LOTS 12 AND 13 LODGE DRIVE EAST ROCKINGHAM

TUART WOODLAND TEC ASSESSMENT AND BLACK COCKATOO HABITAT ASSESSMENT

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pgv ENVIRONMENTAL

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1 INTRODUCTION

1.1 Site Location

Lots 12 and 13 Lodge Drive, East Rockingham (the site) are located in the City of Rockingham approximately 36km south of the Perth Central Business District (Figure 1). The site is bound to the north and east by cleared land in the Clipper Precinct of the Rockingham Industry Zone (RIZ), to the south by cleared rural land and to the west by native vegetation in the RIZ Conservation Area.

The site is 11.9098ha in size.

1.2 Background

The site contains a large shed and some disused infrastructure associated with a Wool Scouring plant that was built between 1995 and 2000. The shed and yards are now used for a different purpose.

The shed and other areas of infrastructure occupy about 6ha of the 11.9ha site. The balance of the site remains undeveloped and contains a large number of trees and some bare areas.

Hero Properties Pty Ltd is assessing the potential for development of the site. Development is likely to include the clearing of most of the vegetation on the site.

Preliminary site investigations undertaken by PGV Environmental for Hero Properties Pty Ltd identified the trees on the site are all Tuart trees (*Eucalyptus gomphocephala*). The Tuart trees have the potential to be a part of the Tuart Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community (Tuart Woodland TEC) which is listed as a Critically Endangered community under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Tuart trees provide a low value foraging source for Carnaby's Black Cockatoos, and any Tuart trees with a DBH greater than 500mm may provide future nesting habitat for Carnaby's and Forest Red-tailed Black Cockatoo.

The site was not included in the RIZ environmental approvals obtained at State and Commonwealth level. Therefore, the potential presence of the Tuart Woodland TEC and Black Cockatoo habitat on the site may have implications for the future development of the site.

PGV Environmental was commissioned by Hero Properties Pty Ltd to assess whether the Tuart vegetation on the site meets the criteria of the Tuart Woodland TEC and to assess the Black Cockatoo habitat in accordance with the EPBC Black Cockatoo Referral guidelines and the EPBC Significant Impact Guidelines.

1.3 Scope of Works

The scope of work for the assessment included the following:

1 Undertake the appropriate survey work to obtain information with which to assess the Tuart Woodland TEC;

2 Determine whether the Tuart Woodland TEC occurs on Lots 12 and 13, using the criteria contained in the Approved Tuart Woodland TEC Conservation Advice; and

3 Undertake a Black Cockatoo Habitat assessment using the EPBC Black Cockatoo Guidelines and EPBC Significant Impact guidelines.

2 SITE HISTORY

Aerial photography from 1995 shows the site as undeveloped but with a large amount of clearing over the site (Plate 1). Trees are apparent at the northern end and south-west corner.

Plate 1: Historic Aerial Photograph 1995

The 2000 aerial photo shows the wool scouring shed had been constructed on most of the eastern half and the smaller built area in the western half is the water treatment plant (Plate 2). Native vegetation remains in the north-west corner, and some scattered trees at the north-east end and some vegetation in the south-west corner.

Plate 2: Historic Aerial Photograph 2000

The 2021 aerial photograph shows the current situation with more trees on the site than was previously there in 2000 (Plate 3). The additional trees are the result of landscape planting around the carparks as well as some natural recruitment of trees.

Plate 3: Historic Aerial Photograph 2021

3 TUART WOODLAND TEC ASSESMENT

3.1 Tuart Woodlands and Forests TEC Description

The Tuart Woodlands and Forests of the Swan Coastal Plain was listed as a Threatened Ecological Community (TEC) with a rating of Critically Endangered under the Commonwealth EPBC Act on 4 July 2019 (for brevity the community will be called the Tuart Woodland TEC in this report). A description of the Tuart Woodland TEC is available through the EPBC Act listing and more specifically the *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community* (DoEE, 2017) released by the Commonwealth Government. According to the Conservation Advice the diagnostic characteristics of the TEC are outlined in the following sections.

