Koala Habitat Rehabilitation Monitoring Report 8th Monitoring Period – Yarrabilba

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Project Name:	Yarrabilba
Proponent's ACN:	103 578 436
Proposed Action:	To construct the Yarrabilba residential development and associated infrastructure approximately 40 kilometres south east of Brisbane, Qld (see EPBC Act referral 3013/6791 and request to vary proposal dated 5 August 2013)
Prepared for:	Lendlease
Prepared by:	K. Leopold, Dr M.N. Runkovski, J. Pittard, B. Steinrücken, K. Richardt
Date:	21 March 2022

Natura Pacific – Document Control Sheet

Project	
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Contents

List of Figures

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List of Tables

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1 Executive summary

Natura Pacific has developed this *Habitat Rehabilitation Monitoring Report* for the 8th monitoring period for rehabilitation within the Yarrabilba Koala Habitat Areas as prescribed in the *Habitat Rehabilitation and Management Plan* (Natura Consulting, March 2015) and the Approval Conditions set out under the *Environmental Protection and Biodiversity Conservation Act 1999* originally dated 13 November 2014 and varied 8 December 2017.

The intent of this report is to provide 8th monitoring period information to direct the rehabilitation works associated with koala habitat within the 'koala habitat areas to be protected and managed' on the Yarrabilba site. These areas are to be rehabilitated, ensuring that koala habitat outside of the offset sites areas are protected and managed. This report provides 8th monitoring period data for the rehabilitation of these areas, with 60 out of 62 sites monitored (see later). In this monitoring period, one site was inaccessible due to inundation by floodwaters, and another site was removed due to disturbance from encroaching development works being undertaken in Precinct 4 adjacent to (and encroaching upon) the Greenspace Corridor that reaches towards Wal's Block in the east. Each monitoring site is located within a Koala Habitat Rehabilitation Unit (HRU1 to HRU31) including Road Crossing Rehabilitation Units (CRU2, CRU4 to CRU7 and CRU9 to CRU14), with the pre-clearing Regional Ecosystem, management type and corridor type tabulated.

Each rehabilitation unit is to be rehabilitated to a vegetation structure and species composition that is in line with that of the appropriate pre-clearing Regional Ecosystem (RE). This is derived from the vegetation structure and species composition of the appropriate pre-clearing RE. The Final Benchmark for rehabilitation is derived from the definition of remnant vegetation under the *Vegetation Management Act 1999* (canopy is 70% of the height, 50% of the cover and similar species composition of the appropriate pre-clearing RE). Interim Benchmarks are also provided whereby an assessment at regular intervals will be made on the progress of the rehabilitation / revegetation efforts towards achieving this plan's outcomes. For Interim Benchmark years 1 to 10, vegetation structure has been quantified from a cumulative growth curve (CGC). The reference benchmark, Interim Benchmarks and Final Benchmarks have been tabulated for each RE, with the relevant rehabilitation unit also identified. A species list for each RE, including dominant species within each stratum, has also been provided.

Provision of contingency measures and corrective actions will account for instances of when Interim Benchmarks are not being met. 'As constructed' data and surveyed boundaries will also be provided for each rehabilitation unit to test and demonstrate compliance with the requirement to maintain and protect existing koala habitat.

The monitoring methodology that is applied has been detailed, where a minimum of two monitoring sites per rehabilitation unit will be surveyed, to document and assess rehabilitation through time. All final locations of the monitoring sites (now 61 in total) have been mapped. Monitoring includes photo point monitoring along with transect and quadrat monitoring to monitor changes in species richness, percentage foliage cover for the ground layer, shrub and canopy layers, canopy height, and weed prevalence.

An assessment of site species richness and structure was undertaken to determine the current condition against the benchmark values. Several sites already meet the '*Final Benchmark*' for some individual parameters. Rehabilitation efforts need to ensure that the full suite of species represented in the pre-RE condition for each rehabilitation unit are planted where possible, with a strong focus on eradicating exotic weed infestations including *Pinus elliottii,* particularly in those areas where highest weed cover has been recorded.

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A total of 34 sites (57%) met a benchmark for canopy tree cover (up from 29 sites in 7th monitoring period), 38 sites (63%) met a benchmark for canopy tree height (up from 32 sites in 6th monitoring period). 60 sites (100%) meet a benchmark for both small tree cover and height (equivalent to results for 7th monitoring period). For shrub cover, 45 sites (75%) met a benchmark (down from 55 sites in 7th monitoring period). For shrub height, 57 sites (95%) met a benchmark (down from 58 sites in 7th monitoring period). For ground cover, 59 sites (98%) meet a benchmark (same as 7th monitoring period). There was a decline observed in benchmarks met for weed cover, with 17 sites (28%) now meeting the <5% weed cover the ground-layer benchmark (down from 29 sites in the 7th monitoring period).

Overall, this assessment indicates that recommended management actions are proving successful, with many 7th monitoring priority sites showing improvement and being replaced by new priority management areas. **Recommended management actions for this report are mostly consistent with previous monitoring periods, including assisted natural regeneration with continued weed control for a range of target species alongside infill planting to improve native species richness and cover predominantly in the shrub and ground layers, with planting of canopy species recommended for sites where the T1 layer remains absent**. There is some variation in top priority HRU based on monitoring results and changes to benchmark attainment across sites and parameters. Field assessments were carried out over a longer time period than usual due to ongoing adverse weather and inundation of sites, limiting accessibility for collecting results. It was observed that many of the inundated sites had seen the growth of ephemeral native and exotic species, which was reflected in a higher than average ground cover, as well as a significant increase in the average weed cover.

Rehabilitation works need to continue prioritising weed control of the ground-layer to provide opportunity for native species richness and shrub cover to increase through assisted natural regeneration over time. Furthermore, strategic planting of the ground, shrub and tree layers will ensure that weeds are outcompeted and shaded out over time. A number of sites do not yet meet a benchmark for tree and shrub FPC, and so these sites will need to be prioritised for rehabilitation within the next 6 months to facilitate attainment of the minimum IMO-5 year benchmark for these strata (see table 13 for top priority sites and focus areas). Management of *Pinus elliotti* has shown good results and is recommended to continue through strategic removal across all strata in addition to management for priority sites.

Based on the results of this monitoring period, there are 22 sites currently regarded as the poorest in terms of height and cover and meeting low benchmarks (IMO-1, IMO-2, IMO-3) or no benchmarks at all, in four or more parameters across canopy, shrub and ground-layers with the percentage of weed cover also taken into consideration. Considering these, **there are 14 top priority rehabilitation units** most urgently requiring management actions for improving multiple benchmarks (predominantly species richness, shrub height and cover and weed cover, with 5 of these RMU requiring *P. elliotti* removal). These are **HRU3 (site 6, same as 7th monitoring period), CRU12 (site 12, included in 7th monitoring), HRU18 (site 88 and site 87 included in 7th monitoring), HRU4 (site 15), HRU22 (site 93, included in 7th monitoring and 94), HRU9 (site 35, included in 7th monitoring), CRU13 (sites 8 and 9), HRU15 (site 71 included in 7th monitoring and 73), CRU7 (site 139, included in 6th and 7th monitoring), HRU1 (Site 1, included in 7th monitoring), HRU 3 (site 6), HRU23 (site 89 included in 6th and 7th monitoring), HRU20 (sites 81 and 83), HRU21 (site 146, included in 6th monitoring) and HRU29 (Sites 141 and 142, included in 6th and 7th monitoring) (in order of highest to lower priority).**

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2 Introduction

2.1 Background

The Yarrabilba development site is located on the eastern side of Waterford - Tamborine Road and to the south of Logan Village (refer to Figure 1). It is bounded by rural residential areas to the north, Plunkett Road to the south and the Plunkett Conservation Park to the east. The site consists of approximately 2,200 ha, of which 1,931 ha is controlled by Lendlease Communities (Yarrabilba) Pty Ltd. The land has been historically used for pine forestry, a military training camp in WWII and for livestock grazing, when first cleared. Yarrabilba is predominately vegetated with areas of regrowth native vegetation, regenerating pines and exotic grasslands. Some limited areas of native remnant and regrowth vegetation exist but they are mostly confined to creeks, drainage channels and wetlands.

The site is currently in the early stages of development with the growth of Yarrabilba projected to span approximately 30 years. The long-term master-planned development incorporates an extensive network of dedicated open space (approx. 25% of the site). A significant component of the open space is dedicated to the conservation of habitat for koalas (*Phascolarctos cinereus*).

Habitat rehabilitation is intended to improve koala habitat quality within the site in order to significantly increase the site's koala carrying capacity in the medium to long term. In addition, the configuration of key elements of the open space system (Fauna Corridor, Greenspace Corridor and Environmental Protection Zone) will enhance the site's contribution to koala movement opportunities within the context of larger areas of koala habitat to the east and west of the site (Austecology 2012). Under the development of Yarrabilba, all existing fragments of remnant vegetation which have value for koalas will be retained (approximately 5.4% of the total site area) (Austecology 2012). The rehabilitation of the Fauna Corridor, Greenspace Corridor and Environmental Protection Zone will significantly expand on these values by providing additional koala habitat (Natura Consulting 2011).

Natura Pacific has developed this *Habitat Rehabilitation Monitoring Report – 8h Monitoring Period within Koala Habitat Areas* prior to the commencement of habitat rehabilitation in Koala Habitat Areas in the Yarrabilba Residential Development. This report provides data for the 8th monitoring period for the rehabilitation of Koala Habitat Areas within the development site, with 60 sites monitored this survey period. As noted in previous monitoring reports, Slash Pine (*Pinus elliottii*) control has already occurred throughout >90% of the entire development site.

2.2 Objectives

The intent of this report is to provide 8th monitoring period data with which to assess the rehabilitation of koala habitat within the 'koala habitat to be protected and managed'.

This report is consistent with the *Habitat Rehabilitation and Management Plan* (Natura Consulting 2015), *Offset Management Plan* (Austecology 2015), *Koala Management Plan* (Austecology 2012) and *Fauna Corridor Infrastructure Master Plan* (Natura Consulting 2011). Specifically, the objectives of this report are to:

- describe the rehabilitation areas and clear and concise rehabilitation outcomes and performance indicators against which achievement of the rehabilitation will be measured
- identify contingency measures and appropriate corrective actions that will be undertaken if the performance indicators or outcomes are not being met
- outline the monitoring methodology including monitoring site locations
- present the 8th monitoring period results
- assess whether rehabilitation is on-track to meet the next interim performance indicator

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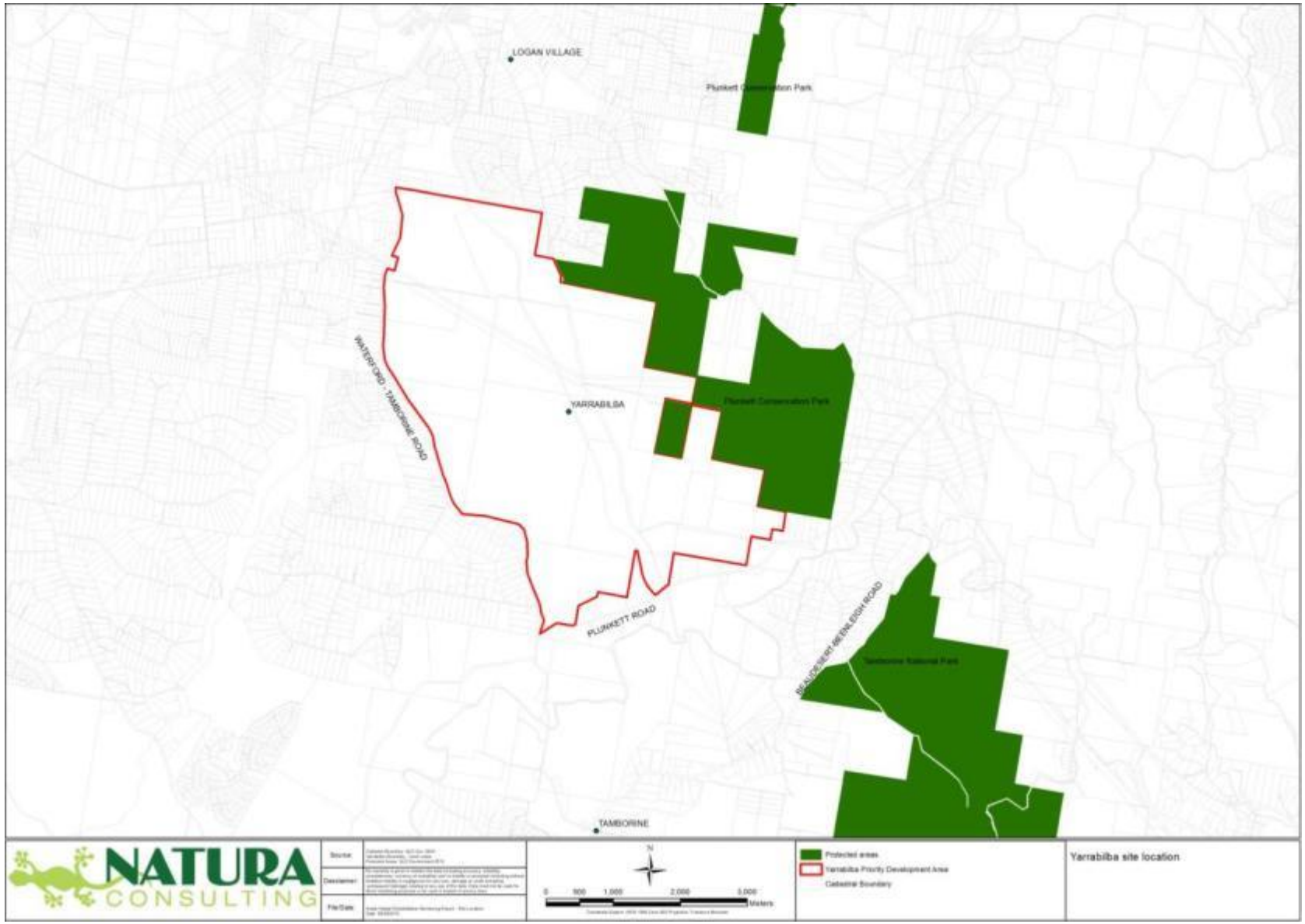

Figure 1 Yarrabilba site location

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3 Rehabilitation areas

3.1 Purpose of habitat rehabilitation

Koala habitat rehabilitation is to be undertaken within *Existing Assessable Koala Habitat to be protected and managed* within Fauna Corridors, Greenspace Corridors and Environmental Protection Zones. This totals an area of 754,657 m^2 (75.5 ha) within *Existing Assessable Koala Habitat* areas outside of Offset areas (195 ha), comprising a combined area of 2,736,428 m^2 (273.6 ha).

