APPENDIX

F

Addendum to the Narrabri to North Star Biodiversity Report

NARRABRI TO NORTH STAR SUBMISSIONS PREFERRED INFRASTRUCTURE REPORT

IR_1432

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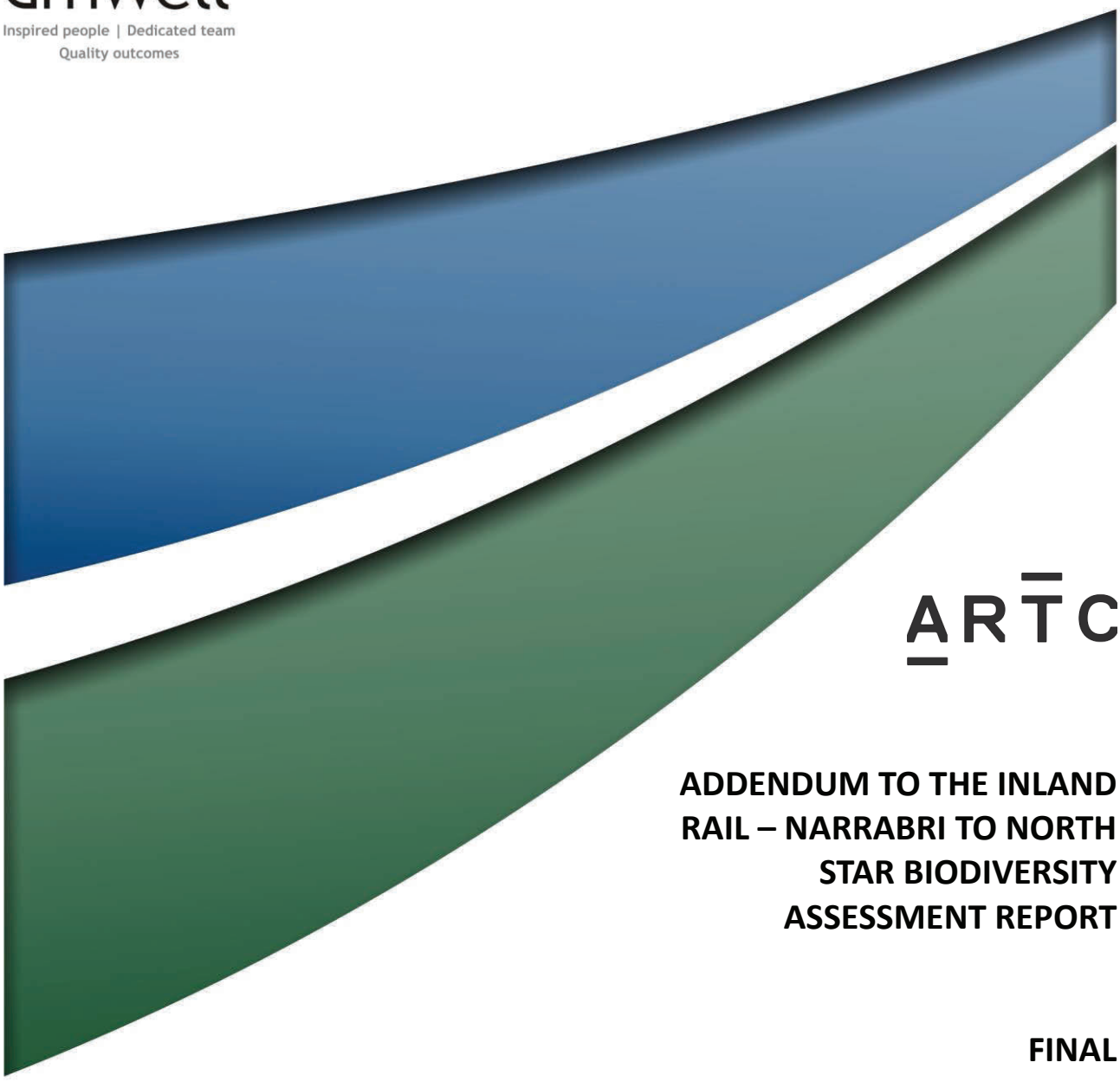

ARTC

ADDENDUM TO THE INLAND RAIL – NARRABRI TO NORTH STAR BIODIVERSITY ASSESSMENT REPORT

FINAL

October 2018

ADDENDUM TO THE INLAND RAIL – NARRABRI TO NORTH STAR BIODIVERSITY ASSESSMENT REPORT

FINAL

Prepared by
Umwelt Environmental & Social Consultants
on behalf of
Australian Rail Track Corporation

Project Director: John Merrell

Technical Director: Allison Riley
Technical Manager: Ryan Parsons
Report No. 3607/R11/Final
Date: October 2018

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

www.umwelt.com.au

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Document Status

Rev No.	**Reviewer**		**Approved for Issue**	
	Name	**Date**	**Name**	**Date**
Final	Allison Riley	05 October 2018	John Merrell	05 October 2018

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1.0 Introduction

The Australian Government has committed to delivering a significant piece of national transport infrastructure by constructing a high performance and direct interstate freight rail corridor between Melbourne and Brisbane. The Inland Rail programme (Inland Rail) involves the design and construction of a new inland rail connection, about 1,700 kilometres long, between Melbourne and Brisbane. Inland Rail is a transformational rail infrastructure initiative that will enhance Australia's existing national rail network and serve the interstate freight market.

Australian Rail Track Corporation Ltd (ARTC) is seeking approval to construct and operate the Narrabri to North Star section of Inland Rail ('the Proposal'), which consists of 188 kilometres of upgraded rail track and associated facilities.

The Proposal requires approval from the NSW Minister for Planning under Part 5.1 of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The Proposal is also a controlled action under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and requires approval from the Australian Minister for the Environment.

This addendum report has been prepared by Umwelt Environmental and Social Consultants (Umwelt) as part of ARTC's response to agency submissions on the Environmental Impact Statement (EIS) for the Proposal. This report has been prepared to address the requirements discussed at a meeting between OEH and Umwelt on 26 June 2018 and the two following agency letters:

- Department of Planning and Environment (DPE) – Response to Submissions Report, Narrabri to North Star Project, dated 26 June 2018

- Office of Environment and Heritage (OEH) – Outcomes of Narrabri to North Star Inland Rail Biodiversity Assessment Report Review Meeting with Umwelt, dated 29 June 2018.

As detailed in the OEH letter dated 29 June 2018, the required works to be documented in an addendum report are detailed in **Table 1.1** below. References to the relevant sections of this addendum report are also included for each of the requirements.

Table 1.1 Addendum Report Requirements According to the OEH letter dated 29 June 2018

OEH Addendum Report Requirements	Where addressed in this Addendum Report
1. Clarification that no clearing is proposed along roadsides adjacent to the rail corridor.	Addressed in **Section 2.1**.
2. Confirmation that all level crossing upgrade sites have been identified, are included in the construction impact zone, and their impacts have been assessed.	Addressed in **Section 2.2**.
3. Confirmation that all impacts identified as temporary in the BAR are now considered to be permanent impacts and are included in the updated total area to be impacted.	Addressed in **Section 2.3**.
4. Confirmation that rapid assessments were also used in the February and April 2016 survey periods to infill data gaps rather than just being used in the constraints analysis exercise at the commencement of the project.	Addressed in **Section 3.4**.
5. Inclusion of more detail on the parameters and considerations applied to the mapping of zone classifications.	Addressed in **Section 3.3**.
6. Inclusion of more detailed information on (1) the Jones Avenue Bridge additional area, and (2) the North Star Extension additional area. Information should include their location on a diagram or map, and the data used to determine that each area has a site value score ≤ 17 (e.g. aerial photography, rapid assessment, existing vegetation mapping).	Addressed in **Section 2.4**.
7. Updated information regarding the impacts to koalas including: a. Reference to the importance of mapping refugia habitat and shelter trees essential for thermoregulation particularly in extreme heat in western NSW. b. Updating the species credit polygon for the koala (and providing this to OEH). c. Updating the area of impact and species credit requirement.	Addressed in **Section 4.1**.
8. Updated area of impact and credit requirements for the three species credit flora species if required.	Addressed in **Section 4.2**.
9. Explanation of the additional mapping datasets that were reviewed to inform and/or support the vegetation mapping in the BAR.	Addressed in **Section 3.1**.

OEH Addendum Report Requirements	Where addressed in this Addendum Report
10. Following inclusion of all temporary impacts, review of the Jones Avenue and North Star Extension additional areas, review of existing mapping datasets, and review of priority review areas identified by OEH, the area of impact to each PCT must be updated. The update should include: a. A comparison table (as per Table 1 in the Parkes to Narromine BAR Addendum [herein referred to as P2N Addendum]) summarising the PCT, disturbance area in the BAR and disturbance area in the Addendum. b. Updated Table 2 (as per P2N Addendum) identifying the disturbance area for BC Act and EPBC Act EECs. c. Update comparison Table 3 (as per P2N Addendum) identifying PCTs, total disturbance area and ecosystem credit requirements. d. Update Table 5.3 of the BAR/Table 4 (as per P2N Addendum) comparing species credit requirements.	Addressed in **Section 4.0** and **Section 5.0**.
11. Updated commentary on impacts to Matters of National Environmental Significance. Where impacts to MNES are increased due to vegetation mapping amendments, consideration should be given to whether this may result in a significant impact to any MNES. Updated information should include: a. Updated Table 4.1 from the Commonwealth Matters Assessment in the EIS comparing impacts to MNES as outlined in the BAR and Addendum. b. Updated Table 6.1 from the Commonwealth Matters Assessment as required.	Addressed in **Section 6.0**.
12. Updated BioBanking Credit Calculator to reflect the changes in impacts to each PCT.	Addressed in **Section 5.0** and updated BioBanking Credit Calculator assessments re-submitted to OEH.
13. Inclusion of updated BioBanking Credit Reports.	Addressed in **Appendix A**.

Complimentary to the above requirements are those detailed in the DPE letter dated 29 June 2018 as detailed in **Table 1.2** below. References to the relevant sections of this addendum report are also included for each of the requirements.