3.1.1 Key Diagnosis Characteristics

- The ecological community is limited to patches of vegetation (with their associated biota) that meet all of the following key diagnostic characteristics:
- Occurs in the Swan Coastal Plain Bioregion, Western Australia (IBRA v7. Department of the Environment 2012).
- Primarily occurs on the Spearwood and Quindalup dune systems but can also occur on the Bassendean dunes and Pinjarra Plain. It can occur on the banks of rivers and wetlands.
- The primary defining feature is the presence of at least two living established *Eucalyptus gomphocephala* (Tuart) trees in the uppermost canopy layer, although they may co-occur with trees of other species. There is a gap of no more than 60 m between the outer edges of the canopies of adjacent Tuart trees. These trees may occur either as single stemmed trees or as a mallee growth form.
- Most often occurs as a woodland but can occur in other structural forms, For example, forest, open forest, woodland, open woodland, and various mallee forms (NVIS Technical Working Group 2017).
- Other tree species may be present in the canopy or sub-canopy. They commonly include: *Agonis flexuosa* (Peppermint) and *Banksia grandis* (Bull Banksia) (both in the southern part of the range), *Banksia attenuata* (Candlestick Banksia), *Eucalyptus marginata* (Jarrah); and less commonly, *Corymbia calophylla* (Marri), *Banksia menziesii* (Firewood Banksia) and *Banksia prionotes* (Acorn Banksia).
- An understorey of native plants is typically present, which may include grasses, herbs and shrubs, although this is often modified by disturbance. Some understorey plant species that are most commonly present are listed in Section 2.3.3 of the Conservation Advice.
- Native fauna species that are most commonly present are noted in Section 2.4 of the Conservation Advice.

3.1.2 Defining a Patch of the Ecological Community

- A patch of the ecological community is a discrete and mostly continuous area of vegetation that meets the key diagnostic characteristics.
- Boundaries for a patch can extend beyond a site or property boundary, or potential area of impact for a proposed action.

- The patch boundary is 30 m beyond the outer canopy of the established Tuart trees (≥15 cm diameter at breast height (DBH)), including dead Tuart trees (stags). See Plate 4
- Where a dead Tuart tree (stag) is being considered for inclusion in a patch of the ecological community, the vertical projection of its outermost remaining branches is used to define the edge of its canopy. If the species of a stag tree is unclear, if the edge of its canopy is within 60 m of an identified Tuart tree the stag is presumed to be a Tuart.
- Patches of Tuart woodlands and forests may contain areas that vary in structural or biological complexity. One part of a patch may have a larger number of mature trees and more ecological diversity, whereas another part of the same patch may demonstrate fewer mature trees and less groundcover. Areas with soil exposed and/or plant litter can also be expected within this ecological community.
- Variation in quality or condition of vegetation across a patch should not necessarily be considered to be evidence of multiple patches. Patches of the ecological community can be spatially variable and are often characterised by one or more areas within a patch that meet higher condition thresholds amongst areas of lower condition.
- If an area meets the key diagnostic characteristics but the average condition across that area falls below the minimum condition thresholds, the largest area or areas of at least 0.5 ha that meet minimum condition thresholds on average, should be specified as the patch or patches of the nationally listed ecological community. This may result in multiple patches of the ecological community being identified within the overall area first identified as meeting the key diagnostics.
- A patch may include small areas without understorey vegetation, such as bare ground, as well as waterbodies or hardscape (e.g. roads, paths, car parks, or buildings) that do not significantly alter the overall function of the ecological community. These small areas do not break up a patch, or divide a patch into multiple patches, as long as there are some parts of the canopy within 60 m of the outer edges of the canopies of adjacent Tuart trees (as per Plate 4). However, existing buildings and other human-made structures and gardens are not part of the nationally protected ecological community and should be excluded from the calculation of patch size and condition. See Plate 5.

