare ground cover	5m	15%	32%	
	15m	30%		
	25m	70%		
	35m	30%		
	45m	15%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79	2		2
30-49			
20-29			
10-19		1	
5-9		3	
<5	1	2	N/A
Length of logs (m)		2	

COMPOSITION & STRUCTURE

Species recorded for	IR 30									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cory trac amph	*Corymbia trachyphloia s*		Myrtaceae	20			Tree (TG)	No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	5			Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	30			Shrub (SG)	HTE		

rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	1			Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	2			Forb (FG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	0.5	1		Tree (TG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.2	10		Shrub (SG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.5	20		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	20	*		No		
acac Sali	*Acacia salicina*	Cooba	Fabaceae (Mi	1			Tree (TG)	No		
aris ramo	*Aristida ramosa*	Purple Wiregrass	Poaceae	1			Grass & grasslike (GG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
myop mont	*Myoporum montanum*	Western Boobialla	Myoporaceae	0.1	1		Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	5		*		HTE		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.1	7		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.2	40		Forb (FG)	No		
malv parv	*Malva parviflora*	Small-flowered Mallo	Malvaceae	0.1	1	*		No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	2		Shrub (SG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	10		*		HTE		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1			Shrub (SG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	0.1	6		Grass & grasslike (GG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	4		Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	10		Grass & grasslike (GG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 31

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	0
	Forb (FG)	8
	Grass & grasslike (GG)	4
	Fern (EG)	0
	Other (OG)	0
	TOTAL	14

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	45
	Shrub (SG)	0
	Forb (FG)	0.7
	Grass & grasslike (GG)	5.3
	Fern (EG)	0
	Other (OG)	0
	TOTAL Native	51
	TOTAL 'HTE'	61

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	60%	48.20%	
	15m	60%		
	25m	50%		
	35m	70%		
	45m	1%		
Bare ground cover	5m	0%	19%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	95%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80	4		4
50-79			
30-49	1	2	
20-29	1		
10-19		2	
5-9			
<5			N/A
Length of logs (m)		3	

COMPOSITION & STRUCTURE

Species recorded for IR 31

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama cama	*Eucalyptus camaldulensi*	River Red Gum	Myrtaceae	40			Tree (TG)	No		
meli azed	*Melia azedarach*	White Cedar	Meliaceae	5			Tree (TG)	No		
phra aust	*Phragmites australis*	Common Reed	Poaceae	5			Grass & grasslike (GG)	No		

lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1		*		HTE		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	0.1	20		Grass & grasslike (GG)	No		
aust vert	*Austrostipa verticillata*	Slender Bamboo Gras	Poaceae	0.1	3		Grass & grasslike (GG)	No		
ajug aust	*Ajuga australis*	Austral Bugle	Lamiaceae	0.1	1		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0	1		Forb (FG)	No		
eina trig	*Einadia trigonos*	Fishweed	Chenopodiac	0.1	2		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	3		Forb (FG)	No		
elym scab	*Elymus scaber*	Common Wheatgrass	Poaceae	0.1	4		Grass & grasslike (GG)	No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	60		*		HTE		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	2		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	10		Forb (FG)	No		
plan debi	*Plantago debilis*	Shade Plantain	Plantaginacea	0.1	1		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

FUNCTION

Function attributes for	IR 32

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	4
	Forb (FG)	5
	Grass & grasslike (GG)	2
	Fern (EG)	0
	Other (OG)	1
	TOTAL	13

BAM Attribute (20x20m plot)		
	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	5
	Shrub (SG)	40.3
	Forb (FG)	1.9
	Grass & grasslike (GG)	0.6
	Fern (EG)	0
	Other (OG)	0.1
	TOTAL Native	47.9
	TOTAL 'HTE'	35

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	Euc	Non Euc	Hollows
>80			
50-79			
30-49			
20-29			
10-19		1	
5-9			
<5			N/A
Length of logs (m)		3	

BAM Attributes (1 x 1m Plots)				
	Tape length	% cover	Average %	Photos
Litter Cover	5m	1%	6.60%	
	15m	0%		
	25m	2%		
	35m	5%		
	45m	25%		
Bare ground cover	5m	96%	80%	
	15m	80%		
	25m	80%		
	35m	80%		
	45m	65%		
Cryptogam cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		
Rock Cover	5m	0%	0%	
	15m	0%		
	25m	0%		
	35m	0%		
	45m	0%		

COMPOSITION & STRUCTURE

Species recorded for	IR 32									
Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Weeping Myall, Bore	Fabaceae (Mi	5			Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	30			Shrub (SG)	HTE		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	5		*		HTE		

opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	1		*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiace	10			Shrub (SG)	No		
nept grac	*Neptunia gracilis f. graci*	Sensitive Plant	Fabaceae (Mi	0.5	10		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1			Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.5	20	*		No		
pasp glob	*Paspalidium globoideum*	Shotgrass	Poaceae	0.1	2		Grass & grasslike (GG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	0.1	8		Other (OG)	No		
sola	*Solanum spp.*		Solanaceae	0.1	7	*	Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.5	15		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.2	7		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiace	0.2	10		Shrub (SG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiace	0.1	1		Shrub (SG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fal	0.1	1		Forb (FG)	No		
	#N/A	#N/A	#N/A			#N/A		FALSE	#N/A	#N/A

B.2 Plot Data February 2022

Plot IR 1

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR1	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				45	
Recorders	John Hunter, Rachael Buzio		**PCT:**	27				
GPS Easting	778626.644	**GPS Northing**	6739863.16		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N1							
Area of Zone (Ha)	8.539							
Mitchell Landscapes	Gwydir Channels and Floodplains							

FUNCTION

Function attributes for **IR1**

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	1
	Shrub (SG)	4
	Forb (FG)	9
	Grass & grasslike (GG)	4
	Fern (EG)	0
	Other (OG)	1
	TOTAL	19

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	30
	Shrub (SG)	81
	Forb (FG)	2.7
	Grass & grasslike (GG)	71
	Fern (EG)	0
	Other (OG)	1
	TOTAL Native	185.7
	TOTAL 'HTE'	2.1

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	6	0
5-9	0	16	0
<5	0	5	N/A
Length of logs (m)		2	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%	4.8%	Q1
	15m	10%		Q2
	25m	2%		Q3
	35m	4%		Q4
	45m	6%		Q5
Bare ground cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR1

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Acacia pendula population in the Hur	Fabaceae (Mi	30	32		Tree (TG)	No		E2
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	65	200		Shrub (SG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	60	500		Grass & grasslike (GG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	12	80		Shrub (SG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	1	20	*		No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	2	10		Shrub (SG)	No		
brac dent	*Brachyscome dentata*		Asteraceae	0.1	10		Forb (FG)	No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	10		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	10		Shrub (SG)	HTE		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	0.1	1		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	2	*		HTE		
malv amer	*Malvastrum americanur*	Spiked Malvastrum	Malvaceae	0.1	1	*		No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	1	20		Grass & grasslike (GG)	No		
pani quee	*Panicum queenslandicur*	Yadbila Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	1	20		Forb (FG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	1	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	1	20		Forb (FG)	No		
amye quan	*Amyema quandang*	Grey Mistletoe	Loranthaceae	1	3		Other (OG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	0.1	1		Forb (FG)	No		
cent meli	*Centaurea melitensis*	Maltese Cockspur	Asteraceae	0.1	1	*		No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		

Plot IR 2

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Updates	**Plot Identifier**	IR2	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	24/02/2022		**Compass Orientation (head of 20x20 plot)**				315	
Recorders	John Hunter, Rachael Buzio		**PCT:**	36				
GPS Easting	777055.455	**GPS Northing**	6737374.08		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N4							
Area of Zone (Ha)	8.831							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR2**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**1**
Forb (FG)	**6**
Grass & grasslike (GG)	**0**
Fern (EG)	**1**
Other (OG)	**2**
TOTAL	**13**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**66**
Shrub (SG)	**1**
Forb (FG)	**2.4**
Grass & grasslike (GG)	**0**
Fern (EG)	**0.1**
Other (OG)	**2**
TOTAL Native	**71.5**
TOTAL 'HTE'	**26.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	40%		Yes
	15m	36%		Yes
	25m	0%	**26.8%**	Yes
	35m	50%		Yes
	45m	8%		Yes
Bare ground cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes
Cryptogam cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes
Rock Cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	1	0	1
50-79	0	0	0
30-49	0	2	0
20-29	0	4	0
10-19	0	7	0
5-9	0	3	0
<5	0	1	N/A
Length of logs (m)		5	

COMPOSITION & STRUCTURE

Species recorded for IR2

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Sta
euca cama	*Eucalyptus camaldulensis*	Eucalyptus camaldulensis popul	Myrtaceae	25	3		Tree (TG)	No		E2
acac sali	*Acacia salicina*		Fabaceae (Mi	35	40		Tree (TG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	7	100	*		No		
cent mini mini	*Centipeda minima subsp. minin*	spreading sneezeweed	Asteraceae	30	500			No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	5	*		No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	6	8		Tree (TG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	25	15	*		HTE		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	1	20		Forb (FG)	No		
glin loto	*Glinus lotoides*	Hairy Carpet-weed	Aizoaceae	0.1	5		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	1	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	5		Fern (EG)	No		
desm vari	*Desmodium varians*	Slender Tick-trefoil	Fabaceae (Fal	1	20		Other (OG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	2		Forb (FG)	No		
gomp celo	*Gomphrena celosioides*	Gomphrena Weed	Amaranthace	0.1	1	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1	3		Shrub (SG)	HTE		
alte dent	*Alternanthera denticulata*	Lesser Joyweed	Amaranthace	1	20		Forb (FG)	No		
xant spin	*Xanthium spinosum*	Bathurst Burr	Asteraceae	0.1	1	*		HTE		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	5		Forb (FG)	No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	1	5		Other (OG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	5	*		No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	1	*		No		

Plot IR 3

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR3	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	24/02/2022		**Compass Orientation (head of 20x20 plot)**				270	
Recorders	John Hunter, Rachael Buzio		**PCT:**	36				
GPS Easting	776839.088	**GPS Northing**	6737155.1		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	low							
Zone ID	N5							
Area of Zone (Ha)	20.085							
Mitchell Landscapes	Gwydir Alluvial Plains							

FUNCTION

Function attributes for	**IR3**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**6**
Forb (FG)	**7**
Grass & grasslike (GG)	**7**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**23**

Count of Native Richness

BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**4**
Shrub (SG)	**8.4**
Forb (FG)	**6.8**
Grass & grasslike (GG)	**64**
Fern (EG)	**0**
Other (OG)	**0.1**
TOTAL Native	**83.3**
TOTAL 'HTE'	**0.3**

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	8%	**28.8%**	Q1
	15m	20%		Q2
	25m	80%		Q3
	35m	30%		Q4
	45m	6%		Q5
Bare ground cover	5m	0%	**3.2%**	Q1
	15m	2%		Q2
	25m	10%		Q3
	35m	2%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	1	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR3

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
pasp glob	*Paspalidium globoideum*	Shotgrass	Poaceae	30	500		Grass & grasslike (GG)	No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	1	*		HTE		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
cham dall	*Chamaesyce dallachyana*		Euphorbiacea	1	20		Forb (FG)	No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	5		Forb (FG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	8	80	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.5	10		Forb (FG)	No		
mair micr	*Maireana microphylla*		Chenopodiac	5	50		Shrub (SG)	No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	0.1	3		Shrub (SG)	No		
SOLA ESUR	*Solanum esuriale*	Quena	Solanaceae	4	80		Forb (FG)	No		
vitt cune cune	*Vittadinia cuneata var. c*	A Fuzzweed	Asteraceae	1	100		Forb (FG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	0.1	1		Forb (FG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	2	50		Grass & grasslike (GG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	1	5		Tree (TG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	0.1	1		Other (OG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	3	1		Tree (TG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	2	20	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	3		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	3	30		Shrub (SG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	2	*		HTE		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	3	*		No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	0.1	5	*		No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	2	20		Grass & grasslike (GG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	1	100	*		No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	5	100		Grass & grasslike (GG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	2	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	0.1	1		Shrub (SG)	HTE		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	4	50		Grass & grasslike (GG)	No		
chen dese	*Chenopodium desertoru*	Desert Goosefoot	Chenopodiac	0.1	1		Shrub (SG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
Pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	20	200		Grass & grasslike (GG)	No		

Plot IR 4

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR4	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				180	
Recorders	John Hunter, Rachael Buzio		**PCT:**	36				
GPS Easting	776513.184	**GPS Northing**	6736854.73		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	low							
Area of Zone (Ha)	20.085							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR4**
BAM Attribute (20x20m plot)	
Count of Native Richness	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**2**
Forb (FG)	**1**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**8**
BAM Attribute (20x20m plot)	
Count of cover abundance (native vascular plants)	
Stratum	**Sum**
Tree (TG)	**73**
Shrub (SG)	**5**
Forb (FG)	**1**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**0.2**
TOTAL Native	**79.2**
TOTAL 'HTE'	**7.2**

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2	0	2
50-79	3	0	0
30-49	0	2	0
20-29	0	2	0
10-19	0	2	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		26	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	4%		Q1
	15m	4%		Q2
	25m	2%	**18.4%**	Q3
	35m	80%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR4

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac sali	*Acacia salicina*		Fabaceae (Mi	25	40		Tree (TG)	No		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	18	1		Tree (TG)	No		E2
myop mont	*Myoporum montanum*	Western Boobialla	Myoporaceae	3	1		Shrub (SG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	30	30		Tree (TG)	No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	0.1	1		Other (OG)	No		
mega maxi	*Megathyrsus maximus*		Poaceae	90	1000	*		No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	0.1	1	*		No		
desm camp	*Desmodium campylocau*	Creeping Tick-trefoil	Fabaceae (Fal	1	10		Forb (FG)	No		E1,P
rici comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	0.1	2	*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	5		Shrub (SG)	HTE		
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	5	50	*		HTE		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	1	*		HTE		
clem micr	*Clematis microphylla*	Small-leaved Clematis	Ranunculacea	0.1	2		Other (OG)	No		

Plot IR 5

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR5	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				135		
Recorders	John Hunter, Rachael Buzio		**PCT:**	36					
GPS Easting	776579.656	**GPS Northing**	6736741.29		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N4								
Area of Zone (Ha)	8.831								
Mitchell Landscapes	Gwydir Alluvial Plains								

Function attributes for	**IR5**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**4**
Shrub (SG)	**1**
Forb (FG)	**4**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**10**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**105**
Shrub (SG)	**1**
Forb (FG)	**7.5**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL Native	**115.5**
TOTAL 'HTE'	**42**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	50%		Q1
	15m	10%		Q2
	25m	20%	**24.0%**	Q3
	35m	10%		Q4
	45m	30%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2	0	1
50-79	3	0	0
30-49	0	5	0
20-29	0	5	0
10-19	0	2	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		34	

COMPOSITION & STRUCTURE

Species recorded for IR5

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	15	500	*		No		
card gran	*Cardiospermum grandifl*	Balloon Vine	Sapindaceae	20	20	*		HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	5	10	*		HTE		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	15	50	*		HTE		
acac sali	*Acacia salicina*		Fabaceae (Mi	15	50		Tree (TG)	No		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	65	40		Tree (TG)	No		E2
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	5	50		Forb (FG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	2	20	*		No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	2	10		Other (OG)	No		
grev robu	*Grevillea robusta*	Silky Oak	Proteaceae	10	1		Tree (TG)	No		
mega maxi	*Megathyrsus maximus*		Poaceae	35	200	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	2	30	*		No		
desm camp	*Desmodium campylocau*	Creeping Tick-trefoil	Fabaceae (Fal	0.5	15		Forb (FG)	No		E1,P
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	1	20	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.2	10	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1	3		Shrub (SG)	HTE		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.15		*		No		
RICI comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	1	10	*		HTE		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	2	6	*		No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	1	50		Forb (FG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	15	15		Tree (TG)	No		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	1	10		Forb (FG)	No		
lact serr	*Lactuca serriola*	Prickly Lettuce	Asteraceae	0.1	2	*		No		
heli annu	*Helianthus annuus*	Common Sunflower	Asteraceae	0.1	1	*		No		

Plot IR 6

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR6	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				90	
Recorders	John Hunter, Rachael Buzio		**PCT:**	78				
GPS Easting	783454.235	**GPS Northing**	6743124.32		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	Moderate							
Zone ID	C6							
Area of Zone (Ha)	2.186							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR6**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**1**
Forb (FG)	**1**
Grass & grasslike (GG)	**3**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**9**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**81**
Shrub (SG)	**0.1**
Forb (FG)	**0.1**
Grass & grasslike (GG)	**1.2**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL Native	**83.4**
TOTAL 'HTE'	**30**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	2	0	2
50-79	1	2	0
30-49	0	3	0
20-29	0	5	0
10-19	0	3	0
5-9	0	2	0
<5	0	1	N/A
Length of logs (m)		58	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%		Q1
	15m	50%		Q2
	25m	100%	**64.0%**	Q3
	35m	80%		Q4
	45m	90%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR6

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
meli azed	*Melia azedarach*	White Cedar	Meliaceae	20	30		Tree (TG)	No		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	60	2		Tree (TG)	No		E2
mega maxi	*Megathyrsus maximus*		Poaceae	75	500	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	6	50	*		No		
rici comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	15	50	*		HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	15	20	*		HTE		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	1	10	*		No		
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae	0.1	1		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.1	5	*		No		
chen dese	*Chenopodium desertoru*	Desert Goosefoot	Chenopodiac	0.1	1		Shrub (SG)	No		
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	0.1	3		Grass & grasslike (GG)	No		
junc aust	*Juncus australis*	Rush	Juncaceae	1	10		Grass & grasslike (GG)	No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	0.1	1	*		No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	1	5		Other (OG)	No		
call vimi	*Callistemon viminalis*	Weeping Bottlebrush	Myrtaceae	1	1		Tree (TG)	No		
sali	*Salix spp.*		Salicaceae	1	1	*		No		
elym scab	*Elymus scaber*	Common Wheatgrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		

Plot IR 7

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR7	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				0		
Recorders	John Hunter, Rachael Buzio		**PCT:**	36					
GPS Easting	780516.717	**GPS Northing**	6741244.52		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Low								
Zone ID	N7								
Area of Zone (Ha)	2.355								
Mitchell Landscapes	Gwydir Alluvial Plains								

Function attributes for	**IR7**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**6**
Forb (FG)	**7**
Grass & grasslike (GG)	**5**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**22**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**18**
Shrub (SG)	**42.1**
Forb (FG)	**29.2**
Grass & grasslike (GG)	**31**
Fern (EG)	**0**
Other (OG)	**1.1**
TOTAL Native	**121.4**
TOTAL 'HTE'	**20.7**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1	0	1
50-79	1	0	1
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		9	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	0%	**1.2%**	Q1
	15m	2%		Q2
	25m	2%		Q3
	35m	2%		Q4
	45m	0%		Q5
Bare ground cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR7

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac sali	*Acacia salicina*		Fabaceae (Mi	3	1		Tree (TG)	No		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	15	2		Tree (TG)	No		E2
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	10	200		Grass & grasslike (GG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	1	10	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	15	20	*		HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	18	200		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	8	15		Shrub (SG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	5	100		Forb (FG)	No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	1	10	*		No		
xant spin	*Xanthium spinosum*	Bathurst Burr	Asteraceae	0.5	8	*		HTE		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	2	10	*		No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	8	20		Shrub (SG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	1	10	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	20	80		Shrub (SG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	1	50		Other (OG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	6	100		Grass & grasslike (GG)	No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	0.1	5		Forb (FG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.2	3	*		HTE		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	0.1	10	*		No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	2	50		Grass & grasslike (GG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	12	100		Grass & grasslike (GG)	No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	3	50		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5	10		Shrub (SG)	HTE		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	0.1	3		Forb (FG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	1		Shrub (SG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	1	20	*		No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	1	10		Shrub (SG)	No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	2	30		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	1	20		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.1	1		Other (OG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	2	*		No		

Plot IR 8

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR8	**Pic 20x20**	Yes	**Pic 20x50**		
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				270	
Recorders	John Hunter, Rachael Buzio		**PCT:**	71				
GPS Easting	785156.47	**GPS Northing**	6744235.82		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N12							
Area of Zone (Ha)	8.196							
Mitchell Landscapes	Gwydir Channels and Floodplains							

Function attributes for	**IR8**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**5**
Shrub (SG)	**6**
Forb (FG)	**8**
Grass & grasslike (GG)	**7**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**28**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**49**
Shrub (SG)	**30.1**
Forb (FG)	**34.3**
Grass & grasslike (GG)	**31.2**
Fern (EG)	**0**
Other (OG)	**6**
TOTAL Native	**150.6**
TOTAL 'HTE'	**24**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1	0	1
50-79	3	0	1
30-49	3	0	2
20-29	3	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		19	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	8%		Q1
	15m	2%		Q2
	25m	4%	**3.6%**	Q3
	35m	2%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**2.0%**	Q3
	35m	0%		Q4
	45m	10%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR8

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	15	1		Tree (TG)	No		
geij parv	*Geijera parviflora*	Wilga	Rutaceae	4	1		Shrub (SG)	No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	10	5		Tree (TG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	3	30	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	6	100	*		No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	25	200		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2	5		Shrub (SG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	12	200		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	5	15		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	16	20		Shrub (SG)	HTE		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	8	10	*		HTE		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	3	40	*		No		
care brev	*Carex breviculmis*		Cyperaceae	4	50		Grass & grasslike (GG)	No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	4	20	*		No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	10	100		Grass & grasslike (GG)	No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	3	40	*		No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	4	20		Other (OG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	2	30		Forb (FG)	No		
rume brow	*Rumex brownii*	Swamp Dock	Polygonaceae	0.1	1		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
rhag spin	*Rhagodia spinescens*		Chenopodiac	6	10		Shrub (SG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	3	30		Grass & grasslike (GG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	1	1		Tree (TG)	No		
desm vari	*Desmodium varians*	Slender Tick-trefoil	Fabaceae (Fal	2	20		Other (OG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	2	20		Shrub (SG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	1	*		No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	0.1	1		Forb (FG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1	10		Forb (FG)	No		
cype grac	*Cyperus gracilis*	Slender Flat-sedge	Cyperaceae	2	50		Grass & grasslike (GG)	No		
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	20	2		Tree (TG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1	20		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
brom cath	*Bromus catharticus*	Praire Grass	Poaceae	0.1	1	*		No		
both deci deci	*Bothriochloa decipiens*	Pitted Bluegrass	Poaceae	0.1	5			No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	0.1	1	*		No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	3	1		Tree (TG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
aris pers	*Aristida personata*		Poaceae	0.1	5		Grass & grasslike (GG)	No		

Plot IR 9

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Update	**Plot Identifier**	IR9	**Pic 20x20**		**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				0		
Recorders	John Hunter, Rachael Buzio		**PCT:**	71					
GPS Easting	785068.852	**GPS Northing**	6744314		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N12								
Area of Zone (Ha)	8.196								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR9**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**4**
Shrub (SG)	**7**
Forb (FG)	**5**
Grass & grasslike (GG)	**10**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**27**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**42**
Shrub (SG)	**11.4**
Forb (FG)	**13.2**
Grass & grasslike (GG)	**50**
Fern (EG)	**65**
Other (OG)	**0**
TOTAL Native	**181.6**
TOTAL 'HTE'	**22**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		No
	15m	2%		No
	25m	4%	**2.4%**	No
	35m	2%		No
	45m	2%		No
Bare ground cover	5m	0%		No
	15m	0%		No
	25m	0%	**0.0%**	No
	35m	0%		No
	45m	0%		No
Cryptogam cover	5m	0%		No
	15m	0%		No
	25m	0%	**0.0%**	No
	35m	0%		No
	45m	0%		No
Rock Cover	5m	0%		No
	15m	0%		No
	25m	0%	**0.0%**	No
	35m	0%		No
	45m	0%		No

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1	0	1
50-79	3	0	1
30-49	3	0	0
20-29	0	0	2
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		8	

COMPOSITION & STRUCTURE

Species recorded for IR9

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Sta
euca popu bimb	*Eucalyptus populnea subsp.*	Bimble Box	Myrtaceae	8	1		Tree (TG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	15	5		Tree (TG)	No		
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	15	1		Tree (TG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	20	400		Grass & grasslike (GG)	No		
alte dent	*Alternanthera denticulata*	Lesser Joyweed	Amaranthace	2	100		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	4	15		Shrub (SG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	65	500		Fern (EG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	3	50		Grass & grasslike (GG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	4	40	*		HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	5	20		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	5	100	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	6	8		Shrub (SG)	HTE		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	5	*		No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	18	200	*		No		
pani deco	*Panicum decompositum*	Native Millet	Poaceae	3	40		Grass & grasslike (GG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	10	*		No		
cype gunn gunn	*Cyperus gunnii subsp. gunni*		Cyperaceae	3	50		Grass & grasslike (GG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	8	50	*		HTE		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	6	100		Grass & grasslike (GG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	4	5	*		HTE		
erio proc	*Eriochloa procera*	Spring Grass	Poaceae	4	100		Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioides*	New Zealand Spinach	Aizoaceae	6	100		Forb (FG)	No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	4	2		Tree (TG)	No		
pani quee	*Panicum queenslandicum*	Yadbila Grass	Poaceae	2	20		Grass & grasslike (GG)	No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	0.1	1	*		No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	0.1	1	*		No		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	1	10	*		No		
chlo diva diva	*Chloris divaricata var. divari*	Slender Chloris	Poaceae	1	20		Grass & grasslike (GG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	6	100		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	0.1	1		Forb (FG)	No		
care brev	*Carex breviculmis*		Cyperaceae	2	50		Grass & grasslike (GG)	No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	0.1	1	*		No		
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	0.1	1	*		No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	1	2		Shrub (SG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
mair micr	*Maireana microcarpa*		Chenopodiac	0.1	1		Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		

Plot IR 10

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR10	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				180		
Recorders	John Hunter, Rachael Buzio		**PCT:**	71					
GPS Easting	785496.78	**GPS Northing**	6744177.43		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N12								
Area of Zone (Ha)	8.196								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR10**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**2**
Forb (FG)	**7**
Grass & grasslike (GG)	**11**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**23**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**10.1**
Shrub (SG)	**3**
Forb (FG)	**9.4**
Grass & grasslike (GG)	**28**
Fern (EG)	**65**
Other (OG)	**0**
TOTAL Native	**115.5**
TOTAL 'HTE'	**7.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	1	0	0
30-49	0	0	0
20-29	2	0	0
10-19	3	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		1	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	6%	**3.2%**	Q3
	35m	4%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR10

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	5	20		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	4	50		Forb (FG)	No		
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	10	2		Tree (TG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	3	10	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	65	500		Fern (EG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	5	*		No		
chlo virg	*Chloris virgata*	Feathertop Rhodes Grass	Poaceae	3	40	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	1	*		HTE		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	4	50		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	4	30	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	5	*		No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	4	100		Grass & grasslike (GG)	No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	1	5		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	10	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	1	10	*		No		
junc arid	*Juncus aridicola*	Tussock Rush	Juncaceae	3	10		Grass & grasslike (GG)	No		
care brev	*Carex breviculmis*		Cyperaceae	2	50		Grass & grasslike (GG)	No		
lach fili	*Lachnagrostis filiformis*		Poaceae	2	30		Grass & grasslike (GG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1	1		Shrub (SG)	HTE		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	6	100	*		HTE		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	1	10		Grass & grasslike (GG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	0.1	1		Tree (TG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	2	20		Grass & grasslike (GG)	No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
eleo pall	*Eleocharis pallens*	Pale Spike Sedge	Cyperaceae	1	10		Grass & grasslike (GG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2	20		Shrub (SG)	No		
sene glos	*Senecio glossanthus*	Streaked Poverty Bush	Asteraceae	0.1	1		Forb (FG)	No		
eleo plan	*Eleocharis plana*	Flat Spike-sedge	Cyperaceae	2	20		Grass & grasslike (GG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	5	30		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No		

Plot IR 11

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Updates	**Plot Identifier**	IR11	**Pic 20x20**	Yes	**Pic 20x50**		
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				270	
Recorders	John Hunter, Rachael Buzio		**PCT:**	71				
GPS Easting	785218.882	**GPS Northing**	6744209.72		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	**Northern Outwash**							
Condition	Moderate							
Zone ID	N12							
Area of Zone (Ha)	8.196							
Mitchell Landscapes	Gwydir Channels and Floodplains							

Function attributes for	**IR11**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**3**
Forb (FG)	**10**
Grass & grasslike (GG)	**6**
Fern (EG)	**1**
Other (OG)	**1**
TOTAL	**24**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**8**
Shrub (SG)	**18.1**
Forb (FG)	**12**
Grass & grasslike (GG)	**52.2**
Fern (EG)	**60**
Other (OG)	**1**
TOTAL Native	**151.3**
TOTAL 'HTE'	**19.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	1	0	1
30-49	0	0	0
20-29	3	0	2
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		12	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	4%	6.0%	Q1
	15m	2%		Q2
	25m	8%		Q3
	35m	6%		Q4
	45m	10%		Q5
Bare ground cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR11

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Stat
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	25	200		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	60	500		Fern (EG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	3	20	*		No		
care brev	*Carex breviculmis*		Cyperaceae	18	300		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	6	100	*		No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	2	10		Forb (FG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	2	1		Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	16	20		Shrub (SG)	HTE		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	3	20	*		No		
alte dent	*Alternanthera denticalata*	Lesser Joyweed	Amaranthace	1	20			No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.5	20		Forb (FG)	No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	1	10	*		No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	1	20		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioides*	New Zealand Spinach	Aizoaceae	5	40		Forb (FG)	No		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	1	10	*		No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	4	100		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	3	20		Forb (FG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	1	*		No		
cype gunn gunn	*Cyperus gunnii subsp. gunnii*		Cyperaceae	5	20		Grass & grasslike (GG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	1	*		HTE		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	1		Shrub (SG)	No		
crin flac	*Crinum flaccidum*	Darling Lily	Amaryllidacea	0.1	1		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	3	5	*		HTE		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	2	30	*		No		
digi brow	*Digitaria brownii*	Cotton Panic Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
euca popu bimb	*Eucalyptus populnea subsp. bimbil*	Bimble Box	Myrtaceae	5	1		Tree (TG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	2	5		Shrub (SG)	No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	1	20	*		No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	1	1		Tree (TG)	No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	1	5		Other (OG)	No		
sene glos	*Senecio glossanthus*	Streaked Poverty Bush	Asteraceae	0.1	1		Forb (FG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
erio pseu	*Eriochloa pseudoacrotricha*	Early Spring Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	0.1	1		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		

Plot IR 12

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR12	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				225		
Recorders	John Hunter, Rachael Buzio		**PCT:**	56					
GPS Easting	785306.797	**GPS Northing**	6744205.49		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	**Northern Outwash**								
Condition	Moderate								
Zone ID	N11								
Area of Zone (Ha)	6.944								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR12**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**2**
Forb (FG)	**8**
Grass & grasslike (GG)	**5**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**18**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**10.5**
Shrub (SG)	**5**
Forb (FG)	**14.3**
Grass & grasslike (GG)	**62**
Fern (EG)	**50**
Other (OG)	**0**
TOTAL Native	**141.8**
TOTAL 'HTE'	**9.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		3	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%	**2.0%**	Q1
	15m	2%		Q2
	25m	2%		Q3
	35m	4%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR12