The koala habitat rehabilitation area has been divided into Offset Rehabilitation and Habitat Rehabilitation Units and Crossing Rehabilitation Units. This report is relevant to the Habitat Rehabilitation Units and Crossing Rehabilitation Units.

3.2 Habitat Rehabilitation Units (HRU)

Koala habitat rehabilitation is to occur within Habitat Rehabilitation Units as shown in Figure 2. Each rehabilitation unit (HRU1 to HRU31) is a mapped polygon, where the polygon boundaries are the mapped Pre-Clearing Regional Ecosystems. The Regional Ecosystem (RE) code applicable to each unit was determined by overlapping Pre-Clearing Regional Ecosystem mapping (Queensland Government 2015b) with maps of *Existing Assessable Koala Habitat – to be protected and managed* within the Fauna Corridors, Greenspace Corridors and Environmental Protection Zones.

The following table (Table 1) presents a summary of rehabilitation unit attributes, including the:

- area of the rehabilitation unit in square metres
- corridor within which the rehabilitation unit is located
- RE code for pre-clearing vegetation within the rehabilitation unit and the landzone / geology of the rehabilitation unit

It is noted that the minimum rehabilitation unit size is ~2,500 m^2 to reflect the mapping limitation of the Pre-Clearing Regional Ecosystems mapping dataset (Queensland Government 2015a). However, there are two rehabilitation units with areas of slightly less than 2,500 m^2, which were retained due to their immediate proximity to adjacent rehabilitation units.

3.3 Crossing Rehabilitation Units (CRU)

Rehabilitation and monitoring are also being undertaken where road and infrastructure traverses a Habitat Rehabilitation Unit. These areas are known as Crossing Rehabilitation Units. Crossing Rehabilitation Units have been identified by overlaying the proposed internal road network with the Pre-Clearing Regional Ecosystem mapping (Queensland Government 2015a) and Koala Habitat Rehabilitation Unit mapping. Each Crossing Rehabilitation Unit (CRU1 to CRU15) is a mapped polygon. It is noted that these locations are indicative and may change with the final alignment of roads. Table 2 presents a summary of the Crossing Rehabilitation Units, which are subject to rehabilitation actions outlined in this report.

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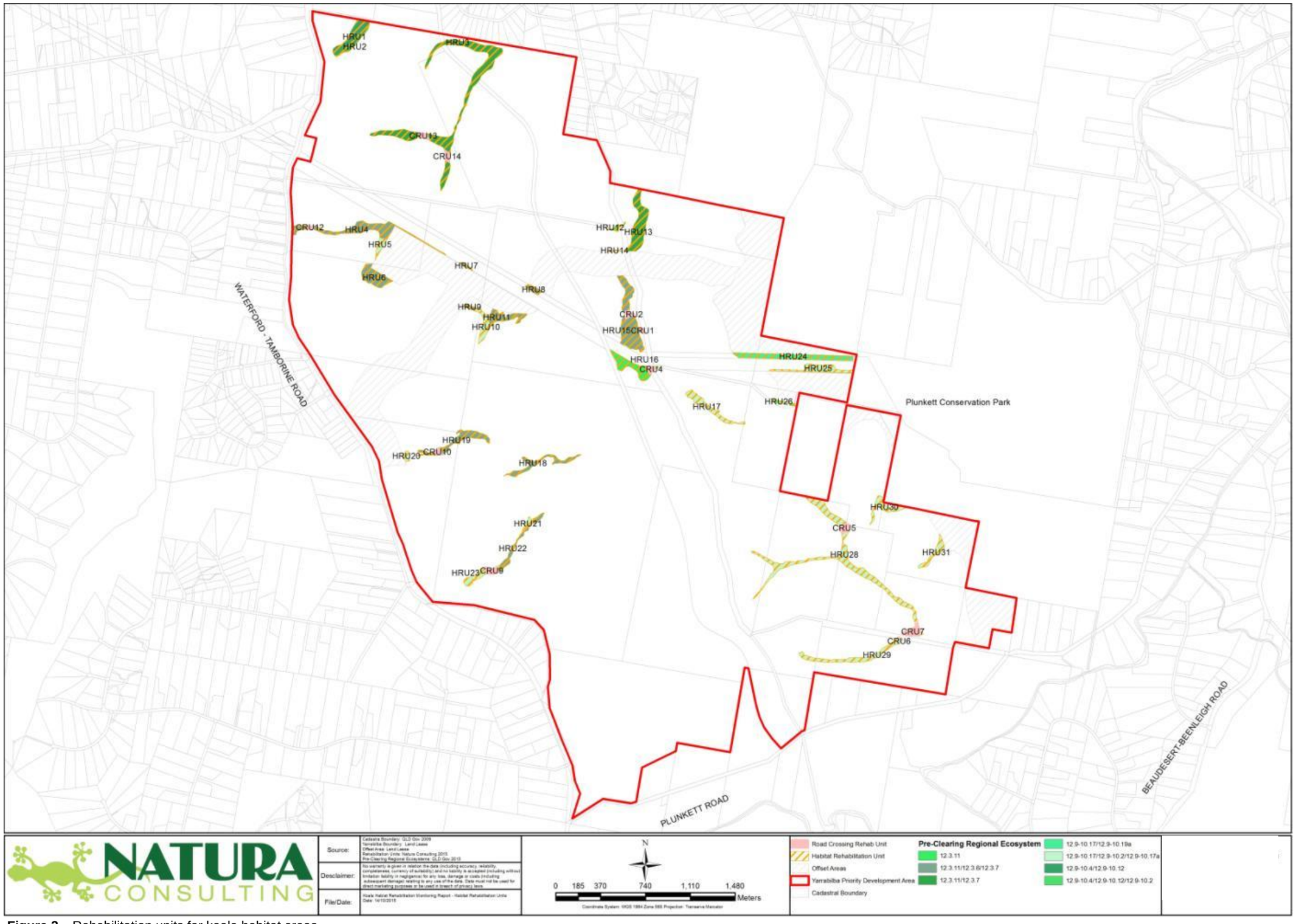

Figure 2 Rehabilitation units for koala habitat areas

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Table 1 Habitat Rehabilitation Units (HRU) within the corridor network

Rehab. Unit	Area (m^2)	Corridor Type	RE Code(s)	Landzone / Geology
HRU1	31,875	Greenspace Corridor	12.9-10.4/12.9-10.12	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU2	2,947	Greenspace Corridor	12.9-10.4/12.9-10.12/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU3	116,097	Greenspace Corridor	12.3.11/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU4	47,894	Fauna Corridor Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU5	6,788	Greenspace Corridor	12.9-10.17/12.9-10.2	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU6	26,102	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU7	1,684	Fauna Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU8	5,206	Fauna Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU9	2,935	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU10	13,511	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU11	19,528	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU12	3,128	Greenspace Corridor	12.9-10.4/12.9-10.12/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU13	42,093	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU14	910	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU15	62,944	Fauna Corridor Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU16	29,486	Fauna Corridor Greenspace Corridor	12.3.11	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU17	19,638	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU18	19,604	Fauna Corridor Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats

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Rehab. Unit	Area (m^2)	Corridor Type	RE Code(s)	Landzone / Geology
HRU19	29,070	Fauna Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU20	3,784	Fauna Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU21	5,688	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU22	14,158	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Recent quaternary alluvial systems – Alluvial river and creek flats
HRU23	15,932	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU24	38,783	Environmental Protection	12.9-10.17/12.9-10.19	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU25	22,618	Environmental Protection	12.9-10.17/12.9-10.2/12.9-10.19	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU26	2,818	Environmental Protection	12.9-10.17/12.9-10.19	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU27	15,379	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU28	99,585	Fauna Corridor Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU29	27,237	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU30	15,378	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
HRU31	11,857	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
Total	**754,657**			

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Table 2 Road and infrastructure crossing rehabilitation units (CRU) traversing Habitat Rehabilitation Units (HRU)

Crossing Rehab. Unit	Area (m^2)	Traversing ORU	Corridor Type	RE Code(s)	Landzone / Geology
CRU1	1,369	HRU15	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU2	3,670	HRU15	Fauna Corridor Greenspace Corridor	12.3.11/12.3.6/12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU4	3,347	HRU16	Greenspace Corridor	12.11.3	Metamorphic rocks - hills and lowlands on metamorphic rocks
CRU5	6,013	HRU28	Fauna Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU6	731	HRU29	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU7	10,045	HRU28	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU9	5,542	HRU22, HRU23	Greenspace Corridor	12.9-10.17/12.9-10.2	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU10	3,555	HRU19	Fauna Corridor	12.3.11/12.3.6/12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU12	1,775	HRU4	Greenspace Corridor	12.3.11/12.3.6/12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU13	3,766	HRU3	Greenspace Corridor	12.3.11//12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
CRU14	3,496	HRU3	Greenspace Corridor	12.3.11//12.3.7	Fine grained sedimentary rocks – Undulating country on fine grained sedimentary rocks
Total	**43,309**				

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3.4 Pre-clearing Regional Ecosystems Rehabilitation Units

A short description of the pre-clearing Regional Ecosystems identified in the Koala Habitat Rehabilitation Units and Crossing Rehabilitation Units is provided in Table 3.

Table 3 Summary of pre-clearing Regional Ecosystems within Offset Rehabilitation Units and Crossing Rehabilitation Units

RE Code	RE short description (extract from Qld Herbarium) RE Description Database	Vegetation Management Act class	Biodiversity status
12.3.6	*Eucalyptus tereticornis*, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp. fringing woodland	Least concern	No concern at present
12.3.7	*Melaleuca quinquenervia* +/- *Eucalyptus tereticornis*, *Lophostemon suaveolens* open forest on coastal alluvial plains	Least concern	No concern at present
12.3.11	*Eucalyptus tereticornis* +/- *Eucalyptus siderophloia*, *Corymbia intermedia* open forest on alluvial plains	Of concern	Of concern
12.9-10.2	*Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks	Least concern	No concern at present
12.9-10.4	*Eucalyptus racemosa* subsp. *racemosa* woodland on sedimentary rocks	Least concern	No concern at present
12.9-10.12	*Eucalyptus seeana*, *Corymbia intermedia*, *Angophora leiocarpa* woodland on sedimentary rocks	Endangered	Endangered
12.9-10.17	*Eucalyptus acmenoides*, *E. major*, *E. siderophloia* +/- *Corymbia citriodora* subsp. *variegata* woodland on sedimentary rocks	Least concern	No concern at present
12.9-10.19	*Eucalyptus fibrosa* subsp. *fibrosa* woodland on sedimentary rocks	Least concern	No concern at present
12.11.3	*Eucalyptus siderophloia*, *E. propinqua* +/- *E. microcorys*, *Lophostemon confertus*, *Corymbia intermedia*, *E. acmenoides* open forest on metamorphics +/- interbedded volcanics	Least concern	No concern at present

Source: QLD Government 2015a

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4 Rehabilitation performance indicators

In accordance with the *EPBC Act 1999* decision notice, the *Koala Habitat Rehabilitation Management Plan* (Natura Consulting 2015) was formulated reflecting the onsite rehabilitation requirements of Fauna and Green Space Corridors, Regional Ecosystems, drainage lines and post development fauna movement pathways within Offset Areas on the site. This plan identifies koala habitat rehabilitation benchmarks and determines restoration actions to meet these benchmarks.

Each rehabilitation unit is to be rehabilitated to a vegetation structure and species composition that is in line with that of the appropriate pre-clearing RE (identified in Table 5 and Table 6). The reference benchmark for rehabilitation of each rehabilitation unit is derived from the vegetation structure and species composition of the appropriate pre-clearing Regional Ecosystem (RE) (refer to Table 5 and Table 6). These benchmarks quantify average canopy cover, shrub cover, ground cover, species richness and average height of the canopy and have been sourced from the Queensland Herbarium (Queensland Government 2015b). These technical descriptions are a compilation of data from multiple sites for canopy cover, shrub cover, and average stem density for each strata, groundcover and average species richness (Queensland Government 2015b). Through establishing these benchmarks, a reasonable comparison can be made between the floristic composition and vegetation structure of a given rehabilitation unit and the appropriate pre-clearing RE.

4.1 Performance indicators

The Final Benchmark for rehabilitation is derived from the definition of remnant vegetation under the *Vegetation Management Act 1999.* Vegetation can be mapped as remnant vegetation and associated essential habitat for koalas if the canopy is 70% of the height, 50% of the cover and similar species composition of the appropriate pre-clearing RE (Queensland Government 2015b). Therefore, the Final Benchmark for rehabilitation is 70% of the reference benchmark cover (for canopy, shrub and ground-layer) and 50% of the reference benchmark height (for canopy and shrub layer) of the appropriate RE.

Six rehabilitation performance indicators were selected:

1. average canopy cover
2. average height of canopy
3. dominant canopy species
4. average shrub cover
5. average groundcover
6. species richness
7. weed cover

Weed cover needs to be considered for rehabilitation benchmarks for this site, particularly in the canopy where numerous exotic pine trees exist. Throughout the life of the development a weed cover of ≤5% is to be maintained.

The reference and Final Benchmark vegetation structure and species composition for each of the pre-clearing REs identified within the mapped rehabilitation units is identified in Table 5 and Table 6 respectively. Note that exotic species identified in Table 6 are to assist with identification purposes only and are to be controlled and managed, not planted or assisted.

Rehabilitation units are to be managed and restored until they reach the Final Benchmark condition as identified in Table 4 and Table 5, along with the objectives of the Habitat Rehabilitation and Management Plan. The objectives of this plan are long term and are likely to require more than 15 years to be achieved, within each rehabilitation unit, after implementation is commenced.