Plate 4: Patch boundaries (DoEE, 2019)

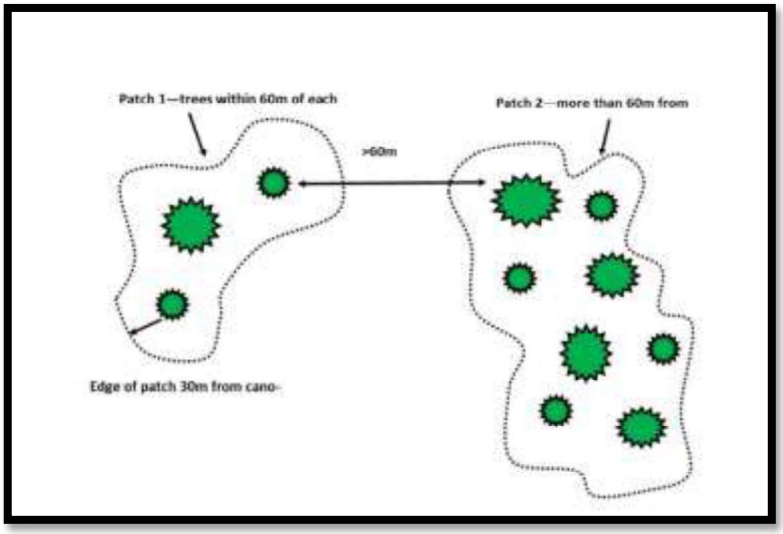
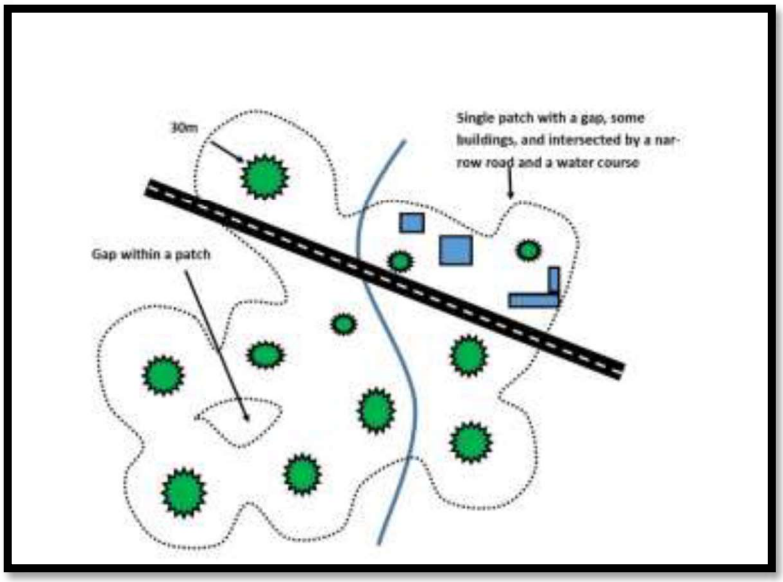


Plate 5: Variation within a patch, including small areas without understorey vegetation, and a small gap within a patch due to part of the Tuart canopy being >60 m apart (DoEE, 2019).



3.1.3 Condition Thresholds and Categories

For confirmed patches of the ecological community, following the key diagnostic characteristics and patch definition above (Step 1), determine the following requirements for information on condition to indicate if they are part of the nationally protected ecological community:

- If the patch is smaller than 0.5 ha it is **not** part of the nationally protected ecological community.
- If **the patch is at least 0.5 ha and up to 5 ha** in size, conduct on ground surveys (see Section 3.4.3) to determine which condition category applies, referring to Section 3.3.1. Patches in this size range are presumed to be part of the nationally protected ecological community unless surveys indicate they do not meet the minimum condition required for national protection. For patches in this size range inclusion in the nationally protected ecological community is determined by surveyed characteristics such as native plant species richness and contribution to cover, habitat values, evidence of regeneration and landscape characteristics.
- **All patches of 5 ha or greater** that meet the key diagnostic characteristics **are part of the nationally protected ecological community**. It is not necessary to conduct additional surveys to confirm that they meet biotic condition thresholds (Table 2) and that they are protected. However more detailed survey may assist in environment impact assessment, planning and monitoring management, or in determining relative biodiversity value between and within different large patches (e.g. to be used in prioritising conservation works etc.). Patches of this size that meet the key diagnostic characteristics provide important contributions to local biodiversity, habitat features and contribute to ecological connectivity of the ecological community and other surrounding ecological communities. Larger patches are likely to be more resilient to some kinds of disturbance and native species loss associated with fragmentation. These characteristics are all important for the long-term resilience of the ecological community across its range.