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	35	100		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	2	20	*		No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	3	15		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	6	100	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	50	500		Fern (EG)	No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	6	50		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	15	300		Grass & grasslike (GG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	3	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	4		Shrub (SG)	HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	3	10		Shrub (SG)	No		
care brev	*Carex breviculmis*		Cyperaceae	7	200		Grass & grasslike (GG)	No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	1	20		Forb (FG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	3	50		Grass & grasslike (GG)	No		
pani anti	*Panicum antidotale*	Giant Panic Grass	Poaceae	2	5	*		No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	3	20		Forb (FG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	6	100	*		HTE		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	0.1	1	*		No		
sonc aspe	*Sonchus asper*	Prickly Sowthistle	Asteraceae	2	30	*		No		
crin flac	*Crinum flaccidum*	Darling Lily	Amaryllidace	0.1	1		Forb (FG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	0.5	1		Tree (TG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1	2	*		HTE		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	2	20		Grass & grasslike (GG)	No		
phys ixoc	*Physalis ixocarpa*	Ground Cherry	Solanaceae	2	20	*		No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	2	30	*		No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	1	10		Forb (FG)	No		
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	10	1		Tree (TG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	1	*		HTE		
malv amer	*Malvastrum americanun*	Spiked Malvastrum	Malvaceae	1	10	*		No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
boer domi	*Boerhavia dominii*	Tarvine		0.1	1		Forb (FG)	No		

Plot IR 13

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR13	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				0		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	784846.984	**GPS Northing**	6744195.06		**Datum**	GDA2020	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N9								
Area of zone (Ha)	0.297								
Mitchell Landscape	Gwydir channels and Floodplains								

Function attributes for	**IR13**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**2**
Forb (FG)	**6**
Grass & grasslike (GG)	**6**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**16**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**46**
Forb (FG)	**12.3**
Grass & grasslike (GG)	**57.2**
Fern (EG)	**2**
Other (OG)	**0**
TOTAL Native	**118.5**
TOTAL 'HTE'	**41**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	1	0	4
30-49	6	0	1
20-29	2	0	0
10-19	0	4	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		4	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%	**4.0%**	Q1
	15m	2%		Q2
	25m	4%		Q3
	35m	6%		Q4
	45m	6%		Q5
Bare ground cover	5m	2%	**2.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	6%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for	IR13									
Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	40	50		Shrub (SG)	HTE		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	15	200	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	20	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacaceae	3	30		Forb (FG)	No		
cype	*Cyperus spp.*		Cyperaceae	1	10		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	40	500		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	2	50		Fern (EG)	No		
care brev	*Carex breviculmis*		Cyperaceae	1	30		Grass & grasslike (GG)	No		
erio proc	*Eriochloa procera*	Spring Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
Scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	6	10		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	20	30	*		No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	1	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	1	10	*		HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	5	50		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	10	100		Grass & grasslike (GG)	No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	0.2	5		Forb (FG)	No		
sene glos	*Senecio glossanthus*	Streaked Poverty Bush	Asteraceae	0.1	1		Forb (FG)	No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	3	40		Forb (FG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	1	1		Tree (TG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	0.2	5		Grass & grasslike (GG)	No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fa	0.1	10	*		No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	1	30		Forb (FG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		

Plot IR 14

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR14	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				90		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	781121.714	**GPS Northing**	6741655.98		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	High								
Zone ID	C3								
Area of Zone total (Ha	24.442								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR14**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**6**
Forb (FG)	**10**
Grass & grasslike (GG)	**9**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**29**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**9.1**
Shrub (SG)	**17.1**
Forb (FG)	**16.8**
Grass & grasslike (GG)	**47.9**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL Native	**91.9**
TOTAL 'HTE'	**11.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%		Q1
	15m	4%		Q2
	25m	2%	**2.4%**	Q3
	35m	4%		Q4
	45m	2%		Q5
Bare ground cover	5m	2%		Q1
	15m	2%		Q2
	25m	2%	**1.2%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR14

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	15	60		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	4	6		Shrub (SG)	HTE		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	5	20		Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	4	6		Shrub (SG)	No		
malv amer	*Malvastrum americanun*	Spiked Malvastrum	Malvaceae	1	10	*		No		
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	6	2		Tree (TG)	No		
acac sten	*Acacia stenophylla*	River Cooba	Fabaceae (Mi	3	2		Tree (TG)	No		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	0.1	5		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	5	40	*		No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	6	100		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1	20		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	15	200		Grass & grasslike (GG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	25	400		Grass & grasslike (GG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fat	1	20		Other (OG)	No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	1	3	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	6	10	*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	3	5		Shrub (SG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	2		Forb (FG)	No		
desm camp	*Desmodium campylocau*	Creeping Tick-trefoil	Fabaceae (Fat	0.1	1		Forb (FG)	No		E1,P
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	3	8	*		No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	5		Shrub (SG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
cype grac	*Cyperus gracilis*	Slender Flat-sedge	Cyperaceae	0.1	5		Grass & grasslike (GG)	No		
atri lept	*Atriplex leptocarpa*	Slender-fruit Saltbush	Chenopodiac	1	20		Shrub (SG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
pasp dila	*Paspalum dilatatum*	Paspalum	Poaceae	1	10	*		HTE		
mega maxi	*Megathyrsus maximus*		Poaceae	20	200	*		No		
them aven	*Themeda avenacea*	Native Oatgrass	Poaceae	1	15		Grass & grasslike (GG)	No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	4	50	*		No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	0.5	20		Grass & grasslike (GG)	No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	2		Forb (FG)	No		
casu cunn cunn	*Casuarina cunninghamia*	River Oak	Casuarinacea	1	1			No		P
aris lept	*Aristida leptopoda*	White Speargrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	3		Forb (FG)	No		
euca pill	*Eucalyptus pilligaensis*	Narrow-leaved Grey Box	Myrtaceae	0.1	3		Tree (TG)	No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	1	*		HTE		
care gaud	*Carex gaudichaudiana*		Cyperaceae	0.1	10		Grass & grasslike (GG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	0.1	5	*		No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fat	0.1	5		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	3		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No		

Plot IR 15

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR15	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				45		
Recorders	John Hunter, Rachael Buzio		**PCT:**	27					
GPS Easting	778766.09	**GPS Northing**	6740024.4		**Datum**	GDA94	**Zone**	55	
IBRA Bioregion	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N1								
Area of Zone total (Ha	8.539								
Mitchell Landscape	hannels and Floodplains								

Function attributes for	**IR15**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**5**
Forb (FG)	**7**
Grass & grasslike (GG)	**3**
Fern (EG)	**1**
Other (OG)	**1**
TOTAL	**18**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**25**
Shrub (SG)	**44.1**
Forb (FG)	**10.4**
Grass & grasslike (GG)	**85.1**
Fern (EG)	**0.1**
Other (OG)	**6**
TOTAL Native	**170.7**
TOTAL 'HTE'	**7**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	5	0
5-9	0	16	0
<5	0	5	N/A
Length of logs (m)		31	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%	**5.2%**	Q1
	15m	20%		Q2
	25m	2%		Q3
	35m	0%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%	**0.8%**	Q1
	15m	2%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR15

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Acacia pendula population in th	Fabaceae (Mi	25	20		Tree (TG)	No		E2
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	20	50		Shrub (SG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	20	50		Shrub (SG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	70	1000		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	15	500		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	3	50	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	5		Shrub (SG)	HTE		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	2	20		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	5	100		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	3	20		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	5		Fern (EG)	No		
brac dent	*Brachyscome dentata*		Asteraceae	0.1	1		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	2	5		Shrub (SG)	No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	5		Forb (FG)	No		
amye quan	*Amyema quandang*	Grey Mistletoe	Loranthaceae	6	10		Other (OG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	5	15	*		HTE		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	5		Forb (FG)	No		

Plot IR 16

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR16	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				E		
Recorders	John Hunter, Rachael Buzio		**PCT:**	27					
GPS Easting	29.44046	**GPS Northing**	149.8716		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Very Low								
Zone ID	N3								
Area of Zone total (H	1.814								
Mitchell Landscape	hannels and Floodplains								

Function attributes for	**IR16**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**5**
Forb (FG)	**5**
Grass & grasslike (GG)	**6**
Fern (EG)	**1**
Other (OG)	**2**
TOTAL	**19**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**86**
Forb (FG)	**6.2**
Grass & grasslike (GG)	**122.1**
Fern (EG)	**0.1**
Other (OG)	**0.2**
TOTAL Native	**214.6**
TOTAL 'HTE'	**37**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	4%		Q1
	15m	8%		No
	25m	2%	**3.2%**	No
	35m	0%		No
	45m	2%		No
Bare ground cover	5m	10%		Q1
	15m	0%		No
	25m	0%	**2.0%**	No
	35m	0%		No
	45m	0%		No
Cryptogam cover	5m	0%		Q1
	15m	0%		No
	25m	0%	**0.0%**	No
	35m	0%		No
	45m	0%		No
Rock Cover	5m	0%		Q1
	15m	0%		No
	25m	0%	**0.0%**	No
	35m	0%		No
	45m	0%		No

COMPOSITION & STRUCTURE

Species recorded for IR16

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	35	50		Shrub (SG)	HTE		
brac dent	*Brachyscome dentata*		Asteraceae	4	200		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	70	500		Grass & grasslike (GG)	No		
astr lapp	*Astrebla lappacea*	Curly Mitchell Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	4	100	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	40	200		Shrub (SG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	40	400		Grass & grasslike (GG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	8	40		Shrub (SG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	0.1	5		Other (OG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	10	200		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	1	10		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	2	10	*		HTE		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	1	5		Shrub (SG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.1	5		Other (OG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	1	10		Forb (FG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	2	20		Shrub (SG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1	5	*		No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	0.1	5	*		No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	10		Fern (EG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		

Plot IR 17

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR17	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	24/02/2022		**Compass Orientation (head of 20x20 plot)**				90		
Recorders	John Hunter, Rachael Buzio		**PCT:**	36					
GPS Easting	777213.645	**GPS Northing**	6737445.59		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N6								
Area of Zone total (H	6.995								
Mitchell Landscape	Gwydir Alluvial Plains								

Function attributes for	**IR17**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**4**
Shrub (SG)	**1**
Forb (FG)	**5**
Grass & grasslike (GG)	**1**
Fern (EG)	**2**
Other (OG)	**2**
TOTAL	**15**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**93**
Shrub (SG)	**1**
Forb (FG)	**5.2**
Grass & grasslike (GG)	**2**
Fern (EG)	**5.1**
Other (OG)	**10.1**
TOTAL Native	**116.4**
TOTAL 'HTE'	**5**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	1	0	1
50-79	0	0	0
30-49	0	2	0
20-29	0	4	0
10-19	0	7	0
5-9	0	3	0
<5	0	1	N/A
Length of logs (m)		5	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	94%	**34.4%**	Q1
	15m	0%		Q2
	25m	70%		Q3
	35m	0%		Q4
	45m	8%		Q5
Bare ground cover	5m	0%	**0.4%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR17

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	55	4		Tree (TG)	No		E2
acac sali	*Acacia salicina*		Fabaceae (Mi	35	70		Tree (TG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	3	30	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	1	40	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	2	20	*		HTE		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	0.1	1	*		No		
azol fili	*Azolla filiculoides*	Pacific Azolla	Azollaceae	5			Fern (EG)	No		
pers hydr	*Persicaria hydropiper*	Water Pepper	Polygonaceae	1	15		Forb (FG)	No		
ecli plat	*Eclipta platyglossa*	Yellow Twin-heads	Asteraceae	2	100		Forb (FG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	5	200	*		No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	2	100		Forb (FG)	No		
care brev	*Carex breviculmis*		Cyperaceae	2	100		Grass & grasslike (GG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	2	5	*		HTE		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	10	50		Other (OG)	No		
cent mini mini	*Centipeda minima subsp*	spreading sneezeweed	Asteraceae	1	100			No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	1	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	1	5	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	1	2		Shrub (SG)	HTE		
lact serr	*Lactuca serriola*	Prickly Lettuce	Asteraceae	0.1	1	*		No		
cycl lept	*Cyclospermum leptophyl*	Slender Celery	Apiaceae	0.1	5	*		No		
gali lept	*Galium leptogonium*		Rubiaceae	0.1	1			No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	2	1		Tree (TG)	No		
loli pere	*Lolium perenne*	Perennial Ryegrass	Poaceae	0.1	1	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	5		Fern (EG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	1	1		Tree (TG)	No		
clem micr	*Clematis microphylla*	Small-leaved Clematis	Ranunculacea	0.1	1		Other (OG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		

Plot IR 18

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR18	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	782362.811	**GPS Northing**	6742012.65		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	Moderate							
Zone ID	C4							
Area of Zone (Ha)	18.282							
Mitchell Landscapes	Gwydir Channels and Floodplains							

Function attributes for	**IR18**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**6**
Forb (FG)	**6**
Grass & grasslike (GG)	**8**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**23**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0.1**
Shrub (SG)	**66.2**
Forb (FG)	**8.5**
Grass & grasslike (GG)	**30.3**
Fern (EG)	**0**
Other (OG)	**0.2**
TOTAL Native	**105.3**
TOTAL 'HTE'	**2.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	0%		Q2
	25m	2%	**2.4%**	Q3
	35m	0%		Q4
	45m	8%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR18

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	3	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	16	40	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	60	500		Shrub (SG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	10		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	10	100	*		No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	3	10		Shrub (SG)	No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	0.1	1	*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	8	80		Forb (FG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	3	50	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	4		Shrub (SG)	HTE		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	0.1	1	*		No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	3		Forb (FG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	1		Shrub (SG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
pani deco	*Panicum decompositum*	Native Millet	Poaceae	2	5		Grass & grasslike (GG)	No		
cent meli	*Centaurea melitensis*	Maltese Cockspur	Asteraceae	0.1	3	*		No		
bulb bulb	*Bulbine bulbosa*	Bulbine Lily	Asphodelacea	0.1	1		Forb (FG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	15	200		Grass & grasslike (GG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	6	50		Grass & grasslike (GG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	2	20		Grass & grasslike (GG)	No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
ATRI semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	1	20		Shrub (SG)	No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	0.1	2		Other (OG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	1	*		No		
conv gram	*Convolvulus graminetinu*		Convolvulace	0.1	5		Other (OG)	No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	0.1	1	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE		
pasp glob	*Paspalidium globoidium*	Shotgrass	Poaceae	5	50			No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
acac sali	*Acacia salicina*		Fabaceae (Mi	0.1	1		Tree (TG)	No		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	0.1	1		Shrub (SG)	FALSE		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	0.1	2	*		No		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	0.1	2		Forb (FG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
care gaud	*Carex gaudichaudiana*		Cyperaceae	0.1	20		Grass & grasslike (GG)	No		

Plot IR 19

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR19	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				225		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	783457.881	**GPS Northing**	6742997.6		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	Moderate								
Zone ID	C4								
Area of Zone total (Ha	18.282								
Mitchell Landscape	**Gwydir Alluvial Plains**								

Function attributes for	**IR19**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**2**
Forb (FG)	**5**
Grass & grasslike (GG)	**5**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**13**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**6**
Forb (FG)	**35.1**
Grass & grasslike (GG)	**84**
Fern (EG)	**0.1**
Other (OG)	**0**
TOTAL Native	**125.2**
TOTAL 'HTE'	**5.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	3	0	5
50-79	1	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	10	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		20	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	6%	**2.0%**	Q1
	15m	0%		Q2
	25m	2%		Q3
	35m	0%		Q4
	45m	2%		Q5
Bare ground cover	5m	92%	**57.2%**	Q1
	15m	0%		Q2
	25m	96%		Q3
	35m	0%		Q4
	45m	98%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR19

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	30	500		Grass & grasslike (GG)	No		
chen cris	*Chenopodium cristatum*	Crested Goosefoot	Chenopodiac	10	100		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	10	100		Forb (FG)	No		
glin loto	*Glinus lotoides*	Hairy Carpet-weed	Aizoaceae	5	50		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5	8		Shrub (SG)	HTE		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	20	200		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	30	500		Grass & grasslike (GG)	No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	0.1	1	*		No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	1		Forb (FG)	No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	3	50		Grass & grasslike (GG)	No		
ecli plat	*Eclipta platyglossa*	Yellow Twin-heads	Asteraceae	10	100		Forb (FG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	1	10		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.1	1	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	1	*		HTE		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.1	10		Fern (EG)	No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fa	0.1	5	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1	3		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1	3	*		No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	1	*		No		

Plot IR 20

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR20	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				45		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	782936.635	**GPS Northing**	6744352.53		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	High								
Zone ID	C3								
Area of Zone total (Ha	24.442								
Mitchell Landscape	Gwydir Channels and Floodplains								

Function attributes for	**IR20**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**9**
Forb (FG)	**15**
Grass & grasslike (GG)	**8**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**32**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**34.5**
Forb (FG)	**14.1**
Grass & grasslike (GG)	**93**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**141.6**
TOTAL 'HTE'	**7**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	10%		Q1
	15m	2%		Q2
	25m	2%	**4.0%**	Q3
	35m	4%		Q4
	45m	2%		Q5
Bare ground cover	5m	2%		Q1
	15m	0%		Q2
	25m	0%	**1.2%**	Q3
	35m	2%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR20

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
lept squa squa	*Leptorhynchos squamata*		Asteraceae	10	100		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	50	500		Grass & grasslike (GG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	12	100		Grass & grasslike (GG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	20	50		Shrub (SG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	5	100	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	7	15		Shrub (SG)	HTE		
brac diss	*Brachyscome dissectifoli*		Asteraceae	1	50		Forb (FG)	No		
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	1	50		Forb (FG)	No		
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	18	200		Grass & grasslike (GG)	No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	4	80		Grass & grasslike (GG)	No		
chen dese	*Chenopodium desertoru*	Desert Goosefoot	Chenopodiac	0.1	1		Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	6	10		Shrub (SG)	No		
crin flac	*Crinum flaccidum*	Darling Lily	Amaryllidacea	0.1	1		Forb (FG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	0.1	1		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	1		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	2	5	*		No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	3	50		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	1	20		Shrub (SG)	FALSE		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1	5	*		No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	1	20		Forb (FG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	1		Forb (FG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	0.1	1	*		No		
vitt cune cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	1		Forb (FG)	No		
erag cili	*Eragrostis cilianensis*	Stinkgrass	Poaceae	0.1	5	*		No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	2	30		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	3	100		Grass & grasslike (GG)	No		
plan cunn	*Plantago cunninghamii*	Sago-weed	Plantaginacea	0.1	1		Forb (FG)	No		
mair micr	*Maireana microphylla*		Chenopodiac	0.1	1		Shrub (SG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		

Plot IR 21

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR21	**Pic 20x20**	RT_NGH Consult	**Pic 20x50**		
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	56				
GPS Easting	783383.471	**GPS Northing**	6742887.43		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N11							
Area of Zone (Ha)	6.944							
Mitchell Landscapes	**Gwydir Channels and Floodplains**							

Function attributes for	**IR21**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**4**
Forb (FG)	**8**
Grass & grasslike (GG)	**3**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**16**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**10.1**
Forb (FG)	**13.5**
Grass & grasslike (GG)	**75**
Fern (EG)	**65**
Other (OG)	**0**
TOTAL Native	**163.6**
TOTAL 'HTE'	**14**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	1	0	4
30-49	6	0	1
20-29	2	0	0
10-19	0	4	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		4	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	4%		Q1
	15m	2%		Q2
	25m	10%	**4.4%**	Q3
	35m	2%		Q4
	45m	4%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR21

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	35	300		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	65	500		Fern (EG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	10	200	*		HTE		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	5	20		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	4	10		Shrub (SG)	HTE		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	2	20		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	30	500		Grass & grasslike (GG)	No		
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	0.1	1	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	5	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	4	100	*		No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	3	50		Shrub (SG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	10	*		No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	1	20	*		No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.2	5		Forb (FG)	No		
lach fili	*Lachnagrostis filiformis*		Poaceae	10	50		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	5	50		Forb (FG)	No		
crin flac	*Crinum flaccidum*	Darling Lily	Amaryllidace	0.1	1		Forb (FG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	1	*		No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	1	20		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	3	20		Shrub (SG)	No		
cent meli	*Centaurea melitensis*	Maltese Cockspur	Asteraceae	0.1	1	*		No		
fest prat	*Festuca pratensis*	Meadow Fescue	Poaceae	0.1	1	*		No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		

Plot IR 22

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR22	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	71				
GPS Easting	785376.025	**GPS Northing**	6744253.22		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N12							
Area of Zone (Ha)	8.196							
Mitchell Landscapes	Gwydir Channels and Floodplains							

Function attributes for	**IR22**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**5**
Forb (FG)	**8**
Grass & grasslike (GG)	**5**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**22**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**8**
Shrub (SG)	**29.2**
Forb (FG)	**24.2**
Grass & grasslike (GG)	**56.1**
Fern (EG)	**3**
Other (OG)	**0**
TOTAL Native	**120.5**
TOTAL 'HTE'	**21**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	1	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		2	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	6%		Q1
	15m	10%		Q2
	25m	6%	**6.8%**	Q3
	35m	8%		Q4
	45m	4%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR22

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca popu bimb	*Eucalyptus populnea sub*	Bimble Box	Myrtaceae	5	1		Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	12	20		Shrub (SG)	HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	8	50		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	25	500		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	10	200	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	15	50		Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	2	5		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	12	15	*		No		
acac sali	*Acacia salicina*		Fabaceae (Mi	2	1		Tree (TG)	No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	2	4	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	6	8	*		HTE		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	4	20		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	18	300		Grass & grasslike (GG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	5	50		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	10	*		No		
care brev	*Carex breviculmis*		Cyperaceae	12	100		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	3	20		Forb (FG)	No		
brac dent	*Brachyscome dentata*		Asteraceae	2	50		Forb (FG)	No		
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	1	10		Grass & grasslike (GG)	No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	2	40		Forb (FG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	3	50		Fern (EG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	3	50	*		HTE		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	1	1		Tree (TG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	1	*		No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	0.1	1	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		

Plot IR 23

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR23	**Pic 20x20**		**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	783283.601	**GPS Northing**	6742586.76		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	High							
Zone ID	C1							
Area of Zone (Ha)	103.09							
Mitchell Landscapes	Gwydir Channels and Floodplains							

Function attributes for	**IR23**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**3**
Forb (FG)	**8**
Grass & grasslike (GG)	**6**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**19**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**5**
Shrub (SG)	**53**
Forb (FG)	**26.3**
Grass & grasslike (GG)	**94**
Fern (EG)	**15**
Other (OG)	**0**
TOTAL Native	**193.3**
TOTAL 'HTE'	**23**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	2%	**1.2%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR23

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	35	50		Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	15	20		Shrub (SG)	HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	20	50		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	20	300		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	10	200	*		No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	0.1	1	*		No		
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	50	500		Grass & grasslike (GG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	1	30		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	3	5		Shrub (SG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	15	200		Fern (EG)	No		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	5	1		Tree (TG)	No		E2
calo scap	*Calotis scapigera*	Tufted Burr-daisy	Asteraceae	2	50		Forb (FG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	2	40		Forb (FG)	No		
poly pleb	*Polygonum plebeium*	Small Knotweed	Polygonaceae	0.1	1		Forb (FG)	No		
junc arid	*Juncus aridicola*	Tussock Rush	Juncaceae	1	10		Grass & grasslike (GG)	No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	0.1	1		Forb (FG)	No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	30	*		No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	8	200	*		HTE		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	20	300		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1	20		Forb (FG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	5	*		No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fa	2	100	*		No		
lept digi	*Leptochloa digitata*	Umbrella Canegrass	Poaceae	2	5		Grass & grasslike (GG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	0.1	1		Forb (FG)	No		

Plot IR 24

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR24	**Pic 20x20**		**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				315	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	783383.471	**GPS Northing**	6742887.43		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	Low							
Zone ID	C5							
Area of Zone (Ha)	17.141							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR24**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**3**
Forb (FG)	**2**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**7**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**9.1**
Forb (FG)	**1.1**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**0.2**
TOTAL Native	**10.4**
TOTAL 'HTE'	**10.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	8%	**3.2%**	Q3
	35m	2%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR24

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
mega maxi	*Megathyrsus maximus*		Poaceae	100	1000	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	8	30		Shrub (SG)	HTE		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1		*		No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	3		*		No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	1	50		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	2	10	*		HTE		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	2	50	*		No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	1	5		Shrub (SG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fal	0.1	5		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	5	*		No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	3	*		HTE		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	0.1	1	*		No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	5	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	0.1	1		Shrub (SG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	0.1	1		Other (OG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	0.1	1		Other (OG)	No		

Plot IR 25

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR25	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				90	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	783355.881	**GPS Northing**	6743233.02		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	Moderate							
Zone ID	C4							
Area of Zone (Ha)	18.282							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR25**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**5**
Forb (FG)	**8**
Grass & grasslike (GG)	**2**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**16**

Count of Native Richness

BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**22**
Forb (FG)	**12.2**
Grass & grasslike (GG)	**32**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL Native	**67.2**
TOTAL 'HTE'	**34**

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	0%		Q1
	15m	2%		Q2
	25m	0%	**1.2%**	Q3
	35m	2%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR25

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	30	300		Grass & grasslike (GG)	No		
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	25	200	*		HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5	20		Shrub (SG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	1	*		No		
mega maxi	*Megathyrsus maximus*		Poaceae	80	500	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	3	50	*		No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	2	30	*		No		
vitt cune cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	1	50		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	6	15		Shrub (SG)	No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	3	50		Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5	10		Shrub (SG)	HTE		
rume crys	*Rumex crystallinus*	Shiny Dock	Polygonaceae	2	20		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	10	*		No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	2	50		Grass & grasslike (GG)	No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	1	30		Forb (FG)	No		
sida corr	*Sida corrugata*	Corrugated Sida	Malvaceae	0.1	1		Forb (FG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	1	20		Other (OG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	4	20		Forb (FG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	3	15		Shrub (SG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	3	50		Forb (FG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	4	6	*		HTE		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	1	20		Forb (FG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	1		Forb (FG)	No		

Plot IR 26

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR26	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	783701.456	**GPS Northing**	6743397.6		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	Low							
Zone ID	C5							
Area of Zone (Ha)	17.141							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR26**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**4**
Forb (FG)	**4**
Grass & grasslike (GG)	**1**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**9**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**11**
Forb (FG)	**93.1**
Grass & grasslike (GG)	**30**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**134.1**
TOTAL 'HTE'	**6**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	8%		Q1
	15m	0%		Q2
	25m	4%	**3.2%**	Q3
	35m	2%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR26

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	2	5	*		HTE		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	30	300		Grass & grasslike (GG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	60	150		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1	5		Shrub (SG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	30	100		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	4	6	*		HTE		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	5	100		Shrub (SG)	No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	3	50		Forb (FG)	No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	15	100	*		No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	4	10		Shrub (SG)	No		
cucu melo melo	*Cucumis melo*		Cucurbitacea	1	1	*		No		
brom cath	*Bromus catharticus*	Praire Grass	Poaceae	0.1	1	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	0.1	1		Forb (FG)	No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	1	10		Shrub (SG)	No		

Plot IR 27

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR27	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				0		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	783518.718	**GPS Northing**	6743618.61		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	High								
Zone ID	C3								
Area of Zone (Ha)	24.442								
Mitchell Landscapes	Gwydir Alluvial Plains								

Function attributes for	**IR27**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**5**
Forb (FG)	**5**
Grass & grasslike (GG)	**9**
Fern (EG)	**1**
Other (OG)	**2**
TOTAL	**22**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**3.2**
Forb (FG)	**8**
Grass & grasslike (GG)	**65**
Fern (EG)	**0.5**
Other (OG)	**2.1**
TOTAL Native	**78.8**
TOTAL 'HTE'	**0.2**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	10%		Q1
	15m	4%		Q2
	25m	2%	**5.2%**	Q3
	35m	8%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**4.0%**	Q3
	35m	20%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR27

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	20	300	*		No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	35	500		Grass & grasslike (GG)	No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	2	50	*		No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fal	2	50		Other (OG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	0.1	1		Other (OG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	8	100		Grass & grasslike (GG)	No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	2	50		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	20	*		No		
dact radu	*Dactyloctenium radulans*	Button Grass	Poaceae	5	100		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
uroc mosa	*Urochloa mosambicensis*	Sabi Grass	Poaceae	2	20	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	3	100		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	2	50		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	3	80	*		No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	2	50		Forb (FG)	No		
malv parv	*Malva parviflora*	Small-flowered Mallow	Malvaceae	0.1	1	*		No		
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	5	100		Grass & grasslike (GG)	No		
calo scab	*Calotis scabiosifolia*	Rough Burr-daisy	Asteraceae	1	50		Forb (FG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	1	50		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	1	30		Shrub (SG)	FALSE		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	2	50		Grass & grasslike (GG)	No		
cucu melo melo	*Cucumis melo*		Cucurbitacea	0.1	1	*		No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	1	5		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	0.5	2	*		No		
lach fili	*Lachnagrostis filiformis*		Poaceae	1	20		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	0.5	20		Fern (EG)	No		
atri lept	*Atriplex leptocarpa*	Slender-fruit Saltbush	Chenopodiac	1	10		Shrub (SG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
erag cili	*Eragrostis cilianensis*	Stinkgrass	Poaceae	0.1	5	*		No		
cent meli	*Centaurea melitensis*	Maltese Cockspur	Asteraceae	0.1	1	*		No		
scle calc	*Sclerolaena calcarata*	Redburr	Chenopodiac	0.1	1		Shrub (SG)	No		
chlo diva diva	*Chloris divaricata var. div*	Slender Chloris	Poaceae	1	20		Grass & grasslike (GG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	0.1	1		Shrub (SG)	HTE		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		

Plot IR 28

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR28	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				180	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52				
GPS Easting	784127.367	**GPS Northing**	6744271.37		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	High							
Zone ID	C1							
Area of Zone total (H	103.07							
Mitchell Landscape	Gwydir Channels and Floodplains							

Function attributes for	**IR28**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**4**
Forb (FG)	**10**
Grass & grasslike (GG)	**5**
Fern (EG)	**1**
Other (OG)	**1**
TOTAL	**21**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**83.1**
Forb (FG)	**6.6**
Grass & grasslike (GG)	**75**
Fern (EG)	**2**
Other (OG)	**0.1**
TOTAL Native	**166.8**
TOTAL 'HTE'	**10.2**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	16%		Q1
	15m	2%		Q2
	25m	4%	**5.6%**	Q3
	35m	2%		Q4
	45m	4%		Q5
Bare ground cover	5m	2%		Q1
	15m	4%		Q2
	25m	4%	**3.2%**	Q3
	35m	4%		Q4
	45m	2%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR28

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	70	200		Shrub (SG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	15	200		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	5	100	*		No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10	20		Shrub (SG)	HTE		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	3	5		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	8	15	*		No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	50	500		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	2	100		Fern (EG)	No		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	0.1	1		Shrub (SG)	FALSE		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	3	20		Forb (FG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE		
astr lapp	*Astrebla lappacea*	Curly Mitchell Grass	Poaceae	6	100		Grass & grasslike (GG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1	30		Forb (FG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	1	20		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	1	20		Forb (FG)	No		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	0.1	5		Forb (FG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	5		Forb (FG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	1	50		Grass & grasslike (GG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	0.1	1		Forb (FG)	No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	3	20		Grass & grasslike (GG)	No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	0.1	1	*		No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	1		Forb (FG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	1	*		HTE		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.1	1		Other (OG)	No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		

Plot IR 29

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR29	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				225		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	783816.31	**GPS Northing**	6743866.51		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	High								
Zone ID	C1								
Area of Zone total (Ha	103.07								
Mitchell Landscape	Gwydir Channels and Floodplains								

Function attributes for	**IR29**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**5**
Forb (FG)	**10**
Grass & grasslike (GG)	**7**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL	**23**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**49.1**
Forb (FG)	**10.5**
Grass & grasslike (GG)	**74.1**
Fern (EG)	**1**
Other (OG)	**0**
TOTAL Native	**134.7**
TOTAL 'HTE'	**10.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	4%	**2.8%**	Q3
	35m	4%		Q4
	45m	2%		Q5
Bare ground cover	5m	2%		Q1
	15m	4%		Q2
	25m	2%	**2.8%**	Q3
	35m	2%		Q4
	45m	4%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR29