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Interim Benchmarks are also provided whereby an assessment at regular intervals can be made on the progress of the rehabilitation / revegetation efforts towards achieving this plan's outcomes. Given this, adaptive management approaches can also be employed to redirect restoration approaches, in the event that Interim Benchmarks are not being met. Table 5 provides a summary of the timeframe to achieve the Interim and Final Benchmarks.

For Interim Benchmark years 1 to 10, vegetation structure has been quantified from a cumulative growth curve (CGC), which for biological organisms, including trees and shrubs, is sigmoidal (Brack and Wood 1996). As the reference benchmarks applied for this report are at the Regional Ecosystem level, and site data and long term tree and shrub growth curves are not available for Yarrabilba, we have derived general growth curves for each Regional Ecosystem. This is based on a sigmoidal growth curve, the average reference benchmark height of the stratum, the minimum height at which regrowth vegetation is considered to be of equivalent height as the RE (50% of reference benchmark height), and the average height of tubestock (20 cm) that is predominately used for revegetation in southeast Queensland.

The Final Benchmark at year 15 is 70% of the reference benchmark cover (for canopy, shrub and ground-layer) and 50% of the reference benchmark height (for canopy and shrub layer) of the appropriate pre-clearing RE. See Appendix A for species composition of Final Benchmark Regional Ecosystems.

4.2 Contingency measures and corrective actions

4.2.1 Meeting benchmarks

During the course of monitoring, if Interim Benchmarks are not being met, the timeframes to achieve the Final Benchmarks will be reviewed and extended, whereby Lendlease will continue to undertake rehabilitation works with continued monitoring until the Final Benchmarks are met. The review of the success of meeting Interim Benchmarks will be undertaken at each monitoring event and reported on. Where the extension of rehabilitation works is required for particular Rehabilitation Units, discussions will be undertaken with the Department of Environment, to ensure that any additional requirements are also highlighted and addressed.

4.2.2 As constructed data

Constructed data and surveyed boundaries will be provided for each Rehabilitation Unit, within three months of completion of earthworks. This will be undertaken to test and demonstrate compliance within the offset area (195 ha) requirement.

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Table 4 Reference, Interim & Final Benchmark vegetation structure for each pre-clearing RE detailed for rehabilitation units (HRU) & crossing rehabilitation units (CRU)

Benchmark Condition (where rehabilitation units are treated individually, at least 70% of height and 50% of cover values to be attained within first 15 years of commencement of rehabilitation works)											
RE Code	**Name**	**VMA Status**	**Biodiversity**	**Habitat Rehabilitation Unit**				**Crossing Rehabilitation Unit**			
12.3.6	***Melaleuca quinquenervia* +/- *Eucalyptus tereticornis, Lophostemon suaveolens* open forest on coastal alluvial plains**	Least concern	No concern at present	HRU4, HRU6, HRU7, HRU8, HRU9, HRU11, HRU13, HRU14, HRU15, HRU18, HRU19, HRU22							
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
			Interim Benchmark by 1 year	10.0	1.5			1.5	0.5	6.0	
			Interim Benchmark by 2 years	14.0	3.0			2.0	0.8	10.0	
			Interim Benchmark by 3 years	16.0	4.0			2.5	1.2	15.0	
			Interim Benchmark by 5 years	22.0	6.0			3.0	1.4	20.0	
			Interim Benchmark by 10 years	28.0	9.2			4.0	1.5	25.0	
			Final Benchmark by 15 years	**30.5**	**10.7**			**4.5**	**1.6**	**29.2**	**-**
			Reference Benchmark (Pre-Clearing RE)	**60.9**	**15.3**			**8.9**	**2.3**	**58.4**	**33.3 +/- 10.5**
12.3.7	***Eucalyptus tereticornis*, *Casuarina cunninghamiana* subsp. *cunninghamiana* +/- *Melaleuca* spp. fringing woodland**	Least concern	No concern at present	HRU3, HRU4, HRU6, HRU7, HRU8, HRU9, HRU11, HRU13, HRU14, HRU15, HRU18, HRU19, HRU22							
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
			Interim Benchmark by 1 year	5.5	1.6	2.0	0.8	2.5	0.5	6.0	
			Interim Benchmark by 2 years	6.0	2.9	3.0	2.7	3.0	0.8	7.0	
			Interim Benchmark by 3 years	7.0	4.1	4.0	3.7	3.5	1.2	8.0	
			Interim Benchmark by 5 years	9.0	6.2	5.9	5.2	4.0	1.4	10.0	
			Interim Benchmark by 10 years	12.0	10.1	9.3	7.3	6.0	1.5	12.0	
			Final Benchmark by 15 years	**13.3**	**13.6**	**11.5**	**8.2**	**6.6**	**1.6**	**14.4**	**-**
			Reference Benchmark (Pre-Clearing RE)	**26.6**	**19.4**	**15.3**	**9.0**	**13.2**	**2.3**	**28.7**	**52.8 +/- 7.5**

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Benchmark Condition (where rehabilitation units are treated individually, at least 70% of height and 50% of cover values to be attained within first 15 years of commencement of rehabilitation works)											
RE Code	**Name**	**VMA Status**	**Biodiversity**	**Habitat Rehabilitation Unit**				**Crossing Rehabilitation Unit**			
12.3.11	***Eucalyptus tereticornis* +/- *Eucalyptus siderophloia*, *Corymbia intermedia* open-forest on alluvial plains**	Of concern	Of concern	HRU3, HRU4, HRU6, HRU7, HRU8, HRU9, HRU11, HRU13, HRU14, HRU15, HRU16, HRU18, HRU19							
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
Interim Benchmark by 1 year				7.0	1.6	2.0	0.8	2.0	0.4	1.5	
Interim Benchmark by 2 years				10.0	3.0	3.0	2.8	4.0	0.7	2.0	
Interim Benchmark by 3 years				12.0	4.2	4.2	3.8	5.0	1.1	3.0	
Interim Benchmark by 5 years				18.0	6.4	6.4	5.5	7.0	1.3	4.5	
Interim Benchmark by 10 years				22.0	10.7	10.7	8.2	9.0	1.5	7.0	
Final Benchmark by 15 years				**25.6**	**16.7**	**13.9**	**9.6**	**10.9**	**1.9**	**8.5**	**-**
Reference Benchmark (Pre-Clearing RE)				**51.1**	**23.8**	**23.9**	**11.3**	**21.7**	**2.7**	**17**	**40.6 +/- 8.5**
12.9-10.2	***Corymbia citriodora* subsp. *variegata* +/- *Eucalyptus crebra* open forest on sedimentary rocks**	Least concern	No concern at present	HRU2, HRU5, HRU10, HRU12, HRU17, HRU20, HRU21, HRU23, HRU27, HRU28, HRU29, HRU30, HRU31				CRU5, CRU6, CRU9			
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
Interim Benchmark by 1 year				6.0	1.6	2.0	0.8	6.0	0.4	6.0	3.0
Interim Benchmark by 2 years				10.0	2.9	2.9	2.8	6.5	0.7	7.0	4.0
Interim Benchmark by 3 years				12.0	4.2	4.0	3.8	7.0	1.1	12.0	5.0
Interim Benchmark by 5 years				18.0	6.3	6.0	5.3	8.5	1.3	18.0	7.0
Interim Benchmark by 10 years				22.0	10.5	9.6	7.7	11.4	1.5	22.0	9.0
Final Benchmark by 15 years				**26.8**	**15.5**	**11.9**	**8.9**	**15.1**	**1.8**	**23.6**	**10.8**
Reference Benchmark (Pre-Clearing RE)				**53.5**	**22.2**	**16.5**	**10.1**	**21.6**	**2.5**	**47.2**	**21.6**

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Benchmark Condition (where rehabilitation units are treated individually, at least 70% of height and 50% of cover values to be attained within first 15 years of commencement of rehabilitation works)												
RE Code	**Name**	**VMA Status**	**Biodiversity**	**Habitat Rehabilitation Unit**				**Crossing Rehabilitation Unit**				
12.9-10.17	***Eucalyptus acmenoides, Eucalyptus major, Eucalyptus siderophloia +/- Corymbia citriodora subsp. variegata* woodland on sedimentary rocks**	Least concern	No concern at present	HRU5, HRU10, HRU17, HRU20, HRU21, HRU23, HRU24, HRU25, HRU26, HRU27, HRU28, HRU29, HRU30, HRU31				CRU5, CRU6, CRU7, CRU9				
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
			Interim Benchmark by 1 year	6.0	1.6	2.0	0.8	6.0	0.6	10.0	
			Interim Benchmark by 2 years	10.0	3.0	3.0	2.8	7.0	1.0	20.0	
			Interim Benchmark by 3 years	12.0	4.2	4.3	3.9	10.0	1.5	25.0	
			Interim Benchmark by 5 years	18.0	6.4	6.5	5.7	14.0	1.8	30.0	
			Interim Benchmark by 10 years	22.0	10.9	11.3	8.9	16.0	2.2	35.0	
			Final Benchmark by 15 years	**27.2**	**18.2**	**15.0**	**10.4**	**20.0**	**2.8**	**43.9**	-
			Reference Benchmark (Pre-Clearing RE)	**54.3**	**26.0**	**30.5**	**12.9**	**40.0**	**4.0**	**87.8**	**36.5 +/- 15.1**
12.9-10.19	***Eucalyptus fibrosa subsp. fibrosa* woodland on sedimentary rocks**	Least concern	No concern at present	HRU24, HRU25, HRU26								
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
			Interim Benchmark by 1 year	6.0	1.6	2.0	0.8	2.5	0.4	2.5	
			Interim Benchmark by 2 years	7.0	3.0	2.9	2.7	4.0	0.7	3.0	
			Interim Benchmark by 3 years	9.0	4.2	4.0	3.7	5.0	1.1	4.0	
			Interim Benchmark by 5 years	12.0	6.3	6.0	5.2	7.0	1.3	6.0	
			Interim Benchmark by 10 years	15.0	10.5	9.6	7.3	9.0	1.5	8.0	
			Final Benchmark by 15 years	**20.9**	**15.8**	**11.9**	**8.2**	**9.6**	**1.7**	**8.2**	-
			Reference Benchmark (Pre-Clearing RE)	**41.8**	**22.5**	**16.4**	**9.0**	**19.1**	**2.4**	**16.4**	**30.1 +/- 4.6**

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Benchmark Condition (where rehabilitation units are treated individually, at least 70% of height and 50% of cover values to be attained within first 15 years of commencement of rehabilitation works)										
RE Code	**Name**	**VMA Status**	**Biodiversity**	**Habitat Rehabilitation Unit**				**Crossing Rehabilitation Unit**			
12.9-10.4	***Eucalyptus racemosa* subsp. *racemosa* woodland on sedimentary rocks**	Least concern	No concern at present	HRU1, HRU3							
				Average Canopy Cover (%)	**Average Canopy Height (m)**	**Average T2-T3 Canopy Cover (%)**	**Average T2-T3 Canopy Height (m)**	**Average Shrub Cover (%)**	**Average Shrub Height (m)**	**Average Ground cover (%)**	**Species Richness (av. +/- SD)**
Interim Benchmark by 1 year				6.0	1.6	2.0	0.8	2.5	0.6	6.0	
Interim Benchmark by 2 years				7.0	3.0	2.5	2.7	4.0	0.9	10.0	
Interim Benchmark by 3 years				9.0	4.2	3.8	3.7	5.0	1.5	15.0	
Interim Benchmark by 5 years				12.0	6.3	5.3	5.2	7.0	1.8	20.0	
Interim Benchmark by 10 years				15.0	10.5	7.4	7.3	9.0	2.1	25.0	
Final Benchmark by 15 years				**20.9**	**15.8**	**10.4**	**8.2**	**9.6**	**2.6**	**29.2**	-
Reference Benchmark (Pre-Clearing RE)				**38**	**23.2**	**11.8**	**8.9**	**15.7**	**4.1**	**59.9**	**35.4 +/- 5.2**

Adapted from Queensland Government (2015).* No pre-defined benchmarks for this RE are provided within the RE technical descriptions (Queensland Government 2015a) and therefore, these numbers have been based on data collected in the field from previous assessments and reference sites within this RE type.

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5 Monitoring methodology

The following monitoring program was implemented to capture baseline data prior to rehabilitation treatments being applied. Adaptive management strategies will be used where a rehabilitation treatment does not produce the desired result. When this occurs, the treatment will be identified and/or modified.

For this monitoring program, a minimum of two monitoring sites per rehabilitation unit is sufficient to identify any major changes and to provide a 'snapshot' of ecological conditions. Monitoring in this way will allow the ongoing collection of information to demonstrate the effectiveness of habitat rehabilitation efforts, and the frequency of monitoring activities will enable management prescriptions to be adjusted to bring about any necessary changes and corrective actions (adaptive management).

5.1 Sites

Vegetation monitoring for the 8th monitoring period occurred in 60 of 62 sampling sites. One site (site 96) was removed due to development of a batter, which encroached into the transect within a Greenspace Corridor in Precinct 4. A replacement site of similar characteristics is to be established in the 9th monitoring period. Another site (site 118) was inundated due to flooding and unable to be accessed.

The final location of each monitoring site within its representative rehabilitation unit was identified by GPS coordinates and direction (compass bearing). Monitoring site locations are identified in Figure 3.

Site locations have been permanently marked by two steel pickets with yellow safety caps, placed 50 m apart. The yellow safety caps were used to mark the site number and distance e.g., 0 m and 50 m. Lastly, wooden stakes mark quadrat locations at 10 m, 20 m, 30 m and 40 m along the transect.

The following methodology was applied to monitoring at each of the sampled sites.

5.2 Photo point monitoring

For each site, a permanently marked photo point has been established at the first marker picket with a photograph taken towards the first wooden stake at 10 m along the relevant compass bearing. Yellow safety caps are labelled with a permanent marker identifying site number (refreshed each monitoring period). All photos were taken such that the 0 m picket was in the bottom left-hand corner of the photo.