Table 1: Condition Categories and Thresholds

All patches ≥5 ha is part of the nationally protected ecological community, regardless of their understorey condition. That is, thresholds in this table do not apply to patches ≥5 ha, but the key diagnostic characteristics and patch definition must be met.

Patch size Biotic thresholds	≥2 ha <5 ha	≥0.5 ha <2 ha
Very high condition ≥80 % of all understorey vegetation cover is native Or At least 12 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with very high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY
High condition ≥60 % of all understorey vegetation cover is native Or At least 8 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with high condition understorey. PART OF THE PROTECTED ECOLOGICAL COMMUNITY	Smaller patches with high condition understorey. AND That either: have an important landscape role (≤100 m to native vegetation) OR have a habitat role (≥2 very large trees per 0.5 ha) OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha) PART OF THE PROTECTED ECOLOGICAL COMMUNITY
Moderate condition ≥50 % of all understorey vegetation cover is native Or At least 4 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	Medium sized patches with moderate condition understorey. **AND** That either: have an important landscape role (≤100 m to native vegetation) OR have a habitat role (≥2 very large trees per 0.5 ha) OR show regeneration (≥15 seedlings and/or saplings per 0.5 ha) PART OF THE PROTECTED ECOLOGICAL COMMUNITY	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)
Poor Has minimal or no native cover and species richness. That is: <50 % of all understorey vegetation cover is native And Less than 4 native understorey species per 0.01 ha (10 m x 10 m plot or equivalent sample unit)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)	NOT PART OF THE PROTECTED ECOLOGICAL COMMUNITY (but may be a focus for local protection or restoration)

3.2 Methodology

A survey of the Tuart vegetation on the site was undertaken by Dr Paul van der Moezel of PGV Environmental on 1 July 2021.

All Tuart trees with a diameter at breast height (DBH) greater than 15cm were mapped using a hand-held GPS with an accuracy of around 3m. The canopy of the outermost Tuart in each stand of trees was also measured using a GPS.

In addition, the percentage cover and height of native and introduced species was recorded from four 10m x 10m quadrats sampled from within areas of Tuart vegetation.

The location of the closest Tuart trees and their canopies in the adjoining RIZ Conservation Area was also measured.

3.3 Vegetation

3.3.1 Tuart Vegetation

A total of 134 Tuart trees with a DBH greater than 15cm were mapped on the site (Figure 2). Seven of these were in the landscaped carpark at the southern end of the shed and have not been included for further analysis. Most of the Tuarts were relatively young, with DBH less than 50cm. Overall, the Tuarts occurred in a Woodland structure (10-30% foliage cover), with some isolated trees further away from the woodland areas.

The understorey of the Tuart trees consisted either of a thick layer of mulch (Plate 6) or dense weeds (Plate 7). The mulch layer was around 0.5m thick. The date of mulching is not known but is likely to be associated with the clearing of the adjoining Clipper Precinct in early 2021. The areas containing weeds are considered to be representative of the vegetation that previously existed in the areas that were mulched. That is, the mulch was placed over weeds rather than over good quality native vegetation.

Only three native species were recorded in the whole area containing Tuart trees; *Acacia rostellifera, Acacia saligna* and the climbing plant *Clematis linearifolia.*

Introduced weed species dominated the species list. Common introduced species were Veltdgrass (*Ehrharta longiflora*), Cotton Bush (*Gomphocarpus fruticosus*), Geraldton carnation Weed (*Euphorbia terracina*), Oxalis (*Oxalis pes-caprae*), Fumitory (*Fumaria capreolata*) and Bridal Creeper (*Asparagus asparagoides*).

Several Tuart trees were planted since 2000 after construction of the wool scouring shed and carparks. The planted trees are obvious due to them being in a straight line and of relatively even size structure. Other trees are likely to have been planted given the increase in tree density from the 2000 aerial photo (Plate 2) and the 2021 aerial photo (Plate 3) but these are less obvious on the site.