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	10	15		Shrub (SG)	HTE		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	4	100	*		No		
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	16	200		Grass & grasslike (GG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	30	50		Shrub (SG)	No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	1	50		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	3	10		Shrub (SG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
brac dent	*Brachyscome dentata*		Asteraceae	1	50		Forb (FG)	No		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	0.1	1		Shrub (SG)	FALSE		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	1	50		Grass & grasslike (GG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	2	40		Forb (FG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	6	15		Shrub (SG)	No		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	2	50	*		No		
atri muel	*Atriplex muelleri*	Mueller's Saltbush	Chenopodiac	0.1	5		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	4	50		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	50	500		Grass & grasslike (GG)	No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	3	30		Grass & grasslike (GG)	No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	1	50		Fern (EG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	0.1	1	*		HTE		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	2	40		Forb (FG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	3	50		Grass & grasslike (GG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	0.1	1		Forb (FG)	No		
spor caro	*Sporobolus caroli*	Fairy Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
astr lapp	*Astrebla lappacea*	Curly Mitchell Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1	3	*		No		
good glau	*Goodenia glauca*	Pale Goodenia	Goodeniacea	0.1	5		Forb (FG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllacea	0.1	3	*		No		
sola esur	*Solanum esuriale*	Quena	Solanaceae	0.1	1		Forb (FG)	No		

Plot IR 30

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Updates	**Plot Identifier**	IR30	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				135		
Recorders	John Hunter, Rachael Buzio		**PCT:**	71					
GPS Easting	785013.178	**GPS Northing**	6744237.44		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N12								
Area of Zone (Ha)	8.196								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR30**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**6**
Shrub (SG)	**4**
Forb (FG)	**10**
Grass & grasslike (GG)	**10**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**31**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**33**
Shrub (SG)	**27**
Forb (FG)	**35**
Grass & grasslike (GG)	**72.1**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL Native	**168.1**
TOTAL 'HTE'	**19**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	2	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	1	0
5-9	0	3	0
<5	0	1	N/A
Length of logs (m)		2	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	12%		Q2
	25m	4%	4.8%	Q3
	35m	4%		No
	45m	2%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	0.0%	Q3
	35m	0%		No
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	0.0%	Q3
	35m	0%		No
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	0.0%	Q3
	35m	0%		No
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR30

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Sta
acac sali	*Acacia salicina*		Fabaceae (Mi	10	5		Tree (TG)	No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	9	5		Tree (TG)	No		
euca popu bimb	*Eucalyptus populnea subsp. bimbil*	Bimble Box	Myrtaceae	6	2		Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	15	20		Shrub (SG)	HTE		
malv amer	*Malvastrum americanum*	Spiked Malvastrum	Malvaceae	4	20	*		No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	8	100	*		No		
tetr tetr	*Tetragonia tetragonioides*	New Zealand Spinach	Aizoaceae	5	40		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	1	5	*		No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	2	20		Forb (FG)	No		
aust vert	*Austrostipa verticillata*	Slender Bamboo Grass	Poaceae	1	5		Grass & grasslike (GG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	2	20		Grass & grasslike (GG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	4	100		Grass & grasslike (GG)	No		
desm camp	*Desmodium campylocaulon*	Creeping Tick-trefoil	Fabaceae (Fal	0.5	2		Forb (FG)	No		E1,P
cype grac	*Cyperus gracilis*	Slender Flat-sedge	Cyperaceae	3	100		Grass & grasslike (GG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	7	10		Shrub (SG)	No		
sida rhom	*Sida rhombifolia*	Paddy's Lucerne	Malvaceae	4	60	*		No		
erio pseu	*Eriochloa pseudoacrotricha*	Early Spring Grass	Poaceae	15	200		Grass & grasslike (GG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	4	6	*		HTE		
zale gale	*Zaleya galericulata*	Hogweed	Aizoaceae	2	20		Forb (FG)	No		
crin flac	*Crinum flaccidum*	Darling Lily	Amaryllidace	0.1	1		Forb (FG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	5	*		No		
care brev	*Carex breviculmis*		Cyperaceae	4	100		Grass & grasslike (GG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	2	20		Shrub (SG)	No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	1	5		Other (OG)	No		
euca mela	*Eucalyptus melanophloia*	Silver-leaved Ironbark	Myrtaceae	2	1		Tree (TG)	No		
pani quee	*Panicum queenslandicum*	Yadbila Grass	Poaceae	10	50		Grass & grasslike (GG)	No		
calo lapp	*Calotis lappulacea*	Yellow Burr-daisy	Asteraceae	0.1	1		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	3	10		Shrub (SG)	No		
aris pers	*Aristida personata*		Poaceae	3	50		Grass & grasslike (GG)	No		
oxal chno	*Oxalis chnoodes*		Oxalidaceae	0.1	1		Forb (FG)	No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	30	500		Grass & grasslike (GG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	1	*		No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	1	5	*		No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
senn barc	*Senna barclayana*	Smooth Senna	Fabaceae (Ca	0.1	1		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	25	100		Forb (FG)	No		
them aven	*Themeda avenacea*	Native Oatgrass	Poaceae	0.1	1		Grass & grasslike (GG)	No		
cory trac	*Corymbia trachyphloia*	White Bloodwood	Myrtaceae	5	1		Tree (TG)	No		
alst cons	*Alstonia constricta*	Quinine Bush	Apocynaceae	1	1		Tree (TG)	No		
malv parv	*Malva parviflora*	Small-flowered Mallow	Malvaceae	0.1	1	*		No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	2	50	*		No		

Plot IR 31

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR31	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				90	
Recorders	John Hunter, Rachael Buzio		**PCT:**	78				
GPS Easting	783401.686	**GPS Northing**	6743075.04		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Castlereagh-Barwon							
Condition	low							
Zone ID	C7							
Area of Zone (Ha)	10.214							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR31**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**1**
Forb (FG)	**0**
Grass & grasslike (GG)	**1**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**4**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**70**
Shrub (SG)	**0.1**
Forb (FG)	**0**
Grass & grasslike (GG)	**2**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**72.1**
TOTAL 'HTE'	**10.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	4	0	4
50-79	0	0	0
30-49	1	2	0
20-29	1	0	0
10-19	0	2	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		3	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	0%	**1.2%**	Q3
	35m	2%		Q4
	45m	0%		Q5
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR31

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	50	2		Tree (TG)	No		E2
rici comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	10	50	*		HTE		
mega maxi	*Megathyrsus maximus*		Poaceae	95	500	*		No		
meli azed	*Melia azedarach*	White Cedar	Meliaceae	20	30		Tree (TG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	1	50	*		No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	3	*		No		
chen dese	*Chenopodium desertoru*	Desert Goosefoot	Chenopodiac	0.1	1		Shrub (SG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	2	50		Grass & grasslike (GG)	No		
alte pung	*Alternanthera pungens*	Khaki Weed	Amaranthace	0.1	1	*		HTE		

Plot IR 32

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR32	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				90	
Recorders	John Hunter, Rachael Buzio		**PCT:**	27				
GPS Easting	778436.706	**GPS Northing**	6739572.06		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Moderate							
Zone ID	N1							
Area of Zone total (Ha	8.539							
Mitchell Landscape	Gwydir Channels and Floodplains							

Function attributes for	**IR32**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**4**
Forb (FG)	**8**
Grass & grasslike (GG)	**4**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**18**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**103.1**
Forb (FG)	**6.9**
Grass & grasslike (GG)	**97.1**
Fern (EG)	**0**
Other (OG)	**0.1**
TOTAL Native	**209.2**
TOTAL 'HTE'	**55**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	1	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		3	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	6%	**14.8%**	Q1
	15m	4%		Q2
	25m	8%		Q3
	35m	6%		Q4
	45m	50%		Q5
Bare ground cover	5m	4%	**2.8%**	Q1
	15m	2%		Q2
	25m	2%		Q3
	35m	0%		Q4
	45m	6%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR32

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac pend	*Acacia pendula*	Acacia pendula population in th	Fabaceae (Mi	2	1		Tree (TG)	No		E2
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	55	100		Shrub (SG)	HTE		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	40	200		Shrub (SG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	8	50		Shrub (SG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	75	1000		Grass & grasslike (GG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	5	200	*		No		
mega maxi	*Megathyrsus maximus*		Poaceae	7	300	*		No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.5	2	*		No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	0.1	5		Forb (FG)	No		
comm cyan	*Commelina cyanea*	Native Wandering Jew	Commelinace	0.5	10		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	3	20		Forb (FG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	2	50		Forb (FG)	No		
pasp glob	*Paspalidium globoideum*	Shotgrass	Poaceae	2	200		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	20	200		Grass & grasslike (GG)	No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	1	20		Forb (FG)	No		
opun stri	*Opuntia stricta*	Common Prickly Pear	Cactaceae	4	15	*		No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	5	*		No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	4	60	*		No		
dauc gloc	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	1	200	*		No		
vitta cune	*Vittadinia cuneata*	#N/A	#N/A	0.1	5	#N/A	Forb (FG)	No	#N/A	#N/A
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	1	5	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	0.1	5		Grass & grasslike (GG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	1		Forb (FG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.1	5		Other (OG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		

Plot IR 33

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR33	**Pic 20x20**		**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				90	
Recorders	John Hunter, Rachael Buzio		**PCT:**	27				
GPS Easting	778827.36	**GPS Northing**	6739950.74		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	Low							
Zone ID	N2							
Area of Zone total (H	6.716							
Mitchell Landscape	Gwydir Channels and Floodplains							

Function attributes for	**IR33**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**1**
Forb (FG)	**5**
Grass & grasslike (GG)	**2**
Fern (EG)	**1**
Other (OG)	**2**
TOTAL	**12**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**8**
Forb (FG)	**43.2**
Grass & grasslike (GG)	**11**
Fern (EG)	**35**
Other (OG)	**3**
TOTAL Native	**102.2**
TOTAL 'HTE'	**20**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	1	0
50-79	0	1	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	8	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%		Q1
	15m	2%		Q2
	25m	2%	**2.0%**	Q3
	35m	4%		Q4
	45m	0%		No
Bare ground cover	5m	0%		Q1
	15m	0%		Q2
	25m	4%	**0.8%**	Q3
	35m	0%		Q4
	45m	0%		No
Cryptogam cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		No
Rock Cover	5m	0%		Q1
	15m	0%		Q2
	25m	0%	**0.0%**	Q3
	35m	0%		Q4
	45m	0%		No

COMPOSITION & STRUCTURE

Species recorded for IR33

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	65	500	*		No		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	35	500		Fern (EG)	No		
poly pleb	*Polygonum plebeium*	Small Knotweed	Polygonaceae	30	500		Forb (FG)	No		
pers pros	*Persicaria prostrata*	Creeping Knotweed	Polygonaceae	10	100		Forb (FG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	8	50	*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	8	7		Shrub (SG)	HTE		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	4	30	*		HTE		
junc arid	*Juncus aridicola*	Tussock Rush	Juncaceae	1	4		Grass & grasslike (GG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	3	50		Forb (FG)	No		
cyno dact	*Cynodon dactylon*	Common Couch	Poaceae	10	100		Grass & grasslike (GG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	1	5	*		No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	1	20		Other (OG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	6	50	*		No		
vign lanc lanc	*Vigna lanceolata var. lan*		Fabaceae (Fa	2	20		Other (OG)	No		
acac sali	*Acacia salicina*		Fabaceae (Mi	2	4		Tree (TG)	No		
trib terr	*Tribulus terrestris*	Cat-head	Zygophyllace	0.1	1	*		No		
datu fero	*Datura ferox*	Fierce Thornapple	Solanaceae	0.5	3	*		No		
rori eust	*Rorippa eustylis*		Brassicaceae	0.1	1		Forb (FG)	No		
senn barc	*Senna barclayana*	Smooth Senna	Fabaceae (Ca	0.1	1		Forb (FG)	No		

Plot IR 34

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR34	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				180		
Recorders	John Hunter, Rachael Buzio		**PCT:**	78					
GPS Easting	782670.872	**GPS Northing**	6742449.31		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	Low								
Zone ID	C7								
Area of Zone total (H	10.214								
Mitchell Landscape	Gwydir Channels and Floodplains								

Function attributes for	**IR34**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**2**
Shrub (SG)	**0**
Forb (FG)	**1**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**3**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**50**
Shrub (SG)	**0**
Forb (FG)	**1**
Grass & grasslike (GG)	**0**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**51**
TOTAL 'HTE'	**35**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	90%	**75.6%**	Q1
	15m	94%		Q2
	25m	2%		Q3
	35m	94%		Q4
	45m	98%		Q5
Bare ground cover	5m	2%	**0.8%**	Q1
	15m	2%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR34

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	35	4		Tree (TG)	No		E2
meli azed	*Melia azedarach*	White Cedar	Meliaceae	15	25		Tree (TG)	No		
rici comm	*Ricinus communis*	Castor Oil Plant	Euphorbiacea	35	100	*		HTE		
mega maxi	*Megathyrsus maximus*		Poaceae	70	1000	*		No		
urti inci	*Urtica incisa*	Stinging Nettle	Urticaceae	1	20		Forb (FG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	5	*		No		

Plot IR 35

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR35	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				SW		
Recorders	John Hunter, Rachael Buzio		**PCT:**	27					
GPS Easting	29.43539	**GPS Northing**	149.87655		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Low								
Zone ID	N2								
Area of Zone total (H	6.716								
Mitchell Landscape	Gwydir Channels and Floodplains								

Function attributes for	**IR35**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**4**
Forb (FG)	**2**
Grass & grasslike (GG)	**1**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL	**7**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**20.2**
Forb (FG)	**0.2**
Grass & grasslike (GG)	**15**
Fern (EG)	**0**
Other (OG)	**0**
TOTAL Native	**35.4**
TOTAL 'HTE'	**15.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	1	0
30-49	0	0	0
20-29	0	0	0
10-19	2	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		8	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%	**4.8%**	Yes
	15m	16%		Yes
	25m	2%		Yes
	35m	2%		Yes
	45m	2%		Yes
Bare ground cover	5m	10%	**5.6%**	Yes
	15m	0%		Yes
	25m	6%		Yes
	35m	8%		Yes
	45m	4%		Yes
Cryptogam cover	5m	0%	**0.0%**	Yes
	15m	0%		Yes
	25m	0%		Yes
	35m	0%		Yes
	45m	0%		Yes
Rock Cover	5m	0%	**0.0%**	Yes
	15m	0%		Yes
	25m	0%		Yes
	35m	0%		Yes
	45m	0%		Yes

COMPOSITION & STRUCTURE

Species recorded for IR35

Abbreviation	**Scientific Name**	**Common Name**	**Family**	**% Cover**	**Abundance**	**Exotic**	**Growth Form**	**High Threat?**	**EPBC Status**	**BCA Status**
MEGA MAXI	*Megathyrsus maximus*		Poaceae	90	1000	*		No		
CONY BONA	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	8	100	*		No		
VACH FARN	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	15	50		Shrub (SG)	HTE		
SCLE MURI	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	5	50		Shrub (SG)	No		
SORG HALE	*Sorghum halepense*	Johnson Grass	Poaceae	0.1	3	*		HTE		
ASTE SUBU	*Aster subulatus*	Wild Aster	Asteraceae	0.1	2	*		No		
ERIO PSEU	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	15	200		Grass & grasslike (GG)	No		
DAUC GLOC	*Daucus glochidiatus*	Native Carrot	Apiaceae	0.1	1		Forb (FG)	No		
EINA NUTA	*Einadia nutans*	Climbing Saltbush	Chenopodiac	0.1	1		Forb (FG)	No		
RHAG SPIN	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	0.1	1	*		No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	0.1	1		Shrub (SG)	No		

Plot IR 36

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR36	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				270		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	785445.13	**GPS Northing**	6744282.39		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Low								
Zone ID	N10								
Area of Zone (Ha)	21.592								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR36**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**4**
Forb (FG)	**6**
Grass & grasslike (GG)	**6**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**18**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**80**
Forb (FG)	**14.2**
Grass & grasslike (GG)	**13.1**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL Native	**112.3**
TOTAL 'HTE'	**67.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	4%		Yes
	15m	2%		Yes
	25m	0%	**3.6%**	Yes
	35m	4%		Yes
	45m	8%		Yes
Bare ground cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes
Cryptogam cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes
Rock Cover	5m	0%		Yes
	15m	0%		Yes
	25m	0%	**0.0%**	Yes
	35m	0%		Yes
	45m	0%		Yes

COMPOSITION & STRUCTURE

Species recorded for IR36

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	65	60		Shrub (SG)	HTE		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	0.1	3	*		HTE		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	8	100	*		No		
verb gaud	*Verbena gaudichaudiand*	Verbena	Verbenaceae	10	200			No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
sene glos	*Senecio glossanthus*	Streaked Poverty Bush	Asteraceae	0.1	1		Forb (FG)	No		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	10	50		Forb (FG)	No		
scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	6	20		Shrub (SG)	No		
conv gram	*Convolvulus graminetinu*		Convolvulace	2	30		Other (OG)	No		
lact serr	*Lactuca serriola*	Prickly Lettuce	Asteraceae	5	40	*		No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	2	5	*		No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	1	5	*		HTE		
acac sali	*Acacia salicina*		Fabaceae (Mi	3	1		Tree (TG)	No		
care gaud	*Carex gaudichaudiana*		Cyperaceae	1	50		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	4	200		Grass & grasslike (GG)	No		
dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	4	200		Grass & grasslike (GG)	No		
atri semi	*Atriplex semibaccata*	Creeping Saltbush	Chenopodiac	3	50		Shrub (SG)	No		
ammi maju	*Ammi majus*	Bishop's Weed	Apiaceae	2	10	*		No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	15	300	*		No		
rume cris	*Rumex crispus*	Curled Dock	Polygonaceae	2	10	*		No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fal	1	10		Forb (FG)	No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	6	15		Shrub (SG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	1	2	*		HTE		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1	20		Forb (FG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	2	30		Forb (FG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	3	50		Grass & grasslike (GG)	No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	2	5	*		No		
aust aris	*Austrostipa aristiglumis*	Plains Grass	Poaceae	1	10		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	0.1	1	*		No		
crin flac	*#NAME?*	Darling Lily	Amaryllidace	0.1	1		#NAME?	FALSE		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	1	30	*		No		
uroc gile	*Urochloa gilesii*		Poaceae	0.1	5		Grass & grasslike (GG)	No		

Plot IR 37

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR37	**Pic 20x20**	Yes	**Pic 20x50**	Yes		
Survey date:	22/02/2022		**Compass Orientation (head of 20x20 plot)**				0		
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	783160.551	**GPS Northing**	6742752.47		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Castlereagh-Barwon								
Condition	Moderate								
Zone ID	C2								
Area of Zone (Ha)	17.326								
Mitchell Landscapes	**Gwydir Channels and Floodplains**								

Function attributes for	**IR37**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**2**
Forb (FG)	**6**
Grass & grasslike (GG)	**4**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**13**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**0**
Shrub (SG)	**2.1**
Forb (FG)	**24.3**
Grass & grasslike (GG)	**61.1**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL Native	**89.5**
TOTAL 'HTE'	**4**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	0	N/A
Length of logs (m)		15	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	8%	**3.2%**	Q1
	15m	0%		Q2
	25m	4%		Q3
	35m	2%		Q4
	45m	2%		Q5
Bare ground cover	5m	0%	**36.0%**	Q1
	15m	70%		Q2
	25m	0%		Q3
	35m	100%		Q4
	45m	10%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR37

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
erio creb	*Eriochloa crebra*	Cup Grass, Tall Cupgrass	Poaceae	50	500		Grass & grasslike (GG)	No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	1	10	*		No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	10	50	*		No		
chen cari	*Chenopodium carinatum*	Keeled Goosefoot	Chenopodiac	20	200		Forb (FG)	No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	3	50		Forb (FG)	No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	2	40	*		HTE		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	2	3		Shrub (SG)	HTE		
cype gunn gunn	*Cyperus gunnii subsp. gu*		Cyperaceae	0.1	1		Grass & grasslike (GG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	10	200		Grass & grasslike (GG)	No		
pers lapa	*Persicaria lapathifolia*	Pale Knotweed	Polygonaceae	0.1	1		Forb (FG)	No		
rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	2	30		Other (OG)	No		
ecli plat	*Eclipta platyglossa*	Yellow Twin-heads	Asteraceae	1	50		Forb (FG)	No		
phys ixoc	*Physalis ixocarpa*	Ground Cherry	Solanaceae	0.1	1	*		No		
verb gaud	*Verbena gaudichaudii*	Verbena	Verbenaceae	0.1	1		Forb (FG)	No		
abut oxyc	*Abutilon oxycarpum*	Straggly Lantern-bush	Malvaceae	0.1	1		Shrub (SG)	FALSE		
eleo plan	*Eleocharis plana*	Flat Spike-sedge	Cyperaceae	1	20		Grass & grasslike (GG)	No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	0.1	2	*		No		
glin loto	*Glinus lotoides*	Hairy Carpet-weed	Aizoaceae	0.1	5		Forb (FG)	No		

Plot IR 38

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR38	**Pic 20x20**	Yes	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				180	200	
Recorders	John Hunter, Rachael Buzio		**PCT:**	52					
GPS Easting	784787.734	**GPS Northing**	6744359.02		**Datum**	GDA94	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	High								
Zone ID	N8								
Area of Zone (Ha)	18.615								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR38**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**1**
Shrub (SG)	**4**
Forb (FG)	**5**
Grass & grasslike (GG)	**9**
Fern (EG)	**0**
Other (OG)	**2**
TOTAL	**21**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**5**
Shrub (SG)	**41**
Forb (FG)	**12.2**
Grass & grasslike (GG)	**65.7**
Fern (EG)	**0**
Other (OG)	**1.2**
TOTAL Native	**125.1**
TOTAL 'HTE'	**45**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	0	0
50-79	0	0	0
30-49	0	0	0
20-29	0	0	0
10-19	0	0	0
5-9	0	0	0
<5	0	1	N/A
Length of logs (m)		0	

BAM Attributes (1 x 1m Plots)				
	Tape length	**% cover**	**Average %**	**Photos**
Litter Cover	5m	2%	**1.4%**	Q1
	15m	1%		Q2
	25m	1%		Q3
	35m	2%		Q4
	45m	1%		Q5
Bare ground cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR38

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
acac sali	*Acacia salicina*		Fabaceae (Mi	5	3		Tree (TG)	No		
rhag spin	*Rhagodia spinecens*	Thorny Saltbush	Chenopodiac	6	8			No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	15	20	*		HTE		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	10	30		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.2	10	*		No		
SCLE MURI	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	8	40		Shrub (SG)	No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	50	500		Grass & grasslike (GG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	10	*		No		
Dich seri	*Dichanthium sericeum*	Queensland Bluegrass	Poaceae	0.5	15		Grass & grasslike (GG)	No		
Rhyn mini	*Rhynchosia minima*		Fabaceae (Fa	0.2	10		Other (OG)	No		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	1	20		Forb (FG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	30	25		Shrub (SG)	HTE		
astr lapp	*Astrebla lappacea*	Curly Mitchell Grass	Poaceae	0.1	3		Grass & grasslike (GG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	6	80		Grass & grasslike (GG)	No		
uroc pani	*Urochloa panicoides*	Urochloa Grass	Poaceae	1	10	*		No		
port oler	*Portulaca oleracea*	Pigweed	Portulacacea	1	20		Forb (FG)	No		
Oxal pes-	*Oxalis pes-caprae*	Soursob	Oxalidaceae	0.1	20	*		No		
Erem debi	*Eremophila debilis*	Amulla	Myoporaceae	1	10		Shrub (SG)	No		
Pani deco	*Panicum decompositum*	Native Millet	Poaceae	1	20		Grass & grasslike (GG)	No		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	2	10		Shrub (SG)	No		
pasp glob	*Paspalidium globoideum*	Shotgrass	Poaceae	2	50		Grass & grasslike (GG)	No		
euch spha	*Euchiton sphaericus*	Star Cudweed	Asteraceae	0.1	5		Forb (FG)	No		
opun aura	*Opuntia aurantiaca*	Tiger Pear	Cactaceae	0.1	1	*		No		
conv gram	*Convolvulus graminetinu*		Convolvulace	1	20		Other (OG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
pani quee	*Panicum queenslandicun*	Yadbila Grass	Poaceae	5	50		Grass & grasslike (GG)	No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	1	3	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	4	20	*		No		
cirs vulg	*Cirsium vulgare*	Spear Thistle	Asteraceae	0.1	1	*		No		
OPUN STRI	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
Cype grac	*Cyperus gracilis*	Slender Flat-sedge	Cyperaceae	0.1	1		Grass & grasslike (GG)	No		
boer domi	*Boerhavia dominii*	Tarvine	Nyctaginacea	0.1	1		Forb (FG)	No		

Plot IR 39

BAM Site Field Survey								
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR39	**Pic 20x20**	Yes	**Pic 20x50**	Yes	
Survey date:	23/02/2022		**Compass Orientation (head of 20x20 plot)**				225	
Recorders	John Hunter, Rachael Buzio		**PCT:**	36				
GPS Easting	780210.488	**GPS Northing**	6741244.09		**Datum**	GDA94	**Zone**	55
IBRA Region	Brigalow Belt South							
IBRA Subregion	Northern Outwash							
Condition	High							
Zone ID	N6							
Area of Zone (Ha)	6.995							
Mitchell Landscapes	Gwydir Alluvial Plains							

Function attributes for	**IR39**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**3**
Shrub (SG)	**4**
Forb (FG)	**5**
Grass & grasslike (GG)	**2**
Fern (EG)	**0**
Other (OG)	**1**
TOTAL	**15**
BAM Attribute (20x20m plot)	
Stratum	**Sum**
Tree (TG)	**60.1**
Shrub (SG)	**26.1**
Forb (FG)	**10.8**
Grass & grasslike (GG)	**5**
Fern (EG)	**0**
Other (OG)	**0.1**
TOTAL Native	**102.1**
TOTAL 'HTE'	**65.1**

Count of Native Richness

Count of cover abundance (native vascular plants)

BAM Attribute (20 x 50m plot) Tree Stem Counts			
DBH (cm)	**Euc**	**Non Euc**	**Hollows**
>80	0	1	3
50-79	0	1	0
30-49	0	0	0
20-29	0	0	0
10-19	0	6	0
5-9	0	0	0
<5	0	2	N/A
Length of logs (m)		8	

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	8%	**2.8%**	Q1
	15m	4%		Q2
	25m	2%		Q3
	35m	0%		Q4
	45m	0%		Q5
Bare ground cover	5m	1%	**1.4%**	Q1
	15m	4%		Q2
	25m	1%		Q3
	35m	0%		Q4
	45m	1%		Q5
Cryptogam cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	**0.0%**	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

COMPOSITION & STRUCTURE

Species recorded for IR39

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cenc cili	*Cenchrus ciliaris*	Buffel Grass	Poaceae	20	100	*		HTE		
euca cama	*Eucalyptus camaldulensi*	Eucalyptus camaldulensis popul	Myrtaceae	40	2		Tree (TG)	No		E2
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	10	100		Forb (FG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	2	10	*		No		
rhag spin	*Rhagodia spinescens*	Thorny Saltbush	Chenopodiac	15	50		Shrub (SG)	No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	30	50	*		HTE		
acac sali	*Acacia salicina*		Fabaceae (Mi	20	16		Tree (TG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	5	10		Shrub (SG)	HTE		
ench tome	*Enchylaena tomentosa*	Ruby Saltbush	Chenopodiac	6	20		Shrub (SG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	1	20	*		No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	0.1	2	*		No		
malv amer	*Malvastrum americanun*	Spiked Malvastrum	Malvaceae	4	50	*		No		
glan aris	*Glandularia aristigera*	Mayne's Pest	Verbenaceae	2	20	*		No		
vitt cune	*Vittadinia cuneata*	A Fuzzweed	Asteraceae	0.1	10		Forb (FG)	No		
aste subu	*Aster subulatus*	Wild Aster	Asteraceae	2	15	*		No		
pasp grac	*Paspalidium gracile*	Slender Panic	Poaceae	4	50		Grass & grasslike (GG)	No		
verb bona	*Verbena bonariensis*	Purpletop	Verbenaceae	0.5	10	*		No		
scle birc	*Sclerolaena birchii*	Galvinized Burr	Chenopodiac	0.1	2		Shrub (SG)	No		
mega maxi	*Megathyrsus maximus*		Poaceae	20	200	*		No		
chlo trun	*Chloris truncata*	Windmill Grass	Poaceae	1	20		Grass & grasslike (GG)	No		
glyc tome	*Glycine tomentella*	Woolly Glycine	Fabaceae (Fa	0.1	5		Other (OG)	No		
tetr tetr	*Tetragonia tetragonioide*	New Zealand Spinach	Aizoaceae	0.5	10		Forb (FG)	No		
chlo gaya	*Chloris gayana*	Rhodes Grass	Poaceae	0.1	10	*		HTE		
cull tena	*Cullen tenax*	Emu-foot	Fabaceae (Fa	0.1	10		Forb (FG)	No		
bide pilo	*Bidens pilosa*	Cobbler's Pegs	Asteraceae	0.1	1	*		No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	0.1	1		Tree (TG)	No		
lepi afri	*Lepidium africanum*	Common Peppercress	Brassicaceae	0.1	1	*		No		
erag cili	*Eragrostis cilianensis*	Stinkgrass	Poaceae	1	10	*		No		
sorg hale	*Sorghum halepense*	Johnson Grass	Poaceae	10	50	*		HTE		
sida tric	*Sida trichopoda*	High Sida	Malvaceae	0.1	1		Forb (FG)	No		

Plot IR 40

BAM Site Field Survey									
Project:	20-429 N2NS BDAR Upd	**Plot Identifier**	IR40	**Pic 20x20**	art_NGH Consul	**Pic 20x50**			
Survey date:	21/02/2022		**Compass Orientation (head of 20x20 plot)**				180		
Recorders	John Hunter, Rachael Buzio		**PCT:**	71					
GPS Easting	784979.4	**GPS Northing**	6744321.58		**Datum**	GDA2020	**Zone**	55	
IBRA Region	Brigalow Belt South								
IBRA Subregion	Northern Outwash								
Condition	Moderate								
Zone ID	N12								
Area of Zone (Ha)	8.196								
Mitchell Landscapes	Gwydir Channels and Floodplains								

Function attributes for	**IR40**

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of Native Richness	Tree (TG)	2
	Shrub (SG)	4
	Forb (FG)	6
	Grass & grasslike (GG)	9
	Fern (EG)	1
	Other (OG)	1
	TOTAL	23

BAM Attribute (20x20m plot)

	Stratum	Sum
Count of cover abundance (native vascular plants)	Tree (TG)	11
	Shrub (SG)	33.1
	Forb (FG)	24.1
	Grass & grasslike (GG)	61
	Fern (EG)	5
	Other (OG)	0.2
	TOTAL Native	134.4
	TOTAL 'HTE'	34

BAM Attributes (1 x 1m Plots)

	Tape length	% cover	Average %	Photos
Litter Cover	5m	4%	5.4%	Q1
	15m	2%		Q2
	25m	1%		Q3
	35m	16%		Q4
	45m	4%		Q5
Bare ground cover	5m	4%	2.4%	Q1
	15m	0%		Q2
	25m	8%		Q3
	35m	0%		Q4
	45m	0%		Q5
Cryptogam cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5
Rock Cover	5m	0%	0.0%	Q1
	15m	0%		Q2
	25m	0%		Q3
	35m	0%		Q4
	45m	0%		Q5

BAM Attribute (20 x 50m plot) Tree Stem Counts

DBH (cm)	Euc	Non Euc	Hollows
>80	2	0	5
50-79	1	0	3
30-49	0	0	0
20-29	1	1	0
10-19	0	7	0
5-9	0	5	0
<5	1	1	N/A
Length of logs (m)		0	