The photos were saved with the following information recorded for each file:

- site number
- survey (i.e., baseline)
- date

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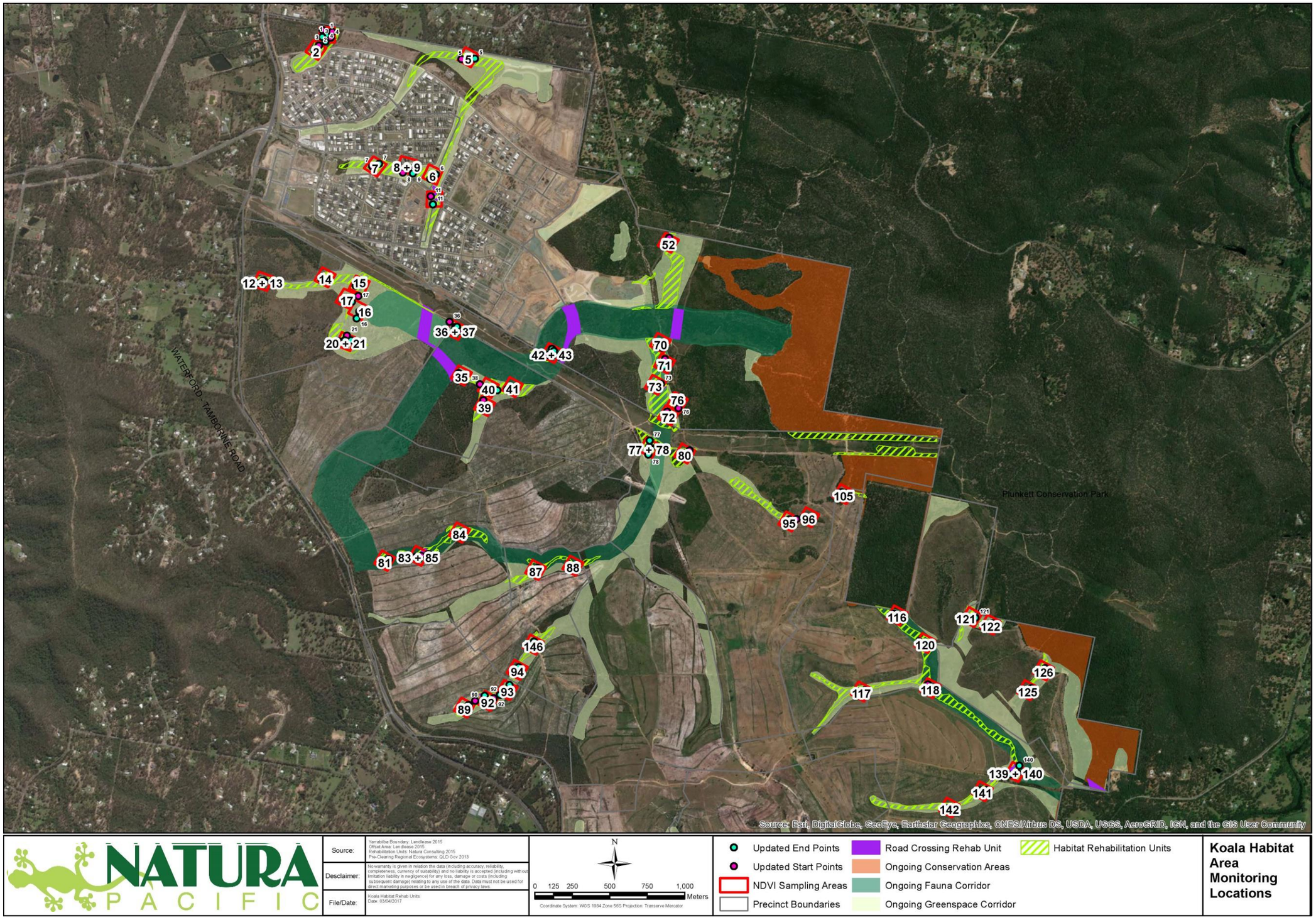

Figure 3 Koala Habitat Rehabilitation Units, habitat monitoring permanent transect locations and NDVI sampling areas

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5.3 Transect and quadrat monitoring

Quantitative site data, including the attributes of species richness, percentage foliage cover for the ground layer, shrub and canopy layers, canopy height, and weed cover are to be collected from field transects and quadrats established at each of the monitoring sites:

- A 50 m transect was placed between two metal pickets (0 m and 50 m).

- Quadrats were placed along the transect:
  - 50 x 10 m plot positioned at the transect start at 0 m on the right-hand side of the transect.
  - 1 x 1 m subplots positioned at 0 m, 10 m, 20 m, 30 m and 40 m. Adjustments were made for each subplot if its positioning was placed over a trunk, fallen tree or roots. Locations of quadrats along transect are identified using wooden stakes such that the quadrat is consistently placed at this location during future monitoring.

- When recording data, reference height ranges were used for allocating vegetation to different strata layers according to dominant pre-clearing RE allocated for the different rehabilitation units (ORU and HRU) and crossing rehabilitation units (CRU) (Table 5).

Table 5 Example reference height ranges used for classifying RE vegetation to respective strata layers

RE Type	Pre clearing height ranges (m)			
	Canopy (T1)	Small trees (T2-T3)	Shrub layer (S1)	Ground Layer (G1)
12.3.11	>19.1	5.1-19	1.26-5	<1.25
12.9-10.17	>13.1	6.1-13	0.76-6	<0.75
12.9-10.4	>14.1	6.6-14	1.25-6.5	<1.25

Given the above, each monitoring site had the information collected, as detailed in (Table 6). This benchmark monitoring process has also been undertaken at 1 year, 18 months, 2 years, 2.5 years, 3 years (current monitoring period) and will continue at 6 monthly intervals until significant progress has been achieved towards RE benchmark values at which point monitoring can be reduced to annual events. Reporting from each of the monitoring events shall be provided to the Department of Environment within 4 weeks of completion of monitoring.

Table 6 Data collected at monitoring sites

Method of collection	Data collected
50 m x 10 m quadrat (plot)	Species richness
50 m transect	Canopy species cover (% Foliage Projected Cover (FPC) and height Shrub % FPC and height)
Five 1 x 1 m quadrats (subplot)	Percentage cover in ground layer (including regenerating native canopy cohorts)

Percent Foliage Projected Cover calculation:

$$\%\ FPC = \frac{total\ cover\ (m)}{transect\ length\ (m)} \times 100$$

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6 Results

6.1 Photo-point monitoring

Photo monitoring results are reported in the following table (Table 7), indicating a variety of vegetation types and condition. The vegetation varies from exotic grass pasture dominated by species such as *Chloris gayana* and *Setaria sphacelata* with sparse native regenerating shrubs and trees, to eucalypt forest with intact canopy and native species composition across multiple strata. A number of sites were partially inundated in this monitoring period, with periods of heavy rainfall attributed to observable growth of native wetland rushes as well as native and exotic grasses such as *Ficinia nodosa, Juncus usitatus, Leersia hexandra, imperata cyclindrica, Cynodon dactylon* and *Paspalum urvellei* in sites that had low ground cover in the previous monitoring period, including sites 117, 120 and 139.

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Table 7 Photo monitoring images

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Site 2 (22/06/2021)

Site 3 (22/06/2021)

Site 4 (30/06/2021)

Site 5 (24/06/2021)

Site 6 - Photo from previous mon. (19/08/2020)

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Site 7 - Photo from previous mon. (29/07/2020)

Site 8 - Photo from previous mon. (29/07/2020)

Site 9 - Photo from previous mon. (30/07/2020)

Site 11 - Photo from previous mon. (29/07/2020)

Site 12 (25/08/2021)

Site 13 (25/08/2021)

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Site 14 (25/08/2021)

Site 15 (24/08/2021)

Site 16 (01/09/2021)

Site 17 (01/09/2021)

Site 20 (01/09/2021)

Site 21 (01/09/2021)

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Site 35 (25/08/2021)

Site 36 (24/08/2021)

Site 37 (24/08/2021)

Site 38 (07/09/2021)

Site 39 (07/09/2021)

Site 40 – Photo from previous mon. (13/08/2020)

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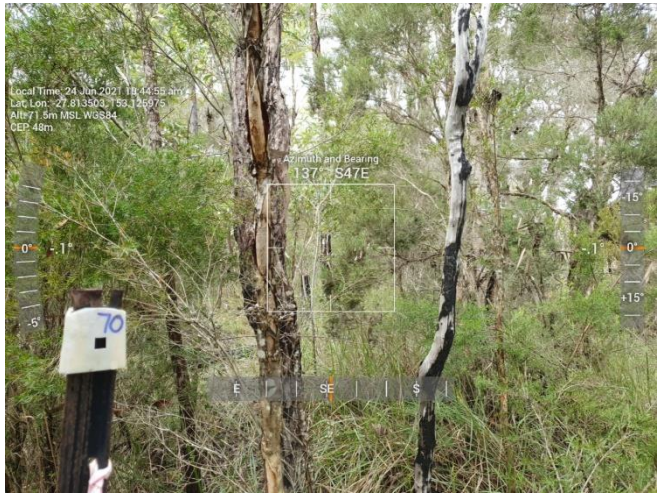
Site 41 (07/09/2021)

Site 42 (08/09/2021)

Site 43 (08/09/2021)

Site 52 (24/06/2021)

Site 70 (24/06/2021)



Site 71 (17/06/2021)

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Site 72 (17/06/2021)

Site 73 (17/06/2021)

Site 77 (17/06/2021)

Site 78 (17/06/2021)

Site 80 (17/06/2021)

Site 81 (22/09/2021)

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Site 83 (08/09/2021)

Site 84 (21/12/2021)

Site 85 (21/12/2022)

Site 87 (21/12/2021)

Site 88 (21/12/2022)

Site 89 (08/11/2021)

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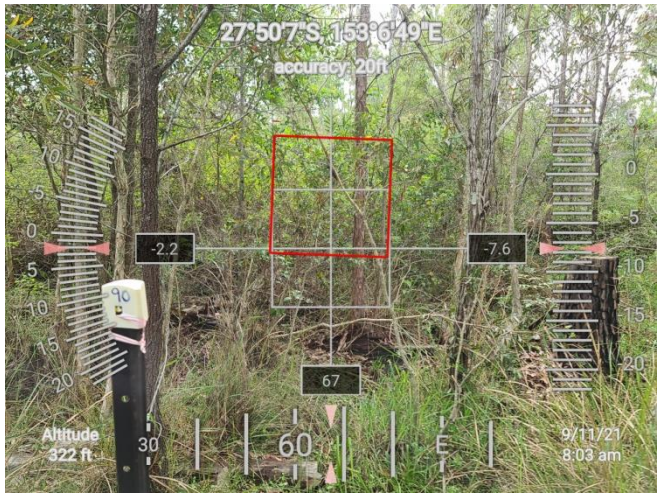
Site 90 (09/11/2021)



Site 92 (09/11/2021)

Site 93 (22/12/2021)

Site 94 – (22/12/2021)

Site 95 (11/01/2022)

Site 96

SITE REMOVED
DUE TO DEVELOPMENT IMPACTS
IN PRECINCT 4

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Site 105 (11/01/2022)

Site 116 (10/01/2022)

Site 117 (05/01/2022)

Site 118 – not surveyed (Photo taken 06/08/2020)

Site 120 (10/01/2022)

Site 121 (10/01/2022)

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Site 122 (10/01/2022)

Site 125 (10/01/2022)

Site 126 (10/01/2022)

Site 139 (05/01/2022)

Site 140 (05/01/2022)

Site 141 (23/11/2021)

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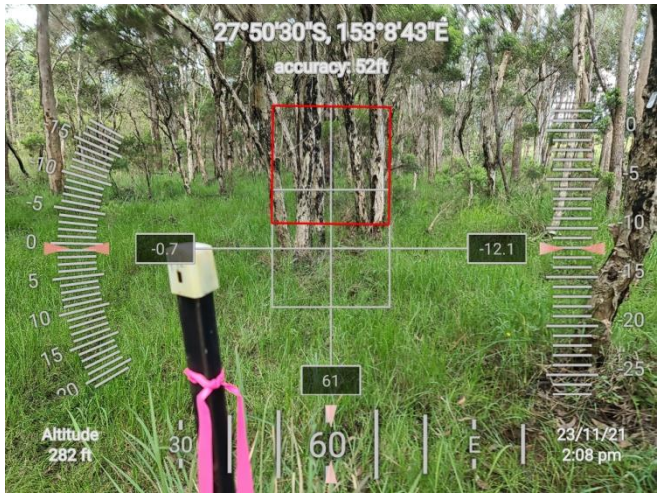
Site 142 (23/11/2021)



Site 146 (22/12/2021)

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6.2 Transect and quadrat monitoring

6.2.1 Species richness

At baseline in May 2016, a total of 339 species were recorded within 59 surveyed monitoring sites in the koala habitat areas (Habitat Area). In successive monitoring periods, there has been variability in the total species richness, with the lowest number of species recorded in the 6th monitoring period (304 species). In the current monitoring period, a total of 327 species were recorded across 60 sites, a decrease of 11 since the 7th monitoring period. The average number of species was calculated from the values across all 9 monitoring periods, and the results from the 8th monitoring period were close to the average of 329 species recorded across sites. Table 8 provides a summary of total species richness, as well as the average number of species recorded for all monitoring periods to date.

Table 8 Summary of total species richness recorded in monitoring periods.

Monitoring period	Baseline	1st	2nd	3rd	4th	5th	6th	7th	8th	Average
Total Species Richness	339	313	334	310	359	343	304	338	327	330
Total Weeds	62	68	60	48	56	62	65	63	61	61
Total Native	276	245	274	262	303	281	239	275	266	269
No. of sites monitored	59	64	59	62	62	61	59	62	60	61

Species richness within sites ranged from 19 to 66 species, with an average of 44 species per site (6 species more than 7th monitoring period). The largest number of species was recorded in sites 80 (Precinct 5), 84 (P10), 83 (P10), 85 (P10) and 41 (P6) (from lowest to highest in species richness), ranging between 56-63 species. This varied slightly from the 7th monitoring period, where the largest number of species was observed in sites 9 (Precinct 13), 11 (P1), 36 (P13), 41 (P6) and 6 (P1).

The lowest number of species was recorded in site 71 (19 species, an increase of 1 species since the 7th monitoring period). Site 71 is located in the Greenspace Corridor of Precinct 3. Site 89 had previously been among the sites with lowest species richness; however a significant increase was observed in this monitoring period, with 32 species recorded (an increase of 14 species since the 7th monitoring period).