Table 1.2 Addendum Report Requirements According to the DPE letter dated 29 June 2018

OEH Addendum Report Requirements	Where addressed in this Addendum Report
1. Identify all construction and operational impact zones (such as compounds, level crossings, and areas where no previous assessment has been undertaken), including locations that were added to the construction impact zone after the biodiversity assessment was completed and where desktop assessment only was undertaken to assess biodiversity impacts.	**Section 2.4** and **Figures 2.1** and **2.2** identify the Jones Avenue Bridge and North Star Extension additional areas that weren't subject to targeted survey as part of the original assessment. A revised assessment of these areas is provided in **Section 2.4**.

OEH Addendum Report Requirements		Where addressed in this Addendum Report
2.	Vegetation mapping review as per proposed methodology (22/5/18) - but using all available vegetation mapping data sets and other relevant information to determine vegetation zones to provide confidence in the vegetation mapping for the proposal. Detailed review methodology to be provided to DPE and agreed to by OEH prior to commencement of review.	In consultation with OEH, the vegetation mapping of the Development Footprint has been updated to address OEH comments and the updated mapping approved by OEH, with updated GIS files provided to OEH. Addressed in **Section 3.0**.
3.	Review existing vegetation plots and identify potential need for additional plots, including justification for vegetation zones identified, and area of EECs.	In consultation with OEH, the vegetation mapping of the Development Footprint has been updated to address OEH comments and the updated mapping approved by OEH, with updated GIS files provided to OEH.
4.	Validation of tree species to be undertaken in consultation with OEH.	Validation of tree species was not deemed necessary by OEH. In consultation with OEH, the vegetation mapping of the Development Footprint has been updated to address OEH comments and the updated mapping approved by OEH, with updated GIS files provided to OEH.
5.	Review mapping of Koala habitat in consultation with OEH, identify likely impacts and update species credit polygons if required.	Addressed in **Section 4.1**.
6.	Potential review of biodiversity assessment by independent ecological expert (Koala and vegetation experts - as approved/recommended by OEH).	Review of the biodiversity assessment by independent experts was not deemed to be required by OEH following consultation with OEH.
7.	Mapping and assessment of Matters of National Environmental Significance in accordance with the relevant listing advice or policy statement, and accurate quantification of impacts. Note the FBA requires that CEEC and EECs on the development site that are associated with a Plant Community Type (PCT) are identified. CEEC and EEC are defined in the FBA as being listed under either (or both) the TSC Act and the EPBC Act.	Addressed in **Section 6.0**.
8.	Where necessary following the detailed review, update all vegetation mapping and species credit polygons, update the area of permanent impacts, and update the credit calculator to quantify the biodiversity offset credit liability.	In consultation with OEH, the vegetation mapping of the Development Footprint has been updated to address OEH comments and the updated mapping approved by OEH, with updated GIS files provided to OEH. Updated species polygons have also been provided to OEH. A summary of the changes relating to ecosystem and species credits are included in **Sections 4.0** and **5.0**.

The FBA requires specific terminology to be used to describe the site and impact area being assessed in an FBA report. For this reason the terminology in this report which is FBA specific differs from that used in the EIS. To avoid any doubt, **Table 1.3** below compares the terminology.

Table 1.3 Comparison of Addendum and EIS Terminology

FBA Terminology	EIS Terminology
Development Site	Proposal site and the Additional Assessment Area
Development Footprint	Proposal site

2.0 Project Definition Clarifications

2.1 Impacts to Road Side Vegetation Along Access Roads

It is confirmed that no clearing of native vegetation is proposed along the access roads included in the Construction Impact Zone (CIZ) layer shown in the Biodiversity Assessment Report (BAR) (Umwelt 2017a). Works along these access tracks will be confined to existing disturbed/cleared roads/tracks. Works would involve grading and resurfacing some of these tracks/roads as required to facilitate access for construction works.

No native vegetation clearing will be associated with these works.

2.2 Level Crossing Upgrades

As described in the EIS, the CIZ includes the proposal site as well as additional assessment areas to provide flexibility for the design (particularly in relation to culvert and level crossing upgrades), including:

- an approximate 60 metre buffer around culverts, and
- an approximate 120 metre buffer around the locations of level crossings.

All potential impacts associated with level crossing upgrade works have been assessed in the BAR.

2.3 Assessment of Temporary Impacts

As detailed in **Section 4** and **Section 5**, the BioBanking Credit Calculator (BBCC) has been updated to include those areas of the development site that were previously mapped as temporary impacts and not subject to credit generation. These areas have been assessed as comprising permanent impacts and the site values of these areas have been identified as being completely removed in the BBCC. This is a conservative, worst case, approach as these areas will be subject to only temporary impacts and not cleared as discussed in the BAR.

The revised impact areas and updated credit calculations are included in **Section 4.0** and **Section 5.0**.

2.4 Jones Avenue Bridge and North Star Extension Area

At the request of OEH, further review of the Jones Avenue Bridge and North Star Extension Area was undertaken as part of this Addendum report. This included a review of available mapping products as detailed in **Section 3.1,** the results of which are detailed in **Table 2.1**.

The most recent and finest scale vegetation mapping available for the region is the *Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping* (OEH 2015) which was utilised as part the BAR (Umwelt 2017a) to map the Jones Avenue Bridge and North Star Extension area. This regional mapping product identifies both the Jones Avenue Bridge and North Star Extension Area as 'Not Native' (refer to **Figure 2.1** and **Figure 2.2**). All other applicable mapping products indicate that the Jones Avenue Bridge area comprises non-native vegetation, which is consistent with high resolution aerial photography interpretation (API).

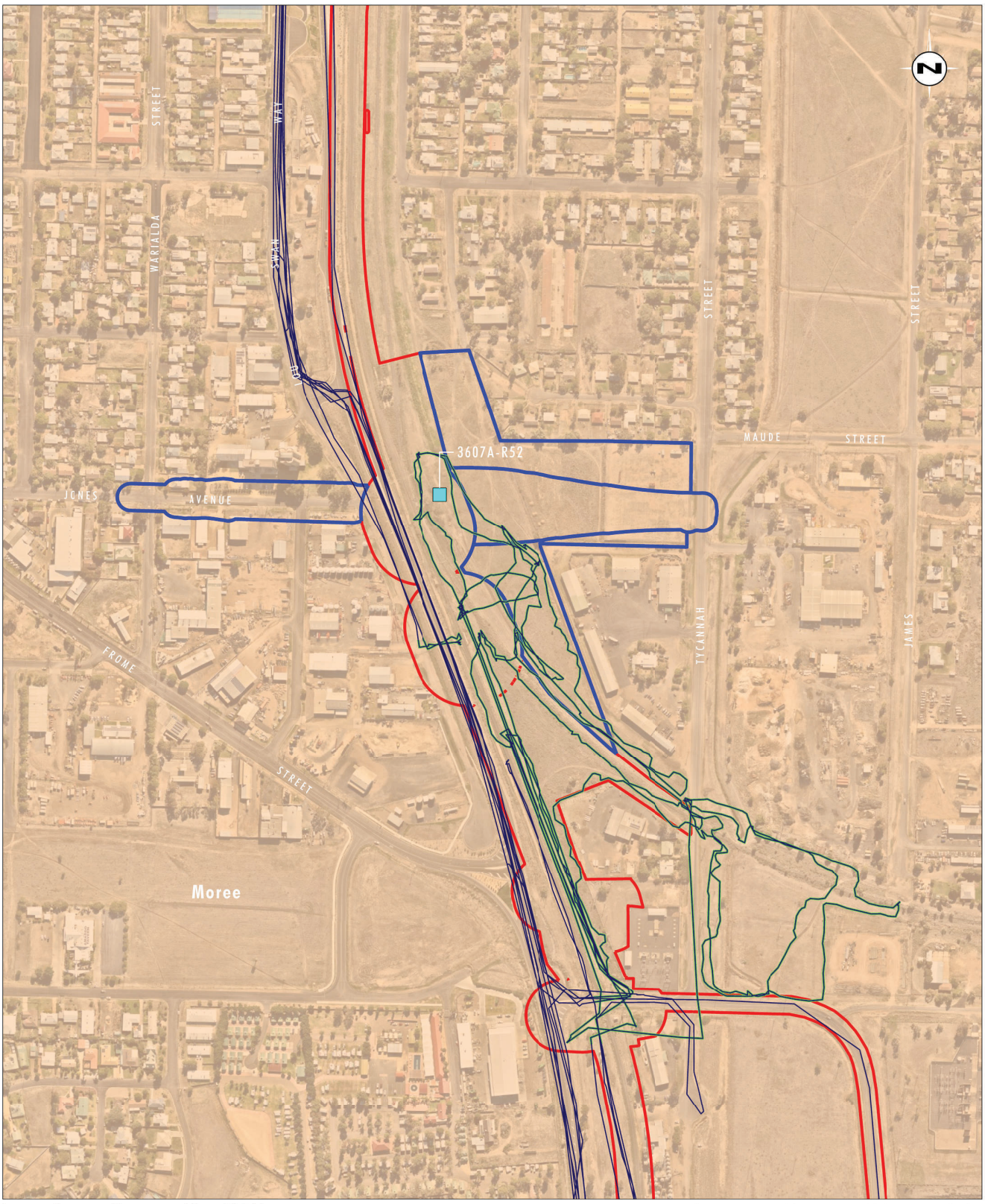

Image Source: Nearmap (May 2016)
Data Source: ARTC (2018)

0 100 200 300m
1:6 000

Legend

- Development Site
- Jones Avenue Bridge Impact Area
- Walking Tracks
- Tracks from High-rail Vehicle
- Rapid Assessment

Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping (OEH 2015):
- Not Native Vegetation