Plate 6: Tuart Trees over Mulch

Plate 7: Tuart Trees over Weeds

3.3.2 Patch Size

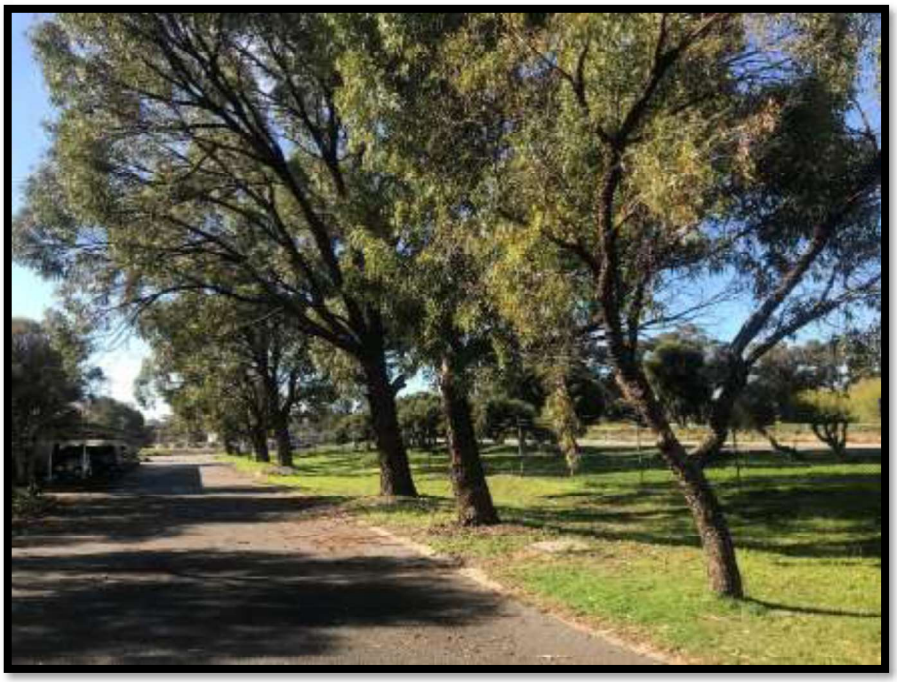
The definition of a 'patch' of Tuart woodland is included in the Conservation Advice. The boundary of a patch is 30m beyond the outer canopy of the established (≥15cm DBH) Tuart trees. A patch can include man-made structures such as roads, paths, carparks and buildings provided that they do not significantly alter the overall function of the ecological community. According to the conservation

advice existing buildings and other man-made structures and gardens are not part of the TEC and should be excluded from the calculation of patch size and condition.

The 30m boundary around the Tuart trees extends into the carpark and access road as well as the large shed on the site. PGV Environmental has excluded these areas from the boundary of the patch as these areas clearly do not function in any way as an ecological community (Plate 8). Similarly, the planted Tuarts in the landscaped carpark at the southern end of the shed have been excluded (Plate 9) as has the dis-used water treatment plant which is all hardstand and offers no ecological function to the Tuart community.

Plate 8: Carpark and Shed Within 30m of Tuart Canopy

Plate 9: Planted Tuarts in Landscaped Carpark



Taking into consideration the definition of a patch of Tuart woodland ecological community PGV Environmental considers there is one patch of Tuart Woodland on the site. The size of the Tuart Woodland on the site is 5.495ha.

There are no Tuart trees to the north or east. Some planted Tuarts on the rural land to the south are more than 60m from the nearest Tuart in natural conditions on the site.

Tuart trees occur in the RIZ Conservation Area to the west. PGV Environmental mapped the co-ordinates of the nearest established tree as well as the boundary of the canopy (Figure 2). The distance between the nearest Tuart tree canopy in the Conservation Area and the canopy on the site is 28m. As a result, the Tuart trees in the Conservation Area are part of the same patch.

The size of the patch mapped on the site is:

- Patch (on-site only)– 5.495ha

The size of the patch including the Tuart trees in the RIZ Conservation Area is:

- Patch (including Tuarts off-site) – minimum 6.71ha, extending further west into the Conservation Area.

3.3.3 Vegetation Condition

The condition of the Tuart vegetation was all rated as Completely Degraded according to the Keighery scale (Government of Western Australia, 2000).

3.3.4 Quadrat Data

Four quadrats were sampled in the area containing Tuart trees. The locations of the quadrats are shown in Figure 2. The quadrat information is provided in Appendix 1 and summarised in Table 2.