COMPOSITION & STRUCTURE

Species recorded for IR40

Abbreviation	Scientific Name	Common Name	Family	% Cover	Abundance	Exotic	Growth Form	High Threat?	EPBC Status	BCA Status
cory tess	*Corymbia tessellaris*	Carbeen	Myrtaceae	8	2		Tree (TG)	No		
Euca popu bimb	*Eucalyptus populnea*	Bimble Box	Myrtaceae	12	3			No		
acac sali	*Acacia saliciformis*		Fabaceae (Mi	3	1		Shrub (SG)	No		
pasp jubi	*Paspalidium jubiflorum*	Warrego Grass	Poaceae	20	100		Grass & grasslike (GG)	No		
jasm line	*Jasminum lineare*	Desert Jasmine	Oleaceae	0.2	5		Other (OG)	No		
eina hast	*Einadia hastata*	Berry Saltbush	Chenopodiac	1	10		Forb (FG)	No		
erio pseu	*Eriochloa pseudoacrotric*	Early Spring Grass	Poaceae	6	200		Grass & grasslike (GG)	No		
phyl cane	*Phyla canescens*	Lippia	Verbenaceae	7	300	*		HTE		
Scle muri	*Sclerolaena muricata*	Black Rolypoly	Chenopodiac	10	30		Shrub (SG)	No		
vach farn	*Vachellia farnesiana*	Mimosa Bush	Fabaceae (Mi	20	30		Shrub (SG)	HTE		
mars drum	*Marsilea drummondii*	Common Nardoo	Marsileaceae	5	100		Fern (EG)	No		
tetr tetr	*Tetragonia tetragonioid*	New Zealand Spinach	Aizoaceae	4	50		Forb (FG)	No		
erem debi	*Eremophila debilis*	Amulla	Myoporaceae	0.1	1		Shrub (SG)	No		
cony bona	*Conyza bonariensis*	Flaxleaf Fleabane	Asteraceae	0.1	5	*		No		
raph raph	*Raphanus raphanistrum*	Wild Radish	Brassicaceae	6	10	*		No		
xant occi	*Xanthium occidentale*	Noogoora Burr	Asteraceae	2	5	*		HTE		
eina nuta	*Einadia nutans*	Climbing Saltbush	Chenopodiac	15	50		Forb (FG)	No		
sily mari	*Silybum marianum*	Variegated Thistle	Asteraceae	0.1	1	*		No		
eina poly	*Einadia polygonoides*	Knotweed Goosefoot	Chenopodiac	2	20		Forb (FG)	No		
cype	*Cyperus spp.*		Cyperaceae	3	20		Grass & grasslike (GG)	No		
alte dent	*Alternanthera denticulat*	Lesser Joyweed	Amaranthace	2	50		Forb (FG)	No		
junc arid	*Juncus aridicola*	Tussock Rush	Juncaceae	1	10		Grass & grasslike (GG)	No		
phys ixoc	*Physalis ixiocarpa*	Ground Cherry	Solanaceae	0.1	2	*		No		
alec olei	*Alectryon oleifolius*	Western Rosewood	Sapindaceae	3	3		Tree (TG)	No		
sola nigr	*Solanum nigrum*	Black-berry Nightshade	Solanaceae	1	10	*		No		
erag parv	*Eragrostis parviflora*	Weeping Lovegrass	Poaceae	15	300		Grass & grasslike (GG)	No		
sene glos	*Senecio glossanthus*	Streaked Poverty Bush	Asteraceae	0.1	1		Forb (FG)	No		
lepi bona	*Lepidium bonariense*	Argentine Peppercress	Brassicaceae	0.1	1	*		No		
pasp glob	*Paspalidium globoideum*	Shotgrass	Poaceae	1	20		Grass & grasslike (GG)	No		
care brev	*Carex breviculmis*		Cyperaceae	3	300		Grass & grasslike (GG)	No		
ente ramo	*Enteropogon ramosus*	Curly Windmill Grass	Poaceae	2	50		Grass & grasslike (GG)	No		
sida spin	*Sida spinosa*		Malvaceae	0.1	1	*		No		
OPUN STRI	*Opuntia stricta*	Common Prickly Pear	Cactaceae	0.1	1	*		No		
medi poly	*Medicago polymorpha*	Burr Medic	Fabaceae (Fal	0.1	10	*		No		
sonc oler	*Sonchus oleraceus*	Common Sowthistle	Asteraceae	0.1	1	*		No		
sisy erys	*Sisymbrium erysimoides*	Smooth Mustard	Brassicaceae	1	10	*		No		
lyci fero	*Lycium ferocissimum*	African Boxthorn	Solanaceae	5	6	*		HTE		
cype grac	*Cyperus gracilis*	Slender Flat-sedge	Cyperaceae	10	300		Grass & grasslike (GG)	No		
malv amer	*Malvastrum americanun*	Spiked Malvastrum	Malvaceae	1	5	*		No		

B.3 Plot Photos from 2019 and 2020 surveys

Plot 1	27 Moderate
Plot 2	**36 FV**

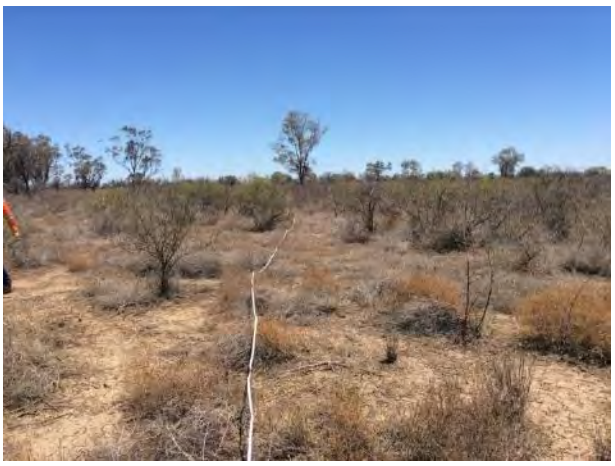
Plot 3	36 FV
Plot 4	**36 Mehi**

Plot 5	36 Mehi
Plot 6	**78 Gwydir**

Plot 7	36 FV
Plot 8	**71 Moderate**

Plot 9	56 Woodland
Plot 10	**71 Low**

Plot 11	56 Woodland
Plot 12	**56 DNG**

Plot 13	52 Mimosa
	
Plot 14	**52 Mimosa**

Plot 15	27 Moderate
Plot 16	**27 Low**

Plot 17	36 FV
Plot 18	**52 Low**

Plot 19	52 Low
Plot 20	**52 Mimosa**

Plot 21	56 DNG
Plot 22	**71 Low**
Plot 23	**52 Mimosa**

Plot 24	52 Low
Plot 25	52 Low
Plot 26	52 Low

Plot 27	52 Low
Plot 28	52 Mimosa
Plot 29	52 Mimosa

Plot 30	71 Moderate
Plot 31	**78 Gwydir**
Plot 32	**27 Low**

B.4 Plot Photos from February 2022 surveys

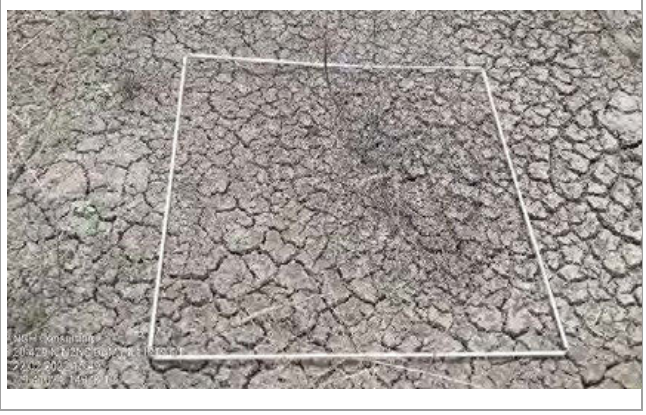
Plot 1	27 Moderate
Plot 2	**36 Moderate**
Plot 3	**36 Low**

Plot 4	36 Low
Plot 5	36 Moderate
Plot 6	78 Moderate

Plot 7	Low_FV
Plot 8	71 Moderate
Plot 9	71 Moderate
Plot 10	71 Moderate

Plot 11	71 Moderate
Plot 12	56 Moderate
Plot 13	52 Moderate

Plot 14	52 High
Plot 15	27 Moderate
Plot 16	Very Low

Plot 17	36 Moderate_FV
Plot 18	**52 Moderate**
Plot 19	**52 Moderate**
	

Plot 20	52 High
Plot 21	56 Moderate
Plot 22	71 Moderate

Plot 23	52 High Mimosa
Plot 24	52 Low
Plot 25	52 Moderate

Plot 26	52 Low
Plot 27	52 High
Plot 28	52 Low

Plot 29	52 High Mimosa
Plot 30	**71 Moderate**
Plot 31	**78 Low**

Plot 32	27 Moderate
Plot 33	27 Low
Plot 34	78 Low

Plot 35	27 Low
Plot 36	52 Low
Plot 37	52 Moderate Mimosa

Plot 38	52 High
Plot 39	36 Moderate_FV
Plot 40	71 Moderate

B.5 Fauna Survey Results

Common Name	Scientific Name	2019 Mehi River	2019 Gwydir River	2019 Grassland TSR	Weeping Myall Woodland	Feb 2020 TSR south of Gwydir	Feb 2020 Gun Club woodland	Feb 2020 Billabong in corridor	Feb 2020 Gwydir River Harp site
Long-thumbed Frog	*Limnodynastes fletcheri*	10	1					4	
Broad-palmed Frog	*Litoria latopalmata*		1						
Salmon Striped Frog	*Limnodynastes salmini*							1	
Spotted Grass Frog	*Limnodynastes tasmaniensis*							4	
Ornate Burrowing Frog	*Platyplectrum ornatum*							1	
Desert Tree Frog	*Litoria rubella*							Call only	
Peron's Tree Frog	*Litoria peronii*	1	1					Call only	
Shingle-back	*Tiliqua rugosa*			2					
Dubious Dtella	*Gehyra dubia*	5	2			15	2	2	
Bynoe's Gecko	*Heteronotia binoei*	2	4	1			13		
Tree Skink	*Egernia striolata*		1	1					
South-eastern Morethia Skink	*Morethia boulengeri*	1		1		1	1		
Robust Ctenotus	*Ctenotus robustus*						1		
Ragged Snake-eyed Skink	*Cryptoblepharus pannosus*	2	4	1		2	3		2
Grey Teal	*Anas gracilis*		2					2	
Pacific Black Duck	*Anas superciliosa*	2	4					2	
Australian Wood Duck	*Chenonetta jubata*		6					2	
Bar-shouldered Dove	*Geopelia humeralis*	2							
Peaceful Dove	*Geopelia striata*	2	2						
Crested Pigeon	*Ocyphaps lophotes*	2	2	2	1		2		
Tawny Frogmouth	*Podargus strigoides*	3					1		
Australasian Darter	*Anhinga novaehollandiae*	1	1						
Little Pied Cormorant	*Microcarbo melanoleucos*		1						
Little Black Cormorant	*Phalacrocorax sulcirostris*		1						
Australian Pelican	*Pelecanus conspicillatus*		2						
Intermediate Egret	*Ardea intermedia*		1						
White-faced Heron	*Egretta novaehollandiae*	1	1						
Nankeen Night Heron	*Nycticorax caledonicus*	1							
Black Kite	*Milvus migrans*			1					
Nankeen Kestrel	*Falco cenchroides*		1	1					
Whistling Kite	*Haliastur sphenurus*						1		
Dusky Moorhen	*Gallinula tenebrosa*	2	2						
Sulphur-crested Cockatoo	*Cacatua galerita*	4	10				2		
Little Corella	*Cacatua sanguinea*	10					6		
Galah	*Eolophus roseicapillus*	6	6	2		2	2		
Cockatiel	*Nymphicus hollandicus*		4			4	6		
Red-winged Parrot	*Aprosmictus erythropterus*	2	2						
Pale-headed Rosella	*Platycercus adscitus*	2	2				2		

Common Name	Scientific Name	2019 Mehi River	2019 Gwydir River	2019 Grassland TSR	Weeping Myall Woodland	Feb 2020 TSR south of Gwydir	Feb 2020 Gun Club woodland	Feb 2020 Billabong in corridor	Feb 2020 Gwydir River Harp site
Red-rumped Parrot	*Psephotus haematonotus*		2	4					
Rainbow Lorikeet	*Trichoglossus haematodus*	10	10		2				
Little Loirkeet	*Glossopsitta pusilla*	2							
Southern Boobook	*Ninox novaeseelandiae*	1		1			1		
Laughing Kookaburra	*Dacelo novaeguineae*	2					1		
Sacred Kingfisher	*Todiramphus sanctus*	2	2				1		
Dollarbird	*Eurystomus orientalis*	2							
Spotted Bowerbird	*Ptilonorhynchus maculatus*	2							
Variegated Fairy-wren	*Malurus lamberti*	4	6	5	2	4	4		
White-winged Fairy-wren	*Malurus leucopterus*			5					
Weebill	*Smicrornis brevirostris*	1							
Spiny-cheeked Honeyeater	*Acanthagenys rufogularis*	2							
Singing Honeyeater	*Gavicalis virescens*					2			
Yellow-throated Miner	*Manorina flavigula*		2		2				
Noisy Miner	*Manorina melanocephala*	2					4		
Little Friarbird	*Philemon citreogularis*	2							
White-plumed Honeyeater	*Ptilotula penicillatus*	4	4						
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	2	2	1			1		
White-winged Triller	*Lalage sueurii*	1	1						
White-breasted Woodswallow	*Artamus leucorynchus*	2							
Pied Butcherbird	*Cracticus nigrogularis*			2		1	1		
Australian Magpie	*Cracticus tibicen*	2	2			2	2		
Grey Butcherbird	*Cracticus torquatus*	1	1						
Willie Wagtail	*Rhipidura leucophrys*	2	2			2	2		
Australian Raven	*Corvus coronoides*	1	1	2		2	2		
Torresian Crow	*Corvus orru*			2					
Magpie-lark	*Grallina cyanoleuca*		2	2			2		
White-winged Chough	*Corcorax melanorhamphos*		9						
Apostlebird	*Struthidea cinerea*	8				6			
Australian Reed-Warbler	*Acrocephalus australis*	2							
Welcome Swallow	*Hirundo neoxena*	6	6						
Fairy Martin	*Petrochelidon ariel*	10	4						
Common Myna	*Sturnus tristis*	2	2			2	2		
Common Starling	*Sturnus vulgaris*	2	2						
Mistletoebird	*Dicaeum hirundinaceum*	1	1		2				
Double-barred Finch	*Taeniopygia bichenovii*	2		4					
Zebra Finch	*Taeniopygia guttata*			2					
Common Bronzewing	*Phaps chalcoptera*	2							
Eastern Rosella	*Platycercus eximius*			2					
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*		4						

Common Name	Scientific Name	2019 Mehi River	2019 Gwydir River	2019 Grassland TSR	Weeping Myall Woodland	Feb 2020 TSR south of Gwydir	Feb 2020 Gun Club woodland	Feb 2020 Billabong in corridor	Feb 2020 Gwydir River Harp site
Yellow Thornbill	*Acanthiza nana*	4							
Inland Thornbill	*Acanthiza apicalis*						1		
Striped Honeyeater	*Plectorhyncha lanceolata*		2						
Cicadabird	*Coracina tenuirostris*		1						
Olive-backed Oriole	*Oriolus sagittatus*	1							
Channel-billed Cuckoo	*Scythrops novaehollandiae*	2							
Short-beaked Echidna	*Tachyglossus aculeatus*	1							
Koala	*Phascolarctos cinereus*	2	2						
Common Brushtail Possum	*Trichosurus vulpecula*	8	9					2	
Eastern Grey Kangaroo	*Macropus giganteus*		4	10			4		
Swamp Wallaby	*Wallabia bicolor*	2	2				1		
Water-rat	*Hydromys chrysogaster*	1							
Little Red Flying-fox	*Pteropus scapulatus*	50	2						
Grey-headed Flying-fox	*Pteropus poliocephalus*	10	4						
Yellow-bellied Sheathtail-bat	*Saccolaimus flaviventris*		confident	confident					
White-striped Freetail-bat	*Austronomus australis*		confident						
Little Pied Bat	*Chalinolobus picatus*		confident						
Chocolate Wattled Bat	*Chalinolobus morio*	probable							
Gould's Wattled Bat	*Chalinolobus gouldii*	possible	confident				5m 1f	1	1m & 3f
Inland Broad-nosed Bat	*Scotorepens balstoni*	confident	confident				1f & 1m		
Little Broad-nosed Bat	*Scotorepens greyii*	1	2						
Lesser Long-eared Bat	*Nyctophilus geoffroyi*	2					4m		2m & 1f
Bristle-faced Free-tailed Bat	*Setirostris eleryi*	possible	possible						
Little Mastiff-bat	*Ozimops planiceps*	confident	confident						
Inland Free-tailed Bat	*Ozimops petersi*	confident	confident	confident			1f		2m
Eastern Free-tailed Bat	*Ozimops ridei*	confident	confident						
Inland Forest Bat	*Vespadelus baverstockii*	possible						possible	
Little Forest Bat	*Vespadelus vulturnus*							1	
Fox	*Vulpes*			1					
Cat	*Felis catus*			1					
Brown Hare	*Lepus capensis*			1	1	1	1		
Pig	*Sus scrofa*		1	1					
House Mouse	*Mus musculus*						2		

TECHNICAL PAPER 01

Biodiversity development assessment report

Appendix C Personnel

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Appendix C Personnel

Name	Title	Qualifications	Role
Mitch Palmer	Acting Principal Ecologist	• BAM Accredited Assessor #BAAS17051) • B.Science (Geology and Geography)	Direction in BAM Assessment, Land Category Assessment, primary author
Aleksei Atkin	Senior Fauna Ecologist	• Master of Wildlife Management • Bachelor of Natural Science (Nature Conservation) • BAM Accredited Assessor #BAAS17093)	Field Surveys
Joshua Smart	Senior Ecologist	• B Env Sc & Mgt (Hons)	BDAR Review
Sarah Downey	Ecologist	• B Env Sc & Mgt (Hons)	Field Surveys GIS mapping
Ainslee Roser	Ecologist	• B Env Sc & Mgt	Field Surveys
Giorginna Xu	Ecologist	• B Env Sc & Mgt	Field Surveys
Phil Spark	Fauna Ecologist and Subject Matter Expert	• > 25 years' experience, particularly in north-west NSW • Species expert for Pale-headed snake • Subject matter expert for *Digitaria porrecta*, *Homopholis belsonii*, Five-clawed Worm skink and Koala	Field Surveys Technical advice and survey guidance
Rachael Buzio	Ecologist	• B Mar Sc. Dip CLM, Cert III CLM	2022 Field Survey and Reporting
Dr John Hunter	Botanist	• B.Sc. (Hons), PhD • Adjunct Associate Professor - School of Environmental and Rural Science	2022 Field Survey
Claire Hewitt	Senior Ecologist	• M. Sc. (Natural Sciences) • BAM Accredited Assessor #BAAS20009)	Direction in BAM Assessment, technical advice and survey guidance, Land Category Assessment, reporting and review.

TECHNICAL PAPER 01

Biodiversity development assessment report

Appendix D Biodiversity Assessment Method Calculator credit report

Appendix D BAM Calculator Credit Report

D.1 Northern Outwash IBRA subregion

BAM Candidate Species Report

Proposal Details

Assessment Id 00017933/BAAS20009/19/00017934	Proposal Name N2NS Phase 2	BAM data last updated * 24/11/2021
Assessor Name	Report Created 07/04/2022	BAM Data version * 50
Assessor Number BAAS20009	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 11	Date Finalised 07/04/2022	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Ardeotis australis Australian Bustard	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Cyperus conicus Cyperus conicus	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Desmodium campylocaulon Creeping Tick-trefoil	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Dichanthium setosum Bluegrass	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Digitaria porrecta Finger Panic Grass	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☑ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Homopholis belsonii Belson's Panic	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lepidium aschersonii Spiny Peppercress	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Phascolarctos cinereus Koala	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Polygala linariifolia Native Milkwort	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Pteropus poliocephalus Grey-headed Flying-fox	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Setirostris eleryi Bristle-faced Free-tailed Bat	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Slender Darling Pea	Swainsona murrayana	Habitat degraded

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00017933/BAAS20009/19/00017934

Proposal Name
N2NS Phase 2

BAM data last updated *
16/06/2022

Assessor Name
Julie Gooding

Assessor Number
BAAS18074

BAM Data version *
54

Proponent Name(s)
Dave Fleming

Report Created
16/08/2022

BAM Case Status
Finalised

Assessment Revision
15

Assessment Type
Major Projects

Date Finalised
16/08/2022

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
36-River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Not a TEC	12.4	237	0	237.00
52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Not a TEC	16.9	0	351	351.00
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	0.6	14	0	14.00

36-River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Moderate	Yes	27	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Low	Yes	188	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Moderate_FV	Yes	18	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Low_FV	Yes	4	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Forested Wetlands	Tier 3 or higher threat status	36_Moderate	Yes (including artificial)	27	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Forested Wetlands	Tier 3 or higher threat status	36_Low	Yes (including artificial)	188	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	36_Moderate_FV	Yes (including artificial)	18	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Forested Wetlands	Tier 3 or higher threat status	36_Low_FV	Yes (including artificial)	4	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_High	No	146	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_Low	No	205	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region
Grasslands	Tier 2 or higher threat status	52_High	No	146	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Grasslands	Tier 2 or higher threat status	52_Low	No	205	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 56, 71, 227, 428, 441, 628, 1179	-	56_Moderate	Yes	14	Northern Outwash,Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	Zone	HBT	Credits	IBRA region

	Grassy Woodlands	Tier 3 or higher threat status	56_Moderate	Yes (including artificial)	14	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Desmodium campylocaulon / Creeping Tick-trefoil	**27_Low, 27_Moderate, 52_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 52_High**	19.6	445.00
Digitaria porrecta / Finger Panic Grass	**27_Low, 27_Moderate, 52_Low, 36_Low, 52_High**	18.7	422.00
Hieraaetus morphnoides / Little Eagle	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV, 52_High, 52_Low, 56_Moderate, 71_Moderate**	24.2	360.00
Phascolarctos cinereus / Koala	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV**	8.8	195.00
Setirostris eleryi / Bristle-faced Free-tailed Bat	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV, 56_Moderate, 71_Moderate**	13.8	307.00

Credit Retirement Options

Like-for-like options

	Spp	IBRA region
Desmodium campylocaulon/ Creeping Tick-trefoil	**Desmodium campylocaulon**/Creeping Tick-trefoil	Any in NSW
	Variation options	

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Digitaria porrecta/ Finger Panic Grass	Spp	IBRA region	
	Digitaria porrecta/Finger Panic Grass	Any in NSW	
	Variation options		
	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Flora	Endangered	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Hieraaetus morphnoides/ Little Eagle	Spp	IBRA region	
	Hieraaetus morphnoides/Little Eagle	Any in NSW	
	Variation options		

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Vulnerable	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Phascolarctos cinereus/ Koala	Spp	IBRA region
	Phascolarctos cinereus/Koala	Any in NSW
	Variation options	

Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
Fauna	Endangered	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Setirostris eleryi/ Bristle-faced Free-tailed Bat	Spp	IBRA region
	Setirostris eleryi/Bristle-faced Free-tailed Bat	Any in NSW
	Variation options	

	Kingdom	Any species with same or higher category of listing under Part 4 of the BC Act shown below	IBRA region
	Fauna	Endangered	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00017933/BAAS20009/19/00017934

Proposal Name
N2NS Phase 2

BAM data last updated *
16/06/2022

Assessor Name
Julie Gooding

Assessor Number
BAAS18074

BAM Data version *
54

Proponent Names
Dave Fleming

Report Created
16/08/2022

BAM Case Status
Finalised

Assessment Revision
15

Assessment Type
Major Projects

Date Finalised
16/08/2022

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Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
36-River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion	Not a TEC	12.4	237	0	237
52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Not a TEC	16.9	0	351	351
56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	0.6	14	0	14

36-River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Moderate	Yes	27	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Low	Yes	188	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Moderate_FV	Yes	18	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	36_Low_FV	Yes	4	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	**Like-for-like credit retirement options**					
	Class	Trading group	Zone	HBT	Credits	IBRA region
	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_High	No	146	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_Low	No	205	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

56-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

Like-for-like credit retirement options

Name of offset trading group	Trading group	Zone	HBT	Credits	IBRA region
Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions This includes PCT's: 56, 71, 227, 428, 441, 628, 1179	-	56_Moderate	Yes	14	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Desmodium campylocaulon / Creeping Tick-trefoil	**27_Low, 27_Moderate, 52_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 52_High**	19.6	445.00
Digitaria porrecta / Finger Panic Grass	**27_Low, 27_Moderate, 52_Low, 36_Low, 52_High**	18.7	422.00
Hieraaetus morphnoides / Little Eagle	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV, 52_High, 52_Low, 56_Moderate, 71_Moderate**	24.2	360.00
Phascolarctos cinereus / Koala	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV**	8.8	195.00
Setirostris eleryi / Bristle-faced Free-tailed Bat	**27_Low, 36_Moderate, 36_Low, 36_Moderate_FV, 36_Low_FV, 56_Moderate, 71_Moderate**	13.8	307.00

Credit Retirement Options

Like-for-like credit retirement options

	Spp	IBRA subregion
Desmodium campylocaulon / Creeping Tick-trefoil	**Desmodium campylocaulon /** Creeping Tick-trefoil	Any in NSW

Digitaria porrecta / Finger Panic Grass	Spp	IBRA subregion
	Digitaria porrecta / Finger Panic Grass	Any in NSW
Hieraaetus morphnoides / Little Eagle	Spp	IBRA subregion
	Hieraaetus morphnoides / Little Eagle	Any in NSW
Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Setirostris eleryi / Bristle-faced Free-tailed Bat	Spp	IBRA subregion
	Setirostris eleryi / Bristle-faced Free-tailed Bat	Any in NSW

BAM Credit Summary Report

Proposal Details

Assessment Id
00017933/BAAS20009/19/00017934

Proposal Name
N2NS Phase 2

BAM data last updated *
16/06/2022

Assessor Name
Julie Gooding

Report Created
16/08/2022

BAM Data version *
54

Assessor Number
BAAS18074

BAM Case Status
Finalised

Date Finalised
16/08/2022

Assessment Revision
15

Assessment Type
Major Projects

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Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits

Carbeen - White Cypress Pine - River Red Gum - bloodwood tall woodland on sandy loam alluvial and eolian soils in the northern Brigalow Belt South Bioregion and Darling Riverine Plains Bioregion												
10	71_Moderate	Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	55.2	55.2	0.77	PCT Cleared - 78%	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		21
											Subtotal	**21**
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW												
9	56_Moderate	Carbeen Open Forest Community in the Darling Riverine Plains and Brigalow Belt South Bioregions	43.7	43.7	0.64	PCT Cleared - 78%	High Sensitivity to Gain	Endangered Ecological Community	Not Listed	2.00		14
											Subtotal	**14**

Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion												
7	52_High	Not a TEC	80	80.0	3.6	PCT Cleared - 70%	High Sensitivity to Gain			2.00		146
8	52_Low	Not a TEC	30.9	30.9	13.2	PCT Cleared - 70%	High Sensitivity to Gain			2.00		205
											Subtotal	**351**
River Red Gum tall to very tall open forest / woodland wetland on rivers on floodplains mainly in the Darling Riverine Plains Bioregion												
3	36_Moderate	Not a TEC	50.7	50.7	1.2	PCT Cleared - 53%	High Sensitivity to Gain			1.75		27
4	36_Low	Not a TEC	43.2	43.2	9.9	PCT Cleared - 53%	High Sensitivity to Gain			1.75		188
5	36_Moderate_FV	Not a TEC	49	49.0	0.84	PCT Cleared - 53%	High Sensitivity to Gain			1.75		18
6	36_Low_FV	Not a TEC	27.6	27.6	0.36	PCT Cleared - 53%	High Sensitivity to Gain			1.75		4
											Subtotal	**237**

Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion												
1	27_Moderate	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	68.4	68.4	2.4	PCT Cleared - 86%	High Sensitivity to Gain	Endangered Ecological Community	Endangered	2.00		83
2	27_Low	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	30.5	30.5	4.7	PCT Cleared - 86%	High Sensitivity to Gain	Endangered Ecological Community	Endangered	2.00		72
											Subtotal	**155**
											Total	**778**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits
Desmodium campylocaulon / Creeping Tick-trefoil (Flora)									
27_Low	30.5	30.5	4.4			Endangered	Not Listed	False	67
27_Moderate	68.4	68.4	2.4			Endangered	Not Listed	False	83
52_Low	30.9	30.9	8.3			Endangered	Not Listed	False	129
36_Moderate	50.7	50.7	0.51			Endangered	Not Listed	False	13
36_Low	43.2	43.2	0.01			Endangered	Not Listed	False	1
36_Moderate_FV	49.0	49.0	0.31			Endangered	Not Listed	False	8
52_High	80.0	80.0	3.6			Endangered	Not Listed	False	144
								Subtotal	**445**
Digitaria porrecta / Finger Panic Grass (Flora)									
27_Low	30.5	30.5	4.4			Endangered	Not Listed	False	67
27_Moderate	68.4	68.4	2.4			Endangered	Not Listed	False	83
52_Low	30.9	30.9	8.2			Endangered	Not Listed	False	127
36_Low	43.2	43.2	0.01			Endangered	Not Listed	False	1
52_High	80.0	80.0	3.6			Endangered	Not Listed	False	144
								Subtotal	**422**
Hieraaetus morphnoides / Little Eagle (Fauna)									
27_Low	30.5	30.5	1.8			Vulnerable	Not Listed	False	21
36_Moderate	50.7	50.7	1.2			Vulnerable	Not Listed	False	23

36_Low	43.2	43.2	8.1			Vulnerable	Not Listed	False	132
36_Moderate_FV	49.0	49.0	0.84			Vulnerable	Not Listed	False	15
36_Low_FV	27.6	27.6	0.36			Vulnerable	Not Listed	False	4
52_High	80.0	80.0	0.96			Vulnerable	Not Listed	False	29
52_Low	30.9	30.9	9.5			Vulnerable	Not Listed	False	110
56_Moderate	43.7	43.7	0.64			Vulnerable	Not Listed	False	10
71_Moderate	55.2	55.2	0.77			Vulnerable	Not Listed	False	16
								Subtotal	**360**
Phascolarctos cinereus / Koala (Fauna)									
27_Low	30.5	30.5	0.01			Endangered	Endangered	False	1
36_Moderate	50.7	50.7	1			Endangered	Endangered	False	26
36_Low	43.2	43.2	6.8			Endangered	Endangered	False	148
36_Moderate_FV	49.0	49.0	0.67			Endangered	Endangered	False	16
36_Low_FV	27.6	27.6	0.29			Endangered	Endangered	False	4
								Subtotal	**195**
Setirostris eleryi / Bristle-faced Free-tailed Bat (Fauna)									
27_Low	30.5	30.5	0.01			Endangered	Not Listed	False	1
36_Moderate	50.7	50.7	1.2			Endangered	Not Listed	False	31
36_Low	43.2	43.2	9.9			Endangered	Not Listed	False	214
36_Moderate_FV	49.0	49.0	0.84			Endangered	Not Listed	False	21
36_Low_FV	27.6	27.6	0.36			Endangered	Not Listed	False	5
56_Moderate	43.7	43.7	0.64			Endangered	Not Listed	False	14

71_Moderate	55.2	55.2	0.77			Endangered	Not Listed	False	21
								Subtotal	**307**

D.2 Castlereagh-Barwon IBRA subregion

BAM Candidate Species Report

Proposal Details

Assessment Id 00031835/BAAS20009/22/00031837	Proposal Name N2NS-SP2 Update - Castlereagh Barwon	BAM data last updated * 24/11/2021
Assessor Name Claire Hewitt	Report Created 07/04/2022	BAM Data version * 50
Assessor Number BAAS20009	Assessment Type Major Projects	BAM Case Status Finalised
Assessment Revision 3	Date Finalised 07/04/2022	

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

List of Species Requiring Survey

Name	Presence	Survey Months
Ardeotis australis Australian Bustard	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Burhinus grallarius Bush Stone-curlew	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Calyptorhynchus banksii samueli Red-tailed Black-Cockatoo (inland subspecies)	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Calyptorhynchus lathami Glossy Black-Cockatoo	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Desmodium campylocaulon Creeping Tick-trefoil	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Digitaria porrecta Finger Panic Grass	Yes (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☑ Survey month outside the specified months?
Haliaeetus leucogaster White-bellied Sea-Eagle	No (surveyed) *Survey months are outside of the months specified in Bionet.	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☑ Survey month outside the specified months?
Hamirostra melanosternon Black-breasted Buzzard	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Hieraaetus morphnoides Little Eagle	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Homopholis belsonii Belson's Panic	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Hoplocephalus bitorquatus Pale-headed Snake	No (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Lepidium monoplocoides Winged Peppercress	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophochroa leadbeateri Major Mitchell's Cockatoo	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Lophoictinia isura Square-tailed Kite	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Ninox connivens Barking Owl	No (surveyed)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☑ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Phascolarctos cinereus Koala	Yes (surveyed)	☐ Jan ☑ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☑ Dec ☐ Survey month outside the specified months?
Platyzoma microphyllum Braid Fern	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Polytelis swainsonii Superb Parrot	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?
Tyto novaehollandiae Masked Owl	Yes (assumed present)	☐ Jan ☐ Feb ☐ Mar ☐ Apr ☐ May ☐ Jun ☐ Jul ☐ Aug ☐ Sep ☐ Oct ☐ Nov ☐ Dec ☐ Survey month outside the specified months?