FIGURE 2.1

Jones Avenue Bridge Impact Area Regional Vegetation Mapping and Survey Effort

File Name (A4): R11/3607_243.dgn
20180913 16.17

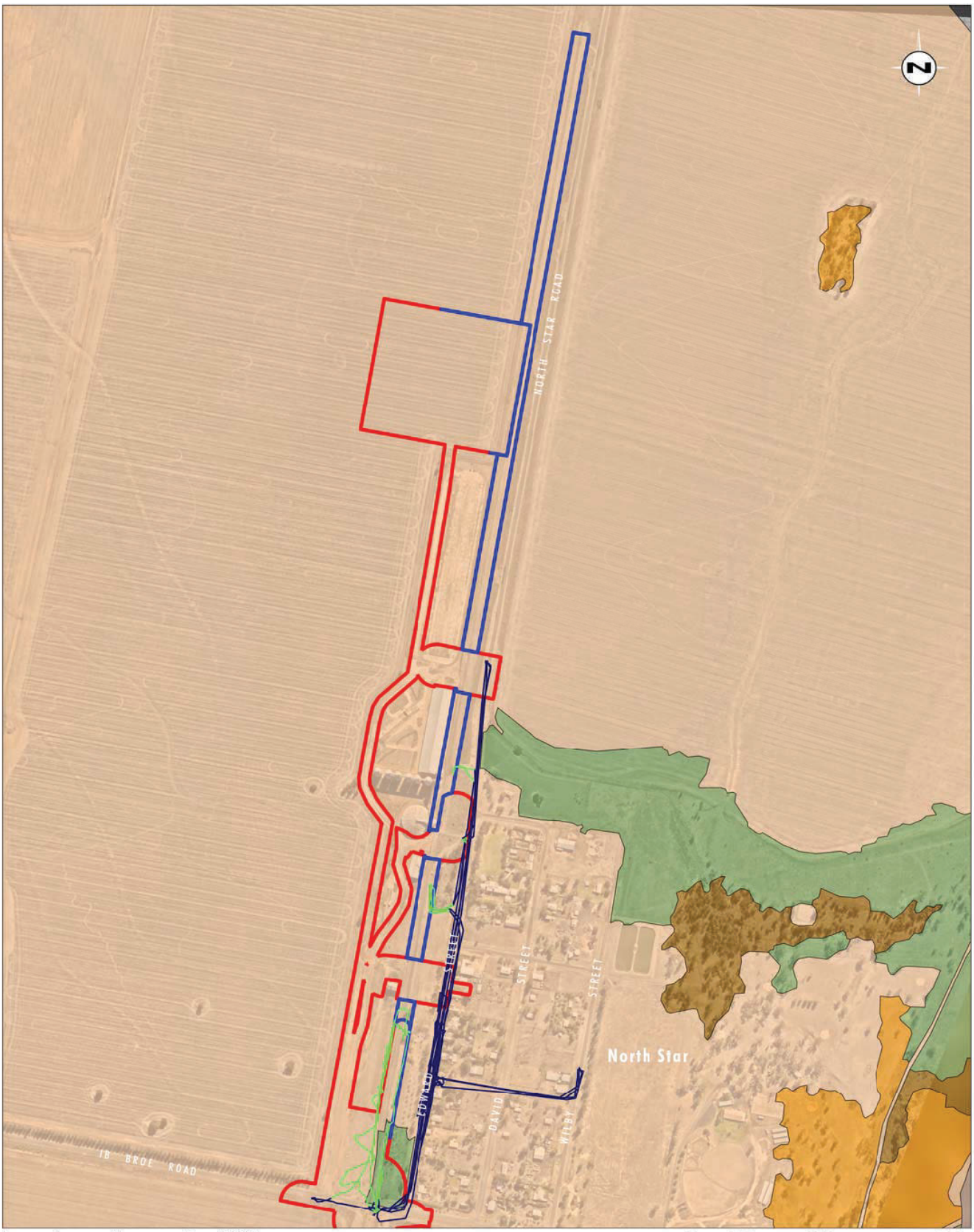

Image Source: Nearmap (May 2016)
Data Source: ARTC (2018)

0 100 250 500m
1:10 000

Legend

- Development Site
- North Star Extension Area
- Walking Tracks
- Tracks from High-rail Vehicle
- Not Native Vegetation

Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping (OEH 2015):

- 1 - Candidate Native Grasslands
- 35 - Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion
- 56 - Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW

FIGURE 2.2

North Star Extension Area Regional Vegetation Mapping and Survey Effort

File Name (A4): R11/3607_244.dgn
20180913 16.09

As part of the review for the North Star Extension Area the *Mapping Vegetation Landscapes of the NSW North West Slopes and Plains* (North West Catchment Management Committee 2015) and *NSW Landuse Map* (2013) mapping products were also reviewed. The 2015 mapping product maps the North Start Extension Area as a combination of residential, continuous or rotational cropping and predominantly native pastures (with a Tree Canopy Cover <20%), while the 2013 mapping maps the area as grazing native vegetation and farm buildings / infrastructure. However API of the North Star Extension Area indicates that it is likely to be non-native vegetation given that the majority of this mapped area includes existing railway tracks and raised ballast. This finding is consistent with the 2015 OEH vegetation mapping.

Table 2.1 outlines the results of the review of regional vegetation and land use mapping products that were identified as potentially relevant to the Development Footprint. **Table 2.1** also identifies what each mapping product identified the vegetation present in the Jones Avenue Bridge and North Star Extension Area as likely comprising.

Table 2.1 Results of Mapping Product Review for the Jones Avenue Bridge and North Star Extension Area

Mapping Product	Map Unit in Jones Avenue Bridge	Map Unit in North Star Extension Area
Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping (OEH 2015) – VIS ID 4467	Not Native	Not Native
The Reconstructed Distribution and Extent of Indigenous Vegetation Types in the Moree Plains Shire (White 2002) – VIS ID 928 and 929	No native vegetation identified	Does not cover the North Star Extension Area
Vegetation of the Bellata, Gravesend, Horton and Boggabri 1:100 000 Map Sheets, NSW (Cannon *et* al. 2002) – VIS ID 2133	Does not cover the Jones Avenue Bridge area	Does not cover the North Star Extension Area
Mapping Vegetation Landscapes of the NSW North West Slopes and Plains (North West Catchment Management Committee 2015) – VIS ID 4169	Residential	Residential Continuous or rotational cropping Predominantly native pastures (with a Tree Canopy Cover <20%)
A Vegetation Map for the Namoi Catchment Management Authority (ELA 2009) – VIS ID 3851	Does not cover the Jones Avenue Bridge area	Does not cover the North Star Extension Area
A Vegetation Map for the Namoi Catchment Management Authority (ELA 2013) – VIS ID 4028	Does not cover the Jones Avenue Bridge area	Does not cover the North Star Extension Area
Mapping of the EPBC-listed "Natural Grasslands on the basalt and fine textured alluvial plains of the northern NSW and southern Queensland" in the Namoi Catchment (ELA 2010) – VIS ID 3852	Does not cover the Jones Avenue Bridge area	Does not cover the North Star Extension Area

Mapping Product	Map Unit in Jones Avenue Bridge	Map Unit in North Star Extension Area
Travelling Stock Reserve Conservation Values spatial layer (Rural Lands Protection Board 2010)	Does not cover the Jones Avenue Bridge area	Does not cover the North Star Extension Area
NSW Landuse Map (2013)	Urban residential Services Roads Railways	Grazing native vegetation Farm buildings/infrastructure

Further to the review of regional mapping products, a review of nearby flora survey points was also undertaken for the Jones Avenue Bridge and North Star Extension Area. Rapid Vegetation Assessment 3607_R52 was completed within the Development Footprint adjacent to the Jones Avenue Bridge area, as shown on **Figure 2.1**. At this rapid assessment point, exotic grasslands were identified dominated by the exotic species Coolatai grass (*Hyparrhenia hirta*), Johnson Grass (*Sorghum halepense*) and paspalum (*Paspalum dilatatum*), along with native couch grass (*Cynodon dactylon*). Photographs taken to the east and west of this Rapid Vegetation Assessment point indicate that the vegetation in the Jones Avenue Bridge area is also consistent with exotic grasslands (refer to **Plate 1.1** and **Plate 1.2**). Trees that can be seen in **Plate 1.1** and **Plate 1.2** are associated with residential and industrial developments.

Plate 2.1 Photograph looking east from Rapid Vegetation Assessment 3607_R52 at the Jones Avenue Bridge area.

Plate 2.2 Photograph looking west from Rapid Vegetation Assessment 3607_R52 at the Jones Avenue Bridge area

Consistent with the BAR (Umwelt 2017a), the additional review of the Jones Avenue Bridge and North Star Extension Area indicates that these two areas comprise non-native vegetation (with a site value score less than ≤17) and no biodiversity credits for these areas have been generated.

No amendments to the vegetation map were made at these locations as an outcome of the review.

3.0 Vegetation Mapping and Assessment

3.1 Additional Vegetation Mapping Datasets

The following key vegetation mapping and classification products were identified and reviewed as part of the BAR (Umwelt 2017a). These include:

- A Vegetation Map for the Namoi Catchment Management Authority (ELA 2009) – VIS ID 3851
- Mapping of the EPBC-listed "Natural Grasslands on the basalt and fine textured alluvial plains of the northern NSW and southern Queensland" in the Namoi Catchment (ELA 2010) – VIS ID 3852
- Vegetation of the Bellata, Gravesend, Horton and Boggabri 1:100 000 Map Sheets, NSW (Cannon *et al.* 2002) – VIS ID 2133
- The Reconstructed Distribution and Extent of Indigenous Vegetation Types in the Moree Plains Shire (White 2002) – VIS ID 928 and 929
- Travelling Stock Reserve Conservation Values spatial layer (Rural Lands Protection Board 2010) - and
- Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping (OEH 2015) – VIS ID 4467

In addition to these, OEH has identified two other regional mapping products that may be applicable, as well as updated mapping for one of the above mentioned products:

- Updated version of A Vegetation Map for the Namoi Catchment Management Authority (ELA 2013) – VIS ID 4028
- Mapping Vegetation Landscapes of the NSW North West Slopes and Plains (North West Catchment Management Committee 2015) – VIS ID 4169, and
- NSW Landuse Map (2013)

A further geographic search by Umwelt of the Sharing and Enabling Environmental Data (SEED) website did not identify any further mapping products of relevance to the Proposal.