Table 2: Quadrat Information

Quadrat	Species Richness (understorey spp.)		% Cover (understorey spp.)		Understorey Mulched?	Condition (Keighery)
	native	introduced	native	introduced		
LR1	1	27	1	80	No	Completely Degraded
LR2	0	12	1	40	Yes	Completely Degraded
LR3	3	12	1	34	Yes	Completely Degraded
LR4	2	14	12	84	No	Completely Degraded

Native understorey species richness ranged from 0-3 in the quadrats. The average number of native understorey species in the quadrats was 1.5. The number of native species is highly unlikely to increase in a spring survey given that more than half the understorey is thick mulch and the rest is dominated by weeds.

The number of introduced species ranged from 12-27 in the quadrats with the lowest number in the areas containing mulch.

Percentage cover of native species was very low ranging from 0-10%. Percentage cover of introduced species was higher, at 22-84% with the higher amounts in the areas without mulch.

3.4 Tuart Woodland Tec Assessment

3.4.1 Step-wise Analysis

The key diagnostic characteristics of the Tuart Woodland TEC are contained in the Approved Conservation Advice for the TEC published at the time of the proposed listing on 16 September 2016 and with the Tuart Woodlands and Forests of the Swan Coastal Plain: A Nationally Significant Ecological Community (DoEE, 2019).

The Conservation Advice contains the following step-wise approach to use in determining if the TEC occurs on a site:

- Step 1: Is the Tuart Woodlands and Forests ecological community in your proposed project site? Is it in other adjacent or off-site areas that may be impacted (for example, by introducing weeds)?
- Step 2: What is the patch size and condition category of the Tuart Woodlands and Forests in the proposed project site and in the surrounding area?
- Step 3: What further information can assist in identifying patches of the Tuart Woodlands and Forests and avoiding significant adverse impacts?
- Step 4: Will your proposed action have a significant impact on Tuart Woodlands and Forests

Step 1: Is the Tuart Woodlands and Forests ecological community in your proposed project site? Is it in other adjacent or off-site areas that may be impacted (for example, by introducing weeds)?

Table 3: Step 1

Key diagnostic characteristics♦	Information	Key diagnostic questions* (Refer to Section 3.2 of the Approved Conservation Advice for a complete explanation of these diagnostic features – other sections of the Approved Conservation Advice are referenced where relevant)	Response (yes/no/possibly) and detailed comments. Use as much space as you need to fully answer the question#
Location and physical environment	Bioregion	Is the proposal site within the Swan Coastal Plain IBRA bioregion?	Yes
Soils and Landform	Soil type	Is the soil type consistent with where the Tuart Woodlands and Forests may occur? (see Section 2.2.1♦)	Yes - Quindalup
	Location in the landscape, topography	Is the topography/physical environment consistent with where the Tuart Woodlands and Forests may occur? Is the site associated with any hydrology (groundwater/surface water)?	Yes Not associated with any hydrological features
Structure	Presence of Tuart trees	How many Tuart trees are present and are they consistent with the characteristics set out in the Approved Conservation Advice? **Note:** Please present this information in terms of total number of trees (dead, established, seedlings etc.) and trees per hectare of the footprint. Diagrams/maps should also be provided.	127 trees with DBH ≥15cm on the lot
	Structural form	What structural form is the vegetation?	Woodland