Threatened species Manually Added

None added

Threatened species assessed as not on site

Refer to BAR for detailed justification

Common name	Scientific name	Justification in the BAM-C
Slender Darling Pea	Swainsona murrayana	Habitat degraded
Squatter Pigeon (southern subspecies)	Geophaps scripta scripta	Habitat degraded

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00017933/BAAS20009/20/00022515

Proposal Name
PT N2NS Phase 2

BAM data last updated *
24/11/2021

Assessor Name

Assessor Number
BAAS20009

BAM Data version *
50

Proponent Name(s)
Dave Fleming ,

Report Created
05/08/2022

Assessment Type
Scattered Trees

Date Finalised
07/04/2022

Assessment Revision
2

BAM Case Status
Finalised

BOS entry trigger
Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Variations)

PCT	TEC	HBT Cr	No HBT Cr	Credits
27-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	0	1	1

Credit classes for 27

Like-for-like options

TEC	Trading group	HBT	Credits	IBRA region
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	-	No	1	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	HBT	IBRA region
Semi-arid Woodlands (Grassy sub-formation)	Tier 3	No	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00017933/BAAS20009/22/00032428

Proposal Name
N2NS - SP2 - Castlereagh Barwon SubIBRA

BAM data last updated *
16/06/2022

Assessor Name
Claire Hewitt

Assessor Number
BAAS20009

BAM Data version *
54

Proponent Names
Dave Fleming

Report Created
05/08/2022

BAM Case Status
Finalised

Assessment Revision
0

Assessment Type
Major Projects

Date Finalised
02/08/2022

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Name of threatened ecological community	Listing status	Name of Plant Community Type/ID
Nil		

Species
Nil

Additional Information for Approval

PCT Outside Ibra Added

None added

PCTs With Customized Benchmarks

PCT
No Changes

Predicted Threatened Species Not On Site

Name
No Changes

Ecosystem Credit Summary (Number and class of biodiversity credits to be retired)

Name of Plant Community Type/ID	Name of threatened ecological community	Area of impact	HBT Cr	No HBT Cr	Total credits to be retired
52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Not a TEC	60.9	544	2300	2844
78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Not a TEC	1.0	26	0	26

52-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_High_Mimosa	No	1493	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_High	No	521	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_Moderate	Yes	544	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.
	Semi-arid Floodplain Grasslands This includes PCT's: 52	Semi-arid Floodplain Grasslands >=70% and <90%	52_Low	No	286	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

78-River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion

Like-for-like credit retirement options

Class	Trading group	Zone	HBT	Credits	IBRA region
Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	78_Moderate	Yes	25	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

	Inland Riverine Forests This includes PCT's: 9, 36, 78, 79, 112, 249, 356, 362	Inland Riverine Forests >=50% and <70%	78_Low	Yes	1	Castlereagh-Barwon, Bogan-Macquarie, Boorindal Plains, Culgoa-Bokhara, Liverpool Plains, Louth Plains, Moonie-Barwon Interfluve, Narrandool, Nebine Plains, Northern Basalts, Northern Outwash, Pilliga, Pilliga Outwash and Warrambool-Moonie. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Species Credit Summary

Species	Vegetation Zone/s	Area / Count	Credits
Calyptorhynchus banksii samueli / Red-tailed Black-Cockatoo (inland subspecies)	**52_Moderate, 52_Low, 78_Moderate, 78_Low**	5.8	257.00
Desmodium campylocaulon / Creeping Tick-trefoil	**52_High_Mimosa, 52_High, 52_Moderate, 52_Low**	49.2	2358.00
Digitaria porrecta / Finger Panic Grass	**52_High_Mimosa, 52_High, 52_Moderate, 52_Low**	49.2	2358.00

Hamirostra melanosternon / Black-breasted Buzzard	**52_High_Mimosa, 52_Moderate, 52_Low, 78_Moderate, 78_Low**	4.5	146.00
Hieraaetus morphnoides / Little Eagle	**52_High_Mimosa, 52_Moderate, 52_Low, 78_Moderate, 78_Low**	4.5	146.00
Lepidium monoplocoides / Winged Peppercress	**52_High_Mimosa, 52_High, 52_Moderate, 52_Low**	47.7	2285.00
Lophochroa leadbeateri / Major Mitchell's Cockatoo	**52_High_Mimosa, 52_Moderate, 52_Low, 78_Moderate, 78_Low**	10.7	477.00
Phascolarctos cinereus / Koala	**78_Moderate**	0.7	21.00
Platyzoma microphyllum / Braid Fern	**78_Moderate, 78_Low**	1.0	29.00
Polytelis swainsonii / Superb Parrot	**52_High_Mimosa, 52_Moderate, 52_Low, 78_Moderate, 78_Low**	4.6	193.00
Tyto novaehollandiae / Masked Owl	**52_High_Mimosa, 52_Moderate, 52_Low, 78_Moderate, 78_Low**	4.6	193.00

Credit Retirement Options

Like-for-like credit retirement options

Calyptorhynchus banksii samueli / Red-tailed Black-Cockatoo (inland subspecies)	Spp	IBRA subregion

	Calyptorhynchus banksii samueli / Red-tailed Black-Cockatoo (inland subspecies)	Any in NSW
Desmodium campylocaulon / Creeping Tick-trefoil	Spp	IBRA subregion
	Desmodium campylocaulon / Creeping Tick-trefoil	Any in NSW
Digitaria porrecta / Finger Panic Grass	Spp	IBRA subregion
	Digitaria porrecta / Finger Panic Grass	Any in NSW
Hamirostra melanosternon / Black-breasted Buzzard	Spp	IBRA subregion
	Hamirostra melanosternon / Black-breasted Buzzard	Any in NSW
Hieraaetus morphnoides / Little Eagle	Spp	IBRA subregion
	Hieraaetus morphnoides / Little Eagle	Any in NSW
Lepidium monoplocoides / Winged Peppercress	Spp	IBRA subregion
	Lepidium monoplocoides / Winged Peppercress	Any in NSW
Lophochroa leadbeateri / Major Mitchell's Cockatoo	Spp	IBRA subregion
	Lophochroa leadbeateri / Major Mitchell's Cockatoo	Any in NSW

Phascolarctos cinereus / Koala	Spp	IBRA subregion
	Phascolarctos cinereus / Koala	Any in NSW
Platyzoma microphyllum / Braid Fern	Spp	IBRA subregion
	Platyzoma microphyllum / Braid Fern	Any in NSW
Polytelis swainsonii / Superb Parrot	Spp	IBRA subregion
	Polytelis swainsonii / Superb Parrot	Any in NSW
Tyto novaehollandiae / Masked Owl	Spp	IBRA subregion
	Tyto novaehollandiae / Masked Owl	Any in NSW

BAM Credit Summary Report

Proposal Details

Assessment Id
00017933/BAAS20009/22/00032428

Proposal Name
N2NS - SP2 - Castlereagh Barwon SubIBRA

BAM data last updated *
16/06/2022

Assessor Name
Claire Hewitt

Report Created
05/08/2022

BAM Data version *
54

Assessor Number
BAAS20009

BAM Case Status
Finalised

Date Finalised
02/08/2022

Assessment Revision
0

Assessment Type
Major Projects

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Ecosystem credits for plant communities types (PCT), ecological communities & threatened species habitat

Zone	Vegetation zone name	TEC name	Current Vegetation integrity score	Change in Vegetation integrity (loss / gain)	Area (ha)	Sensitivity to loss (Justification)	Species sensitivity to gain class	BC Act Listing status	EPBC Act listing status	Biodiversity risk weighting	Potential SAII	Ecosystem credits
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion												
1	52_High_Mimosa	Not a TEC	97.3	97.3	30.7	PCT Cleared - 70%	High Sensitivity to Gain			2.00		1493

2	52_High	Not a TEC	98.1	98.1	10.6	PCT Cleared - 70%	High Sensitivity to Gain			2.00		521
3	52_Moderate	Not a TEC	97.5	97.5	11.2	PCT Cleared - 70%	High Sensitivity to Gain			2.00		544
4	52_Low	Not a TEC	67.8	67.8	8.4	PCT Cleared - 70%	High Sensitivity to Gain			2.00		286
											Subtotal	**2844**
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion												
5	78_Moderate	Not a TEC	58.4	58.4	0.96	PCT Cleared - 60%	High Sensitivity to Gain			1.75		25
6	78_Low	Not a TEC	32.8	32.8	0.08	PCT Cleared - 60%	High Sensitivity to Gain			1.75		1
											Subtotal	**26**
											Total	**2870**

Species credits for threatened species

Vegetation zone name	Habitat condition (Vegetation Integrity)	Change in habitat condition	Area (ha)/Count (no. individuals)	Sensitivity to loss (Justification)	Sensitivity to gain (Justification)	BC Act Listing status	EPBC Act listing status	Potential SAII	Species credits

Calyptorhynchus banksii samueli / Red-tailed Black-Cockatoo (inland subspecies) (Fauna)									
52_Moderate	97.5	97.5	4.5	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	219
52_Low	67.8	67.8	0.27	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	9
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	28
78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1
								Subtotal	**257**
Desmodium campylocaulon / Creeping Tick-trefoil (Flora)									
52_High_Mimosa	97.3	97.3	30.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1483
52_High	98.1	98.1	4.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	240

52_Moderate	97.5	97.5	11.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	544
52_Low	67.8	67.8	2.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	91
								Subtotal	**2358**
Digitaria porrecta / Finger Panic Grass (Flora)									
52_High_Mimosa	97.3	97.3	30.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1483
52_High	98.1	98.1	4.9	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	240
52_Moderate	97.5	97.5	11.2	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	544

52_Low	67.8	67.8	2.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	91
								Subtotal	**2358**
Hamirostra melanosternon / Black-breasted Buzzard (Fauna)									
52_High_Mimosa	97.3	97.3	1.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	64
52_Moderate	97.5	97.5	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	56
52_Low	67.8	67.8	0.14	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	4
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	21

78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	1
								Subtotal	**146**
Hieraaetus morphnoides / Little Eagle (Fauna)									
52_High_Mimosa	97.3	97.3	1.7	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	64
52_Moderate	97.5	97.5	1.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	56
52_Low	67.8	67.8	0.14	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	4
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	21

78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Vulnerable	Not Listed	False	1
								Subtotal	**146**
Lepidium monoplocoides / Winged Peppercress (Flora)									
52_High_Mimosa	97.3	97.3	30.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	1486
52_High	98.1	98.1	4.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	237
52_Moderate	97.5	97.5	9.8	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	479
52_Low	67.8	67.8	2.5	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	83
								Subtotal	**2285**

Lophochroa leadbeateri / Major Mitchell's Cockatoo (Fauna)									
52_High_Mimosa	97.3	97.3	3.3	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	160
52_Moderate	97.5	97.5	4.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	234
52_Low	67.8	67.8	1.6	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	54
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	28
78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1
								Subtotal	**477**
Phascolarctos cinereus / Koala (Fauna)									
78_Moderate	58.4	58.4	0.72	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Endangered	False	21
								Subtotal	**21**

Platyzoma microphyllum / Braid Fern (Flora)									
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	28
78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Effectiveness of management in controlling threats	Endangered	Not Listed	False	1
								Subtotal	**29**
Polytelis swainsonii / Superb Parrot (Fauna)									
52_High_Mimosa	97.3	97.3	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	58
52_Moderate	97.5	97.5	1.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	90
52_Low	67.8	67.8	0.48	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	16
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	28

78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Vulnerable	False	1
								Subtotal	**193**
Tyto novaehollandiae / Masked Owl (Fauna)									
52_High_Mimosa	97.3	97.3	1.2	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	58
52_Moderate	97.5	97.5	1.8	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	90
52_Low	67.8	67.8	0.48	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	16
78_Moderate	58.4	58.4	0.96	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	28
78_Low	32.8	32.8	0.08	Biodiversity Conservation Act listing status	Species dependent on habitat attributes	Vulnerable	Not Listed	False	1
								Subtotal	**193**

D.3 Scattered tree streamlined assessment module

Note to BCS: there are issues with the Biodiversity Credit Reports (Like for Like and Variations) which means that the wrong area is being used to calculate Like for Like / Variation credits. This has been flagged with the Biodiversity Offsets Support Team (called logged 11/5/2022). The Credit Summary Report and Payment Report are correct.

BAM Biodiversity Credit Report (Like for like)

Proposal Details

Assessment Id
00017933/BAAS20009/20/00022515

Assessor Name

Proponent Names
Dave Fleming ,

Assessment Revision
2

BOS entry trigger
Major Project

Proposal Name
PT N2NS Phase 2

Assessor Number
BAAS20009

Report Created
07/04/2022

Assessment Type
Scattered Trees

BAM data last updated *
24/11/2021

BAM Data version *
50

Date Finalised
07/04/2022

BAM Case Status
Finalised

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks

No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Like for like)

PCT	TEC	HBT Cr	No HBT Cr	Credits
27-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	0	1	1

Credit classes for 27

Like-for-like options

TEC	Trading group	HBT	Credits	IBRA region
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	-	No	1	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Biodiversity Credit Report (Variations)

Proposal Details

Assessment Id
00017933/BAAS20009/20/00022515

Proposal Name
PT N2NS Phase 2

BAM data last updated *
24/11/2021

Assessor Name

Assessor Number
BAAS20009

BAM Data version *
50

Proponent Name(s)
Dave Fleming ,

Report Created
07/04/2022

Assessment Type
Scattered Trees

Date Finalised
07/04/2022

Assessment Revision
2

BAM Case Status
Finalised

BOS entry trigger
Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Potential Serious and Irreversible Impacts

Nil

Additional Information for Approval

PCTs With Customized Benchmarks
No Changes

Ecosystem Credit Summary

BAM Biodiversity Credit Report (Variations)

PCT	TEC	HBT Cr	No HBT Cr	Credits
27-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	0	1	1

Credit classes for 27

Like-for-like options

TEC	Trading group	HBT	Credits	IBRA region
Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions	-	No	1	Northern Outwash, Castlereagh-Barwon, Liverpool Plains and Northern Basalts. or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

Variation options

Formation	Trading group	HBT	IBRA region
Semi-arid Woodlands (Grassy sub-formation)	Tier 3	No	IBRA Region: Brigalow Belt South, or Any IBRA subregion that is within 100 kilometers of the outer edge of the impacted site.

BAM Credit Summary Report

Proposal Details

Assessment Id	Proposal Name	BAM data last updated *
00017933/BAAS20009/20/00022515	PT N2NS Phase 2	24/11/2021
Assessor Name	Report Created	BAM Data version *
	07/04/2022	50
Assessor Number	BAM Case Status	Date Finalised
BAAS20009	Finalised	07/04/2022
Assessment Revision	Assessment Type	BOS entry trigger
2	Scattered Trees	Major Project

* Disclaimer: BAM data last updated may indicate either complete or partial update of the BAM calculator database. BAM calculator database may not be completely aligned with Bionet.

Scattered Trees Credit Requirement

Class	Contains hollows	Number of trees	Ecosystem credits
27-Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion			
2	False	1.0	1
			1
			1

Species credits for threatened species

Nil

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Biodiversity development assessment report

Appendix E Hollow-bearing tree inventory

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Appendix E Hollow-bearing tree inventory

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
1	*Eucalyptus camaldulensis*	90	✓		✓		Scratch marks	Retained
2	*E.camaldulensis*	60		✓	✓			Retained
3	*E.camaldulensis*	110		✓	✓			Retained
4	*E.camaldulensis*	110			✓		Scratch marks, scats recorded.	Retained
5	*E.camaldulensis*	120		✓	✓		Scratch marks, scats recorded.	Retained
6	*E.camaldulensis*	80		✓				Retained
7	*E.camaldulensis*	90		✓			Scats recorded.	**Removed**
8	Stag	90		✓				**Removed**
9	*E.camaldulensis*	150			✓		Scratch marks, scats recorded.	**Removed**
10	*E.camaldulensis*	170		✓	✓		Scratch marks, scats recorded.	**Removed**
11	Stag	90		✓				Retained
12	*E.camaldulensis*	70	✓	✓				Retained
13	*E.camaldulensis*	110		✓				Retained
14	*E.chloroclada*	130		✓	✓			Retained
15	*Corymbia tessellaris*	90		✓				Retained
16	*Corymbia tessellaris*	90		✓				Retained
17	*Corymbia tessellaris*	120		✓				Retained
18	*E.chloroclada*	110		✓	✓			Retained
19	*E.camaldulensis*	80		✓				Retained
20	*E.camaldulensis*	60	✓	✓			Koala scratches, scats recorded.	Retained
21	*E.camaldulensis*	120		✓	✓	Yes	Koala scratches, medium stick nest, scats recorded.	Retained
22	*E.camaldulensis*	150		✓	✓			**Removed**

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
23	*E.camaldulensis*	80		✓				**Removed**
24	*E.camaldulensis*	150		✓	✓		Scratches	**Removed**
25	*E.camaldulensis*	200		✓	✓			**Removed**
26	*E.camaldulensis*	100		✓	✓			**Removed**
27	*E.camaldulensis*	70	✓	✓			Scats recorded.	**Removed**
28	*E.camaldulensis*	80	✓	✓				**Removed**
29	*E.camaldulensis*	100	✓		✓			**Removed**
30	*E.camaldulensis*	100		✓	✓		Scats recorded.	Retained
31	*E.chloroclada*	80			✓			Retained
32	*E.chloroclada*	90		✓				Retained
33	*E.camaldulensis*	90		✓	✓			Retained
34	*E.camaldulensis*	100		✓	✓			Retained
35	*E.camaldulensis*	40	✓				Scratch marks, Scats recorded.	**Removed**
36	*E.camaldulensis*	80	✓	✓				**Removed**
37	*E.camaldulensis*	90	✓	✓				**Removed**
38	*E.camaldulensis*	90		✓	✓			**Removed**
39	*E.camaldulensis*	80		✓				**Removed**
40	*E.camaldulensis*	110			✓			**Removed**
41	Stag	90		✓				**Removed**
42	*E.camaldulensis*	80	✓	✓				**Removed**
43	*E.camaldulensis*	60		✓				**Removed**
44	*E.camaldulensis*	50	✓	✓				**Removed**
45	*E.camaldulensis*	90		✓	✓			**Removed**
46	*E.camaldulensis*	90		✓				Retained
47	*E.camaldulensis*	110		✓	✓		Scratch marks, Scats recorded.	Retained
48	Stag	90		✓				**Removed**

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
49	*E.camaldulensis*	110		✓	✓		Scratch marks	Retained
50	*E.camaldulensis*	100			✓		Scratch marks	**Removed**
51	*E.camaldulensis*	60	✓	✓				**Removed**
52	*E.camaldulensis*	80		✓				**Removed**
53	*E.populnea*	60	✓					**Removed**
54	*E.populnea*	70		✓				**Removed**
55	*E.populnea*	80		✓	✓			Retained
56	*E.camaldulensis*	80		✓	✓			Retained
57	*E.camaldulensis*	80		✓	✓			Retained
58	*E.camaldulensis*	60		✓				Retained
59	Stag	80		✓				Retained
60	*Corymbia tessellaris*	65	✓	✓				Retained
61	*Corymbia tessellaris*	70		✓				Retained
62	*Corymbia tessellaris*	90		✓	✓			Retained
63	*E.populnea*	90		✓	✓			Retained
64	*E.populnea*	70		✓				Retained
65	*E.populnea*	80		✓				Retained
66	*Corymbia tessellaris*	110		✓	✓	Yes		Retained
67	*E.populnea*	90			✓			Retained
68	Stag	110		✓				Retained
69	*Acacia salicina*	100		✓				Retained
70	*Corymbia tessellaris*	80		✓		Yes		Retained
71	*E.populnea*	70		✓				Retained
72	*Corymbia trachyphloia subsp. amphistomatica*	70		✓				Retained

Name	Species	DBH (cm)	Small Hollow (< 10 cm),	Medium (10 – 20 cm)	Large (> 20 cm).	Fissuring	Signs of use	Removed or retained
73	*E.populnea*	60		✓				Retained
74	*E.populnea*	90		✓			Occupied	Retained
75	*E.populnea*	60	✓				Moderate stick nest. Unoccupied.	Retained
76	*E.populnea*	50	✓			Yes		Retained
77	*E.populnea*	70	✓	✓				Retained
78	*E.populnea*	50	✓					Retained
79	*E.populnea*	70		✓				Retained
80	*E.populnea*	45	✓					Retained
81	*E.populnea*	90		✓	✓			Retained
82	Stag	90		✓	✓			**Removed**
83	*E.camaldulensis*	60			✓	Yes		**Removed**
84	*E.camaldulensis*	70		✓				**Removed**
85	*E.camaldulensis*	70		✓				**Removed**
86	*E.camaldulensis*	100		✓	✓			Retained
87	*E.camaldulensis*	90			✓			Retained
88	*Acacia salicina*	70	✓			Yes		**Removed**
89	*E.camaldulensis*	100		✓	✓		Scratch marks	**Removed**
90	*E.camaldulensis*	90		✓			Scratch marks	Retained
91	*E.camaldulensis*	80		✓				Retained
92	*E.camaldulensis*	95		✓				Retained
93	*E.camaldulensis*	70		✓				Retained
94	*E.camaldulensis*	85	✓	✓				Retained

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Biodiversity development assessment report

Appendix F EPBC Act protected matters search

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Australian Government
Department of Agriculture, Water and the Environment

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 19-Aug-2022

Summary
Details
- Matters of NES
- Other Matters Protected by the EPBC Act
- Extra Information

Caveat
Acknowledgements

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance (Ramsar	4
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	5
Listed Threatened Species:	21
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	4
Commonwealth Heritage Places:	None
Listed Marine Species:	15
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	7
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	1
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

National Heritage Places			[Resource Information]
Name	State	Legal Status	Buffer Status
Indigenous			
Moree Baths and Swimming Pool	NSW	Listed place	In feature area

Wetlands of International Importance (Ramsar Wetlands)		[Resource Information]
Ramsar Site Name	Proximity	Buffer Status
Banrock station wetland complex	1000 - 1100km upstream from Ramsar site	In feature area
Gwydir wetlands: gingham and lower gwydir (big leather) watercourses	30 - 40km upstream from Ramsar site	In feature area
Riverland	900 - 1000km upstream from Ramsar site	In feature area
The coorong, and lakes alexandrina and albert wetland	1100 - 1200km upstream from Ramsar site	In feature area

Listed Threatened Ecological Communities			[Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.
Status of Vulnerable, Disallowed and Ineligible are not MNES under the EPBC Act.

Community Name	Threatened Category	Presence Text	Buffer Status
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	Community likely to occur within area	In feature area
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland	Critically Endangered	Community likely to occur within area	In feature area
Poplar Box Grassy Woodland on Alluvial Plains	Endangered	Community likely to occur within area	In feature area
Weeping Myall Woodlands	Endangered	Community likely to occur within area	In feature area
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	Community may occur within area	In buffer area only

Community Name	Threatened Category	Presence Text	Buffer Status

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Anthochaera phrygia Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related behaviour may occur within area	In buffer area only
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat known to occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Calyptorhynchus lathami lathami South-eastern Glossy Black-Cockatoo [67036]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Geophaps scripta scripta Squatter Pigeon (southern) [64440]	Vulnerable	Species or species habitat may occur within area	In feature area
Grantiella picta Painted Honeyeater [470]	Vulnerable	Species or species habitat known to occur within area	In feature area
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Polytelis swainsonii Superb Parrot [738]	Vulnerable	Species or species habitat known to occur within area	In feature area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area	In feature area
FISH			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Maccullochella peelii](#)			
Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area	In feature area
MAMMAL			
[Chalinolobus dwyeri](#)			
Large-eared Pied Bat, Large Pied Bat [183]	Vulnerable	Species or species habitat may occur within area	In feature area
[Nyctophilus corbeni](#)			
Corben's Long-eared Bat, South-eastern Long-eared Bat [83395]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Phascolarctos cinereus (combined populations of Qld, NSW and the ACT)](#)			
Koala (combined populations of Queensland, New South Wales and the Australian Capital Territory) [85104]	Endangered	Species or species habitat known to occur within area	In feature area
PLANT			
[Cadellia pentastylis](#)			
Ooline [9828]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Dichanthium setosum](#)			
bluegrass [14159]	Vulnerable	Species or species habitat known to occur within area	In feature area
[Homopholis belsonii](#)			
Belson's Panic [2406]	Vulnerable	Species or species habitat may occur within area	In buffer area only
[Lepidium aschersonii](#)			
Spiny Pepper-cress [10976]	Vulnerable	Species or species habitat may occur within area	In feature area
[Lepidium monoplocoides](#)			
Winged Pepper-cress [9190]	Endangered	Species or species habitat likely to occur within area	In feature area
[Swainsona murrayana](#)			
Slender Darling-pea, Slender Swainson, Murray Swainson-pea [6765]	Vulnerable	Species or species habitat likely to occur within area	In feature area
REPTILE			

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Anomalopus mackayi](#) Five-clawed Worm-skink, Long-legged Worm-skink [25934]	Vulnerable	Species or species habitat likely to occur within area	In feature area

Listed Migratory Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Migratory Marine Birds			
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area	In feature area
Migratory Terrestrial Species			
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat may occur within area	In feature area
Migratory Wetlands Species			
[Actitis hypoleucos](#) Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
[Calidris acuminata](#) Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
[Calidris ferruginea](#) Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area	In feature area

Other Matters Protected by the EPBC Act

Commonwealth Lands [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Commonwealth Land Name	State	Buffer Status
Communications, Information Technology and the Arts - Australian Postal Corporation		
Commonwealth Land - Australian Postal Commission [14002]	NSW	In buffer area only
Communications, Information Technology and the Arts - Telstra Corporation Limited		
Commonwealth Land - Australian Telecommunications Commission [14003]	NSW	In buffer area only
Commonwealth Land - Telstra Corporation Limited [14001]	NSW	In buffer area only
Unknown		
Commonwealth Land - [15952]	NSW	In feature area

Listed Marine Species [Resource Information]

Scientific Name	Threatened Category	Presence Text	Buffer Status
Bird			
Actitis hypoleucos			
Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus			
Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In feature area
Bubulcus ibis as Ardea ibis			
Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area	In feature area
Calidris acuminata			
Sharp-tailed Sandpiper [874]		Species or species habitat known to occur within area	In feature area
Calidris ferruginea			
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
[Calidris melanotos](#) Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
[Chalcites osculans as Chrysococcyx osculans](#) Black-eared Cuckoo [83425]		Species or species habitat likely to occur within area overfly marine area	In feature area
[Gallinago hardwickii](#) Latham's Snipe, Japanese Snipe [863]		Species or species habitat may occur within area overfly marine area	In feature area
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area	In feature area
[Hirundapus caudacutus](#) White-throated Needletail [682]	Vulnerable	Species or species habitat likely to occur within area overfly marine area	In feature area
[Merops ornatus](#) Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
[Motacilla flava](#) Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
[Myiagra cyanoleuca](#) Satin Flycatcher [612]		Species or species habitat may occur within area overfly marine area	In feature area
[Neophema chrysostoma](#) Blue-winged Parrot [726]		Species or species habitat may occur within area overfly marine area	In feature area

Scientific Name	Threatened Category	Presence Text	Buffer Status
Rostratula australis as Rostratula benghalensis (sensu lato)			
Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area	In feature area

Extra Information

EPBC Act Referrals			[Resource Information]	
Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
ARG Border Rail Project Moree to Toowoomba QLD	2013/7061	Controlled Action	Further Information Request	In feature area
Inland Rail - Narrabri to North Star Phase 2 Moree to Camurra North	2020/8689	Controlled Action	Assessment Approach	In feature area
Narrabri to North Star Section of Inland Rail, NSW	2016/7729	Controlled Action	Post-Approval	In feature area
Queensland Hunter Gas Pipeline, approximately 825 km in length	2008/4483	Controlled Action	Completed	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Newell Highway Moree Bypass	2001/314	Not Controlled Action	Completed	In feature area
Queensland Hunter Gas Pipeline, approximately 833 km in length	2008/4620	Not Controlled Action	Completed	In feature area

Bioregional Assessments			
SubRegion	BioRegion	Website	Buffer Status
Gwydir	Northern Inland Catchments	BA website	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Department of Land and Resource Management, Northern Territory
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Australian Tropical Herbarium, Cairns
-eBird Australia
-Australian Government – Australian Antarctic Data Centre
-Museum and Art Gallery of the Northern Territory
-Australian Government National Environmental Science Program
-Australian Institute of Marine Science
-Reef Life Survey Australia
-American Museum of Natural History
-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania
-Tasmanian Museum and Art Gallery, Hobart, Tasmania
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Biodiversity development assessment report

Appendix G EPBC Act habitat assessment

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Appendix G EPBC Act habitat assessment

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Ecological Communities				
White Box Yellow Box Blakey's Red Gum Woodland CE EPBC	Characterised by the occurrence of *Eucalyptus albens* (White Box), *E. melliodora* (Yellow Box) and/or *E. blakelyi* (Blakely's Red Gum). The trees may occur as mixtures of the three species, dominated by one of the three or in mixtures with other trees such as *E. microcarpa* (Grey Box), *E. mannifera* (Brittle Gum), *E. bridgesiana* (Apple Box), *E. rubida* (Candlebark), and *E. macrorrhyncha* (Red Stringybark) *E. cinerea* (Argyle Apple).	Absent	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.

[1] Information sourced from species profiles on NSW DPE's threatened species database (BioNet) or the Australian Government's Species Profiles and Threats database (SPRAT) unless otherwise stated.