Table 3.1 below details the applicability of the identified mapping products to the Proposal. The following details were used to categorise the overall applicability of each mapping product:

- mapping scale
- study area size
- whether map units have been attributed to biometric vegetation types (BVTs)/Plant Community Type (PCTs)
- whether native grasslands have been mapped, and
- the proportion of the Development Footprint covered by each mapping product

The areas identified by OEH for further review were further considered against the all the identified mapping products listed in **Table 3.1** below.

Table 3.1 Applicability of Identified Mapping Products to the Proposal

Mapping Product	Mapping Scale	Study Area Size (ha)	Mapping to BVT/PCT level	Maps native grassland	Proportion of Development Footprint Covered	Considered in Original BAR
Border Rivers Gwydir/Namoi Regional Native Vegetation Mapping (OEH 2015) – VIS ID 4467	1:15,000	9,287,431	Yes	Yes – candidate areas only	100%	Yes
The Reconstructed Distribution and Extent of Indigenous Vegetation Types in the Moree Plains Shire (White 2002) – VIS ID 928 and 929	1:100,000	1,786,000	No	Yes	49%	Yes
Vegetation of the Bellata, Gravesend, Horton and Boggabri 1:100 000 Map Sheets, NSW (Cannon *et* al. 2002) – VIS ID 2133	1:100,000	1,065,000	No	Yes	33%	Yes
Mapping Vegetation Landscapes of the NSW North West Slopes and Plains (North West Catchment Management Committee 2015) – VIS ID 4169	1:50,000	3,416,396	No	Yes	50%	No
A Vegetation Map for the Namoi Catchment Management Authority (ELA 2009) – VIS ID 3851	1:50,000	4,206,000	No – mapped to RVCs	Yes	8%	Yes

Mapping Product	Mapping Scale	Study Area Size (ha)	Mapping to BVT/PCT level	Maps native grassland	Proportion of Development Footprint Covered	Considered in Original BAR
A Vegetation Map for the Namoi Catchment Management Authority (ELA 2013) – VIS ID 4028	1:50,000	4,206,000	No – mapped to RVCs	Yes	8%	No
Mapping of the EPBC-listed "Natural Grasslands on the basalt and fine textured alluvial plains of the northern NSW and southern Queensland" in the Namoi Catchment (ELA 2010) – VIS ID 3852	Not specified - regional	Not specified	No – mapped to RVCs	Yes	<1%	Yes
Travelling Stock Reserve Conservation Values spatial layer (Rural Lands Protection Board 2010)	1:10,000	NSW	No	No	6%	Yes
NSW Landuse Map (2013)	1:25,000	NSW	No	No	100%	No

3.2 Vegetation Mapping

Figure 3.1 identifies the process that Umwelt applied to the mapping of vegetation communities for the Proposal. This methodology is described in Section 2.3 of the BAR (Umwelt 2017a) and further information provided in the response to submissions report. The approach used is consistent with relevant guidelines and considered to be consistent with industry best practice. Specifically, the vegetation community assessment undertaken as part of the Proposal included the following key steps which were used to inform the mapping of vegetation, allocation of PCTs and vegetation zones in accordance with the FBA methodology and the identification of threatened ecological communities listed under NSW and Commonwealth legislation:

- Review of regional mapping (refer to **Table 2.1** above for list of regional vegetation mapping products reviewed) and GIS analysis of high resolution aerial photography to inform the development of draft desktop vegetation community mapping

- Initial constraints analysis (September 2014) that included the collection of 176 rapid flora assessment points. This assessment included the collection of dominant canopy, mid stratum and ground layer vegetation. The results of this constraints analysis was used to inform the development of a draft vegetation community map with preliminary PCT and draft vegetation zone allocation and draft site stratification and field survey strategy

- Targeted plot/transect and rapid vegetation assessment surveys in accordance with the FBA methodology. As discussed in the BAR, the vegetation assessment surveys for the Proposal exceeded the minimum requirement of the FBA

- Refinement of vegetation community and allocation of PCT and vegetation zones based on the outcomes of detailed survey

- Detailed quality control/peer review of vegetation community mapping, PCT and vegetation zone allocation and TEC identification by Umwelts' National Ecology Lead and the project Technical Director

- Finalisation of vegetation mapping and application of the BBCC in accordance with the FBA.

3.3 Mapping of Vegetation Zones

A vegetation zone refers to an area of native vegetation on a development site that is the same PCT and has a similar broad condition state. The allocation of vegetation zones in the Development Footprint included the following considerations:

- Identification and mapping of PCTs across the Development Footprint

- Identify all areas of low and moderate to good condition. Vegetation in low condition comprised the following:

    a) woody native vegetation with native over-storey percent foliage cover less than 25% of the lower value of the over-storey percent foliage cover benchmark for that vegetation type, and where either:

        - less than 50% of ground cover vegetation is indigenous species, or

        - greater than 90% of ground cover vegetation is cleared

OR

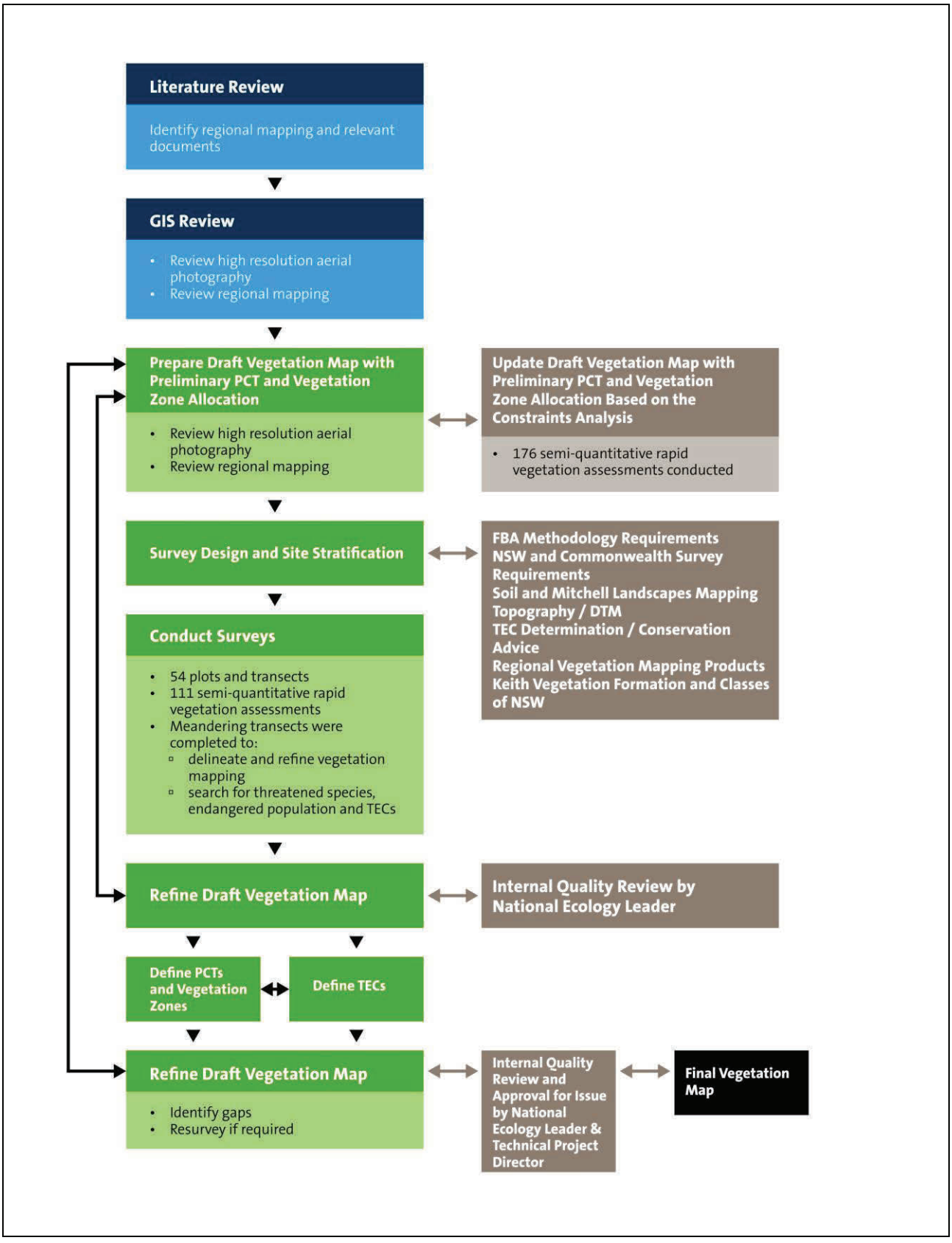

Figure 3.1 Umwelt's Iterative Vegetation Mapping Process including Key Inputs

b) native grassland, wetland or herbfield where either:

- less than 50% of ground cover vegetation is indigenous species, or
- more than 90% of ground cover vegetation is cleared.

Vegetation in Low Condition within the Development Footprint was mapped as cleared/non-native vegetation. This condition zone was targeted during surveys in order to confirm that it did not meet the offsetting threshold – that is, it had a site value score of less than 17. Sampling of each mapped zone to determine site value score was undertaken in accordance with the sampling requirements of the FBA. Sampling of plots/transects and BBCC analysis confirmed that this vegetation zone did not meet the minimum site value score for offsetting.

- The Development Footprint was stratified by the project botanist (an accredited BBAM/FBA assessor) into areas of the same PCT that were in a similar condition state. In stratifying the PCTs, consideration was given to similarity of over-storey cover, mid-storey cover, ground cover, weediness, structure, disturbance or combinations of these.

It is considered that the mapping of vegetation zones within the Development Footprint was conducted in accordance with the methodology prescribed by the FBA and in accordance with industry best practice vegetation mapping.