Canopy tree species (T1 stratum) best represented across the Habitat Area were consistent with 7th monitoring period and included *Eucalyptus tereticornis, E. siderophloia, Angophora leiocarpa, Corymbia trachyphloia,* with the addition of *Eucalyptus seeana* (from highest to lower abundance). There were five native canopy tree species that were most rare (found only at one site) across the Habitat Area varied from the findings in the previous monitoring period, and included *Acacia disparrima, A. woodsiana, E. carnea, E. microcorys* and *Melaleuca quinquenervia. C. citriodora* subsp*. variegata, C. henryi, C. tesselaris, E. acmenoides, Glochidion ferdinandi* were not recorded in the T1 layer in this monitoring period.

Small tree species (T2-T3) common across the Habitat Area only varied slightly to those recorded in the 7th monitoring period and include *Lophostemon suaveolens, Eucalyptus tereticornis, Acacia leiocalyx, A. leiocarpa* and *Melaleuca quinquenervia* (from highest to lower abundance)*. Melaleuca linariifolia* and *Eucalyptus seeana* were no longer amongst the rarest. It is possible that these species had been included in the T1 layer in the previous monitoring period due to recent growth following rainfall, or observer variance. There were six, small native tree species that were rare across the Habitat Area, including *A. concurrens, A. maidenii, E. carnea. E. fibrosa, Glochidion sumatranum* and *M. saligna, E. propinqua,* and *E. resinifera* were no longer amongst the rarest species in the T2 layer whilst *A. falcata* and *Allocasuarina torulosa* were not recorded at all in the T2 layer in this monitoring period.

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Shrub species (S1 stratum) that were commonly observed across the Habitat Area were consistent with those recorded in the 7th monitoring period and include *A. leiocalyx, A. disparrima, Alphitonia excelsa, Leptospermum polygalifolium* and *Lophostemon suaveolens* (from highest to lower abundance). *Lantana camara* (exotic weed) was also among those with highest representation in the shrub layer across sites. A number of native species (13 species) were rare in the shrub layer within the Habitat Area and found only at one site, with some variation to those that were rare in the 7th monitoring period.

Of all the species recorded, 61 were exotic (2 less species than 7th monitoring period). Several of these had significant representation across the Habitat Areas, and some species such as *Lantana camara* and *Pinus elliotti* were present at many sites within multiple levels of strata. Exotic herbs and graminoids were most highly represented in the ground layer. Some of these species increased significantly in their representation, while a decrease was recorded for others. Species with the highest representation were similar to the 7th monitoring period, including *Ageratum houstonianum* (46 sites; 6 more than previous), *Andropogon virginicus* (39 sites; 6 more), *Lantana camara* (39 sites; 3 more), *Megathursus maximus* (31 sites; 10 more), *Emilia sonchifolia* (27 sites; 6 less), *Richardia brasiliensis* (27 sites; 1 less) and *Passiflora suberosa* (24 sites; 3 more).

6.2.2 Tree canopy cover and height (T1)

Of the sites with canopy trees present (T1 stratum) within the transect, tree canopy overlapping % Foliage Projected Cover (FPC) varied from 2% to 98% cover, with average canopy cover of 31.9% (down 2.4% from 7th monitoring period). The canopy species with highest FPC cover in the T1 stratum were consistent with those recorded in the 7th monitoring period, including *Eucalyptus tereticornis, E. siderophloia, Corymbia trachyphloia* subsp. *trachyphloia, Angophora leiocarpa* and *E. moluccana* (in order of highest to lower). The exotic tree *Pinus elliottii,* was still present in the T1 layer at site 121 and was also recorded in this layer at sites 17 and 41.

The number of sites containing T1 canopy trees had decreased slightly since the 7th monitoring period from 41 to 38 sites. There were therefore 22 sites where canopy trees were absent from the canopy FPC assessment along the transect, and also the species richness assessment. In some cases, trees had fallen or died. There may also have been some observer variance for height measurements and therefore strata layer determination. Table 9 indicates sites with no T1 layer for the current monitoring period and previous three monitoring periods for comparison.

Table 9 8th Monitoring period sites with canopy absent from transects for current and previous three monitoring periods.

NOTE: Additional species may have been identified in the wider species search, reflected in the total species richness counts. Orange highlight indicates sites not surveyed in current monitoring periods.

Site and Rehabilitation Unit	T1 Canopy trees absent 5th mon	T1 Canopy trees absent 6th mon	T1 Canopy trees absent 7th mon	T1 Canopy trees absent 8th mon
1 (HRU1)		x		
6 (HRU3)	x	x	x	x
7 (CRU13)	x	x	x	x
8 (CRU13)	x	x		x
9 (CRU13)	x	N/A	x	x
11 (CRU14)	x	x	x	x
12 (CRU12)	x	x	x	
13 (CRU12)	x	x	x	x
15 (HRU4)	x	N/A		
16 (HRU5)	x			

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Site and Rehabilitation Unit	T1 Canopy trees absent 5th mon	T1 Canopy trees absent 6th mon	T1 Canopy trees absent 7th mon	T1 Canopy trees absent 8th mon
35 (HRU9)	x	x	x	x
36 (HRU7)		x	x	
37 (HRU7)	x	x	x	
40 (HRU11)	x			
41 (HRU11)	x		x	
52 (HRU13)	x	x	x	x
70 (HRU15)	x	x	x	x
71 (HRU15)	x	x	x	x
72 (HRU15)	x	x	x	
73 (HRU15)	x	x		x
78 (HRU16)	x			
81 (HRU20)		x		x
83 (HRU20)	x	x	x	x
87 (HRU18)	x	x	x	x
88 (HRU18)	x	x		x
89 (HRU23)	x	x	x	x
92 (HRU22)			x	
93 (HRU22)	x	x	x	x
94 (HRU22)	x	N/A	x	x
95 (HRU17)	x			
118 (HRU28)	x	x		N/A
120 (CRU8)	x			
140 (CRU8)	x	x		x
141 (CRU8)	x	x	x	x
142 (HRU29)	x			x
146 (HRU21)	x	x		x
TOTAL	**32**	**25**	**21**	**22**

T1 canopy tree height varied from 14.5 m to 23.3 m, with the average tree height 18.6 m (up 1 m since 7th monitoring period). Species with high average T1 canopy height were *Corymbia tesselaris, C. citriodora, Angophora leiocarpa, C. intermedia, E. siderophloia and E. moluccana* (in order of highest to lowest average T1 canopy height), which varied slightly from the tallest species in the 7th monitoring period.

6.2.3 Small tree cover and height (T2-T3)

In this monitoring period, 60 of the surveyed sites contained a small tree layer (T2-T3 stratum), which is the same as the 7th monitoring period. Overlapping % FPC varied from 4% to 163%, with average cover 64% (up 14.9% from 7th monitoring period). The top five small tree species with high net cover in the T2-T3 layer were consistent with those recorded in the 5th and 6th monitoring period and included *Lophostemon suaveolens, Melaleuca linariifolia, E. siderophloia, E. tereticornis* and *M. quinquenervia* (from highest to lower). *Pinus elliottii* occurrence decreased from 5 to 4 sites containing the species (sites 12, 20, 40 and 41). These are indicated for comparison with the previous three monitoring periods

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in Table 10. Small tree height varied from 6.6 m to 14.8 m high, with an average of 10 m (0.7 m less than 7th monitoring period).

Table 10 Sites containing *Pinus elliotti* in the small tree layer this monitoring period and previous three monitoring periods

Site and Rehabilitation Unit	X = Pinus elliotti present in small tree layer			
	5th mon	6th mon	7th mon	8th Mon
12 (CRU12)	x	x	x	x
17 (HRU5)		x	x	
20 (HRU6)	x	x	x	x
40 (HRU11)	x	x	x	x
41 (HRU11)	x	x	x	x
TOTAL	**4**	**5**	**5**	**4**

6.2.4 Shrub cover and height (S1)

Of the 57 sites with shrubs present, overlapping % FPC varied from 1% to 27% with an average FPC of 15.1% (decreased 7.2% from 7th monitoring period). Shrub species with highest net FPC in the shrub layer across sites were mostly consistent with those recorded in the 7th monitoring period, including *Acacia leiocalyx, Lantana camara, Acacia disparrima, Leptospermum polygalifolium,* and *Alphitonia excelsa* (in order of highest to lower average cover). Shrub height varied from 1.5 m to 4.3 m with an average height of 2.9 m (0.1 more than 7th monitoring period). Three sites did not have any shrubs present (1 less than 7th monitoring period). This included sites 78 (HRU16), 118 (HRU28) and 139 (CRU7), which were all absent of shrubs in the 7th monitoring period.

6.2.5 Ground cover (G1)

Consistent with the previous four monitoring periods, all of the sites surveyed have a living ground layer, varying in average ground cover across the 5 quadrats per site from 6% (site 81 (HRU20), same as previous four monitoring periods, up 5.2% since 7th monitoring period) to 71.2% (site 139 (CRU7)), same as 7th monitoring period, up 8.8% since 7th monitoring round). Average ground cover was 37.8% (up 14.2% from 7th monitoring period). Ground cover was dominated by native graminoids, a fern, a mat-rush as well as four exotic species. Species varied only slightly from the 7th monitoring period and included *Imperata cylindrica* (which had nearly 2 times higher cover overall than any other species), *Leersia hexandra, Lomandra longifolia, Ageratum houstonianum, Lantana camara* (exotic herb), *Andropogon virginicus* (exotic grass), *Paspalum urvillei* (exotic grass) and *Pteridium esculentum* (from highest to lower abundance).

The extent of regenerating *Pinus elliottii* (exotic weed tree) cover in the ground layer continued to decline, with a 24% reduction since the 7th monitoring period (decreasing from 52% to 28% FPC), represented at 7 sites (sites 2 (HRU3), 12 (CRU12), 14 (HRU4), 37 (HRU7), 41 (HRU11), 87 (HRU18) and 94 (HRU22)). The results indicate that targeted removal is continuing to have a positive result. A number of sites that had *P. elliotti* in the ground layer in the 7th monitoring period no longer contained the species, including sites 39 (HRU10), 84 (HRU19), 116 (HRU28) and 146 (HRU21). It is anticipated that **the management of *P. elliottii* in the ground layer will be reflected in the results as continued reduction in total cover across all strata, working towards the goal to eradicate the species completely from the Yarrabilba footprint area. This approach should continue to combine with efforts to manage and reduce other exotic species including *Lantana camara* and high cover exotic grasses such as *Andropogon virginicus* and *Paspalum urvillei* within the ground-layer to support and improve the long-term regeneration habitat within these areas.**

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6.2.6 Weed incursion

There was a total of 61 species of weeds identified in different strata across sites (2 less than 7th monitoring period). Weeds were recorded in the ground layer at 54 sites surveyed in this monitoring period (1 more than 7th monitoring period).

In sites where weed ground cover was recorded, weed cover in the ground layer varied from 0.8% to 57.2%, with average cover 13.6% (5.5% more than 7th monitoring period). The top 5 sites with highest weed cover were similar to the 7th monitoring period and included site 6 (HRU3, 57.2%), 15 (HRU4, 34.8%), 89 (HRU23), 87 (HRU18, 29.6%), and 1 (HRU1, 28.8%). The composition of weed species in the ground layer with highest cover differed from the 7th monitoring period, were predominantly graminoids and herbs including *Ageratum houstonianum, Lantana camara, Andropogon virginicus, Paspalum urvillei* and *Megathyrsus maximus* (from highest to lower abundance).

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Table 11 8th Monitoring period species richness, average canopy height within the canopy (T1), sub-canopy (T2-T3) and shrub layer (S1) and Foliage Projected Cover within the canopy (T1), sub-canopy (T2-T3), shrub layer (S1) and ground layer (G1). 60 of 62 sites were surveyed in this monitoring period. Orange highlight indicates sites that were not surveyed this monitoring period (see section 5.1).