BCD threatened species database (accessed via login): https://www.environment.nsw.gov.au/asmslightprofileapp/account/login?ForceLogin=1
SPRAT: http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CE EPBC	Typical natural grassland dominated by native perennial tussock grasses. Strongly reliant on soil type as it is associated with fine textured, often cracking clays derived from either basalt or quaternary alluvium. The ecological community generally occurs on flat to low slopes. As slope increases, grassy woodlands dominated by trees such as *Acacia pendula* (weeping myall), *Eucalyptus coolabah* (coolibah), *E. populnea* (poplar box) or *E. melliodora* (yellow box) occur.	**Present**	**Recorded within the subject land**	**Yes – AoS undertaken**
Weeping Myall Woodlands E EPBC	The structure of the community varies from sparse woodland to low open woodland dominated by *Acacia pendula* (Weeping Myall or Boree), which may or may not be the only tree species present. The understorey includes an open layer of chenopod shrubs and other woody plant species and an open to continuous groundcover of grasses and herbs.	**Present**	**Recorded within the subject land**	**Yes – AoS undertaken**
Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions E EPBC	Found on the grey, self-mulching clays of periodically waterlogged floodplains, swamp margins, ephemeral wetlands, and stream levees. Typically form mosaics with grasslands and wetlands and are characterised by Coolibah (*Eucalyptus coolabah*) and, in some areas, Black Box (*E. largiflorens*). Other tree species may be present including River Cooba (*Acacia stenophylla*), Cooba (*A. salicina*), Belah (*Casuarina cristata*) and Eurah (*Eremophila bignoniiflora*).	Marginal	Unlikely – Not recorded during surveys. Coolibah and/or Black Box although occur sporadically within the subject land, are not dominant.	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Poplar Box Grassy Woodland on Alluvial Plains E EPBC	Occurs on fertile clay or loamy soils on alluvial plains, lower slopes, creek flats and drainage lines. Characterised by dominant poplar/bimble box (*Eucalyptus populnea*). Other tree species may occasionally occur depending on the characteristics of the site including white cypress pine (*Callitris glaucophylla*), belah (*Casurina cristata*) Coolabah (*Eucalyptus coolabah*), Black box (*Eucalyptus largiflorens*), Silver leaved ironbark (*Eucalyptus melanophloia*), inland grey box (*Eucalyptus macrocarpa*) and narrow leaved grey box (*Eucalyptus pilligaensis*).	**Present**	**Recorded within the subject land**	**Yes – AoS undertaken**
Flora				
Ooline *Cadellia pentastylis* V EPBC	Forms a closed or open canopy mixing with eucalypt and cypress pine species. There appears to be a strong correlation between the presence of Ooline and low- to medium-nutrient soils of sandy clay or clayey consistencies, with a typical soil profile having a sandy loam surface layer, grading from a light clay to a medium clay with depth.	Absent	Unlikely – Not recorded during surveys	No – Unlikely to occur on site
Bluegrass *Dichanthium setosum* V EPBC	Associated with heavy basaltic black soils and red-brown loams with clay subsoil. Often found in moderately disturbed areas such as cleared woodland, grassy roadside remnants and highly disturbed pasture. (Often collected from disturbed open grassy woodlands on the northern tablelands, where the habitat has been variously grazed, nutrient-enriched and water-enriched).	Present	Unlikely – Unlikely to occur on site following extensive targeted searches. Minimal (2) known records within the study locality.	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Belson's Panic *Homopholis belsonii* V EPBC	Grows in dry woodland (e.g. Belah, Weeping Myall) often on poor soils, although sometimes found in basalt-enriched sites north of Warialda and in alluvial clay soils.	**Marginal**	**Possible – Not recorded during extensive targeted searches however known to occur within Weeping Myall Woodlands.**	**Yes – AoS undertaken**
Spiny peppercress *Lepidium aschersonii* V EPBC	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.	Marginal	Unlikely – Unlikely to occur on site following extensive targeted searches. No known records within the study locality.	No – Unlikely to occur on site.
Slender Darling Pea *Swainsona murrayana* V EPBC	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.	Marginal	Unlikely – Marginal habitat present which is generally highly disturbed. Was not recorded during previous surveys undertaken by Umwelt (2017). Minimal (2) known records within the study locality.	No – Unlikely to occur on site.
Winged Peppercress *Lepidium monoplocoides* E EPBC	Occurs on seasonally moist to waterlogged sites, on heavy fertile soils. Predominant vegetation is usually an open woodland dominated by Buloke Allocasuarina luehmannii and/or eucalypts, particularly Black Box Eucalyptus largiflorens or Poplar Box Eucalyptus populnea, surrounded by tussock grasses.	**Present**	**Possible – not surveyed**	**Yes - AoS undertaken.**

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Birds				
Regent Honeyeater *Anthochaera Phrygia* CE EPBC	The species inhabits dry open forest and woodland, particularly Box-Ironbark woodland, and riparian forests of River Sheoak. Regent Honeyeaters inhabit woodlands that support a significantly high abundance and species richness of bird species. These woodlands have significantly large numbers of mature trees, high canopy cover and abundance of mistletoes.	Absent	Unlikely - Outside mapped important areas (OEH). Not detected during surveys	No – Unlikely to occur on site.
Australasian Bittern *Botaurus poiciloptilus* E EPBC	Favours permanent freshwater wetlands with tall, dense vegetation, particularly bullrushes (*Typha* spp.) and spikerushes (*Eleocharis* spp.).	Absent	Unlikely - Unlikely to occur on site following extensive targeted searches. No known records within the study locality.	No – Unlikely to occur on site.
South-eastern Glossy Black-Cockatoo *Calyptorhynchus lathami lathami* V – EPBC	Inhabits open forest and woodland where stands of Sheoak occur. Feeds almost exclusively on the seeds of serval species of she-oak (Casuarina and Allocasurina species). Dependent on large hollow-bearing eucalypts for nest sites. greater than 15 cm diameter and greater than 2 m above ground.	Marginal – Casuarina	Unlikely – Not detected during targeted surveys. No evidence of foraging. Foraging tree species limited within the study area.	No – Unlikely to occur on site.
Grey Falcon *Falco hypoleucos* V EPBC	Favours timbered lowland plains, particularly acacia shrublands with water courses. Hunts in treeless areas and frequents tussock grassland and open woodland, especially in winter. Eggs are laid in the old nests of other birds, particularly raptors or corvids, usually in the tallest trees along watercourses, particularly River Red Gum *Eucalyptus camaldulensis* and Coolibah *E. coolabah.*	**Present**	**Possible**	**Yes – AoS undertaken**

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Squatter Pigeon (southern subspecies) *Geophaps scripta* V EPBC	Grassy woodlands and plains, preferring sandy areas and usually close to water.	Marginal	Unlikely - Unlikely to occur on site following extensive targeted searches. No known records within the study locality.	No – Unlikely to occur on site.
Painted Honeyeater *Grantiella picta* V EPBC	Inhabits Boree/ Weeping Myall (Acacia pendula), Brigalow (A. harpophylla) and Box-Gum Woodlands and Box-Ironbark Forests.	**Present**	**Possible – Not recorded during extensive targeted searches however known to occur within Weeping Myall Woodlands.**	**Yes – AoS undertaken**
Superb Parrot *Polytelis swainsonii* V EPBC	Hollow-bearing trees, living or dead E. *blakelyi, E. melliodora, E. albens, E camaldulensis, E microcarpa, E. polyanthemos, E mannifera, E. intertexta* with hollows greater than 5cm in diameter, greater than 4m above ground or trees with a DBH of greater than 30cm.	**Present**	**Possible – not surveyed**	**Yes – AoS undertaken.**
White-bellied sea eagle *Haliaeetus leucogaster* M EPBC	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions of mainland Australia and its offshore islands. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). Birds have been recorded in (or flying over) a variety of terrestrial habitats.	Marginal Key habitat characteristics not present	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Mammals				
Large-eared Pied Bat *Chalinolobus dwyeri* V EPBC	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. Females have been recorded raising young in maternity roosts (c. 20-40 females) from November through to January in roof domes in sandstone caves and overhangs. They remain loyal to the same cave over many years.	Marginal – Foraging only	Unlikely – Not recorded during surveys. The closest record of the species occurs approximately 30 km to the east of the Subject land near Narrabri within Mount Kaputar National Park (OEH 2016)	No – Unlikely to occur on site.
Spotted-tailed Quoll *Dasyurus maculatus* E EPBC	Recorded across a range of habitat types, including rainforest, open forest, woodland, coastal heath and inland riparian forest. They use hollow-bearing trees, fallen logs, other animal burrows, small caves and rock outcrops as den sites. Use communal 'latrine sites', often on flat rocks among boulder fields, rocky cliff-faces or along rocky stream beds or banks. Quolls have home ranges of between 200 to 4000 hectares, and often traverse their home ranges along densely vegetated creeklines.	Marginal – Foraging only	Unlikely – Not recorded during surveys and subject land does not contain preferred hatbiat, particularly rocky outcrops and boulder fields.	No – unlikely to occur on site.
Corben's Long-eared Bat *Nyctophilus corbeni* V EPBC	Variety of vegetation types, most commonly lower slopes and ridges containing Mallee, Bulloke, pine and Box-dominated communities, but are most common in vegetation which has a distinct canopy and dense understorey. They roost in tree hollows, crevices, and under loose bark.	**Present**	**Possible – Not recorded during surveys but some roosting habitat is present on site**	**Yes – AoS undertaken.**

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Koala *Phascolarctos cinereus* E EPBC	Range of eucalypt forest and woodland communities, including coastal forests, the woodlands of the tablelands and western slopes, and the riparian communities of the western plains.	**Present**	**Recorded during surveys along both the Mehi and Gwydir Rivers.**	**Yes – AoS undertaken**
Grey-headed flying-fox *Pteropus poliocephalus* V EPBC	Range of vegetation communities including rainforest, open forest, and closed and open woodland. Roost sites usually near water, including lakes, rivers, and coastlines.	**Present - The nearest known roost camp site of the Grey-headed** **flying-fox to the subject land is at** **Mt Russel, near Inverell, as well as Narrabri.** **However, may co-occur in small numbers near the observed Little Red Flying Camp along the Mehi River (National Flying-fox monitoring viewer)**	**Recorded foraging during surveys along the Mehi River.**	**Yes – AoS undertaken**

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Fish				
Murray Cod *Maccullochella peelii* V EPBC	Occurs naturally in the waterways of the Murray–Darling Basin in a wide range of warm water habitats that range from clear, rocky streams to slow flowing turbid rivers and billabongs.	**Present**	**Occur in both the Mehi and Gwydir River systems – detected in targeted surveys.**	**Yes – AoS undertaken**
Reptiles				
Five-clawed Worm-skink, Long-legged Worm-skink *Anomalopus mackayi* V EPBC	Occurs in grasslands and grassy, open woodlands on heavy black and grey, alluvial cracking clay soils. The species has been recorded in grasslands dominated by Mitchell Grass (*Astrebla* spp.), River Red Gum (*Eucalyptus camaldulensis*) - Coolibah (*E. coolabah* subsp*. coolabah*) - Bimble/Poplar Box (*E. populnea* subsp. *bimbil*) - Weeping Myall (*Acacia pendula*) grassy woodlands to open forests with grasses typically of the genera *Austrodanthonia*, *Austrostipa*, *Bothriochloa*, *Chloris*, *Enteropogon* and *Themeda.*	**Present**	**Possible – Not recorded during extensive targeted searches however known to occur within Weeping Myall Woodlands and natural grasslands**	**Yes – AoS undertaken**
Migratory Wetland Species				
Sharp Tailed Sandpiper *Calidris acuminata* M EPBC	Prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, saltmarsh or other low vegetation. This includes lagoons, swamps, lakes and pools near the coast, and dams, waterholes, soaks, bore drains and bore swamps, saltpans and hypersaline saltlakes inland. They use flooded paddocks, sedgelands and other ephemeral wetlands, but leave when they dry.	Absent	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Common Sandpiper *Actitis hypoleucos* M EPBC	This migratory wetland species is found along all Australian coastlines and many inland areas. They are active birds that will pursue invertebrates over rocks. Breeding habitat is mainly in Europe.	Absent	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.
Curlew Sandpiper *Calidris ferruginea* M EPBC CE EPBC	Mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand. They occur in both fresh and brackish waters. Occasionally they are recorded around floodwaters.	Marginal	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.
Pectoral Sandpiper *Calidris melanotos* M EPBC	Prefers shallow fresh to saline wetlands. The population is generally widespread but scattered in NSW. Breeding occurs in Russia and North America.	Absent	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.
Latham's Snipe, Japanese Snipe *Gallinago hardwickii* M EPBC	This migratory wetland species is a non-breeding visitor to much of eastern Australia. Distribution is naturally fragmented as preferred habitat including freshwater wetlands occur in patches.	Marginal	Unlikely	No – Unlikely to occur on site.
Australian Painted Snipe *Rostratula australis* E EPBC	Prefers fringes of swamps, dams and nearby marshy areas where there is a cover of grasses, lignum, low scrub or open timber.	Absent	Unlikely - Unlikely to occur on site following extensive targeted searches. No known records within the study locality.	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Yellow Wagtail *Motacilla flava* M EPBC	Non-breeding habitat only: mostly well-watered open grasslands and the fringes of wetlands. Roosts in mangroves and other dense vegetation.	Marginal	Unlikely	No – Unlikely to occur on site.
Little Curlew *Numenius minutus* M EPBC	The Little Curlew is most often found feeding in short, dry grassland and sedgeland, including dry floodplains and blacksoil plains, which have scattered, shallow freshwater pools or areas seasonally inundated. Open woodlands with a grassy or burnt understorey, dry saltmarshes, coastal swamps, mudflats or sandflats of estuaries or beaches on sheltered coasts, mown lawns, gardens, recreational areas, ovals, racecourses and verges of roads and airstrips are also used. Generally, foraging is in relatively short grass (around 20 cm tall) as the birds avoid dense tall grasses. Foraging sites are usually within 5 km of daytime roosting sites, as birds move between grassland and wetland, most feeding in drier grassland occurring during the first few hours after dawn and the late afternoon. The Little Curlew is known to fly up to 10 km for available water then return to feeding grounds; therefore the availability of drinking water is an important habitat requirement. Habitat requirements in the Huang He (Yellow River) Nature Reserve are similar to those in Australia (Barter et al. 1999).	Marginal	Unlikely – Not recorded during surveys	No – Unlikely to occur on site.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
	When resting during the heat of day, the Little Curlew congregates around pools, river beds and water-filled tidal channels, and shallow water at edges of billabongs. The species prefers pools with bare dry mud (including mudbanks in shallow water) and they do not use pools if they are totally dry, flooded or heavily vegetated. Birds may also rest in grassy, open woodlands and on bare blacksoil plains, or on dry or recently burnt grasslands on floodplains, which may be without vegetation for hundreds of metres, and occasionally on mudflats when nearby grasslands are unburnt, or around swamps. Resting has also been recorded under partly submerged vegetation. After freshwater pools dry up, roosting may occur in the shallows of reservoirs and the sea.			
Migratory Terrestrial Species				
Fork-tailed Swift *Apus pacificus* M EPBC	Non-breeding habitat only: Found across a range of habitats, from inland open plains to wooded areas, where it is exclusively aerial.	Marginal	Possible– Not recorded during surveys but may occur foraging under optimal conditions	No – Unlikely to be impacted, unlikely to be reliant on habitat within development footprint, aerial forager.
White-throated Needletail *Hirundapus caudacutus* M EPBC V EPBC	Recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. They also commonly occur over heathland but less often over treeless areas, such as grassland or swamps	Marginal	Possible– Not recorded during surveys but may occur foraging under optimal conditions	No – Unlikely to be impacted, unlikely to be reliant on habitat within development footprint, aerial forager.

Species	Description of habitat[1]	Presence of habitat	Likelihood of occurrence	Possible impact?
Satin Flycatcher *Myiagra cyanoleuca* M EPBC	This migratory terrestrial species is found in Australia, Indonesia and Papua New Guinea. The species inhabits moist lowland forests and tropical forests over the eastern half of NSW.	**Present**	**Recorded along Gwydir River**	**Yes – AoS undertaken**

E EPBC = listed as Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

V EPBC = listed as Vulnerable under the Commonwealth Environment Protection & Biodiversity Conservation Act 1999.

M EPBC = listed as Migratory under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CE EPBC = listed as Critically Endangered under the Commonwealth *Environment Protection & Biodiversity Conservation Act 1999.*

CAMBA = Chinese-Australia Migratory Bird Agreement

JAMBA = Japan-Australia Migratory Bird Agreement

ROKAMBA = Republic of Korea–Australia Migratory Bird Agreement

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Biodiversity development assessment report

Appendix H EPBC Act assessment of significant impact

NARRABRI TO NORTH STAR—PHASE 2 ENVIRONMENTAL IMPACT STATEMENT

Appendix H EPBC Act assessment of significant impact

The *Environment Protection and Biodiversity Conservation Act 1999* specifies factors to be taken into account in deciding whether a development is likely to significantly affect Threatened Ecological Communities, threatened species and migratory species, listed at the Commonwealth level. The following assessment assesses the significance of the likely impacts associated with the proposed works on:

Threatened species:

- Belson's panic *Homopholis belsonii*– Vulnerable
- Painted Honeyeater *Grantiella picta*– Vulnerable
- Koala *Phascolarctos cinereus* – Vulnerable
- Grey Falcon *Falco hypoleucos* – Vulnerable
- Grey-headed flying-fox *Pteropus poliocephalus* – Vulnerable
- Murray Cod *Maccullochella peelii* Murray Cod – Vulnerable
- Five-clawed Worm-skink *Anomalopus mackayi* – Vulnerable
- Superb Parrot *Polytelis swainsonii*
- Corben's Long-Eared Bat - *Nyctophilus corbeni*
- Winged Peppercress – *Lepidium monoplocoides*

Threatened ecological communities:

- Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland (Critically Endangered)
- Poplar Box Grassy Woodland on Alluvial Plains (Endangered)
- Weeping Myall Woodlands (Endangered)

Migratory Species:

- Satin Flycatcher *Myiagra cyanoleuca*

Different significant impact criteria apply depending on the level at which a species or community is listed (i.e., vulnerable, endangered, critically endangered etc.). The appropriate criteria have been applied to the entities listed above.

In the context of the assessments below, 'the action' refers to 'the proposal' as described in Section 1.1.

H.1 Significant impact criteria

An action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of a population*
- *reduce the area of occupancy of the species*
- *fragment an existing population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of a population*
- *modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*
- *introduce disease that may cause the species to decline, or*
- *interfere with the recovery of the species.*

A 'population of a species' is defined under the EPBC Act as an occurrence of the species in a particular area. In relation to critically endangered, endangered or vulnerable threatened species, occurrences include but are not limited to:

- *a geographically distinct regional population, or collection of local populations, or*
- *a population, or collection of local populations, that occurs within a particular bioregion.*

An action is likely to have a significant impact on a vulnerable species if there is a real chance or possibility that it will:

- *lead to a long-term decrease in the size of an important population of a species*
- *reduce the area of occupancy of an important population*
- *fragment an existing important population into two or more populations*
- *adversely affect habitat critical to the survival of a species*
- *disrupt the breeding cycle of an important population*
- *modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*
- *result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*
- *introduce disease that may cause the species to decline, or*
- *interfere substantially with the recovery of the species.*

Each of these criteria are addressed below. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

H.2 Belson's Panic

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**
This species occurs on the northwest slopes and plains of NSW, mostly between Wee Waa, Goondiwindi and Glen Innes. It also occurs in Queensland predominately in the Brigalow Belt South bioregion. Two priority management sites exist at Kirramingly Nature reserve NSW and Gurley Road NSW, both approximately 50 km south of the proposed subject land. Targeted surveys revealed no sightings of this species, however, surveys for these species were undertaken during non-optimal seasonal conditions (i.e., drought) that may have suppressed seasonal growth or limited population size if present, making detection more difficult. Known records south of the subject land near Gurley were identifiable at the time. Therefore, a precautionary approach has been implemented during the assessment. The proposed works would result in the loss or disturbance to 2.43 ha of optimal habitat and 4.72 ha of suboptimal habitat out of a total 17.31 ha of potential habitat within the subject land. An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. There are a few known populations of this species to the north and south of the subject land, and although the subject land is located towards to western end of its distribution, and although unlikely, if a population was to be present, it is unlikely to be considered an important population necessary for the long-term survival and recovery of this species or impede the ability of other populations to interact for dispersal and genetic viability or diversity. Better quality areas and less disturbed areas of habitat within the subject land would remain and any proposed actions, in conjunction with stringent mitigation measures would unlikely lead to a long-term decrease in the size of any important populations of this species if present.
b) **Will the action reduce the area of occupancy of an important population of a species?**
It is not considered that an important population, or part thereof, is present within the subject land. Therefore, the action would not decrease the area of occupancy of an important population. Potential habitat for the species within the study area would be reduced by 14%.
c) **Will the action fragment an existing important population into two or more populations?**
It is not considered that an important population, or part thereof, is present within the subject land. Proposed actions will disturb a portion of potential habitat on one side of the existing rail alignment.
d) **Will the action adversely affect habitat critical to the survival of a species?**
The is currently no register of critical habitat for the species. The potential habitat within the 2.43 ha area of optimal habitat to be disturbed is not unique to this location and is not considered critical to the survival of this species.
e) **Will the action disrupt the breeding cycle of an important population?**
The species was not recorded within the subject land. Any population of the species occurring within the subject land is not considered to constitute an important population, therefore the proposal is not considered likely to disrupt the breeding cycle of 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 action will disturb the availability of optimal habitat by 2.43 ha and a further 4.72 ha of sub optimal habitat. This degree of habitat modification is not considered likely to occur to the extent 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 proposed action has the potential to contribute to the spread of invasive species in the subject land through the transfer and introduction of plant material and soil on machinery. Any removal of native plant species also presents opportunities for invasive species to establish where ground cover is exposed. The implementation of a weed management plan will assist to prevent and control these impacts. With the appropriate use of a weed management plan, the proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the subject land.
h) **Will the action introduce disease that may cause the species to decline?**
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
No national recovery plan for this species exists, however, a NSW state plan exists under the Saving our Species program. This plan involves management of the species at two established management sites and any proposed actions in this development will not interfere with that recovery plan.
Conclusion
Belson's Panic was not recorded within the subject land during targeted surveys. Nevertheless, habitat for the species is considered present, 2.43 ha of optimal habitat and 4.72 ha of suboptimal habitat which would be disturbed/removed by the proposed action. Given an important population was not recorded, with the application of standard mitigation measures, the potential impact to Benson's Panic is considered negligible.

H.3 Painted Honeyeater

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**
This species is sparsely distributed from south-eastern Australia to north-western Queensland and eastern northern territory. During targeted surveys, no Painted Honeyeaters were observed. The species is considered to constitute a single nomadic population, and as such an important population is considered present. The proposal would result in the loss of 2.43 ha of optimal habitat and 4.72 ha of suboptimal habitat. Weeping Myall Woodland, which is recognised as habitat for this species. Weeping Myall provides foraging and nesting habitat, however, the condition of the Weeping Myall woodland to be removed is in sub-optimal due to past modification, fragmentation and overall lack of mistletoe resources. There is a total of 17.31 ha of Weeping Myall Woodland within the subject land, and 14% of optimal habitat would be removed (2.43 ha). The majority of potential habitat present, including better condition areas inclusive of Weeping Myall individuals and *Amyema* sp. would remain. A population of the species that may utilise the subject land on a transient basis is considered unlikely to be subject to a long-term decline resulting from the proposed clearing of habitat.
b) **Will the action reduce the area of occupancy of an important population of a species?**
The remaining Weeping Myall Woodland in the subject land will continue to provide moderate quality habitat for this species However, it is likely that the proposal would marginally reduce the area of occupancy of an important population

c) **Will the action fragment an existing important population into two or more populations?**
Additionally, this species is a nomadic and highly mobile species that follows flowering resources over a large range and based on this behaviour across already highly fragmented and open landscapes, the proposal would unlikely exacerbate fragmentation of any populations if one was to occur. The proposal would marginally increase fragmentation of existing important population, however not to the extent that it would be fragmented into two or more populations.
d) **Will the action adversely affect habitat critical to the survival of a species?**
Weeping Myall is an important habitat for the survival of this species, however, the patch within the subject land is considered unlikely to be critical to the survival of the species. Furthermore, as only a small portion, which is of sub-optimal quality, would be removed and areas of greater importance, such as individual Weeping Myall and *Amyema* Sp. would be retained. Therefore, the proposed action is considered unlikely to adversely affect habitat critical to the survival of the species.
e) **Will the action disrupt the breeding cycle of an important population?**
The species was not recorded within the subject land. Though the population of the species occurring within the subject land is considered to constitute an important single population, given the small area of the proposal, the proposal is not considered likely to disrupt the breeding cycle of 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?**
It is not likely that the removal or disturbance of 2.43 ha of vegetation will contribute or lead to the decline of the species, as surrounding suitable habitat of marginally higher quality would not be impacted.
g) **Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?**
Mitigation measures have been recommended to ensure that the proposal would not result in the introduction or spread of any invasive species. A weed management plan would be prepared prior to any works taking place.
h) **Will the action introduce disease that may cause the species to decline?**
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
A recovery plan exists for this species under the Saving Our Species program in NSW, however, no nationally coordinated plan exists. The actions in the NSW recovery plan focuses on: protecting, maintaining and planting important vegetation species such as Weeping Myall *Acacia pendula* which is a key species in the Weeping Myall Woodland EEC; encouraging landholders to protect vegetation through sensitive grazing practices; removing weeds; conducting further research into the species and the species' threats. As some Weeping Myall individuals may require removal, this contravenes the NSW recovery objective to protect and maintain *Acacia pendula*. It is also possible, however highly unlikely, that the increase movement if trains upon operation of the rail upgrade could result in train strike. However, it is unlikely that this interference would have a significant impact on the Painted Honeyeater as the portion of vegetation to be disturbed or removed is not high quality and of lower importance to the local recovery of the species with better quality habitat retained.

Conclusion
Due to the remaining vegetation habitat and the condition of the habitat to be disturbed, the proposal is not considered likely to adversely affect habitat which is critical to the ongoing survival of this species. The proposal are unlikely to influence any new establishment of invasive species or diseases that would cause the species to decline. A significant impact to the Painted Honeyeater is considered unlikely as a result of the proposal.

H.4 Koala

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**
An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range. A Koala habitat assessment toll was utilised and determined a score of 9 and, as such, habitat within the subject land is considered critical to the survival of the Koala. Distribution of this species ranges from north eastern Queensland to the south east corner of South Australia. Targeted surveys revealed both sightings and scat present throughout potential habitat areas. Within the subject land, there is 67.99 ha of potential habitat for this species. The individual(s) whose territory overlaps with the habitat present within the subject land are likely to be members of a population whose range may be far ranging given the generally cleared nature of the surrounding landscape. The nearest reserved land is Midkin Nature Reserve, over 13 km to the north-east of the subject land. This suggests that the population is likely to be small commensurate to available resources. Prior to the 2019/2020 bushfire season, this population was unlikely to be considered an important population, however, as the impacts of the fire season to Koala numbers and distribution across NSW are yet to be accurately quantified, on a precautionary basis, an important population is considered to be present. Within the subject land, there is 67.99 ha of potential habitat for this species of which 14.8 ha of this area will be disturbed as a result of these proposed actions, or a total of 22% of the total potential habitat. It is unclear if the proposed actions will lead to a long-term decrease in the size of a potential important population of this species, however disturbance of 22% of potential habitat is substantial and referral to the department is recommended.
b) **Will the action reduce the area of occupancy of an important population of a species?**
The proposed actions will disturb or remove 22% of potential habitat for this species within the subject land. It is possible that this would reduce the area of occupancy of an important population of this species.
c) **Will the action fragment an existing important population into two or more populations?**
Koala habitat in the subject land is already separated by the existing rail corridor. Proposed actions to relocate the rail alignment do not separate any whole patches of potential habitat. Dependant on the proposed actions, if habitat is to be cleared away from each side of the rail alignment this could pose further disturbance and solidify fragmentation of habitats. Although connection will be maintained via the Mehi and Gwydir rivers, it is unlikely the proposed actions will fragment an existing important population into two or more populations.

d) **Will the action adversely affect habitat critical to the survival of a species?**
The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) focus on the impacts of proposals to habitat critical to the survival of the koala present and future. Table 4 of the guidelines provide a habitat assessment tool that allows for a flowchart to be followed in determining whether the habitat proposed to be impacted should be considered critical habitat. In the case of the proposal, the habitat to be impacted generated a score of nine (9) and is therefore considered critical habitat. 14.8 ha of critical habitat would be adversely affected, indicating that a referral is recommended.
e) **Will the action disrupt the breeding cycle of an important population?**
Females breed in high quality habitat with dense resource species. The subject land supports koala food trees and has the possibility to support some breeding behaviour, however, it does not contain the highest quality habitat within the connective landscape. It is unlikely that this is a key breeding area for this species and therefore is unlikely to disrupt the breeding cycle of 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 proposed action has the possibility to disturb or remove 22% of the current existing potential Koala habitat within the subject land. This has the potential to reduce the carrying capacity of the population present. Connectivity will be maintained allowing movement to be maintained within quality areas of habitat within the broader landscape.
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 considered unlikely to generate an increase in invasive species harmful to the species, such as foxes, wild dogs, above what is currently present. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the subject land.
h) **Will the action introduce disease that may cause the species to decline?**
It is unlikely that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. It is however possible that construction and disturbance to Koalas present within the study area may occur stress resulting from the proposal which may exacerbate disease that may be already present within the population. However, with the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
The EPBC Act referral guidelines for the vulnerable koala (DoE, 2014) list several potential impacts that could interfere substantially with the recovery of the species, including: • Increasing koala fatalities in habitat critical to the survival of the koala due to dog attacks to a level that is likely to result in multiple, ongoing mortalities. • Increasing koala fatalities in habitat critical to the survival of the koala due to vehicle-strikes to a level that is likely to result in multiple, ongoing mortalities. • Facilitating the introduction or spread of disease or pathogens for example *Chlamydia* or *Phytophthora cinnamomi*, to habitat critical to the survival of the koala, that are likely to significantly reduce the reproductive output of koalas or reduce the carrying capacity of the habitat. • Creating a barrier to movement to, between or within habitat critical to the survival of the koala that is likely to result in a long-term reduction in genetic fitness or access to habitat critical to the survival of the koala. • Changing hydrology which degrades habitat critical to the survival of the koala to the extent that the carrying capacity of the habitat is reduced in the long-term.

As mentioned, the habitat to be removed may constitute critical habitat for Koala. Direct mortality of individuals from actions such as vehicle strike and disruption of breeding is considered unlikely as such impacts can be reliably mitigated. However, although mitigation is recommended and would be implemented, an increased risk of train strike due to higher numbers and increased length of trains utilising the rail network in this region will increase the risk of train strike above what is currently present. Exclusion fencing would be erected within areas considered critical to the movement of Koalas with alternative measures implemented within these areas such as fauna passage under the rail line, maintaining connectivity. A barrier to movement would therefore not be exacerbated. Implementing hygiene protocols for plant and equipment, and through ensuring that hydrological regimes remain unaltered as far as is practical would protect remaining adjacent vegetation

There is no national recovery plan for this species. A NSW state plan exists under the Saving our Species Program. The objectives of this program include aiming to secure the species in the wild in NSW for 100 years, engaging local communities in its conservation and encourage the NSW community to identify with it as a flagship for threatened species conservation. The proposed actions may interfere with securing this species in the wild.

Conclusion

Disturbance or removal of 22% of potential Koala habitat in the subject land has the possibility to impact an important population of this species. Given that this habitat has been assessed as constituting habitat critical to Koala this suggests a significant impact is possible.

H.5 Grey Falcon

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**

The Grey Falcon is sparsely distributed in NSW, chiefly throughout the Murray-Darling Basin, with the occasional vagrant east of the Great Dividing Range. The breeding range has contracted since the 1950s with most breeding now confined to arid parts of the range. There are possibly less than 5000 individuals left (OEH, 2017). No targeted surveys were undertaken during fieldwork, however, multiple days of fieldwork spanning over several weeks revealed no sightings of this species. Known records occur to the north-west of the subject land within the Gwydir Wetlands State Conservation Area (~50km from Subject Land) and to the east of the township of Mungindi (~95km from Subject Land), however both records were recorded in 1990 and 2005, respectively, with no recent records within the area. Therefore, a precautionary approach has been implemented during the assessment. The proposed works would result in the loss or disturbance to 60.44 ha of optimal habitat, such as areas containing potential breeding trees out of a total 270 ha of potential, associated habitat for this species within the subject land.