3.4 Rapid Vegetation Assessment Surveys

Rapid vegetation assessment surveys were undertaken across all survey events within the Development Footprint. These include the following survey periods:

- 176 rapid vegetation assessments in September 2014
- 16 rapid vegetation assessments in August 2015
- 45 rapid vegetation assessments in February 2016, and
- 50 rapid vegetation assessments in April 2016

Rapid vegetation assessment undertaken during the initial September 2014 constraints were used to inform the development of a draft vegetation community map and PCT/vegetation zone allocation that was then ground-truthed during the vegetation survey. Following completion of the vegetation mapping surveys in February and April 2016, the results of the constraints assessment and additional rapid vegetation assessments undertaken in each of the August 2015, February 2016 and April 2016 surveys were then used to confirm the vegetation map and to supplement the plot/transect data collected. This process was especially important due to the linear nature of the Development Footprint and the highly fragmented nature of the vegetation recorded within the rail corridor. This process ensured that the vegetation map produced following the conduct of the field surveys was an accurate representation of the extent and condition of native vegetation communities occurring within the Development Footprint at that time and it also allowed for the consideration of seasonal variation in vegetation condition.

In addition to these rapid assessments over 300 kilometres of walking meandering transects were completed across the above mentioned survey periods to assist in the delineation and refinement of vegetation mapping and searching for threatened and otherwise significant species, endangered populations and threatened ecological communities (TECs). Where meandering transects revealed significant variation within a vegetation unit, or a potential new vegetation community or vegetation zone, additional vegetation sampling was undertaken. In addition walking meandering transects, the Development Footprint was traversed multiple times across seasons in a high-rail vehicle documenting vegetation communities and condition types.

In addition to rapid vegetation assessment surveys and meandering transects, a high number of additional floristic plots/transects were complete across three separate seasons. Umwelt extensively surveyed the Development Site, having completed 54 floristic plots/transects compared to the minimum requirement specified by the FBA of 32, representing approximately 70 per cent more survey sites than required as a minimum under the FBA Methodology (OEH 2014). The vegetation zones with the greatest variability, derived native grasslands and natural grasslands, were heavily sampled. Across these two zones a minimum of 13 plots/transects are required under the under the FBA Methodology (OEH 2014), of which Umwelt completed close to double the minimum requirements with surveys of 22 plots/transects.

Plots/transects were completed in the following seasons:

- 2 plots/transects in August 2015
- 44 plots/transects in February 2016, and
- 8 plots/transects in April 2016.

3.5 Vegetation Mapping Updates

In its submission on the EIS, OEH made some comments on specific sections of the vegetation mapping. In response to these comments a thorough process of vegetation mapping review was undertaken in consultation with OEH. This included the following steps:

- An onsite meeting with OEH on 26 June 2018
- Detailed feedback on the vegetation map provided by OEH through email correspondence
- Detailed discussions on the provided feedback with OEH to clarify the vegetation mapping approach and decision making process. This process included further review of regional mapping products, review of field data, review of site photos and aerial photography and provision of a range of data to OEH.

As an outcome of the vegetation mapping review process and consultation with OEH, some refinements to the vegetation mapping were made. These refinements affected only small areas of the Development Footprint. The revised vegetation mapping was provided to OEH for review and was accepted by OEH in an email dated 22 August 2018. This revised mapping was used to update the BioBanking Credit Calculator as reported in **Section 5** of this Addendum.

4.0 Species Credit Updates

4.1 Impacts to Koalas

The original koala mapping presented in the BAR (Umwelt 2017a) was based on koala primary and secondary feed trees as defined for the relevant Western Slopes and Plains Koala Management Area according to Appendix 2 of the Approved Recovery Plan (DECC 2008). Since this assessment was completed, OEH has provided new information on the importance of refugia habitat for koalas during times of extreme heat as presented in the research paper by Crowther *et al.* (2014) for the Gunnedah district of NSW. Specifically this research paper highlights the importance of belah (*Casuarina cristata*) trees during periods of extreme heat. Based on this new information, in consultation with OEH Umwelt has included all vegetation zones/PCTs which have belah as a canopy species as Koala habitat, as documented in **Table 4.1**.

Table 4.1 Vegetation Zones/Plant Community Types Identified as Koala Habitat

Vegetation Zone	PCT ID (BVT ID) and PCT Name *Condition Class*	Comments
2	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	This vegetation zone is now included based on the presence of belah.
3	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	This vegetation zone was originally included in the BAR.
5	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	Only the portions of this vegetation zone with Poplar Box feed trees were included in the BAR. The remaining areas dominated by belah are now included.
8	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	This vegetation zone was originally included in the BAR.

As recommended by OEH, Umwelt has also undertaken a review of the grassland mapping within the Development Site and identified several small areas where refinement of the koala species polygons can be made to include scattered feed/refugia trees. In addition to this temporary impacts on koalas are now included.

These changes result in an increase to koala habitat from 62.77 hectares to 94.84 hectares, representing an overall increase of approximately 32.07 hectares of koala habitat. The revised koala habitat species credit polygon GIS file has been provided to OEH for their review and endorsement (as per email dated 4 September 2018 from Samantha Wynn – OEH Senior Team Leader Planning, North West).

In terms of revised species credits for the koala, **Table 4.** includes the number of species credits requiring offsetting according to the BAR (Umwelt 2017a) and the revised mapping included as part of this addendum report.

Table 4.2 Comparison of Original and Revised Koala Species Credit Requirements

Species	Species Credits Required as part of BAR (Umwelt 2017a)	Revised Species Credits Required as of this Addendum Report
Koala	1,632	2,466

4.2 Updated Impacts to Flora Species Credits

Table 4.3 below outlines the species-credit species to be impacted as a result of the Proposal and the species credits required to offset those impacts. A revised Credit Calculator report is included in **Appendix A**.

Due to the high number of individuals of creeping tick-trefoil (*Desmodium campylocaulon*) present within the Development Site and the species association with natural grassland communities, it was determined to be more suitable to calculate species credits based on the area of habitat as opposed to the number of individual plants, as per the NSW Guide to Surveying Threatened Plants (OEH 2016). As a result of changes to the mapping of the extent of natural grassland communities within the Development Footprint (refer to **Section 3.5**), the species credits required to offset the Proposal have also changed, as shown in **Table 4.3** below. The updated flora species-credit requirements also take into account the inclusion of temporary impacts (refer to **Section 2.3**). As shown in **Table 4.3** there are no changes to the credits requiring offset for finger panic grass or Belson's panic, however, there is an increase for creeping tick-trefoil.

Table 4.3 Species-credit Flora Species Requiring Offset and the Species Credits Required

Common Name (scientific name)	Species Credits Required as part of BAR (Umwelt 2017a)	Revised Species Credits Required
finger panic grass (*Digitaria porrecta*)	364	364
creeping tick-trefoil (*Desmodium campylocaulon*)	2,607	3,080
Belson's panic (*Homopholis belsonii*)	1,898	1,898

5.0 Ecosystem Credit Updates

Following the review and minor revisions to the vegetation mapping for the Development Footprint undertaken in consultation with OEH (refer to **Section 3.5**) and with the inclusion of the temporary impact areas as areas of permanent and total impact (refer to **Section 2.3**), the BioBanking Credit Calculator was rerun for the Proposal to determine the credits requiring offsetting. The updated BioBanking Credit Calculator has been submitted to OEH with a summary of the results provided below and the updated credit reports included in **Appendix A**.

Table 5.1 provides a comparison of the Development Footprint impacts according to the original BAR (Umwelt 2017a) and this Addendum which is based on revised PCT mapping and inclusion of temporary impacts. The revised mapping GIS files have been approved by OEH.

Table 5.1 BAR (Umwelt 2017a) and Addendum Impact Areas

Vegetation Zone	PCT ID (BVT IDs) and PCT Name	Condition Class	Extent of BC Act and EPBC Act listed communities associated with each vegetation zone	Area in Development Footprint (ha)	
				BAR (Umwelt 2017a)	Addendum
1	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Moderate to Good	7.26 ha of *Myall Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain, Murray-Darling Depression, Riverina and NSW South Western Slopes bioregions* EEC listed under the BC Act to be impacted 2.61 ha of *Weeping Myall Woodlands* EEC listed under the EPBC Act (the remaining portion of zone 1 does not meet the EPBC listing criteria)	6.95	7.26
2	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	Moderate to Good	4.75 ha of *Brigalow within the Brigalow Belt South, Nandewar and Darling Riverine Plains Bioregions* EEC listed under the BC Act to be impacted (note that a small 0.1 ha patch of vegetation zone 2 is not considered to conform to the EEC given the heavily disturbed condition) 4.75 ha of *Brigalow (Acacia harpophylla dominant and codominant)* EEC listed under the EPBC Act (the remaining portion of zone 2 does not meet the EPBC listing criteria)	4.75	4.85

Vegetation Zone	PCT ID (BVT IDs) and PCT Name	Condition Class	Extent of BC Act and EPBC Act listed communities associated with each vegetation zone	Area in Development Footprint (ha)	
				BAR (Umwelt 2017a)	Addendum
3	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Moderate to Good	1.19 ha of *Coolibah - Black Box Woodland in the Darling Riverine Plains, Brigalow Belt South, Cobar Peneplain and Mulga Lands Bioregions* EEC listed under the BC Act to be impacted 1.19 ha of *Coolibah – Black Box Woodland of the Darling Riverine Plains and the Brigalow Belt South Bioregion* EEC under the EPBC Act to be impacted	1.19	1.19
4	PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Moderate to Good_Natural Grassland	Not listed under the BC Act 279.94 ha of *Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD* CEEC listed under the EPBC Act	268.64	279.94
5	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate to Good	Not listed	71.95	73.21
6	PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate to Good_DNG	Not listed	108.20	111.65
7	PCT71 (BR127, NA126) 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	Moderate to Good	0.04 ha of *Carbeen Open Forest community in the Darling Riverine Plains and Brigalow Belt South Bioregions* EEC listed under the BC Act Not listed the EPBC Act	0.04	0.04

Vegetation Zone	PCT ID (BVT IDs) and PCT Name	Condition Class	Extent of BC Act and EPBC Act listed communities associated with each vegetation zone	Area in Development Footprint (ha)	
				BAR (Umwelt 2017a)	Addendum
8	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Moderate to Good	Not listed	14.70	14.91
9	PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion	Moderate to Good	Not listed	3.79	4.13
10	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	Moderate to Good	Not listed	2.59	2.59
	Cleared/Non-native vegetation	-	-	1,080.44	1063.48
Total				**1,563.25**	**1,563.25**

Further to the revised vegetation community mapping and inclusion of temporary impacts in the BBCC assessment, the total number of ecosystem credits required to offset the revised impacts of the Proposal are included in **Table 5.2**. The revised credit reports for the Proposal are included in **Appendix A**. It is noted that the primary driver for the change in credits generated is the inclusion of temporary impacts as areas of permanent impact, with the minor changes to the vegetation mapping resulting in only minor changes to credits.