	Species Richness						Average Height (m)			Total Crown Cover (% overlapping cover)					Ground Cover (%)	
Site	Canopy (T1)	Sub - Canopy (T2 and T3)	Shrubs (S1)	Ground Layer (G1)	Total	Total weeds	Canopy (T1)	Sub - Canopy (T2 and T3)	Shrubs (S1)	Canopy (T1)	Sub - Canopy (T2 and T3)	Shrubs (S1)	Total Weed Crown Cover	Total Native Crown Cover	Av. Native Shrub and Ground Layer (S1-G1)	Total Weed Ground Cover
1	2	5	9	37	53	12	17	9.1	2.8	16	41	14.9	34	71.9	18.8	28.8
2	3	3	7	38	51	10	17.4	12.2	2.8	40	63	8.2	0	111.2	14.4	2.4
3	2	6	7	37	52	12	18	9	3.5	10	81.6	6	12	97.6	23.2	10.4
4	2	5	7	30	44	9	17.3	10.2	2.6	58	62	16.5	0	136.5	10.4	1.2
5	1	3	5	35	44	11	21	7.4	3.8	20	37	2.4	0	59.4	57.6	13.2
6	0	4	2	21	27	6	0	9.9	4.3	0	23	1.5	0	24.5	8.4	57.2
7	0	7	7	31	45	7	0	10.6	2.2	0	163	2.6	0	165.6	16	1.2
8	0	5	8	17	30	6	0	9.6	3.4	0	105	3.3	0	108.3	16	6
9	0	5	4	34	43	14	0	8.9	3.1	0	63	2.3	0	65.3	51.6	6.4
11	0	3	3	26	32	7	0	8.7	4.1	0	22	25	0	47	23.6	8.4
12	1	3	5	46	55	23	19	9.1	3.4	12	77	6	38	95	38.8	18
13	0	4	8	23	35	10	0	8.3	3.2	0	87	10.5	17	97.5	22.4	8.4
14	2	1	7	35	45	14	21.8	9.8	2.7	92	11	7.1	14	110.1	45.2	17.2
15	1	9	9	37	56	15	20	12	2.6	14	95	4.8	9.6	113.8	43.6	34.8
16	1	1	4	37	49	11	15.7	9.2	3.1	32	51.2	7.7	0	90.9	20	4.4
17	1	6	9	26	42	8	14.5	8.5	3.9	10.6	57	8.3	27.6	75.9	33.2	26.4
20	1	7	6	41	55	15	20	14.8	3.4	6	68	4.9	3	78.9	33.2	12.4
21	1	5	5	38	48	11	20	10.9	2.1	18	21	3.9	6	42.9	32.8	10.8
35	0	2	4	30	36	12	0	7.3	3.9	0	48	8	0	56	32.8	24.8
36	1	9	11	31	52	7	21	11.6	2.5	16	151.4	6.3	3	173.7	30.4	6.4
37	2	8	11	34	55	10	20.3	9.2	3.3	38	108.4	4.2	1	150.6	33.6	6.4
38	1	7	4	32	44	9	17	7.2	3.4	24	31	5.5	0	60.5	40.8	9.6
39	1	3	8	34	46	9	16.5	8.8	2.9	29	68	7.6	19	104.6	35.2	19.2
40	1	5	2	38	46	9	20	11.4	3.5	20	112	3.5	7	135.5	35.6	10.8
41	2	4	7	43	56	6	19.7	12.8	3.8	32	85	8.6	19	125.6	39.2	3.2
42	1	9	7	25	42	10	23	11	2.7	34	144.6	15.4	38	194	26	20
43	3	4	7	37	51	10	22.7	11.8	2.4	60	56	10.8	0	126.8	21.2	14
52	0	5	8	31	44	3	0	11	2.6	0	84	5.7	0	89.7	49.2	0
70	0	6	6	28	40	4	0	10.2	3	0	90	9.1	0	99.1	46.8	0.8
71	0	2	4	13	19	1	0	39.3	3.9	0	76	2.5	0	78.5	53.6	0
72	1	4	2	22	29	3	20	10.1	2.1	4	90	8.3	0	102.3	16	0
73	0	3	3	31	37	9	0	12.4	2.8	0	40.9	2.7	0	43.6	36.8	2
77	1	1	2	26	30	7	23.3	10.5	1.7	50	40	6.3	0	96.3	32	0
78	1	3	0	31	35	6	22	11	1.5	24	73	10	0	107	34.4	0.8
80	2	3	6	52	63	13	20.5	12.3	3.2	36	71	5.8	0	112.8	24.4	3.6
81	1	3	8	33	45	13	0	12	3.4	0	96.4	3.6	8	100	6	12.4
83	0	3	6	50	59	13	0	12.9	2.2	0	153	4.3	3	157.3	54.4	22
84	2	5	6	53	66	15	21	13	2.2	42	40	3.3	6	85.3	66	14.4
85	2	6	5	44	57	8	19.8	11.3	3.3	44	85	5.4	0	134.4	51.2	10.8

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	Species Richness						Average Height (m)			Total Crown Cover (% overlapping cover)					Ground Cover (%)	
Site	**Canopy (T1)**	**Sub - Canopy (T2 and T3)**	**Shrubs (S1)**	**Ground Layer (G1)**	**Total**	**Total weeds**	**Canopy (T1)**	**Sub - Canopy (T2 and T3)**	**Shrubs (S1)**	**Canopy (T1)**	**Sub - Canopy (T2 and T3)**	**Shrubs (S1)**	**Total Weed Crown Cover**	**Total Native Crown Cover**	**Av. Native Shrub and Ground Layer (S1-G1)**	**Total Weed Ground Cover**
87	0	3	3	31	37	11	0	11.7	3.3	0	111	2	0	113	64.4	29.6
88	0	3	4	48	55	14	0	10.1	3	0	104	3.7	0	107.7	47.2	27.2
89	0	2	3	27	32	11	0	8	3.8	0	63	4.7	7	67.7	36.4	30.6
90	1	6	5	33	45	6	15	7.8	3.4	12	16.6	11.4	48	40	46.8	24
92	1	4	5	18	28	6	16.5	8.2	1.9	23	58	7	5	88	47.6	20
93	0	2	3	23	28	9	0	9.3	3.4	0	16	11.7	26	27.7	45.6	13.6
94	0	2	2	30	34	7	0	10.4	2.6	0	26	7	0	33	43.2	8
95	1	4	3	48	56	15	19	7.3	2.7	4	34	4.3	7	42.3	31.2	22.4
96																
105	3	3	5	29	40	4	15.7	11.3	2.6	34	18	3.4	0	55.4	40	2.8
116	2	2	6	30	40	12	16.9	9.7	1.8	36	87	2.7	4	125.7	55.6	27.6
117	1	2	0	45	48	19	15	10.4	0	2	86	0	0	0	53.6	25.6
118																
120	3	4	2	39	48	17	17.2	8.6	1.5	38	43.6	4	5	85.6	63.6	21.6
121	3	3	4	29	39	5	16.7	8	2.4	66	4	8.0	4	78	32.8	2.8
122	4	5	2	32	43	7	15.8	10.3	2.8	38	27	27	0	92	24.8	6.4
125	2	4	3	42	51	5	15.3	6.6	3.2	66	14	17.7	0	97.7	33.2	0.8
126	4	4	2	35	45	8	17.8	10.2	2.1	98	28	2.4	0	128.4	28.8	2.4
139	1	1	0	27	29	7	16	8.5	0	14	6	0	0	0	71.2	10.8
140	0	4	2	39	45	16	0	9.5	4	0	28	1	0	29	58.8	6
141	0	3	5	35	43	15	0	8.1	3.7	0	75	3.9	0	78.9	41.2	14.8
142	1	5	3	34	43	11	0	10.3	0	0	103	0	0	0	66.8	5.2
146	1	4	3	43	51	13	0	9.2	2.6	0	22	9.1	1	31.1	60.4	10.8
8th Mon.*	**1.7**	**4.1**	**5.2**	**33.7**	**43.9**	**9.9**	**18.6**	**10.5**	**2.9**	**31.9**	**64.0**	**7.2**	**13.8**	**92.9**	**37.8**	**13.6**
7th Mon.*	**2.2**	**3.8**	**4.8**	**27.3**	**37**	**9.5**	**17.8**	**9.3**	**2.8**	**34.3**	**49.2**	**22.3**	**11.6**	**87.7**	**23.6**	**8.3**
6th Mon.*	**1.9***	**4.4***	**5.5***	**23.3***	**34***	**8.4***	**17.4***	**9.3***	**2.8***	**32.4***	**50.6***	**27.2***	**11.4***	**93.6***	**28.6***	**13.5***
5th Mon.*	**2.1***	**3.3***	**4.4***	**30.2***	**38.5***	**9.5***	**16.9***	**9.4***	**2.4***	**32***	**49.5***	**20.5***	**6.2***	**85.6***	**34***	**11.8***
4th Mon.*	**1.9***	**3.8***	**3.8***	**32.8***	**40.8***	**10.6***	**16.8***	**9.2***	**2.5***	**28.7***	**46***	**20.2***	**9***	**81.5***	**31.8***	**11.5***
3rd Mon.*	**4.2***	**3.1***	**3***	**28***	**36***	**7.6***	**17. 6***	**8.9***	**2.5***	**25.2***	**42.4***	**5***	**2.4***	**56.8***	**32.3***	**9.5***
2nd Mon.**	**2***	**4.7***	**3.7***	**24.2***	**34.6***	**7.7***	**15.9***	**9.9***	**4.5***	**35.2***	**56.8***	**6.4***	**0**	**70.8****	**31.1***	**12.5***
1st Mon.**	**2.6***	**3.6***	**5.9***	**25.6***	**37.8***	**16.7***	**16.5***	**10.2***	**3.9***	**33***	**19.4***	**4.2***	**6.4****	**79****	**34***	**14.4***
Baseline**	**1.8***	**2.3***	**5.1***	**20.5***	**29.6***	**6.5***	**17.2***	**10.2***	**2.8***	**45***	**20.2***	**6.2***	**16****	**84.8****	**41.1***	**10***

* Note 1: Total average values for 3rd-8th Monitoring period are calculated across sites, only including sites where each respective strata were present and not including sites where they were absent (value = 0). ** Note 2: Total average values for 2nd Monitoring period (2nd Mon.), 1st Monitoring period (1st Mon.) and Baseline for Total Weed Crown Cover and Total Native Crown Cover are calculated across all sites, irrespective of presence / absence.

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6.3 Normalised Difference Vegetation Index (NDVI) monitoring

During the 8th monitoring period, the normal process of carrying out an additional NDVI assessment to determine the health and condition of the native vegetation across the Fauna Corridors, Greenspace and Environmental Protection Zones could not be conducted due to restrictions around the impacts of COVID-19. Therefore, the NDVI section of this report is omitted. For previous results of this assessment for Koala Habitat Areas, please refer to the 5th monitoring period report.

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7 Discussion

An assessment of site vegetation species richness (SR) and structure was undertaken to determine the 8th monitoring period condition against the benchmark, 2nd, 3rd, 4th, 5th, 6th and 7th monitoring periods and baseline values. In this monitoring period, benchmark results are compared to the IMO-5 year target, with 100% meeting this minimum benchmark for at least four of the benchmark parameters. This indicates continued improvement overall since the previous monitoring period, which was compared to IMO3 year targets. It is considered that while results are compared to set benchmarks, variation may occur between monitoring periods due to a number of variables including seasonal variation, observer variation and response to management, number of sites surveyed and slight reactive changes to the methodology. Overall, however, many sites are experiencing a trend of improvement. Similarly, there appears to be an overall trend of improvement within parameters despite some fluctuation between monitoring periods.

Benchmark values for surveyed benchmark parameters at each site are provided in Table 12.

7.1 Overview

Two of the sites (sites 41 and 125) met the benchmark of IMO-5 or greater for all 9 parameters (including weed cover). These sites are therefore considered to be in best condition overall. This is the first time this has been achieved for any sites, which is a positive result particularly considering the benchmark targets were also higher for this monitoring period. A further 6 sites were amongst those in best condition, having met the benchmark of IMO-5 or greater for 8 parameters (sites 2, 4, 43, 78, 80 and 105). These sites are regarded as the most balanced and progressing in terms of achieving benchmarks in the desired 15 year time frame. This was an improvement from the 7th monitoring period, where only two sites had attained the minimum benchmark or greater for 8 parameters.

Site 117 was the site with the lowest number of benchmarks met in the previous monitoring period. In the current round, the site had improved with an increase from 4 to 5 benchmarks met across parameters with the lowest number of any benchmarks met in the previous monitoring period all improved. Site 81 had again declined, decreasing from 7 benchmarks to 4 benchmarks across parameters.

All 60 sites meet the FINAL benchmark for at least one benchmark parameter (a 3% increase since 7th monitoring period) and 32% of sites meet the FINAL benchmark for at least four (50%) of the benchmark parameters (a 5% decrease since 7th monitoring period). There was a slight increase in the number of sites meeting consistently high benchmarks (5 or more parameters with FMO-15 or FINAL), with 30 sites (50%, 5% increase since 7th monitoring period) including sites **1**, 2, 3, 4, 7, 14, 15, **16,** 20, 21, 36, 37, 40, 41, 42, 43, 52, 70, **71,** 72, 73, 77, **78,** 80, 83, 84, 85, **88, 105** and **122 (bold indicates sites that did not achieve this in the previous monitoring period)**. Fourteen of these sites are located in Greenspace Corridors (sites **1,** 2, 3, 4, 7, 14, 15, **16,** 20, 21, 40, 41, 52 and **122**), with 15 sites (sites 36, 37, 42, 43, 70, **71,** 72, 73, 77, **78,** 80, 83, 84, 85, and **88**) located in Fauna Corridors and one site located within conservation areas (site 105). (Figure 3).

There was a continued trend of improvement, or no change observed for 7 benchmark parameters across sites. For canopy tree cover, a total of 27 sites (45%, 2% less than 7th monitoring period) met the minimum benchmark. An acceptable result considering the increased in minimum benchmark targets from Imo-3 to IMO-5 in this monitoring period. For canopy tree height 38 sites (63%, 11% more than 7th monitoring period) exceed the minimum benchmark target, with a benchmark of IMO-10 or greater. For small tree cover, 58 sites (97%, 2% more than 7th monitoring period) exceed the minimum benchmark, with a benchmark of IMO-10 or greater for all except 2 sites. For small tree height, 60 sites (100%, same as 7th monitoring period) exceed the minimum benchmark, with a benchmark of IMO-5 or

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greater. Weed cover stayed comparatively the same, with 29 sites (48%, 1% more than 7th monitoring period) meeting the <5% cover benchmark. **Shrub cover had the greatest decline in achievement of benchmark results, where 17 sites (28%, 60% less than 7th monitoring period) met the minimum benchmark or greater.** For shrub height, 56 sites (93%, 1% more than 7th monitoring period) met the minimum benchmark or greater. Ground cover improved, with 53 sites (88%, 20% more than 7th monitoring period) meeting the minimum benchmark or greater.

There are 22 sites (8 more than 7th monitoring period) that consistently met lower than the IMO-5 target benchmarks (IMO-1, IMO-2, IMO-3 or no benchmark), in four or more benchmark parameters. This is regarded as acceptable, considering the increase in the minimum benchmark target to IMO-5 in this monitoring period. **These sites are regarded as being in the poorest condition in terms of lowest benchmark values for species richness, native height, native cover and weed cover and are primarily consistent with those of poorest condition in the 6th monitoring period, including sites *6, 8, 9, 11,* 12, *13,* 35, 71, *73, 81, 83,* 87, *88,* 89, 93, *94,* 117, 139, 140, 141, 142 and *146*.** Sites 1 and 95 had improved and were no longer amongst those considered to be of poorest condition.

7.1.1 Species richness

For species richness, there has been a significant improvement in total diversity with 42 sites (70% of sites, 25% more than 7th monitoring period) reaching Final benchmark (14 more sites than 7th monitoring period).

In terms of regional ecosystems, RE12.9-10.4 improved significantly, with all 5 five sites in this ecosystem now meeting the Final benchmark for species richness (5 more than 7th monitoring), therefore all sites had reached the minimum of 30 species recorded within the site. Within RE 12.9-10.17, 21 out of 22 sites (95%, 37% more than 7th monitoring period) now meet the final benchmark. The number of sites in this parameter declined since the previous monitoring due to the exclusion of 2 sites in this monitoring period. In RE12.3.11, 16 out of 33 sites (48%, 6% more than 7th monitoring period) meet the final benchmark for this parameter. Observed improvements may be attributed to seasonal variation as a notable increase in the number of ephemeral ground cover species was observed predominantly within low lying / wet sites.