An ‘important population’ is a population that is necessary for a species’ long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

This species is known to occur in low densities in semi-arid and arid areas of Australia. The subject land is located towards the eastern limit of its distribution, and although unlikely, if a population was to be present, it is unlikely to be considered an important population necessary for the long-term survival and recovery of this species or impede the ability of other populations to interact for dispersal and genetic viability or diversity. Better quality areas and less disturbed areas of habitat within the subject land would remain and any proposed actions, in conjunction with stringent mitigation measures would unlikely lead to a long-term decrease in the size of any important populations of this species if present.

b) **Will the action reduce the area of occupancy of an important population of a species?**
It is not considered that an important population, or part thereof, is present within the subject land. Therefore, the action would not decrease the area of occupancy of an important population.
c) **Will the action fragment an existing important population into two or more populations?**
It is not considered that an important population, or part thereof, is present within the subject land. Proposed actions will disturb a portion of potential habitat on one side of the existing rail alignment, however the actions would not impede movement of the Grey Falcon and the proposal would not fragment an important population.
d) **Will the action adversely affect habitat critical to the survival of a species?**
The is currently no register of critical habitat for the species. The potential habitat within the area of optimal habitat to be disturbed is not unique to this location and is not considered critical to the survival of this species.
e) **Will the action disrupt the breeding cycle of an important population?**
The species was not recorded within the subject land. Any population of the species occurring within the subject land is not considered to constitute an important population, therefore the proposal is not considered likely to disrupt the breeding cycle of 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 action will disturb the availability of optimal habitat by an extremely small portion. This degree of habitat modification is not considered likely to occur to the extent 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 proposed action has the potential to contribute to the spread of invasive weed species in the subject land through the transfer and introduction of plant material and soil on machinery. Any removal of native plant species also presents opportunities for invasive species to establish where ground cover is exposed. The implementation of a weed management plan will assist to prevent and control these impacts. With the appropriate use of a weed management plan, the proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the subject land. The proposal is considered unlikely to generate an increase in invasive fauna species harmful to the species, such as feral cats, above what is currently present. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the subject land.

h) **Will the action introduce disease that may cause the species to decline?**
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
No national recovery plan for this species exists, however, a NSW state plan exists under the Saving our Species program. This species has been identified as a data-deficient species with no Priority Management Areas identified as of yet.
Conclusion
The Grey Falcon was not recorded within the subject land during fieldwork. Nevertheless, habitat for the species is considered present which would be disturbed/removed by the proposed action. Given that important populations were not reconsidered to occur, with the application of standard mitigation measures, the potential impact to the Grey Falcon is considered negligible.

H.6 Grey-headed flying-fox

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**
There is a total area of 67.99 ha of potential flying-fox habitat in the subject land. The proposal would remove 2.24 ha potential optimal roosting habitat (on the Mehi and Gwydir Rivers) and 12.56 ha of marginal (Mehi Billabong and floodplain) Grey-headed Flying-fox roosting habitat within the subject land. Targeted surveys observed large numbers of Little Red Flying-foxes and occasional Grey-headed flying-foxes foraging within the subject land and roosting approximately 500 m northwest of the subject land. This camp is not known to be an important breeding site for these species, however it may be considered an important population in future as there are few NSW BioNet records of the species west of Moree, suggesting this camp is nearly the westerly limit of the species' range. This site would not be directly impacted. Therefore, impacts to the species are limited to removal of potential foraging habitat and impact to a potential future roost site. Despite the degree of habitat removal proposed, it is unlikely to lead to a long-term decrease in the population of this species given its high mobility
b) **Will the action reduce the area of occupancy of an important population of a species?**
Grey-headed Flying-fox do not occupy any area within the subject land for breeding and use is limited to temporary roosting and foraging within the subject land and broader landscape. Therefore, the proposed actions will reduce the area of occupancy for roosting and foraging and will result in a reduction of foraging resources however is considered negligible in the broader landscape.
c) **Will the action fragment an existing important population into two or more populations?**
This species does not have any breeding or roosting camps within the subject land, and so it is not possible that the proposed actions will cause any existing important populations to fragment into two or more populations.

d) **Will the action adversely affect habitat critical to the survival of a species?**
This species does not have defined critical habitat and utilises a broad range of resources following blossoming events. Further, the potential habitat to be removed is of poor -moderate quality and is of minimal use to this species. It is more reasonable that this species would utilise resources in other areas of the subject land which is not being removed, and habitat available within the populations' range. It is unlikely that the proposed actions will adversely affect habitat critical to species survival.
e) **Will the action disrupt the breeding cycle of an important population?**
Roosting sites or breeding camps for populations in this location are not within the subject land and proposed actions are unlikely to disrupt the breeding cycle of important populations.
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 potential habitat to be removed is of poor-moderate quality and most likely contributes little to the longevity of this species. As a large portion of the potential habitat to be removed is currently of sub optimal quality, it is most likely inconsequential to the decline of this species. It is unlikely that the proposed actions will alter the existing habitat to the extent which this species declines. Habitat for the species will be retained within the higher quality portion of foraging habitat within the proposal site.
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 considered unlikely to generate an increase in invasive species harmful to the species. The proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the proposal site.
h) **Will the action introduce disease that may cause the species to decline?**
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
The national recovery plan for this species lists the following objectives • Recovery objective 1: Identify, protect and enhance native foraging habitat critical to the survival of the Grey-headed Flying-fox. • Recovery objective 2: Identify, protect and enhance roosting habitat of Grey-headed Flying-fox camps. • Recovery objective 3: Determine population trends in Grey-headed Flying-foxes so as to monitor the species' national distribution and conservation status. • Recovery objective 4: Build community capacity to coexist with flying-foxes and minimise the impacts on urban settlements from existing camps without resorting to dispersal. • Recovery objective 5: Increase public awareness and understanding of Grey-headed Flying-foxes and the recovery program, and involve the community in the recovery program where appropriate. • Recovery objective 6: Improve the management of Grey-headed Flying-fox camps in sensitive areas. • Recovery objective 7: Significantly reduce levels of deliberate Grey-headed Flying-fox destruction associated with commercial horticulture. • Recovery objective 8: Support research activities that will improve the conservation status and management of Grey-headed Flying-foxes.

Whilst the recovery plan states protection of native foraging habitat, the habitat for disturbance or removal in the subject land is not only a small area but is also sub-optimal, therefore it is not considered critical habitat. The proposal do not substantially interfere with the recovery plan.

Conclusion

The habitat to be removed as part of this proposal is not of critical importance to the Grey-headed Flying-fox. Generally, although vegetation may be used for seasonal foraging, roosting sites or breeding camp would be directly impacted. Likelihood of a roosting site or breeding camp being established within the subject land is unlikely and increases in likelihood further away from the existing rail and highway. The proposed action is not considered likely to have a significant impact.

H.7 Murray Cod

a) **Will the action lead to a long-term decrease in the size of an important population of a species?**

In NSW, the Gwydir River is identified as a key asset site for the Murray Cod and the Gwydir River population. The Gwydir River population is noted as an important population in the National Recovery Plan for the Murray Cod. The Murray Cod is more commonly recorded in the Mehi River and may occur in class 1 key fish habitats in the Mehi and Gwydir Rivers. Targeted survey efforts detected Murray Cod within the subject land. Disruption of habitat as a result of the proposed actions would be limited to a small area associated with locations where the rail alignment crosses these rivers, replacement of bridges and also limited to the construction phase of the proposal. The total area of aquatic habitat within the subject land is 7.1 ha, and the area which will be temporarily disturbed covers 0.8 to 1 ha.

The Mehi and Gwydir Rivers are generally turbid, deep, wide and slow moving where the proposal site intersects these rivers. The proposal such as bridge replacement would impact upon small areas of habitat and would require some disturbance of instream habitats, riparian vegetation and water quality to a restricted area of habitat however would be temporary with stringent mitigation measures implemented. No blockage of fish passage would occur. The proposal are not anticipated to modify the river flow.

It is unlikely if the actions will lead to a long-term decrease in the size of the Gwydir River important population, considering the scope of works proposed and stringent mitigation measures.

b) **Will the action reduce the area of occupancy of an important population of a species?**

Disruption of habitat would be limited to a maximum 1 ha area which intersects rivers within the subject land. Where the new alignment crosses these areas via bridges, existing rail alignment and bridges already exist. Existing bridges would be dismantled and new structures put in place within the exiting footprint. Small areas of instream habitats, riparian vegetation and water quality to a restricted area of habitat would occur on a short term temporary basis however stringent mitigation measures would be implemented. No blockage of fish passage would occur. The proposal are not anticipated to modify the river flow.

c) **Will the action fragment an existing important population into two or more populations?**

The proposed actions do not block the river passage, it is unlikely that the present important populations will be fragmented into two or more populations.

d) **Will the action adversely affect habitat critical to the survival of a species?**

Present river conditions and vegetation at the bridge sites are unlikely contain any unique habitat that is not found elsewhere along the Gwydir River, and it not critical to the survival of this species generally. Therefore, it is unlikely that the development will adversely affect habitat which is critical to this species' survival.

e) **Will the action disrupt the breeding cycle of an important population?**
Murray Cod have an annual reproductive cycle with egg development through winter, spawning over 4 to 5 weeks when water temperatures are higher than 15°C. Eggs are most likely laid in a sunken log. Recruitment success is linked to higher flowing rivers. If construction involves removal of debris or materials within the river bed, it has the potential to disrupt breeding cycles. However, it should be noted that the majority of habitat within the study area is void of suitable breeding habitat as it lacks high water flow and sufficient riparian vegetation. As such, the action is considered unlikely to disrupt the breeding cycle of this 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?**
Disruption of habitat would be limited to a maximum 1 ha area which intersects rivers within the subject land. Where the new alignment crosses these areas via bridges, existing rail alignment and bridges already exist. Existing bridges would be dismantled and new structures put in place within the exiting footprint. Small areas of instream habitats, riparian vegetation and water quality to a restricted area of habitat would occur on a short term temporary basis however stringent mitigation measures would be implemented. No blockage of fish passage would occur. The proposal are not anticipated to modify the river flow.
g) **Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?**
Introduced species may compete with this species for habitat resources. It is not considered likely that any works related to the modification of bridges will influence further establishment of invasive species.
h) **Will the action introduce disease that may cause the species to decline?**
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) **Will the action interfere substantially with the recovery of the species?**
A national recovery plan exists for this species and has the following objectives: • Determine the distribution, structure and dynamics of Murray Cod populations across the MDB. • Manage river flows to enhance recruitment to Murray Cod populations. • Evaluate the risks of threats and benefits of recovery options on Murray Cod populations for each management unit. • Determine the habitat requirements of Murray Cod life stages and populations. • Manage the recreational fishery for Murray Cod in a sustainable manner while recognising the social, economic and recreational value of the fishery. • Encourage community ownership for Murray Cod conservation. • Manage Recovery Plan implementation. • The proposal does not interfere with the recovery plan for this species.
Conclusion
Due to the nature of the development and the current understanding of development actions and plans, it is unlikely that the development would significantly impact the Gwydir River population of Murray Cod.

H.8 Five-clawed Worm-skink

a) Will the action lead to a long-term decrease in the size of an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery. This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

The species' known distribution in New South Wales is confined to the Namoi River and Gwydir River floodplains and the lower north-western slopes of the Great Dividing Range. The Five-clawed Worm-skink is known to occur in both remnant and non-remnant woodlands and grasslands. In areas modified by agriculture and other human activities, the species has been found sheltering under artificial materials lying flat on the ground, such as discarded railway sleepers, sheet metal and hay bales. Potential habitat also exists outside of the subject land, and no individuals of this species were observed during targeted surveys of the subject land. Targeted surveys were extensive and involved sight surveys, fauna trapping, nocturnal spotlighting and reptile surveys involving checking under logs, rocks and other debris on the ground where the Five-clawed Skink would usually inhabit. These surveys occurred on two separate occasions approximately two months apart, where weather conditions varied vastly during this time period. No individuals were found, however, any population that may be present may be considered an important population given the species' limited range.

The proposed works would result in the linear loss of 99.7 ha of an existing 307 ha of potential habitat for this species within the subject land. However, 31 ha of the 99.7 ha to be removed is located in densely populated with Mimosa, conditions that are unlikely to be favourable to the species. It is therefore considered unlikely that the proposed works would have such an impact upon that would lead to a long-term decrease in an important population affect the ecology or biology of any residual population in the locality for this species.

b) Will the action reduce the area of occupancy of an important population of a species?

The proposal will disturb or reduce the area of available suitable habitat by 99.7 ha or by 32% within the subject land. Some (31%) of habitat to be removed is of low quality due to weed invasion and generally lacking woody debris. As such, the area of habitat to be disturbed or removed is considered unlikely to significantly reduce the area of occupancy of the species.

c) Will the action fragment an existing important population into two or more populations?

Although no individuals were detected, during to the cryptic nature of this species, an important population of the species may be present and impacted by the proposed action. Existing railway infrastructure already fragments the available habitat and may present a barrier to movement. As the species is known to be found under railway sleepers, this suggests a degree of disturbance tolerance. The proposed action is unlikely to alter the present state of fragmentation or increase a barrier to movement markedly. As such, the proposed action is considered unlikely to fragment an important population into one or more.

d) Will the action adversely affect habitat critical to the survival of a species?

Suitable habitat for this species exists outside of the proposal site, and a large area of suitable habitat will remain in the subject land (207.3 ha). The area to be removed is not considered critical for the survival of this species and is not unique to within the subject land. Therefore, it is unlikely that the proposal will adversely affect any habitat critical to the survival of this species.

e) Will the action disrupt the breeding cycle of an important population?
Due to the size of the area to be removed, the estimated low population numbers in this location and the surrounding potential habitat, it is considered unlikely that the proposed actions will disrupt the breeding cycle of an important population of this species and impede the ability of other populations to interact for dispersal and genetic viability.
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 remaining habitat and habitat outside of the subject land is considered sufficient to ensure that the linear disturbance or removal of 99.7 ha, or 32% of the current existing habitat within the subject land will not decrease the availability of habitat to the extent where 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 is considered unlikely to generate an increase in invasive species which are known to be harmful to the species. A substantial amount of weed infestation such as Mimosa currently occurs and the proposal is not considered likely to exacerbate this impact to the point that it would constitute a substantial reduction in the quality or integrity of the species habitat within the subject land.
h) Will the action introduce disease that may cause the species to decline?
There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.
i) Will the action interfere substantially with the recovery of the species?
A recovery plan exists for this species under the Saving Our Species program in NSW, however no nationally coordinated plan exists. Objectives of the NSW plan involves reoccurring surveys in sites where populations are known. The proposal will not interject with any of the management objectives of the NSW recovery plan.
Conclusion
The proposal would result in 99.7 ha of habitat being removed. Approximately 32% of this is marginal at best and is not considered critical to the continued survival of a potential important population or the species generally. Nevertheless, due to the nature of the development and the current understanding of development actions and plans, it is unclear if the development will significantly impact this species. It may be more susceptible given its limited range and likely limited dispersal capability.

H.9 Corben's Long-eared Bat

a) Will the action lead to a long-term decrease in the size of an important population of a species?
An 'important population' is a population that is necessary for a species' long-term survival and recovery.This may include populations identified as such in recovery plans, and/or that are: • key source populations either for breeding or dispersal • populations that are necessary for maintaining genetic diversity, and/or • populations that are near the limit of the species range (DoE, 2013).

Foraging habitat within the subject land associated with the Corben's Long-eared Bat (PCTs 27, 36, 56 and 78) (DPE, 2022) is present along the Gwydir River and extends for approximately 77.1 ha. As a result of the proposed actions, maximum clearing of approximately 21.8 ha will occur within associated foraging habitat. However, the species was not detected during survey effort (using ultrasonic detection (Anabat survey), thermal cameras, harp trapping and mist nets) on in December 2019 and February 2020, and areas of the Corben's Long-eared Bat's preferred habitat of mallee, Buloke (*Allocasuarina leuhmanni*), box eucalypt dominated or box/ironbark/cypress-pine vegetation communities (DPE, 2022) are not present within the subject land. In addition, the Corben's Long-eared Bat prefers large areas of vegetation and are therefore likely to have large home ranges. Only smaller patches of remnant, woody vegetation are present on the subject land.

The Corben's Long-eared Bat is distributed in south-eastern Australia around the Murray-Darling Basin. Important populations are known from the Pillaga scrub (Threatened Species Scientific Community, 2015), approximately 200 km from the subject land. It is possible that the Corben's Long-eared Bat will be using the subject land for opportunistic foraging and roosting but unlikely that the subject land supports an important population of the species as it does not contain its preferred habitat nor large intact areas of native woody vegetation. In addition, the subject land is not a key source population for breeding or dispersal, it is unlikely to be providing populations to maintain genetic diversity and the subject land does not occur near the limit of the species' range.

It is therefore unlikely that there will be a long-term decrease in the size of an important population as a result of the proposal.

b) Will the action reduce the area of occupancy of an important population of a species?

This species can be found under bark and dry fissures in branches and utilises tree hollows as maternity sites. Foraging habitat (woody vegetation) within the subject land associated with the Corben's Long-eared Bat is present along the Gwydir River and extends for approximately 77.1 ha. As a result of the proposed actions, maximum clearing of approximately 21.8 ha will occur within associated foraging habitat.

This species was not recorded during survey effort within the subject land, although, ninety-four hollow-bearing trees were recorded in the subject land and of these, thirty-five are located within or near the development footprint with the majority along riparian zones of the Mehi and Gwydir rivers. As a result, there is a possibility that hollow-bearing trees suitable for maternity sites and other woody vegetation suitable for foraging within the extent of the development footprint will be impacted and reduce the area of occupancy for nesting individuals.

Mitigation measures will be initiated during the construction phase of the development, such as fauna spotters, and these actions will potentially reduce impacts on the species. However, as described above, the subject land is unlikely to support an important population of the species and thus it is unlikely that the proposed actions will reduce the area of occupancy of any important populations.

c) Will the action fragment an existing important population into two or more populations?

Due to this species commonly having a scattered distribution and are highly mobile, and the nearest known important population in NSW is in the PIllaga scrub (Threatened Species Scientific Community, 2015), and the subject land not supporting the preferred vegetation types of the species, it is unlikely that the proposed actions will fragment an existing important population into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

'Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Such habitat may be, but is not limited to: habitat identified in a recovery plan for the species or ecological community as habitat critical for that species or ecological community; and/or habitat listed on the Register of Critical Habitat maintained by the minister under the EPBC Act.

No habitat critical to the survival of Corben's Long-eared Bat has been declared. The proposal is unlikely to significantly fragment vegetation patches of woody vegetation required by the species as it is a linear development and most of the area of impact is in PCT 52, a grassland vegetation community. However, the proposed actions will impact hollow-bearing trees and other woody vegetation that this species may utilise as maternity and roosting sites and lead to more competition for hollows with other hollow-dependent species. Mitigation measures will be in place during the construction phase of the proposal to reduce the impact to hollow-bearing trees and associated fauna. Thirty-five hollow-bearing trees in the development footprint will be impacted by the proposal, of a total of 94 hollow-bearing trees in the surrounding subject land. Other woody vegetation that may support the species will also be impacted. However, as the vegetation communities and species found within the subject land are not the preferred vegetation, it is unlikely that the proposed actions will adversely affect habitat critical to the survival of this species.

e) Will the action disrupt the breeding cycle of an important population?

The species is a nomadic species that inhabits a variety of vegetation types, including mallee, buloke (*Allocasuarina leuhmanni*) and box eucalypt dominated communities. It utilises tree-hollows as maternity sites and mating takes place in autumn with one or two young born in late spring to early summer (DPE, 2022). Studies in NSW found maternity roosting sites in ironbarks, Buloke and cypress pines ((Threatened Species Scientific Community, 2015) which are not commonly found, if at all, within the subject land. It is possible that the species will be using hollows and fissures in other woody vegetation within the subject land and disruption may occur to the breeding cycle of any Corben's Long-eared Bats using this woody vegetation. However, it is unlikely that the proposal will disrupt the breeding cycle of an important population particularly as the species was not detected during survey effort in December 2019 and February 2020, and mitigation measures will be in place to protect any resident fauna during the construction phase of the proposal. In addition, woody vegetation and hollow bearing trees are present in the subject land and beyond that will not be impacted by the proposal.

In order to avoid any potential disruption to the breeding cycle of the species, it is recommended that HBT clearing not occur in late spring or early summer. If this is unavoidable, inspection of hollows prior to removal is required and standard translocation protocols must be implemented. With the implementation of these mitigation measures, and the fact that the preferred vegetation is not present on the subject land, it is unlikely that there will be a disruption to the breeding cycle of an important population of Corben's Long-eared Bat.

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?

Up to 35 HBTs and 21.8 ha of potential foraging habitat will be removed as a result of the proposal. However, given that 59 HBTs and 77.1 ha of foraging habitat will be retained within the subject land, as well as the the linear nature of the proposal, the fact that the vegetation communities preferred by the species are not present within the subject land, and the amount of intact vegetation (particularly on riparian areas) near the subject land, mean that the proposal is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent 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 Corben's Long-eared Bat may be subject to predation by feral species, and competition for hollows by invasive species such as the common starling *Sturnus vulgaris* and the introduced honeybee *Apis mellifera*, although impacts are not well known (Threatened Species Scientific Community, 2015). It is possible that disturbance caused by the proposal will lead to localised increases in invasive fauna species, however, since the vegetation communities preferred by the species are not present within the subject land and the species was not detected during survey effort in December 2019 and February 2020, the impact of invasive species on the Corben's Long-eared Bat are likely to be limited.

h) Will the action introduce disease that may cause the species to decline?

There is a risk that the proposal may introduce diseases into the subject land via machinery, vehicles, and materials during construction and operation. However, with the effective implementation of the mitigation measures detailed in the BDAR, the risk to Corben's Long-eared Bat habitat as a result of introduced diseases are not considered significant.

i) Will the action interfere substantially with the recovery of the species?

A recovery plan exists for this species under the Saving Our Species (SoS) program in NSW (DPE, 2022a). This SoS strategy aims to manage conservation for this species primarily at the landscape scale and recognises that the occurrence of this species is aligns with the availability of hollow-bearing trees and specific vegetation communities, such as box / ironbark and cypress pine.

Actions for the species in the recovery plan include:

A Saving our Species (SoS) strategy exists for Corben's Long-eared Bat which aims to ensure that the species is secure in the wild in NSW, that its NSW geographic range is extended or maintained, and that its conservation status under the BC Act is maintained. Actions for the species include:

- Encourage land managers to enter into land management agreements that protect and restore key areas.
- Raise awareness among landholders about the importance of retaining large live and standing dead hollow-bearing trees in the landscape as habitat for the species.
- Raise awareness amongst landholders in close proximity (approximately 15km radius) to maternity or roost sites, of the potential impacts of using harmful pesticides, herbicides, and other chemicals and discourage their use in or adjacent to foraging habitat.

- Liaise with relevant authorities or land managers to ensure that the location and sensitivity of roosts/overwintering sites (such as hollow-bearing trees and under bark) and key foraging areas are known prior to any hazard reduction burns. Ensure that areas immediately surrounding maternity and roost sites are identified as an important biodiversity asset in any relevant fire planning and have a 100m buffer zone applied. Planned fires near maternity or roosting sites should not be undertaken during the breeding season, i.e., October to January, or during winter when bats are in residence. Hazard reduction burns in box/ironbark/cypress pine vegetation communities where the bats are known or suspected of using should not occur more than once every 20-50 years. Liaise with the Rural Fire Service, National Parks and Wildlife Service, or relevant land manager, to ensure that prescribed burns that may affect habitat are cool burns and/or do not kill hollow-bearing trees, or remove cohorts of smaller hollow-bearing species over large areas.
- Liaise with relevant authorities and/or land managers to ensure that the location and sensitivity of roosting and key foraging areas are known and encourage that existing lighting and noise impacting on these areas be modified and that any future lighting or noise avoid spilling onto these areas where possible.
- Raise public awareness of the damage caused to habitat by thinning, slashing, underscrubbing and inappropriate grazing, and firewood collection. Encourage land managers to retain tree density and a floristically and structurally diverse and spatially variable mid and understorey.

Insofar as the removal of up to 35 HBTs contradicts the central action of the SoS strategy, the proposal interferes substantially with recovery of the species. However, as the subject land does not contain the vegetation communities preferred by the Corben's Long-eared bat and it is not a known location for the species (DPE, 2022) it is unlikely that the proposed actions will substantially interfere with the recovery of the species.

Noise and light pollution may also be temporary impacts during construction, however, these are not considered to cause substantial interference due to their limited duration.

Conclusion

Due to the lack of vegetation communities preferred by the Corben's Long-eared Bat, lack of detection of the species during survey effort, lack of records of the species within the vicinity, the linear nature of the proposal (and thus fragmentation effects of vegetation clearing will be limited) and assuming the effective implementation of all the recommended mitigation measures in the BDAR, it is unlikely that the proposed actions will have a significant impact on the survival of the species.

H.10 Superb Parrot

a) Will the action lead to a long-term decrease in the size of an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery.This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range (DoE, 2013).

The Superb Parrot is associated with PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion and PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion in the Castlereagh-Barwon IBRA subregion.

The species is known to utilise River Red Gum (*Eucalyptus camaldulensis*) hollows for breeding which are found within the subject land. Thirty-five hollow-bearing trees will be impacted within the development footprint; 29 of which are River Red Gum.

There is a total area of 192.92 ha of potential Superb Parrot (*Polytelis swainsonii*) habitat in the subject land and the proposed actions will impact 61.92 ha of potential habitat. The core breeding areas in NSW of the Superb Parrot are found in the South West Slopes and Riverina and the species utilise the upper Namoi and Gwydir Rivers over winter (DPE, 2022b).

Mitigation measures will be initiated during the construction phase of the development, such as fauna spotters, and these actions will potentially reduce impacts on the species, however, the proposal is likely to impact critical foraging and breeding habitat for the species resulting in a long-term decrease in the size of an important population.

b) Will the action reduce the area of occupancy of an important population of a species?

One of the key attributes that classifies a population as being important and necessary for a species' long-term survival and recovery include 'key source populations either for breeding or dispersal'.

The core breeding area for this species is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this area are typically absent during the winter where they migrate north to the region of the upper Namoi and Gwydir Rivers. Birds may forage up to 10 km from nesting sites, primarily in Box-Gum grassy woodland.

As the proposed actions are likely to impact important over-wintering populations of the species along the riparian areas of the upper Gwydir River, it is likely that there will be a reduction to the area of occupancy of an important population of this species who rely on foraging habitat on the Gwydir and Namoi Rivers during the winter period.

c) Will the action fragment an existing important population into two or more populations?

The proposed actions will impact critical habitat associated with the survival of the species, predominantly the 29 hollow bearing River Red Gum within the development footprint which are important foraging and roosting trees, and suitable habitat in the Castlereagh-Barwon IBRA subregion associated with PCT 52: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion and PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion.

It is likely that the proposed actions will fragment important breeding populations that migrate to the upper part of the Gwydir River during the winter that would typically roost in this habitat within the development footprint.

d) Will the action adversely affect habitat critical to the survival of a species?

The proposed actions will affect critical habitat such as the River Red Gum which is an important foraging and roosting tree that dominates the riparian area of the Gwydir River.

The proposed actions will also clear 61.92 ha of potential Superb Parrot habitat associated with PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion and PCT 78: River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion in the Castlereagh-Barwon IBRA subregion and will remove thirty-five hollow-bearing trees in the development footprint.

Due to the impacts described above, it is likely that the actions will adversely affect habitat critical to the survival of the species.

e) Will the action disrupt the breeding cycle of an important population?

The core breeding area for this species is roughly bounded by Cowra and Yass in the east, and Grenfell, Cootamundra and Coolac in the west. Birds breeding in this area are typically absent during the winter where they migrate north to the region of the upper Namoi and Gwydir Rivers. Birds may forage up to 10 km from nesting sites, primarily in grassy box woodland.

The subject land is not within the core breeding area of the species and is thus the proposal is unlikely to disrupt the breeding cycle of an important population. However, a reduction in the potential roosting and foraging habitat that the species depends on in winter may reduce its ability to find food and shelter and thus maintain the strength necessary for reproductive fitness.

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?

Most of the subject land has been cleared of native vegetation and cultivated for agriculture, however, the riparian areas of the Mehi and Gwydir Rivers and tributaries are dominated by River Red Gum, which is an important roosting and foraging tree for this species in this area. During northwards migration in winter from its core breeding area in the South West Slopes and Riverina areas, the Superb Parrot mainly inhabits forests and woodlands dominated by eucalypts, especially River Red Gums.

As this species is likely to migrate to areas in the upper part of the Gwydir River where the new rail realignment and replacement bridges will be constructed, it is likely that the proposed actions will impact the availability or quality of habitat to the extent that the species may 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, particularly the loss of 35 hollow-bearing trees, may increase competition for remaining hollows by invasive species such as the common starling *Sturnus vulgaris* and the introduced honeybee *Apis mellifera* (Threatened Species Scientific Community, 2015). It is possible that disturbance caused by the proposal will lead to localised increases in invasive fauna species.

h) Will the action introduce disease that may cause the species to decline?

There is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. In addition, the loss of 35 hollow bearing trees, particularly 29 River Red Gums, and the resulting competition between species for hollows may weaken the species and make it more susceptible to Psittacine beak and feather disease (PBFD. This may lead to a decline in the species.

i) Will the action interfere substantially with the recovery of the species?

Currently, a NSW Recovery Plan exists for the species (DPE, 2022g). The Commonwealth's National Recovery Plan lapsed in 2021, however the key conservation focus of minimising the probability of extinction of the species in the wild, and to increase the probability of important populations becoming self-sustaining in the long term through conservation of woodland habitats and protection of hollow-bearing trees is still listed in the Commonwealth's Conservation Advice for the Superb Parrot (DoE, 2016a).

The conservation actions under the NSW Recovery Plan include:

- Retain living and dead paddock trees and plant or direct seed appropriate local eucalypt species, particularly white box, yellow box, Blakely's red gum and river red gum, to replace these trees in the long-term. Ideally, planted paddock trees should be spaced no more than 50 m apart to provide connectivity for other fauna species.
- Measure abundance and impact of feral European honeybees and common mynas on hollow availability for superb parrots and implement control measures
- Report illegal shooting or trapping of superb parrots to Environment Line
- Protect living and dead hollow-bearing trees from fire.
- Investigate the efficacy of radar and radio/satellite telemetry tracking methods to detect superb parrot local and landscape scale flightpaths and key breeding and foraging sites for targeted on-ground protection and restoration actions.
- Supplement the number of natural hollows with artificial hollows. These may be created in living or dead eucalypts without natural hollows using a chainsaw. Alternatively, appropriate nest boxes may also be used, provided that they are monitored for use by superb parrots and not exotic fauna and they are maintained in the long-term.
- Raise awareness amongst land managers of the biodiversity and production value of protecting paddock trees and the need to ensure their replacement over the long term through planting and direct seeding
- Protect known and potential remnant superb parrot habitat, particularly box-gum, box-ironbark and weeping myall woodland and river red gum riparian gallery forest, with large hollow-bearing trees, native shrubs such as wattles, hop bushes and saltbushes and native grasses and manage to allow ongoing regeneration of local native trees, shrubs and groundcover plants.
- Restore superb parrot habitat in strategic locations close to known habitat and movement corridors, including riparian areas, using appropriate local tree, shrub and ground cover species. The planting of wattles, hopbush, saltbush and native grasses will provide important foraging habitat.
- Reduce the risk of superb parrots being killed at grain spill sites by re-establishing the superb parrot grain spill prevention campaign which encourages grain truck drivers to cover their loads.
- Erect warning signs on roads where superb parrot road kill events are known to occur.
- Revegetation activities to consider the implications of climate change impacts by building resilience in the current known range of the species, but also to look at securing or restoring habitats in areas predicted to be important to the superb parrot in the future under climate change.

As the proposed works will interfere with many of the actions proposed above, particularly the loss of hollow bearing trees, it likely that the impacts will interfere with the recovery of the species.

Conclusion

Due to the proposed actions significantly impacting preferred breeding and foraging habitat which includes the removal of 35 hollow-bearing trees, 29 of which are River Red Gums - the dominant riparian species in the development area in the Castlereagh-Barwon IBRA subregion. It is likely that there will be significant impacts to the long-term survival of important populations of the Superb Parrot, especially populations who migrate to the upper region of the Gwydir River during winter. NGH recommends referral to the Commonwealth Government.

H.11 Winged Peppercress

a) Will the action lead to a long-term decrease in the size of an important population of a species?