Table 5.2 Revised Ecosystem Credit Requirements

Veg Zone	PCT ID (BVT IDs) and PCT Name	Condition Class	Ecosystem Credits Generated	
			BAR (Umwelt 2017a)	Addendum Report
1	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	Moderate to Good	254	365
2	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	Moderate to Good	250	343
3	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	Moderate to Good	63	63
4	PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	Moderate to Good_Natural Grassland	11,046	13,025
5	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate to Good	3,386	4,501
6	PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	Moderate to Good_DNG	2,917	3,706

Veg Zone	PCT ID (BVT IDs) and PCT Name	Condition Class	Ecosystem Credits Generated	
			BAR (Umwelt 2017a)	Addendum Report
7	PCT71 (BR127, NA126) 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	Moderate to Good	2	2
8	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	Moderate to Good	675	689
9	PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion	Moderate to Good	133	153
10	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	Moderate to Good	100	113
	Cleared/Non-native vegetation	-	0	0
Total			**18,826**	**22,960**

6.0 Matters of National Environmental Significance

OEH and DPE also requested updated commentary on the impacts of the Proposal on MNES based on the agreed vegetation mapping amendments.

Table 6.1 outlines the revised impact of the Proposal on ecological communities and habitats. As discussed in the BAR, as the Commonwealth listings are different to the NSW listings, in some cases not all of a NSW PCT will meet the EPBC Act listing criteria. For this reason the area of a particular PCT that is impacted may not match the area of an EPBC listed community of which it forms part. For example, only part (2.61 ha) of the total area mapped as PCT27 (7.26 ha) meets the listing criteria for the *Weeping Myall Woodlands EEC* under the EPBC Act.

Table 6.2 provides a summary of the impacts and offsets of the Proposal on impacted MNES, in accordance with the NSW FBA.

Table 6.1 Impacts of the Proposal on MNES

EPBC Act Listed MNES	Corresponding Plant Community Type in the Development Footprint	Area Impacted in the Development Footprint (ha)
Weeping Myall Woodlands EEC	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	7.26 ha (2.61 ha = EPBC Act EEC)
Brigalow (Acacia harpophylla dominant and co-dominant) EEC	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	4.85 ha (4.75 ha = EPBC Act EEC)
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions EEC	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	1.19 ha
Natural grasslands on basalt and fine-textured alluvial plains of northern New South Wales and southern Queensland CEEC	PCT52 (BR191, NA187) Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion *Moderate to Good_Natural Grassland*	279.94 ha

EPBC Act Listed MNES	Corresponding Plant Community Type in the Development Footprint	Area Impacted in the Development Footprint (ha)
Poplar Box Grassy Woodland on Alluvial Plains Proposed EEC	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	73.21 ha
*Poplar Box Grassy Woodland on Alluvial Plains Proposed EEC**	PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good_DNG*	111.65 ha
Not listed under EPBC Act	PCT71 (BR127, NA126) 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 *Moderate to Good*	0.04 ha
Not listed under EPBC Act	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	14.91 ha
Not listed under EPBC Act	PCT135 (BR284, NA271) Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion *Moderate to Good*	4.13 ha
Not listed under EPBC Act	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion *Moderate to Good*	2.59 ha
Total		**499.77**
Belson's panic (*Homopholis belsonii*) – vulnerable	PCT27 (BR233, NA219) Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion Moderate to Good	29 individuals recorded in 7.26 ha of this PCT

EPBC Act Listed MNES	Corresponding Plant Community Type in the Development Footprint	Area Impacted in the Development Footprint (ha)
	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion Moderate to Good	4.85 ha of potential habitat
Total Belson's panic (*Homopholis belsonii*) Habitat		**12.14 ha**
koala (*Phascolarctos cinereus*) – vulnerable Vegetation containing koala feed trees, vegetation types (as per the TSPD) and advice from OEH on refugia habitat during times of extreme heat	PCT-52 BVT-BR191, NA187-Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion-Native Grassland	0.34
	Zone - 6 - PCT-56 BVT-BR186, NA182-Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW-Derived Native Grasslands	0.54
	PCT-35 BVT-BR120, NA117-Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion -Moderate - Good	4.85
	PCT-39/BVT-BR130, NA129/Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion/Moderate - Good	1.19
	PCT-78/BVT-BR196, NA193/River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion/Moderate – Good	14.91
	PCT-56/BVT-BR186, NA182/Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW/Moderate – Good	73.01
Total Koala habitat (including refuge habitat)		**94.84**
grey-headed flying-fox *Pteropus poliocephalus*	PCT35 (BR120, NA117) Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion *Moderate to Good*	4.85 ha

EPBC Act Listed MNES	Corresponding Plant Community Type in the Development Footprint	Area Impacted in the Development Footprint (ha)
	PCT39 (BR130, NA129) Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion *Moderate to Good*	1.19 ha
	PCT56 (BR186, NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW *Moderate to Good*	73.21 ha
	PCT71 (BR127, NA126) 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 *Moderate to Good*	0.04 ha
	PCT78 (BR196, NA193) River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion *Moderate to Good*	14.91 ha
	PCT413 (BR346, NA348) Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion *Moderate to Good*	2.59 ha
Total grey-headed flying-fox habitat		**96.79**

*DNG form of the PCT56 (BR186; NA182) Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW may conform in part to the proposed Draft Conservation Advice for the Poplar Box Grassy Woodland on Alluvial Plains EEC. Patches lacking the canopy cover and tree regrowth are not considered part of this ecological community, except where these represent a gap in, or the edge of a larger patch, or where the tree layer is sparse between two patches across a short distance (up to 50 metres).

Table 6.2 Summary of the Impacts and Offsets of the Proposal on Impacted MNES, in accordance with the NSW FBA

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
Endangered Ecological Communities			
Natural Grassland on Basalt and Fine-textured Alluvial Plains of Northern NSW and Southern QLD	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the: • Construction Environmental Management Plan (CEMP) • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The Proposal is likely to significantly impact this ecological community. The reduction in the extent of the CEEC within the Development Footprint of 279.94 hectares is likely to result in a significant impact on the ecological community. Review of the significance assessment outcomes confirms that the proposal is considered likely to significantly impact this community.	Subject to the revision of credits as part of the detailed design process, 13,025 ecosystem credits will be retired to offset impacts to this CEEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.
Brigalow (*Acacia harpophylla* dominant and co-dominant)	Avoidance of native vegetation and habitat areas through Proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The Proposal would result in the removal of approximately 4.75 hectares of Brigalow (*Acacia harpophylla* dominant and co-dominant) from within the Development Footprint. Review of the significance assessment outcomes confirms that the Proposal is considered unlikely to significantly impact this community.	Subject to the revision of credits as part of the detailed design process, 343 ecosystem credits will be retired to offset impacts to the equivalent PCT (part of which conforms to the EEC), in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	The Proposal will result in the removal of approximately 1.19 hectares of Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions from within the Development Footprint. Review of the significance assessment outcomes confirms that the Proposal is considered unlikely to significantly impact this community.	Subject to the revision of credits as part of the detailed design process, 63 ecosystem credits will be retired to offset impacts to this EEC, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.
Weeping Myall Woodlands	Avoidance of native vegetation and habitat areas through proposal design, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan	The Proposal will result in the permanent loss of approximately 2.61 hectares within the Development Footprint. Review of the significance assessment outcomes confirms that the Proposal is considered unlikely to significantly impact this community.	Subject to the revision of credits as part of the detailed design process, 365 ecosystem credits will be retired to offset impacts to the equivalent PCT (part of which conforms to the EEC), in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

Matter	Avoidance and Mitigation	Proposal Impact	Like-for-like Offset In accordance with NSW FBA
Threatened Species			
Koala (*Phascolarctos cinereus*)	Avoidance of native vegetation and habitat areas, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	DoEE determined that the Proposal is likely to result in a significant impact on the koala. A total of 94.84 hectares of habitat for the koala has been mapped within the Development Footprint. This is based on vegetation containing koala feed trees, vegetation types (as per the TSPD) and advice from OEH on refugia habitat during times of extreme heat.	Subject to the revision of credits as part of the detailed design process, 2,466 species credits will be retired to offset impacts to the habitat of this threatened species, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.
Belson's panic (*Homopholis belsonii*)	Avoidance of native vegetation and habitat areas, where practicable and maximising disturbances within areas of low conservation value (exotic grasslands, disturbed areas). Mitigation of impacts through controls described in Table 4.3 of the Commonwealth Matters Report (Umwelt 2017b) to be implemented as described in the proposed: • CEMP • Soils and Water Management Sub-plan • Biodiversity Management Sub-plan.	Given the relatively small number of individuals recorded in the Development Footprint, the highly disturbed and fragmented nature of the Development Footprint and the reasonable number of records of this species outside the Development Footprint at this locality according to the OEH Atlas of NSW Wildlife, it is unlikely that a key source population either for breeding or dispersal, a population that is necessary for maintaining genetic diversity or a populations that is near the limit of its known range occurs within the Development Footprint. Therefore these individuals of Belson's panic within the Development Footprint are not considered to form part of an important population. Therefore the Proposal is unlikely to result in a significant impact on an important population of Belson's panic.	Subject to the revision of credits as part of the detailed design process, 1,898 species credits will be retired to offset impacts to the habitat of this threatened species, in accordance with the Programme Biodiversity Offset Strategy and the NSW FBA.