A number of sites (18 sites) still failed to meet the benchmark for species richness. Among these, the proportion of exotic to native species was reviewed to indicate the poorest sites in this parameter and therefore the highest priority for management to improve native species richness. The four sites with the highest proportion of weeds compared to native species varied slightly from the 7th monitoring period. **The 4 sites containing the highest proportion of exotic compared to native species and therefore regarded amongst the poorest included sites *9,* 12, *35* and *89)*** (italics indicate sites that did not achieve this in the previous monitoring period). In the 7th monitoring period, sites 12 117, 141 and 142 contained the highest proportion of weeds.

7.1.2 Canopy layer (T1)

The number of sites that fail to meet any benchmarks for T1 cover increased to 36 sites (60%), up from 33 (53%) in 7th monitoring period. A higher number of sites (41) had maintained the 'same' (S) status of 'failure to meet a benchmark', with 4 sites declining (D) in canopy cover (sites **15,** 40, 81 and 105) and 3 sites declining in canopy height (sites **39, 81** and **120**) since the 7th monitoring period, which varied from those declining in the previous monitoring period. **Seven sites had met a benchmark had a lower than IMO-5 result for canopy cover and therefore regarded amongst those in need of most improvement for this category (sites 3, 12, 15, 17, 36, 90 and 139), with a benchmark of IMO-10 or greater met for all 38 sites that had reached a benchmark for canopy height.**

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7.1.3 Small tree layer (T2)

Similar to the 7th monitoring period, T2 cover and height fared best in terms of the number of sites meeting a benchmark, with all 60 sites meeting a benchmark in both parameters. The majority of sites were exceeding the target benchmark of IMO-5 for T2 cover (58 sites) and T2 height (all 60 sites). **Sites in the small tree layer that have not yet met the IMO-5 benchmark for T2 cover and are therefore in need of most improvement include sites 121 and 139, which were also amongst those reported in the 7th monitoring period.**

7.1.4 Shrub layer (S)

There were 15 sites that fail to meet any benchmarks for shrub cover and 3 for shrub height. Of those that did meet a benchmark, there were 28 sites that failed to meet a benchmark of IMO-5 or greater for shrub cover, with 26 of these declining (D) since the 7th monitoring period (sites 3, 7, 8, 9, 12, 15, 16, 17, 20, 21, 36, 37, 39, 40, 52, 71, 73, 77, 80, 83, 84, 85, 87, 88, 90, 92, 121 and 146). There was one site (site 120) that failed to meet the benchmark of IMO-5 or greater for shrub height, and this site had declined in shrub height condition since the 7th monitoring period. **These 15 sites are regarded among those in most need of improvement and should be reviewed closely in the following monitoring period to identify any discrepancies in results. It is possible that some of this decline relates to trees from the shrub layer now being regarded as T2 trees due to seasonal growth.**

7.1.5 Ground layer (G)

There was 1 site (site 81) that failed to meet any benchmarks for ground cover (2 less than 7th monitoring period). **There were 6 sites that failed to meet the benchmark of IMO-5 or greater (sites 1, 2, 4, 16, 122 and 126). All 7 of these sites are considered those in need of most improvement and therefore highest priorities for benchmark improvement in the ground layer**. Interestingly, these sites had all improved (I) since the 7th monitoring period.

7.1.6 Weed cover

There were 43 sites (10 more than 7th monitoring period) that did not meet the benchmark for exotic weed cover (<5% cover). Average weed cover overall has increased considerably to 13.6% (5.5% more than 7th monitoring period). **Sites with the highest % cover of weeds varied slightly from the 7th monitoring period and include sites 6, 15, 89, 87 and 1 (from highest to lower % cover). These sites are <u>not</u> amongst those considered poorest condition overall,** as they have achieved IMO-5 or greater benchmarks for four or more other parameters.

It is recognised that increases in weed incursion at Yarrabilba may involve several variables, including seasonal variation, human induced edge effects and the increasing isolation of HRUs as clearing of the surrounding land-use matrix, which has intensified for pastoral and arable agriculture as well as new clearing in the development precincts 3 and 4. Considering that exotic species often have a competitive advantage with rapid growth and shorter time to seed maturity, it is expected that there will be observed improvements in native species richness, ground cover and shrub cover over time, where targeted management to reduce weed cover is applied and where seasonal conditions are less favourable for the fast growing, ephemeral species.

To continue improving the number of sites meeting this important benchmark, **recommendations for future rehabilitation efforts include continued assisted natural regeneration with weed control across all sites that fail to meet the benchmark, with particular focus on targeting sites with the highest % weed cover (see above) that are infiltrated with the most dominant weed species:** *Ageratum houstonianum* (exotic herb), *Andropogon virginicus* (exotic grass), *Lantana camara* (exotic herb), *Megathyrsus maximus* (exotic grass), *Emilia sonchifolia* (exotic herb), *Richardia brasiliensis*

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(exotic herb), *Digitaria didactyla* (exotic grass) and *Passiflora suberosa* (exotic herb) (from highest to lower number of sites). Additional species should be assessed in-situ and may include *Ambrosia artemisiifolia* (exotic herb), *Baccharis halimifolia* (exotic shrub) *Conyza bonariense* (exotic herb) and *Setaria sphacelata* (exotic grass).

Pinus elliottii **(exotic tree) is still present at a large number of sites within all layers of strata at different life stages, including the ground and canopy layers at sites 1, 2, 4, 5, 11, 12, 14, 15, 21, 35, 36, 37, 38, 39, 41, 73, 87, 94, 95 and 116.** *P. elliotti* had been recorded at sites 3, 17, 20, 40 and 146 in the 7th monitoring period, however the species was not recorded in these sites this monitoring period. Considering that all of these sites have already achieved high benchmarks (IMO-5 or greater) across four or more parameters, they are not included in the top priority sites for rehabilitation. However, continued targeted management of *P. elliottii* should be considered when planning rehabilitation management activities. **It is therefore suggested that further management of *P. elliottii* within these areas is done strategically over time with staged removal to reduce invasion of the ground-layer by exotic species.**

7.2 Summary and conclusions

In summary, there are 22 sites, considered to be in poorest condition and therefore the highest priority, requiring prompt management actions to improve benchmark values and achieve the new benchmark minimum of IMO-5 or greater across all parameters (Table 13). These sites are located within 14 rehabilitation management units. There are a further 13 sites within 9 RMU that may be targeted for improvement of specific benchmark parameters, characterized by sites where two or more strata are 'least improved' and/or the site is amongst the top 5 highest weed cover and/or the site also contains *Pinus elliotti* in one or more layers of strata.

These improvements are to be achieved primarily through assisted natural regeneration in combination with targeted weed control at the sites regarded to be in poorest condition and other priority high weed sites. Weed management is to incorporate reduction of weed cover for dominant species recorded this monitoring period including *Ageratum houstonianum* (exotic herb), *Andropogon virginicus* (exotic grass), *Lantana camara* (exotic herb), *Megathyrsus maximus* (exotic grass), *Emilia sonchifolia* (exotic herb), *Richardia brasiliensis* (exotic herb), *Digitaria didactyla* (exotic grass) and *Passiflora suberosa* (exotic herb) (from highest to lower number of sites). Additional species should be assessed in-situ and may include *Ambrosia artemisiifolia* (exotic herb), *Baccharis halimifolia* (exotic shrub) *Conyza bonariense* (exotic herb) and *Setaria sphacelata* (exotic grass) **as well as others detected in-situ, and finally, the continued felling of *Pinus elliottii* where possible at the sites discussed above.** This will continue to open up more space for species from all strata layers to regenerate naturally through seed bank propagation. Opportunities for complementary infill planting may also be assessed and carried out if deemed necessary at sites that fail to meet the benchmark for ground and or shrub cover, in alignment with the relevant planting schedule for the Regional Ecosystem type.

Due to the large number of RMU containing sites that are in poorest condition this monitoring period, it is recommended that management activities are focussed within these areas, with the further 13 sites considered if possible within available timeframes and budget. **These 14 top priority rehabilitation units most urgently require management actions for improving multiple benchmarks** (predominantly species richness, shrub height and cover and weed cover, with 5 of these RMU requiring *P. elliotti* removal). **One rehabilitation unit, HRU3 (site 6, same as 7th monitoring period), is recommended as the highest priority, specifically for weed removal as it contains the highest weed cover of any site, as well as being amongst those in poorest condition, failing to meet a benchmark for T1 height and cover, shrub cover and species richness. It is also recommended that supplementary planting with shrub and T1 canopy species is conducted following weed**

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management to reduce weed ground cover, in order to progress the site towards achieving benchmarks over the longer term. The other top priority rehabilitation units (in order of highest to lower priority) are CRU12 (site 12, included in 7th monitoring), HRU18 (site 88 and site 87 included in 7th monitoring), HRU4 (site 15), HRU22 (site 93, included in 7th monitoring and 94), HRU9 (site 35, included in 7th monitoring), CRU13 (sites 8 and 9), HRU15 (site 71 included in 7th monitoring and 73), CRU7 (site 139, included in 6th and 7th monitoring), HRU1 (Site 1, included in 7th monitoring), HRU 3 (site 6), HRU23 (site 89 included in 6th and 7th monitoring), HRU20 (sites 81 and 83), HRU21 (site 146, included in 6th monitoring) and HRU29 (Sites 141 and 142, included in 6th and 7th monitoring). As it can be seen, many of these sites have been included among the top priority sites across multiple reporting periods including the 6th and 7th monitoring periods. Two HRU included as top priority in the 7th monitoring period had improved and were no longer regarded amongst the highest priority sites, including HRU17 and HRU28. Table 10 can be used to refine management actions to focus on for benchmark improvements in species richness, ground cover and weed control within top priority areas.

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Table 12 8th Monitoring period benchmark values for species richness, canopy height within the canopy (T1), sub-canopy (T2-T3) and shrub layer (S1) and cover within the canopy (T1), sub-canopy (T2-T3), shrub layer (S1) and ground layer (G1) as well as indicative weed cover benchmarks.

Site	Rehabilitation Unit	Pre-Clearing Regional Ecosystem	Native Species Richness	Canopy Cover (T1)	Canopy Height (T1)	Small Tree Height (T2-T3)	Small Tree Cover (T2-T3)	Shrub Cover (S1)	Shrub Height (S1)	Native Ground Cover (G1)	Weed Cover (<5%)
1	HRU1	12.9-10.4/12.9-10.12	FINAL (I)	IMO-10 (I)	FMO-15 (I)	FINAL (S)	FINAL (S)	FMO-15 (D)	FMO-15 (S)	IMO-3 (I)	N (S)
2	HRU1	12.9-10.4/12.9-10.12	FINAL (I)	FINAL (I)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-5 (D)	FMO-15 (S)	IMO-2 (S)	Y (S)
3	HRU3	12.9-10.4/12.9-10.12/12.9-10.2	FINAL (I)	IMO-3 (S)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-3 (D)	FMO-15 (S)	IMO-5 (I)	N (S)
4	HRU1	12.9-10.4/12.9-10.12	FINAL (I)	FINAL (S)	FMO-15 (S)	FINAL (S)	FINAL (S)	FINAL (S)	IMO-10 (D)	IMO-2 (I)	Y (S)
5	HRU3	12.9-10.4/12.9-10.12/12.9-10.2	FINAL (I)	IMO-10 (S)	FMO-15 (S)	IMO-10 (S)	FINAL (S)	X (D)	FMO-15 (S)	FMO-15 (S)	N (S)
6	HRU3	12.3.11/12.3.7	X (D)	X (S)	X (S)	FMO-15 (I)	FMO-15 (S)	X (D)	FINAL (I)	IMO-10 (D)	N (S)
7	CRU13	12.3.11/12.3.7	FINAL (S)	X (S)	X (S)	FMO-15 (S)	FINAL (S)	IMO-1 (D)	FMO-15 (D)	FMO-15 (S)	Y (S)
8	CRU13	12.3.11/12.3.7	X (D)	X (S)	X (S)	FMO-15 (I)	FINAL (S)	IMO-1 (D)	FINAL (S)	FMO-15 (S)	N (D)
9	CRU13	12.3.11/12.3.7	X (D)	X (S)	X (S)	IMO-10 (S)	FINAL (I)	IMO-1 (D)	FINAL (S)	FINAL (S)	N (S)
11	CRU14	12.3.11/12.3.7	X (D)	X (S)	X (S)	IMO-10 (D)	FMO-15 (D)	FINAL (S)	FINAL (S)	FINAL (S)	N (S)
12	CRU12	12.3.11/12.3.6/12.3.7	X (S)	IMO-3 (I)	FMO-15 (I)	IMO-10 (D)	FINAL (S)	IMO-3 (I)	FINAL (S)	FINAL (S)	N (S)
13	CRU12	12.3.11/12.3.6/12.3.8	X (S)	X (S)	X (S)	IMO-10 (S)	FINAL (S)	IMO-10 (D)	FINAL (S)	FINAL (S)	N (D)
14	HRU4	12.3.11/12.3.6/12.3.7	X (S)	FINAL (S)	FMO-15 (S)	FMO-15 (I)	IMO-10 (I)	IMO-5 (D)	FINAL (I)	FINAL (S)	N (S)
15	HRU4	12.3.11/12.3.6/12.3.7	X (D)	IMO-3 (D)	FMO-15 (I)	FINAL (I)	FINAL (I)	IMO-2 (D)	FINAL (I)	FINAL (S)	N (S)
16	HRU5	12.9-10.17/12.9-10.2	FINAL (S)	FMO-15 (I)	IMO-10 (S)	IMO-10 (I)	FINAL (I)	IMO-2 (D)	FMO-15 (I)	IMO-2 (I)	Y (S)
17	HRU5	12.9-10.17/12.9-10.2	FINAL (S)	IMO-2 (I)	IMO-10 (S)	IMO-5 (D)	FINAL (I)	IMO-2 (D)	FMO-15 (S)	IMO-5 (I)	N (S)
20	HRU6	12.3.11/12.3.6/12.3.7	FINAL (I)	X (S)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-2 (D)	FINAL (I)	FINAL (I)	N (D)
21	HRU6	12.3.11/12.3.6/12.3.7	FINAL (I)	IMO-5 (I)	FMO-15 (S)	FMO-15 (S)	FMO-15 (S)	IMO-1 (S)	FMO-15 (S)	FINAL (S)	N (D)
35	HRU9	12.3.11/12.3.6/12.3.7	X (S)	X (S)	X (S)	IMO-5 (S)	FINAL (I)	IMO-5 (D)	FINAL (S)	FINAL (S)	N (S)
36	HRU7	12.3.11/12.3.6/12.3.7	FINAL (S)	IMO-3 (I)	FMO-15 (I)	FINAL (I)	FINAL (S)	IMO-3 (D)	FMO-15 (D)	FINAL (S)	N (D)
37	HRU7	12.3.11/12.3.6/12.3.7	FINAL (I)	FMO-15 (I)	FMO-15 (I)	IMO-10 (D)	FINAL (S)	IMO-2 (D)	FINAL (S)	FINAL (S)	N (D)
38	HRU10	12.9-10.17/12.9-10.2	FINAL (I)	IMO-10 (S)	IMO-10 (S)	IMO-5 (S)	FINAL (I)	X (D)	FMO-15 (S)	IMO-10 (I)	N (S)
39	HRU10	12.9-10.17/12.9-10.2	FINAL (I)	FMO-15 (I)	IMO-10 (D)	IMO-5 (S)	FINAL (I)	IMO-2 (D)	FMO-15 (S)	IMO-10 (I)	N (S)
40	HRU11	12.3.11/12.3.6/12.3.7	FINAL (D)	IMO-5 (D)	FMO-15 (I)	FINAL (I)	FINAL (S)	IMO-1 (D)	FMO-15 (I)	FINAL (S)	N (D)
41	HRU11	12.3.11/12.3.6/12.3.7	FINAL (S)	FMO-15 (I)	FMO-15 (I)	FINAL (S)	FINAL (S)	IMO-5 (D)	FMO-15 (I)	FINAL (S)	Y (S)