An 'important population' is a population that is necessary for a species' long-term survival and recovery.This may include populations identified as such in recovery plans, and/or that are:

- key source populations either for breeding or dispersal
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range (DoE, 2013).

The National Recovery Plan for Winged Peppercress *Lepidium monoplocoides* (Mavromihalis, 2010) states that this species is recorded from 13 locations, six in Victoria and seven in New South Wales. The TBDC indicates that the species is associated with habitat within the Castlereagh-Barwon IBRA subregion in PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion. It prefers environments consisting of seasonally moist to waterlogged sites, on heavy fertile soils. The total area of habitat in the subject land is 220.28 ha, including areas of PCT 52 within the Northern Outwash subregion, and the total area of habitat in the development footprint (impact area) is 77.76 ha.

As this species was not surveyed for within the subject land, it has been assumed to be present. Most records exist from the Hay Plain at least 600 km from the subject land where conservation efforts are being taken to preserve populations, breeding and genetic diversity. Since the species is more readily observable following heavy rain, 2021 – 22 has been a period of significant rainfall, and *L. monoplocoides* was not identified during survey effort in February 2022, it is unlikely to be present within the subject land. However, as there will be a significant extent of associated vegetation impacted by the proposal (77.76 ha) and Moree is near the limit of the species' range, then if the species is present then local populations will be significantly impacted by the proposal.

b) Will the action reduce the area of occupancy of an important population of a species?

In New South Wales, seven important populations exist on the Hay Plain approximately 600 km from the subject land where conservation efforts are being taken to preserve the species.

The proposed actions do not impact any important populations that inhabit the Hay Plain. However, as suitable habitat occurs on the subject land in PCT 52: Queensland Bluegrass +/- Mitchell Grass grassland within the development footprint in the Castlereagh-Barwon IBRA subregion, heavy fertile soils subject to periodic waterlogging, and woodland dominated by Poplar Box *Eucalyptus populnea* (DPE, 2019), it is possible that a local population of the species is present and, as such, the proposal will reduce the area of occupancy of the local population.

c) Will the action fragment an existing important population into two or more populations?

No records have been identified of *L. monoplocoides* on the subject land on NSW BioNet and most records in New South Wales exist are recorded from the Hay Plain, 600 km from the Hay Plain. It is therefore unlikely that the proposal will fragment any existing known important populations into two or more populations.

d) Will the action adversely affect habitat critical to the survival of a species?

Habitat critical to the survival of a species or ecological community' refers to areas that are necessary:

- for activities such as foraging, breeding, roosting, or dispersal
- for the long-term maintenance of the species or ecological community (including the maintenance of species essential to the survival of the species or ecological community, such as pollinators)
- to maintain genetic diversity and long term evolutionary development, or
- for the reintroduction of populations or recovery of the species or ecological community.

Habitat that is critical to the survival of *L. monoplocoides* includes seasonally moist to waterlogged heavy, fertile soils, particularly in open woodland dominated by Buloke *Allocasuarina luehmannii* and/or eucalypts, particularly Black Box *Eucalyptus largiflorens* or Poplar Box *Eucalyptus populnea* (DPE, 2019). Heavy, fertile, seasonally waterlogged soils occur within the subject land, particularly in PCT 52 of which the proposal will impact an area of 77.76 ha (in both the Castlereagh-Barwon and Northern Outwash IBRA subregions. In addition, the subject land occurs at the edge of the known distribution of the species and thus, if the species does occur within the subject land, it may be an important area for maintaining genetic diversity. It is likely that the proposal will impact habitat that is critical to the survival of the species.

e) Will the action disrupt the breeding cycle of an important population?

L. monoplocoides flowers from August to October and is highly dependent on seasonal conditions. Threats to the survival of the species include altered hydrology, increasing salinity, weed invasion, grazing pressure, physical damage and climate change (Mavromihalis, 2010). The proposal may compound these threats by increasing the risk of altered hydrology, increased salinity, weed invasion and physical damage. However, mitigation measures have been put in place to minimise impacts of the proposal during construction and ongoing use of the rail line (**Table 8-1**).

In addition, the proposal may mean that native herbivores, such as kangaroos, cause more grazing pressure on the species in the subject land outside of the development footprint.

As the subject land occurs at the known edge of distribution of the species, it is possible that the proposal will disrupt the breeding cycle of 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?

Suitable habitat of *L. monoplocoides* that occurs on the subject land includes seasonally moist to waterlogged heavy, fertile soils (in PCT 52) and open woodland dominated by Poplar Box *Eucalyptus populnea.* An area of 77.76 ha (in both the Castlereagh-Barwon and Northern Outwash IBRA subregions) of suitable habitat will be impacted by the proposal which may will lead to a decline of the local population.

g) Will the action result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat?

The proposal may increase the likelihood of invasive weeds that are harmful to *L. monoplocoides* into the subject land due to localised disturbance. Mitigation measures described in **Table 8-1** will minimise these impacts but weed ingress is still possible.

h) Will the action introduce disease that may cause the species to decline?

Little is known of any diseases that may affect *L. monoplocoides* but there is a risk that diseases could be introduced to the subject land via machinery, vehicles, and materials during construction and operation. With the implementation of the recommended mitigation measures, the proposal is unlikely to result in the introduction of any disease that may cause these species to decline.

i) Will the action interfere substantially with the recovery of the species?

Currently, a National Recovery Plan exists for *L. monoplocoides*. The overall objective of recovery is to minimise the probability of extinction of the species in the wild and to increase the probability of populations becoming self-sustaining in the long term (Mavromihalis, 2010). One of the seven specific objectives outlined in the recovery plan is to manage threats to populations.

As it is recognised that this species may occur in the subject land due to suitable habitat being present, and the proposal may increase the risk of known threats to the species (altered hydrology, increased salinity, weed invasion, physical damage and increased grazing pressure in remaining suitable habitat in the subject land), it is likely that the proposal will interfere with the recovery of the species. However, the proposal may not interfere substantially with the recovery of the species as no records exist for the species within the subject land and it was not found during plot survey in February 2022 following significant rain.

Conclusion

As suitable habitat of *L. monoplocoides* occurs on the subject land including seasonally moist to waterlogged heavy, fertile soils (in PCT 52) and open woodland dominated by Poplar Box *Eucalyptus populnea* and an area of 77.76 ha (in both the Castlereagh-Barwon and Northern Outwash IBRA subregions) of suitable habitat will be impacted by the proposal, a precautionary approach has been undertaken to assess significant impact on the species. As such, the proposal may lead to a decline of the local population at the edge of the known distribution of the species and therefore we recommend referral to the Commonwealth Government.

H.12 Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland

a) **Will the action lead to a reduction in the extent of an ecological community?**
This EEC is highly reliant on soil types as it is associated with fine textures, cracking clays. It generally occurs on flat to low slopes of no more than 5%. It is present in northern NSW and South QLD. It is distributed in three major but disjunct occurrences where climate, soils and landform are conducive to the development of tussock grasslands The proposed action will result in linear disturbance or removal of 77.76 ha of this community, of a total of 224.14 ha which exits in the subject land. This means 35% of this existing would be disturbed. Some of which exists on either side of the current rail alignment and will be subjected to clearing for construction works, whereas another portion will be removed to allow for a new portion of rail alignment. The proposed action would reduce the extent of this community by 77.76 ha. Many of the areas consist of invasion of naturalized or exotic flora such as Mimosa and Tiger pear. A precautionary approach has been undertaken in assessing against the criteria listed within the EPBC Act guidance considering drought conditions that were occurring during the field surveys. The majority of the areas identified contain infestations of Mimosa, which is dense in some areas and moderately spaced in others.
b) **Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?**
The proposed action would fragment this community. The relocation of the current rail alignment would further increase fragmentation of this threatened community. This community is currently fragmented throughout the subject land, on either side of the existing rail alignment, and Newell Highway, and the proposed actions will further fragment two portions of this community into four smaller portions.
c) **Will the action adversely affect habitat critical to the survival of an ecological community?**
In the context of the local extent of the community and habitat, the loss of habitat resulting from the proposal is not considered to be significant to any critical habitat for this community. The habitat affected by the proposal is typical of the Natural Grasslands community in the locality and is not critical to the long-term survival of the community
d) **Will the action 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?**
During construction, the proposal would have a short-term impact upon soils and possibly surface water flow, within discrete areas. Soils disturbed during the works would be reinstated to maintain the original soil profile. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to further degrade the community in the long-term. The impacts of the proposed actions would be localised and would not result in changes to abiotic factors outside the impact area. The actions associated with the proposal are not considered likely to substantially alter hydrological patterns necessary for the community's survival**.**
e) **Will the action 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?**
The impacts of the proposal are expected to be localised, assuming best practice weed control, road and crossing construction and drainage and erosion and sedimentation control. The existing community is relatively consistent throughout, with some portions containing a higher density of species. The works are unlikely to result in a substantial change in the species composition of the community outside the impact area of the works, as there are no areas of particularly higher quantity of functionally important species.

f) **Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:** a. **Assisting invasive species, that are harmful to the listed ecological community, to become established; or** b. **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?**
Substantial weed invasion and modification of native vegetation communities currently exists through the majority of the grassland areas. Where the proposal includes clearing of native vegetation, there is a risk that key emerging invasive species could establish via seed dispersal or plant parts on machinery during construction. These impacts can be managed and with the careful implementation of a weed management plan can be readily controlled. Due to the nature of this development, the proposed actions will not incur the requirement for regular fertilisers or other chemicals which will kill or adversely impact the growth of the species within the community. Therefore, it is not likely that the proposed actions will negatively impact the existing community through chemicals or pollutants. With the recommended hygiene measures implemented, the likelihood of the proposal resulting in invasive species or introduction of pollutants that are harmful to the CEEC is minimal.
g) **Will the action interfere with the recovery of an ecological community?**
There is no recovery plan for this EEC.
Conclusion
A precautionary approach has been undertaken in assessing against the criteria listed within the EPBC Act guidance considering drought conditions that were occurring during the field surveys. The majority of the areas identified contain infestations of Mimosa, which is dense in some areas and moderately spaced in others. The proposed action, as it stands given current understanding, would result in a reduction of the extent of the community within the subject land by 77.76 ha (or 35%). This a substantial reduction and may result in a significant impact.

H.13 Weeping Myall Woodlands

a) **Will the action lead to a reduction in the extent of an ecological community?**
This EEC occurs on the inland alluvial plains west of the dividing range in NSW and QLD. Weeping Myall Woodland EEC now only exists as small remnants within its broad range. The ecological community generally occurs on flat areas, shallow depressions or gilgais on raised alluvial plains. These areas are not associated with active drainage channels and are rarely, if ever, flooded. The ecological community occurs on black, brown, red-brown or grey clay or clay loam soils. Most areas remaining in the best condition are in lightly-grazed, uncropped sites such as road reserves and Travelling Stock Routes and Reserves. The proposed action will reduce the current extent of Weeping Myall Woodland patch by 7.15 ha, from 17.31 ha to 10.16 ha. Additionally, the proposed action disturbs a portion of this community which is currently degraded and is of poor quality, that being mostly absent of canopy cover and invasion of weeds, compared to the portion which will remain. It has few mature trees and other species in a healthy and valuable condition. The extent of the area in the subject land would be reduced by 41%.

b) **Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?**
The entirety of the 17.31 ha of the Weeping Myall patch in the subject land, part of a 24 ha patch in the wider landscape, occurs in one clump on the Northern side of the current rail alignment, bordering the existing rail alignment, of which 17.31 ha qualifies as the EPBC community. The existing rail alignment in this location is not being relocated for the new rail alignment and will remain in the same position. The area to be cleared includes areas closest to the existing alignment and will not cause any further fragmentation through the community.
c) **Will the action adversely affect habitat critical to the survival of an ecological community?**
The portion of the community to be removed is in a condition of lower quality than the remaining portion of the community and therefore does not offer any increased biodiversity value to the overall community. However, as it is removing an extent of the community it will reduce the overall size of the community and possibly subject it to further degradation regardless of the quality of the areas to be removed. A significant adverse effect as a result of the proposed action is uncertain and referral is recommended.
d) **Will the action 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?**
During construction, the proposal would have a short term gross impact upon soils and possibly surface water flow, within discrete areas. Soils disturbed during the works would be reinstated to maintain the original soil profile. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to further degrade the community in the long-term. The impacts of the proposed actions would be localised and would not result in changes to abiotic factors outside the impact area. The actions associated with the proposal are not considered likely to substantially alter hydrological patterns necessary for the community's survival.
e) **Will the action 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?**
The proposed actions will not cause any substantial changes in the composition of species in the community as the community composition is relatively consistent throughout, with the exception that the portion to be removed is of lower quality and density than the proposed remaining community. Whilst the portion to be removed does contain *Acacia pendula*, which is an important component of this community, it contains a lower density of this species compared to the component of the community which is further from the rail alignment and will not be removed. Therefor it does not contain any functionally important species.
f) **Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:** a. **Assisting invasive species, that are harmful to the listed ecological community, to become established; or** b. **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?**
A weed management plan will be implemented and will contribute to the control of invasive species in the subject land. With the appropriate use of this management plan it is unlikely that disturbance or removal of the 7.15 ha portion of this community will assist establishment of invasive species. However, clearing of any existing native vegetation gives opportunities for invasive species to establish and spread, so the weed management plan will need to be carefully implemented and monitored.

Due to the nature of this development, the proposed actions will not incur the requirement for regular fertilisers or other chemicals which will kill or adversely impact the growth of the species within the community. Therefore, it is not likely that the proposed actions will negatively impact the existing community through chemicals.
g) **Will the action interfere with the recovery of an ecological community?**
There is no recovery plan for this species.
Conclusion
The proposed action, as it stands given current understanding, would result in a reduction of the extent of the community within the subject land by 30% overall. Given this, a significant impact may be considered likely.

H.14 Poplar Box Grassy Woodland on Alluvial Plains

a) **Will the action lead to a reduction in the extent of an ecological community?**
This community is found on soils that are fine textured, often cracking clays which are derived from either basalt or alluvium on flat to low slopes (<1 degree). A tree canopy is usually sparse, but when present comprises <10%. The proposed actions involve disturbance or removal of 0.64 ha of this community, where a total of 6.94 ha exists in the subject land. This means that 9% of the existing community within the subject land would be removed, modified and directly impacted.
b) **Will the action fragment or increase fragmentation of an ecological community, for example by clearing vegetation for roads or transmission lines?**
This community exists in the north of the subject land, and the community is on the southern side of the existing rail alignment. The existing rail alignment will be upgraded in this location however not relocated, and would involve clearing of portions on the edge of this community closest to the rail alignment. Therefore, the proposal would not involve fragmentation of the community in the subject land.
c) **Will the action adversely affect habitat critical to the survival of an ecological community?**
The small area (6.94 ha) of this community in the subject land is typical of this community within the locality. In the context of the local extent of the community and habitat, the loss of habitat resulting from the proposal is not considered to be significant. The habitat affected by the proposal is typical of the Poplar Box Grassy Woodland community in the locality and is not critical to the long-term survival of the community.
d) **Will the action 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?**
During construction, the proposal would have a short term gross impact upon soils and possibly surface water flow, within discrete areas. Soils disturbed during the works would be reinstated to maintain the original soil profile. These impacts are manageable with the implementation of erosion and sediment controls and would be unlikely to further degrade the community in the long-term. The impacts of the proposed actions would be localised and would not result in changes to abiotic factors outside the impact area. The actions associated with the proposal are not considered likely to substantially alter hydrological patterns necessary for the community's survival.

e) **Will the action 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?**
The proposed actions will not cause any substantial changes in the composition of species in the community as the community composition is relatively consistent throughout, and the relatively small portion (9%) of the community to be removed does not contain any functionally significant species. It is unlikely that disturbance or removal of this portion of the community will cause a substantial change in the species composition within the broader community.
f) **Will the action cause a substantial reduction in the quality or integrity of an occurrence of an ecological community, including but not limited to:** a. **Assisting invasive species, that are harmful to the listed ecological community, to become established; or** b. **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?**
A weed management plan will be implemented and will contribute to the control of invasive species in the subject land. With the appropriate use of this management plan it is unlikely that disturbance or removal of the 0.64 ha portion of this community will assist establishment of invasive species. However, clearing of any existing native vegetation gives opportunities for invasive species to establish and spread, so the weed management plan is required to be diligently implemented and monitored. Due to the nature of this development, the proposed actions will not incur the requirement for regular fertilisers or other chemicals which will kill or adversely impact the growth of the species within the community. Therefore, it is not likely that the proposed actions will negatively impact the existing community through chemicals.
g) **Will the action interfere with the recovery of an ecological community?**
There is no recovery plan for this EEC.
Conclusion
The proposed action, as it stands given current understanding, would result in a reduction of the extent of the community within the subject land by 9%. Given this small-scale reduction, a significant impact is not considered likely. However, for abundant caution referral is recommended.

H.15 Satin Flycatcher

a) **Will the action substantially modify (including fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species?**
One Satin flycatcher was heard calling with the riparian vegetation along the Gwydir River in February 2019. Satin Flycatchers are a summer breeding migrant and generally inhabit heavily vegetated gullies in eucalypt-dominated forests and taller woodlands, and on migration, occur in coastal forests, riparian areas, woodlands, mangroves and drier woodlands and open forests. They are mainly recorded in wet sclerophyll forests. The proposed actions of this development do not substantially modify, destroy or isolate any areas that are this critical habitat type for this species.
b) **Will the action result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for migratory species?**
It is not likely that the proposed actions will result in an invasive species becoming established which is harmful to this species.
c) **Will the action seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species?**
The proposed actions do not impact specific areas that are of importance to this species and therefore will not have adverse impacts on the lifecycle of a migratory species.

TECHNICAL PAPER 01

Biodiversity development assessment report

Appendix I FM Act test of significant impact

Appendix I FM Act Test of significant impact

Potential impact to threatened species listed under the *Fisheries Management Act 1994* has been considered for the

- Eel-tailed Catfish *Tandanus*
- Silver Perch *Bidyanus*
- Olive Perchlet *Ambassis agassizii*
- Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River

An Assessment of Significance (AoS) is provided below, based on the seven-part test as described in Section 220ZZ of the *Fisheries Management Act* 1994

Eel-tailed Catfish *Tandanus*

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(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	Ideal Eel tailed catfish habitat is low turbidity, preferring clear, sluggish or still waters of lagoons and back-waters; living, feeding and breeding near the bottom. The Eel tailed catfish move typically within a 5km range and spawn in spring/summer when water temperatures are 20 to 24°C and eggs are laid in a nest of pebbles and gravel. Eel Tailed Catfish numbers in the Murray-Darling Basin have declined due to a range of impacts including invasive species, habitat degradation, loss of spawning opportunities due to cold water pollution, alterations to flow patterns and flooding regimes and fishing pressures The Mehi and Gwydir Rivers are generally turbid, deep, wide and slow moving where the proposal site intersects these rivers. Activities part of the proposal such as bridge replacement would impact upon small areas of habitat and would require some disturbance of instream habitats, riparian vegetation and water quality to a restricted area of habitat however would be temporary with stringent mitigation measures implemented. No blockage of fish passage would occur. The proposal is not anticipated to modify the river flow. Following completion of the proposal, area disturbed would be rehabilitated. The proposal is unlikely to impact the Eel tailed catfish life cycle that a viable population be placed at risk.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: (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, or (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	Not Applicable
(d) in relation to the habitat of a threatened species, population or ecological community: (i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, 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 action, and (iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality	Localised areas around for existing bridge demolition and bridge replacement would require temporary disturbance as part of the proposal. No fish passage would be blocked. The Gwydir catchment upstream of Moree is considered to support a moderate remnant population of the eel tailed catfish (Fisheries Scientific Committee 2008). The proposal would not result in increased fragmentation or isolated habitats. All works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and impacts to water quality.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	Critical habitat is not defined for this species, therefore the proposal will not have an adverse effect on any critical habitat for this species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Priority action statements for eel tailed catfish include the following recovery actions: • Advice to consent and determining authorities • Collate and review existing information • Community and stakeholder liaison, awareness and education • Compliance / enforcement • Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species • Stocking/translocation • Pest eradication and control • Habitat rehabilitation • Research / monitoring The proposal would replace some of the existing bridges however would be constructed in accordance with the national guidelines *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge 2003).

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	There are three applicable key threatening processes (KTP) which have the possibility to impact this proposal: • Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams; • Degradation of native riparian vegetation along New South Wales water courses; • Removal of woody debris. The proposal may require removal of large woody debris in the within small, localised areas. Where woody debris is removed it is to be replaced within the creek, downstream if appropriate in order to retain any potential habitat features Degradation of native riparian vegetation is a KTP currently affecting the proposal site due to erosion runoff affecting water quality in stream. It is not anticipated that the proposal would further degrade any native riparian vegetation within the proposal site and effects of this proposal on this KTP would be limited to restoration and remediation. The design of the bridges and other watercourse crossing structures have been incorporated as far as practicable to avoid/minimising disturbance of riparian vegetation. The proposal is unlikely to have any adverse impacts or to result in the increase of any key threatening processes.
Considering the context of the low likelihood for the presence of Eel tailed catfish, the scope of works and intensity of the potential impact to the population from the proposal, an overall conclusion has been made that the proposal is unlikely to result in a significant effect to the Eel tailed catfish.	

Silver Perch *Bidyanus*

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(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	Ideal Silver Perch habitat is preferring clear fast-flowing waters, especially were rapids are present. The Silver perch is recorded widely throughout the Murray-Darling Basin with the species migrating to spawn. Only one natural population is known, which occurs downstream of Torrumbarry Weir in the Murray River. Silver Perch numbers in the Murray-Darling Basin have declined due to a range of impacts including invasive species, habitat degradation, loss of spawning opportunities due to cold water pollution, alterations to flow patterns and flooding regimes such as construction barriers and fishing pressures.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
	The Mehi and Gwydir Rivers are generally turbid, deep, wide and slow moving where the proposal site intersects these rivers. Duffys Creek is an ephemeral stream. Activities part of the proposal such as bridge replacement would not impact areas of optimal habitat however would require some disturbance of instream habitats, riparian vegetation and water quality. Works proposed would be temporary with stringent mitigation measures implemented. No blockage of fish passage would occur. The proposal is not anticipated to modify the river flow. Following completion of the proposal, area disturbed would be rehabilitated. The proposal is unlikely to impact the Silver Perch life cycle that a viable population be placed at risk.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **(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, or** **(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**	Not Applicable

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(d) in relation to the habitat of a threatened species, population or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, 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 action, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**	Localised areas around for existing bridge demolition and bridge replacement would require temporary disturbance as part of the proposal. No fish passage would be blocked. No optimal habitat for this species would be impacted The proposal would not result in increased fragmentation or isolated habitats. All works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and impacts to water quality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	Critical habitat is not defined for this species, therefore the proposal will not have an adverse effect on any critical habitat for this species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Priority action statements for Silver Perch may include the following recovery actions: • Advice to consent and determining authorities • Collate and review existing information • Community and stakeholder liaison, awareness and education • Compliance / enforcement • Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species • Stocking/translocation • Pest eradication and control • Habitat rehabilitation • Research / monitoring The proposal would replace some of the existing bridges however would be constructed in accordance with the national guidelines *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge 2003).

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	There are three applicable key threatening processes (KTP) which have the possibility to impact this proposal: • Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams; • Degradation of native riparian vegetation along New South Wales water courses; • Removal of woody debris. The proposal may require removal of large woody debris in the within small, localised areas. Where woody debris is removed it is to be replaced within the creek, downstream if appropriate in order to retain any potential habitat features Degradation of native riparian vegetation is a KTP currently affecting the proposal site due to erosion runoff affecting water quality in stream. It is not anticipated that the proposal would further degrade any native riparian vegetation within the proposal site and effects of this proposal on this KTP would be limited to restoration and remediation. The design of the bridges and other watercourse crossing structures have been incorporated as far as practicable to avoid/minimising disturbance of riparian vegetation. The proposal is unlikely to have any adverse impacts or to result in the increase of any key threatening processes.
Considering the context of the low likelihood for the presence of Silver Perch, sub optimal habitat, the scope of works and intensity of the potential impact to the population from the proposal, an overall conclusion has been made that the proposal is unlikely to result in a significant effect to the Silver Perch.	

Olive Perchlet *Ambassis agassizii*

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(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	Olive perchlets have an oval shaped body with a moderately large mouth, very large eyes and a forked tail. Ideal Olive perchlet habitat are sheltered areas, preferring clear, sluggish or still waters within rivers, creeks and ponds (DPI 2013). Minimal records are known to occur in the vicinity of the proposal. Recent surveys found the Olive perchlet in the Gwydir wetlands, this was thought to be due to large overland flows from northern catchments (DPI 2015). Olive perchlet numbers in the Murray-Darling Basin have declined due to a range of impacts including predation by invasive species, habitat degradation, rapid fluctuations in water levels and cold water pollution.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
	The Mehi and Gwydir Rivers are generally turbid, deep, wide and slow moving where the proposal site intersects these rivers. Activities part of the proposal such as bridge replacement would impact upon small areas of habitat and would require some disturbance of instream habitats, riparian vegetation and water quality to a restricted area of habitat however would be temporary with stringent mitigation measures implemented. No blockage of fish passage would occur. The proposed works are not anticipated to modify the river flow. Following completion of the proposal, area disturbed would be rehabilitated. The proposal is unlikely to impact the Olive perchlet life cycle that a viable population be placed at risk.
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **(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, or** **(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**	Not Applicable

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(d) in relation to the habitat of a threatened species, population or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, 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 action, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**	Localised areas around for existing bridge demolition and bridge replacement would require temporary disturbance as part of the proposal. No fish passage would be blocked. The proposal would not result in increased fragmentation or isolated habitats. All works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and impacts to water quality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	Critical habitat is not defined for this species, therefore the proposal will not have an adverse effect on any critical habitat for this species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Priority action statements for Olive Perchlet include the following recovery actions: • Advice to consent and determining authorities • Collate and review existing information • Community and stakeholder liaison, awareness and education • Compliance / enforcement • Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species • Stocking/translocation • Pest eradication and control • Habitat rehabilitation • Research / monitoring The proposal would replace some of the existing bridges however would be constructed in accordance with the national guidelines *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge 2003).

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	There are three applicable key threatening processes (KTP) which have the possibility to impact this proposal: • Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams; • Degradation of native riparian vegetation along New South Wales water courses; • Removal of woody debris. The proposal may require removal of large woody debris in the within small, localised areas. Where woody debris is removed it is to be replaced within the creek, downstream if appropriate in order to retain any potential habitat features Degradation of native riparian vegetation is a KTP currently affecting the proposal site due to erosion runoff affecting water quality in stream. It is not anticipated that the proposal would further degrade any native riparian vegetation within the proposal site and effects of this proposal on this KTP would be limited to restoration and remediation. The design of the bridges and other watercourse crossing structures have been incorporated as far as practicable to avoid/minimising disturbance of riparian vegetation. The proposal is unlikely to have any adverse impacts or to result in the increase of any key threatening processes.
Considering the context of the low likelihood for the presence of Olive perchlet, the scope of works and intensity of the potential impact to the population from the proposal, an overall conclusion has been made that the proposal is unlikely to result in a significant effect to the Olive perchlet.	

Aquatic Ecological Community in the Natural Drainage System of the Lowland Catchment of the Darling River (Lower Darling River EEC)

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(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	Not Applicable
(b) in the case of an endangered population, whether the action proposed is likely to have an adverse effect on the life cycle of the species that constitutes the endangered population such that a viable local population of the species is likely to be placed at risk of extinction	Not Applicable
(c) in the case of an endangered ecological community or critically endangered ecological community, whether the action proposed: **(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, or** **(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**	The proposal would require localised disturbance of watercourses to replace existing bridges and culverts and will include clearing of adjoining riparian vegetation. All watercourses within the subject land have been modified by existing in-stream structures, clearing of remnant vegetation, weed invasion and potentially altered by deposition of sediment from land practices in their catchments. Bridges and culverts would be designed to avoid blockage of fish passage, minimise disturbance of remnant vegetation upstream and downstream any work areas, and minimise changes to the morphology of the watercourse.

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
(d) in relation to the habitat of a threatened species, population or ecological community: **(i) the extent to which habitat is likely to be removed or modified as a result of the action proposed, 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 action, and** **(iii) the importance of the habitat to be removed, modified, fragmented or isolated to the long-term survival of the species, population or ecological community in the locality**	The area covered by the final recommendation by the fisheries scientific committee for this EEC includes all natural creeks, rivers, streams and associated lagoons, billabongs, lakes, flow diversions to anabranches, the anabranches and the floodplains of the Darling River within the state of NSW. Therefore, all of the above mentioned natural waterways which interject with the subject land and development site are considered to meet the definition of this EEC. Man-made canals, water distribution and drainage works, farm dams and off stream reservoirs are excluded from the recommendation (Final recommendation aquatic ecological community In the natural drainage system of the lowland catchment of The Darling River Ref Nos. FR 22 File no. FSC 01/10, accessed 17/06/2021). Assessment of habitat type and sensitivity of all of the watercourses is provided in Table 3.2 of the Aquatic Ecology Assessment (Umwelt, 2017). The Gwydir River and Mehi River and other major streams supporting higher quality fish habitat and/or with remnant vegetation along the banks and instream are likely to be important to the long-term survival of the ecological community in the locality. Whilst an area of 1 ha of impact to aquatic habitats has been identified, actual impacts would be localised areas around for existing bridge demolition, and bridge replacement would require temporary disturbance as part of the proposal. No fish passage would be blocked. The proposal may require removal of large woody debris in the proposal site. Any large woody debris in the proposal site would be relocated upstream or downstream in consultation with an appropriate qualified ecologist. The proposal would not result in increased fragmentation or isolated habitats. All works would be undertaken in accordance with standard sediment and erosion controls to manage and minimise further siltation and impacts to water quality.
(e) whether the action proposed is likely to have an adverse effect on critical habitat (either directly or indirectly)	Critical habitat is not defined for this species, therefore the proposal will not have an adverse effect on any critical habitat for this species.
(f) whether the action proposed is consistent with the objectives or actions of a recovery plan or threat abatement plan	Priority action statements for Lower Darling River EEC include the following recovery actions: • Advice to consent and determining authorities • Collate and review existing information • Community and stakeholder liaison, awareness and education • Compliance / enforcement • Enhance, modify or implement NRM planning processes to minimize adverse impacts on threatened species • Stocking/translocation

The factors to be considered when determining whether an action, development or activity is likely to significantly affect threatened species, or their habitats are outlined below	
	• Pest eradication and control • Habitat Protection • Habitat rehabilitation • Research / monitoring • Survey and mapping The proposal would replace some of the existing bridges however would be constructed in accordance with the national guidelines *Why do fish need to cross the road? Fish passage requirements for waterway crossings* (Fairfull and Witheridge 2003).
(g) whether the action proposed constitutes or is part of a key threatening process or is likely to result in the operation of, or increase the impact of, a key threatening process	There are three applicable key threatening processes (KTP) which have the possibility to impact this proposal: • Installation and operation of instream structures and other mechanisms that alter natural flow regimes of rivers and streams; • Degradation of native riparian vegetation along New South Wales water courses; • Removal of woody debris. The proposal may require removal of large woody debris in the within small, localised areas. Where woody debris is removed it is to be replaced within the creek, downstream if appropriate in order to retain any potential habitat features Degradation of native riparian vegetation is a KTP currently affecting the proposal site due to erosion runoff affecting water quality in stream. It is not anticipated that the proposal would further degrade any native riparian vegetation within the proposal site and effects of this proposal on this KTP would be limited to restoration and remediation. The design of the bridges and other watercourse crossing structures have been incorporated as far as practicable to avoid/minimising disturbance of riparian vegetation. The proposal is unlikely to have any adverse impacts or to result in the increase of any key threatening processes
Considering the context of the extensive area of the Lower Darling River EEC, the limited disturbance generated by the scope of works, and implementation of mitigation measures detailed within the Aquatic Ecology Assessment (Umwelt, 2017), an overall conclusion has been made that the proposal is unlikely to result in a significant effect to the Lower Darling River EEC.	