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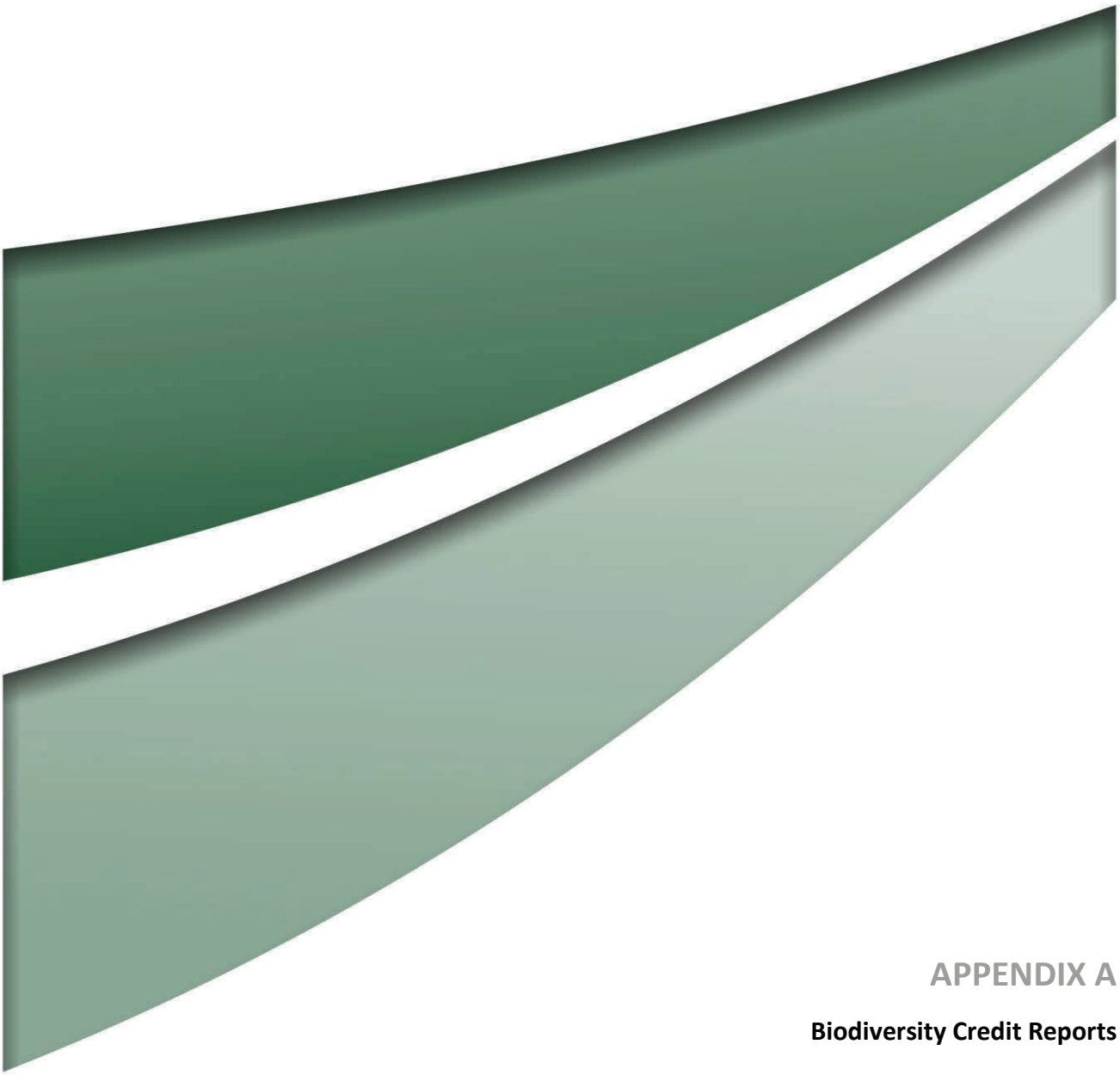

APPENDIX A

Biodiversity Credit Reports

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/09/2018 Time: 3:04:39PM Calculator version: v4.0

Major Project details

Proposal ID:	0113/2016/3684MP
Proposal name:	NNS Assessment Area 1 Namoi CMA/Northern Basalts IBRA Subregion
Proposal address:	na Narrabri NSW 2309
Proponent name:	Australian Rail and Track Corporation
Proponent address:	Level 12, 40 Creek Street Brisbane QLD 4000
Proponent phone:	(07) 3364 8900
Assessor name:	Ryan Parsons
Assessor address:	75 York Street TERALBA NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0113

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	23.82	848.00
Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	0.68	30.00
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	0.04	2.00
Total	24.54	880

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)

Number of ecosystem credits created	848
IBRA sub-region	Northern Basalts - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182) Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (NA146) Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (NA268)	Northern Basalts - Namoi and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Number of ecosystem credits created	30
IBRA sub-region	Northern Basalts - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348) Narrow-leaved Ironbark grassy woodland of the Brigalow Belt South bioregion, (NA164) Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (NA206) White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA222) White Box - White Cypress Pine shrubby open forest of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA225) White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (NA232) Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (NA242) Rough-barked Apple - Yellow Box grass/shrub footslope open forest, Brigalow Belt South Bioregion, (NA343) Warrumbungle trachyte hillcrest Tumbledown Red Gum - Black Cypress Pine - White Bloodwood shrubby woodland, (NA382) White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion, (NA402) Narrow-leaved Ironbark - White Cypress pine woodland on slopes and flats in the Coonabarabran - Pilliga Scrub regions, (NA317) White Box - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion, (NA392) White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (NA407) White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (NA397) Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (NA250) Mugga Ironbark - stringybark shrubby open forest of the far southern Nandewar Bioregion and New England Tableland Bioregion, (NA305) Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (NA341) Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (NA376) White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (NA393) White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (NA408) White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (NA398) White Box shrubby open forest on hills mainly in the Nandewar Bioregion,	Northern Basalts - Namoi and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

(NA401) Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion, (NA349) White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion, (NA396) Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA347)	

3. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219)

Number of ecosystem credits created	2
IBRA sub-region	Northern Basalts - Namoi

Offset options - Plant Community types	Offset options - IBRA sub-regions
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219)	Northern Basalts - Namoi and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/09/2018 Time: 3:08:01PM Calculator version: v4.0

Major Project details

Proposal ID:	0113/2016/3685MP
Proposal name:	NNS Assessment Area 2 - Namoi CMA/Northern Outwash IBRA Subregion
Proposal address:	na Narrabri NSW 2309
Proponent name:	Australian Rail and Track Corporation
Proponent address:	Level 12, 40 Creek Street Brisbane QLD 4000
Proponent phone:	(07) 3364 8900
Assessor name:	Ryan Parsons
Assessor address:	75 York Street TERALBA NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0113

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion.	1.49	54.00
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	5.19	173.00
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0.83	38.00
Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	0.48	21.00
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	0.08	4.01
Total	8.07	290

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182)

Number of ecosystem credits created	173
IBRA sub-region	Liverpool Plains (Part B)

Offset options - Plant Community types	Offset options - IBRA sub-regions
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (NA182) Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (NA146) Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (NA268)	Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348)

Number of ecosystem credits created	21
IBRA sub-region	Liverpool Plains (Part B)

Offset options - Plant Community types	Offset options - IBRA sub-regions

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (NA348) Narrow-leaved Ironbark grassy woodland of the Brigalow Belt South bioregion, (NA164) Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (NA206) White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA222) White Box - White Cypress Pine shrubby open forest of the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA225) White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (NA232) Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (NA242) Rough-barked Apple - Yellow Box grass/shrub footslope open forest, Brigalow Belt South Bioregion, (NA343) Warrumbungle trachyte hillcrest Tumbledown Red Gum - Black Cypress Pine - White Bloodwood shrubby woodland, (NA382) White Box shrubby woodland of the western Liverpool Range, Warrumbungle Range and south-west Pilliga forests, Brigalow Belt South Bioregion, (NA402) Narrow-leaved Ironbark - White Cypress pine woodland on slopes and flats in the Coonabarabran - Pilliga Scrub regions, (NA317) White Box - Black Cypress Pine shrubby hill woodland in the east Pilliga - Mendooran - Gulgong regions, mainly Brigalow Belt South Bioregion, (NA392) White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (NA407) White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (NA397) Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (NA250) Mugga Ironbark - stringybark shrubby open forest of the far southern Nandewar Bioregion and New England Tableland Bioregion, (NA305) Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (NA341) Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (NA376) White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (NA393) White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (NA408) White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (NA398) White Box shrubby open forest on hills mainly in the Nandewar Bioregion,	Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

(NA401) Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion, (NA349) White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion, (NA396) Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA347)	

3. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219)

Number of ecosystem credits created	4
IBRA sub-region	Liverpool Plains (Part B)

Offset options - Plant Community types	Offset options - IBRA sub-regions
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (NA219)	Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (NA271)

Number of ecosystem credits created	54
IBRA sub-region	Liverpool Plains (Part B)

Offset options - Plant Community types	Offset options - IBRA sub-regions
Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (NA271)	Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

5. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA193)

Number of ecosystem credits created	38
IBRA sub-region	Liverpool Plains (Part B)

Offset options - Plant Community types	Offset options - IBRA sub-regions
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (NA193)	Liverpool Plains (Part B) and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/09/2018 Time: 3:26:23PM Calculator version: v4.0

Major Project details

Proposal ID:	0113/2016/3626MP
Proposal name:	NNS Assessment Area 3 - Border Rivers Gwydir CMA/Northern Outwash IBRA SR
Proposal address:	na Narrabri NSW 2309
Proponent name:	Australian Rail and Track Corporation
Proponent address:	Level 12, 40 Creek Street Brisbane QLD 4000
Proponent phone:	na
Assessor name:	Ryan Parsons
Assessor address:	75 York Street TERALBA NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0113