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Site	Rehabilitation Unit	Pre-Clearing Regional Ecosystem	Native Species Richness	Canopy Cover (T1)	Canopy Height (T1)	Small Tree Height (T2-T3)	Small Tree Cover (T2-T3)	Shrub Cover (S1)	Shrub Height (S1)	Native Ground Cover (G1)	Weed Cover (<5%)
42	HRU8	12.3.11/12.3.6/12.3.7	X (S)	FMO-15 (I)	FMO-15 (S)	FMO-15 (S)	FINAL (S)	FMO-15 (S)	FINAL (I)	FINAL (I)	N (S)
43	HRU8	12.3.11/12.3.6/12.3.7	FINAL (I)	FINAL (S)	FMO-15 (S)	FINAL (I)	FINAL (S)	IMO-10 (D)	FMO-15 (D)	FINAL (I)	N (S)
52	HRU13	12.3.11/12.3.6/12.3.7	FINAL (S)	X (S)	X (S)	FMO-15 (I)	FINAL (S)	IMO-3 (D)	FMO-15 (S)	FINAL (S)	Y (S)
70	HRU15	12.3.11/12.3.6/12.3.7	FINAL (S)	X (S)	X (S)	FMO-15 (I)	FINAL (S)	IMO-10 (D)	FINAL (S)	FINAL (S)	Y (S)
71	HRU15	12.3.11/12.3.6/12.3.7	X (S)	X (S)	X (S)	FINAL (I)	FINAL (S)	IMO-1 (S)	FINAL (S)	FINAL (S)	Y (S)
72	HRU15	12.3.11/12.3.6/12.3.7	X (S)	X (S)	FMO-15 (I)	FMO-15 (S)	FINAL (S)	IMO-5 (D)	FMO-15 (S)	FMO-15 (S)	Y (S)
73	HRU15	12.3.11/12.3.6/12.3.7	X (D)	X (S)	X (S)	FINAL (I)	FINAL (S)	IMO-1 (D)	FINAL (I)	FINAL (S)	Y (I)
77	HRU16	12.3.11	X (S)	FMO-15 (S)	FMO-15 (S)	FMO-15 (S)	FINAL (S)	IMO-3 (I)	IMO-10 (I)	FINAL (S)	Y (S)
78	HRU16	12.3.11	X (S)	IMO-10 (I)	FMO-15 (S)	FMO-15 (I)	FINAL (S)	IMO-10 (I)	IMO-10 (I)	FINAL (S)	Y (S)
80	CRU4	12.3.11	FINAL (I)	FMO-15 (S)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-3 (D)	FMO-15 (I)	FINAL (S)	Y (S)
81	HRU20	12.9-10.17/12.9-10.2	FINAL (I)	X (D)	X (D)	FMO-15 (I)	FINAL (S)	X (D)	FMO-15 (I)	X (S)	N (D)
83	HRU20	12.3.11/12.3.6/12.3.7	FINAL (S)	X (S)	X (S)	FINAL (S)	FINAL (S)	IMO-2 (D)	FMO-15 (S)	FINAL (S)	N (S)
84	HRU19	12.3.11/12.3.6/12.3.7	FINAL (S)	FMO-15 (I)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-1 (D)	FMO-15 (I)	FINAL (S)	N (D)
85	CRU10	12.3.11/12.3.6/12.3.7	FINAL (I)	FMO-15 (S)	FMO-15 (S)	FINAL (S)	FINAL (S)	IMO-3 (D)	FINAL (S)	FINAL (S)	N (D)
87	HRU18	12.3.11/12.3.6/12.3.7	X (S)	X (S)	X (S)	FINAL (I)	FINAL (S)	IMO-1 (D)	FINAL (S)	FINAL (S)	N (S)
88	HRU18	12.3.11/12.3.6/12.3.7	FINAL (S)	X (S)	X (S)	FMO-15 (I)	FINAL (S)	IMO-1 (D)	FINAL (S)	FINAL (S)	N (S)
89	HRU23	12.9-10.17/12.9-10.2	X (S)	X (S)	X (S)	IMO-5 (S)	FINAL (I)	X (D)	FMO-15 (S)	IMO-10 (I)	N (S)
90	CRU9	12.9-10.17/12.9-10.2	FINAL (S)	IMO-3 (I)	IMO-10 (I)	IMO-5 (S)	FMO-15 (S)	IMO-3 (D)	FMO-15 (I)	FMO-15 (I)	N (S)
92	HRU22	12.9-10.17/12.9-10.2	X (S)	IMO-10 (I)	IMO-10 (S)	IMO-5 (D)	FINAL (S)	IMO-2 (D)	IMO-5 (D)	FMO-15 (I)	N (S)
93	HRU22	12.3.11/12.3.6/12.3.7	X (S)	X (S)	X (S)	IMO-10 (I)	FMO-15 (I)	FMO-15 (S)	FINAL (S)	FINAL (S)	N (S)
94	HRU22	12.3.11/12.3.6/12.3.7	X (S)	X (S)	X (S)	FMO-15 (I)	FINAL (I)	IMO-5 (D)	FMO-15 (D)	FINAL (S)	N (D)
95	HRU17	12.9-10.17/12.9-10.2	FINAL (S)	X (S)	FMO-15 (I)	IMO-5 (S)	FINAL (S)	X (D)	IMO-10 (I)	IMO-5 (I)	N (S)
96	HRU17	12.9-10.17/12.9-10.2									
105	HRU26	12.9-10.17/12.9-10.19	FINAL (S)	FMO-15 (D)	IMO-10 (S)	FMO-15 (I)	FMO-15 (S)	X (D)	IMO-10 (I)	IMO-10 (I)	Y (S)
116	HRU28	12.9-10.17/12.9-10.2	FINAL (S)	FMO-15 (S)	IMO-10 (S)	IMO-10 (S)	FINAL (S)	X (D)	IMO-5 (I)	FMO-15 (I)	N (S)
117	HRU28	12.9-10.17/12.9-10.2	FINAL (I)	X (S)	IMO-10 (S)	FMO-15 (I)	FINAL (S)	X (S)	X (S)	FMO-15 (S)	N (S)
118	HRU28	12.9-10.17/12.9-10.2									

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Site	Rehabilitation Unit	Pre-Clearing Regional Ecosystem	Native Species Richness	Canopy Cover (T1)	Canopy Height (T1)	Small Tree Height (T2-T3)	Small Tree Cover (T2-T3)	Shrub Cover (S1)	Shrub Height (S1)	Native Ground Cover (G1)	Weed Cover (<5%)
120	CRU8	12.9-10.17/12.9-10.2	FINAL (S)	FMO-15 (S)	IMO-10 (D)	IMO-5 (D)	FINAL (S)	X (S)	IMO-3 (D)	FMO-15 (S)	N (S)
121	HRU30	12.9-10.17/12.9-10.2	FINAL (S)	FINAL (S)	IMO-10 (S)	IMO-5 (S)	IMO-2 (S)	IMO-2 (D)	IMO-10 (S)	IMO-5 (I)	Y (S)
122	HRU30	12.9-10.17/12.9-10.2	FINAL (S)	FMO-15 (S)	IMO-10 (S)	IMO-10 (S)	FMO-15 (S)	FMO-15 (D)	FMO-15 (I)	IMO-2 (S)	N (S)
125	HRU31	12.9-10.17/12.9-10.2	FINAL (S)	FINAL (S)	IMO-10 (S)	IMO-5 (S)	IMO-10 (I)	IMO-10 (D)	FMO-15 (I)	IMO-5 (I)	Y (S)
126	HRU31	12.9-10.17/12.9-10.2	FINAL (S)	FINAL (S)	IMO-10 (S)	IMO-10 (S)	FMO-15 (S)	X (D)	IMO-5 (D)	IMO-3 (I)	Y (S)
139	CRU7	12.9-10.17/12.9-10.2	X (S)	IMO-3 (S)	IMO-10 (S)	IMO-5 (S)	IMO-3 (I)	X (S)	X (S)	FMO-15 (S)	N (S)
140	CRU7	12.9-10.17/12.9-10.2	FINAL (S)	X (S)	X (S)	IMO-10 (I)	FMO-15 (S)	X (S)	FINAL (I)	FMO-15 (I)	N (S)
141	HRU29	12.9-10.17/12.9-10.2	FINAL (I)	X (S)	X (S)	IMO-5 (S)	FINAL (S)	X (D)	FMO-15 (S)	IMO-10 (I)	N (S)
142	HRU29	12.9-10.17/12.9-10.2	FINAL (I)	X (S)	X (S)	FMO-15 (S)	FINAL (S)	X (D)	X (D)	FMO-15 (I)	N (D)
146	HRU21	12.9-10.17/12.9-10.2	FINAL (S)	X (S)	X (S)	IMO-10 (I)	FMO-15 (S)	IMO-2 (D)	IMO-10 (D)	FMO-15 (I)	N (S)
Total meeting a benchmark			**39**	**34**	**38**	**60**	**60**	**45**	**57**	**59**	**17**
Total meeting a benchmark (7th mon.)			**28**	**29**	**32**	**62**	**62**	**55**	**58**	**59**	**29**
Total meeting a benchmark (6th mon.)			**21**	**28**	**28**	**58**	**58**	**52**	**56**	**57**	**23**
Total meeting a benchmark (5th mon.)			**31**	**29**	**32**	**61**	**61**	**55**	**59**	**60**	**28**
Total meeting a benchmark (4th mon.)			**34**	**26**	**31**	**62**	**62**	**53**	**57**	**61**	**23**
Total meeting a benchmark (3rd mon.)			**28**	**15**	**25**	**62**	**56**	**19**	**55**	**61**	**28**
Total meeting a benchmark (2nd mon.)			**3**	**19**	**21**	**57**	**57**	**12**	**29**	**57**	**20**
Total meeting a benchmark (baseline survey)			**65**	**45**	**49**	**60**	**61**	**47**	**62**	**65**	**12**
Total improving (since 7th mon.)			**17**	**15**	**10**	**22**	**13**	**3**	**21**	**23**	**1**
Total declining (since 7th mon.)			**7**	**4**	**3**	**6**	**1**	**46**	**10**	**1**	**12**
Total same (since 7th mon.)			**36**	**41**	**46**	**30**	**44**	**10**	**27**	**35**	**45**
Overall trend			**≥**	**≥**	**≥**	**=**	**≥**	**≤**	**=**	**≥**	**≤**
Total sites surveyed (excl. removed) = 60											

Note 1: Benchmark values - IMO-1 = year 1; IMO-2 = year 2, IMO-3 = year 3, IMO-5 = year 4, IMO-5 = year 5, IMO-10 = year 10, FMO-15 = year 15, FINAL = Final benchmark condition, X = does not meet any benchmark i.e. poorer than IMO-1 year condition. Note 2: D = Decrease, S = Same, I = Increase in all values

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Table 13 Summary of 8th Monitoring top priority sites for management from highest to lowest priority based on poorest condition and % weed cover. Indicates parameters that have failed to meet the IMO-5 or greater benchmark and therefore classified the management unit among top priority sites. Sites were also considered top priority if they were among the top 5 highest weed cover sites.

HRU	Sites	Poorest Condition	Least improved, needs most improvement, fails to meet target benchmark (≥IMO-5)							
			Native Species Richness	Canopy Cover (T1)	Canopy Height (T1)	Small Tree Cover(T2-T3)	Shrub Cover (S1)	Shrub Height (S1)	Native Ground Cover (G1)	Weed cover (>5%)
CRU12	12	x	x	x			x			x
HRU18	87, 88	x	x	x	x		x			X (4)*
HRU4	15			x			x			X (2)*
HRU22	93, 94	x	x	x	x					x
HRU9	35	x	x	x	x					x
CRU13	8, 9	x	x	x	x		x			x
HRU15	71, 73	x	x	x	x		x			
CRU7	139	x		x		x	x	x		x
HRU1	1								x	X (5)*
HRU3	6	x	x	x	x		x			X (1)*
HRU23	89	x	x	x	x		x			X (3)*
HRU20	81, 83	x		x	x		x		x	x
HRU21	146	x		x	x		x			x
HRU29	141, 142	x		x	x		x	x		x

* Indicates top 5 weed cover sites (from highest to lower cover)

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