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion	4.85	343.00
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	0.04	2.00
Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion.	2.63	99.00
Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion	1.19	63.41
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	144.62	6,752.00
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	248.42	11,558.00
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	13.28	615.10
Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion	1.43	62.00
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	7.06	354.01
Total	423.52	19,849

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)

Number of ecosystem credits created	6,752
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186) Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (BR150) Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (BR282)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (BR346)

Number of ecosystem credits created	62
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions

Silver-leaved Ironbark - White Cypress Pine - box dry shrub grass woodland of the Pilliga Scrub - Warialda region, Brigalow Belt South Bioregion, (BR346) Grey Box - Rough-barked Apple shrub/grass open forest of northern parts of the Nandewar Bioregion and New England Tableland Bioregion, (BR146) Silvertop Stringybark - Orange Gum shrubby open forest of the central parts of the Nandewar Bioregion, (BR211) White Box - Red Stringybark shrubby woodlands on basalt slopes of the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR236) White Box - White Cypress Pine shrub grass hills woodland in the Brigalow Belt South Bioregion and Nandewar Bioregion, (BR239) White Cypress Pine - White Box - Silver-leaved Ironbark shrubby open forest of the Nandewar Bioregion, (BR246) Semi-mesic woodland on basalt hills of the dry subtropical climate zone, north western slopes of NSW, (BR257) White Cypress Pine - Silver-leaved Ironbark - Wilga shrub grass woodland of the Narrabri-Yetman region, Brigalow Belt South Bioregion, (BR395) White Cypress Pine - Poplar Box - Silver-leaved Ironbark viney shrub woodland of the Brigalow Belt South Bioregion, (BR393) Black Cypress Pine - White Box - Tumbledown Gum shrubby open forest / woodland mainly in the Mt Kaputar region, Nandewar Bioregion, (BR268) Grey Box shrubby open forest of northern parts of the Nandewar Bioregion and New England Tableland Bioregion, (BR297) Mugga Ironbark - Black Cypress Pine shrubby open forest mainly in the Nandewar Bioregion and northern Brigalow Belt South Bioregion, (BR310) Rough-barked Apple - White Box - Rusty Fig shrubby open forest in the Kaputar area of Brigalow Belt South and Nandewar Bioregions, (BR336) Silver-leaved Ironbark - Black Cypress Pine +/- White Box shrubby open forest mainly in the northern Nandewar Bioregion, (BR343) Tumbledown Red Gum - White Cypress Pine - Caley's Ironbark shrubby open forest of the Nandewar Bioregion and western New England Tableland Bioregion, (BR372) White Box - Silvertop Stringybark +/- White Cypress Pine grass shrub open forest of the southern Nandewar Bioregion and New England Tableland Bioregion, (BR386) White Cypress Pine - Silver-leaved Ironbark - Caley's Ironbark open forest of the central Nandewar Bioregion and western New England Tableland Bioregion, (BR394) White Box - White Cypress Pine shrubby hills open forest mainly in the Nandewar Bioregion, (BR390) White Box shrubby open forest on hills mainly in the Nandewar Bioregion, (BR392) Silver-leaved Ironbark - White Cypress Pine shrubby open forest of Brigalow Belt South Bioregion and Nandewar Bioregion, (BR349) Silver-leaved Ironbark - White Cypress Pine - tea tree shrubby woodland mainly in the northern Nandewar Bioregion, (BR347) Tumbledown Red Gum - White Cypress Pine - Silver-leaved Ironbark shrubby woodland mainly in the northern Nandewar Bioregion, (BR374)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

White Box - cypress pine - Silver-leaved Ironbark shrub grass open forest / woodland of the northern Brigalow Belt South Bioregion and Nandewar Bioregion, (BR385) Silver-leaved Ironbark - White Box - White Cypress Pine viney scrub woodland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR345)	

3. Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120)

Number of ecosystem credits created	343
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Brigalow - Belah open forest / woodland on alluvial often gilgaied clay from Pilliga Scrub to Goondiwindi, Brigalow Belt South Bioregion, (BR120)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion, (BR130)

Number of ecosystem credits created	63
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Coolabah - River Coobah - Lignum woodland wetland of frequently flooded floodplains mainly in the Darling Riverine Plains Bioregion, (BR130) Belah woodland on alluvial plains and low rises in the central NSW wheatbelt to Pilliga and Liverpool Plains regions., (BR102)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

5. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)

Number of ecosystem credits created	354
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

6. 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, (BR127)

Number of ecosystem credits created	2
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
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, (BR127) Silver-leaved Ironbark - White Cypress Pine - Rough-barked Apple woodland on alluvial terraces in central-north NSW, (BR208)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

7. Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (BR284)

Number of ecosystem credits created	99
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Coobah - Western Rosewood low open tall shrubland or woodland mainly on outwash areas in the Brigalow Belt South Bioregion., (BR284)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

8. Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)

Number of ecosystem credits created	11,558
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191) Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones, (BR157) Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion, (BR167) Rats Tail Couch sod grassland wetland of inland floodplains, (BR192) Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR251)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

9. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)

Number of ecosystem credits created	615
IBRA sub-region	Northern Outwash

Offset options - Plant Community types	Offset options - IBRA sub-regions
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)	Northern Outwash and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Summary of species credits required

Common name	Scientific name	Extent of impact Ha or individuals	Number of species credits created
Belson's Panic	Homopholis belsonii	73.00	1,898
Finger Panic Grass	Digitaria porrecta	28.00	364
Creeping Tick-trefoil	Desmodium campylocaulon	280.00	3,080
Koala	Phascolarctos cinereus	94.84	2,466

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/09/2018 Time: 3:09:56PM Calculator version: v4.0

Major Project details

Proposal ID:	0113/2016/3681MP
Proposal name:	NNS Assessment Area 4 - Border Rivers Gwydir/Castlereagh-Barwon IBRA Subregion
Proposal address:	na Narrabri NSW 2309
Proponent name:	Australian Rail and Track Corporation
Proponent address:	Level 12, 40 Creek Street Brisbane QLD 4000
Proponent phone:	na
Assessor name:	Ryan Parsons
Assessor address:	75 York Street TERALBA NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0113

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	11.95	556.00
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0.72	33.00
Total	12.67	589

Credit profiles

1. Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)

Number of ecosystem credits created	556
IBRA sub-region	Castlereagh-Barwon - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191) Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones, (BR157) Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion, (BR167) Rats Tail Couch sod grassland wetland of inland floodplains, (BR192) Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR251)	Castlereagh-Barwon - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)

Number of ecosystem credits created	33
IBRA sub-region	Castlereagh-Barwon - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)	Castlereagh-Barwon - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

Biodiversity credit report

This report identifies the number and type of biodiversity credits required for a major project.

Date of report: 7/09/2018 Time: 3:11:22PM Calculator version: v4.0

Major Project details

Proposal ID:	0113/2016/3676MP
Proposal name:	NNS Assessment Area 5 - Border Rivers Gwydir CMA/Northern Basalts IBRA SR
Proposal address:	na Narrabri NSW 2309
Proponent name:	Australian Rail and Track Corporation
Proponent address:	Level 12, 40 Creek Street Brisbane QLD 4000
Proponent phone:	(07) 3364 8900
Assessor name:	Ryan Parsons
Assessor address:	75 York Street TERALBA NSW 2284
Assessor phone:	02 4950 5322
Assessor accreditation:	0113

Summary of ecosystem credits required

Plant Community type	Area (ha)	Credits created
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW	11.22	434.00
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion	19.58	911.00
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion	0.07	3.00
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion	0.09	5.00
Total	30.96	1,353

Credit profiles

1. Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186)

Number of ecosystem credits created	434
IBRA sub-region	Northern Basalts - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
Poplar Box - Belah woodland on clay-loam soils on alluvial plains of north-central NSW, (BR186) Western Grey Box - cypress pine shrub grass shrub tall woodland in the Brigalow Belt South Bioregion, (BR150) Carbeen +/- Coolabah grassy woodland on floodplain clay loam soil on north-western NSW floodplains, mainly Darling Riverine Plain Bioregion, (BR282)	Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

2. Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)

Number of ecosystem credits created	5
IBRA sub-region	Northern Basalts - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
Weeping Myall open woodland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR233)	Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

3. Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191)

Number of ecosystem credits created	911
IBRA sub-region	Northern Basalts - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
Queensland Bluegrass +/- Mitchell Grass grassland on cracking clay floodplains and alluvial plains mainly the northern-eastern Darling Riverine Plains Bioregion, (BR191) Mitchell Grass grassland - chenopod low open shrubland on floodplains in the semi-arid (hot) and arid zones, (BR157) Native Millet - Cup Grass grassland of the Darling Riverine Plains Bioregion, (BR167) Rats Tail Couch sod grassland wetland of inland floodplains, (BR192) Partly derived Windmill Grass - copperburr alluvial plains shrubby grassland of the Darling Riverine Plains Bioregion and Brigalow Belt South Bioregion, (BR251)	Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

4. River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)

Number of ecosystem credits created	3
IBRA sub-region	Northern Basalts - Border Rivers/Gwydir

Offset options - Plant Community types	Offset options - IBRA sub-regions
River Red Gum riparian tall woodland / open forest wetland in the Nandewar Bioregion and Brigalow Belt South Bioregion, (BR196)	Northern Basalts - Border Rivers/Gwydir and any IBRA subregion that adjoins the IBRA subregion in which the development occurs

umwelt

Newcastle

75 York Street
Teralba NSW 2284

Ph. 02 4950 5322

Perth

PO Box 783
West Perth WA 6872
7 Havelock Street
West Perth WA 6005

Ph. 1300 793 267

Canberra

PO Box 6135
56 Bluebell Street
O'Connor ACT 2602

Ph. 02 6262 9484

Sydney

50 York Street
Sydney NSW 2000

Ph. 1300 793 267

Brisbane

Level 13
500 Queen Street
Brisbane QLD 4000

Ph. 1300 793 267

www.umwelt.com.au