Key diagnostic characteristics♦	Information	Key diagnostic questions* (Refer to Section 3.2 of the Approved Conservation Advice for a complete explanation of these diagnostic features – other sections of the Approved Conservation Advice are referenced where relevant)	Response (yes/no/possibly) and detailed comments. Use as much space as you need to fully answer the question#
Composition	Dominant tree species, emergent tree layer, understory	Is the composition of the community consistent with the characteristics set out in the Approved Conservation Advice? What other tree species are present? How many native understorey species are present and what is the number of weedy species/proportion of weeds?	Yes, Only tree species present is Tuart Native understorey species richness ranges from 0-3 (average 1.75) in 10m x 10m quadrats. Weed species 7-19 in 10m x 10m quadrats. Weed species cover 22-82% well above the native species cover which was very sparse at 0-10% cover overall.
Defining a patch of Tuart Woodlands and Forests	Patch definition	What is the extent of the patch? **Note:** Descriptions of patch extent must include analysis of canopy extent and associated understorey vegetation (see Section 3.2.2♦). Patches may extend beyond the project area or include areas of infrastructure (i.e. road, powerline). The referral should make clear how, and how much of the patch will be directly or indirectly impacted.	A 30m boundary was drawn around all established Tuart trees in the survey area resulting in the delineation of one patch on site and extending off-site to the west. The area of the patch is: On-site – 5.495ha On-site and off-site – Minimum 6.71ha
Relationship with other ecological communities	Other vegetation communities	Are other vegetation communities present? What are they and how do they intergrade and/or interact with the Tuart Woodlands and Forests TEC? (see Section 3.2.3♦)	A small stand of *Melaleuca rhaphiophylla* trees occurs in the north-west corner of the site. The vegetation is Completely Degraded and does not provide any additional ecological function to the patch of Tuart trees.

The complete key diagnostic characteristics are provided in the Approved Conservation Advice.

* The Tuart Woodlands and Forests may include restored, planted or revegetated flora. Do not exclude vegetation from being classed as the Tuart Woodlands and Forests because it is a planted, restoration or revegetation site (unless it is a garden).

Comments should include references to appropriate supporting information and data.

Step 2: What is the patch size and condition category of the Tuart Woodlands and Forests in the proposed project site and in the surrounding area?

Table 4: Step 2

Size and condition♦	Information	Relevant content to be discussed in the referral (Refer to Section 3.3 of the Approved Conservation Advice for a complete explanation of these diagnostic features)	Detailed comments. Use as much space as you need to fully answer the question#
Patch Size	Patch size in hectares	Is the patch size large enough to meet the minimum patch size in this section? (Section 3.3♦) **Note:** Patch boundaries are not limited to the proposal site. You must make clear that the patch boundary is consistent with Section 3.2.2♦.	Yes, the patch is larger than the minimum 0.5ha threshold for the TEC.
Patch condition	Condition thresholds	Using the condition categories in this section, what is the patch condition? (Section 3.3.1♦) What is the quality and size (hectares) of the vegetation community in and around the site where the proposed action will occur? Is the patch expected to improve in condition (e.g. after appropriate fire management) or is there a threatening process underway that will reduce the current size and/or condition? **Note:** Refer to Section 3.4 – Step 3 – Further information to assist in identifying patches of the protected ecological community and avoiding significant adverse impacts If patch quality varies over the site; characterisation of the variation should be provided. Patch condition includes consideration of thresholds for characteristics such as plant species richness, landscape features, Tuart tree age and size and other habitat roles of the vegetation. Other vegetation condition measures (e.g. Keighery scale) do not necessary reflect the condition thresholds and both should be provided, where relevant. Where threats are identified (i.e. those listed in Appendix C of the Approved Conservation Advice) please provide further information on what these are and how they have impacted the condition.	Based on the number of native species per 10m x 10m quadrat the condition category is Poor.

♦ Further information on the key diagnostic characteristics is provided in the Approved Conservation Advice.
Comments should include references to appropriate supporting information and data. The response which includes the information does not need to be presented in table form.

Step 3: What further information can assist in identifying patches of the Tuart Woodlands and Forests and avoiding significant adverse impacts?

Table 5: Step 3

Other characteristics♦	Information	Relevant content to be discussed in the referral (Refer to Section 3.4 of the Approved Conservation Advice for a complete explanation of these)	Detailed comments. Use as much space as you need to fully answer the question#
Buffer zone	Condition thresholds	Has a buffer zone been applied to the Tuart Woodlands and Forests patch and what size is the buffer? What activities will occur within the buffer zone? (Section 3.4.1♦) **Note:** Activities within the buffer zone must be considered where they have the potential or may significantly impact Tuart Woodlands and Forests.	No buffer zone possible to the north or east due to existing developments. Land to the south zoned industrial and is currently cleared and offers no buffer to the Tuart patch. Vegetation to the west is a Conservation Area and will be protected in perpetuity.
Revegetated areas and areas of regrowth	Revegetation	Does the area contain revegetation or areas of regrowth? (Section 3.4.2♦) **Note:** Revegetated areas, if they meet the key diagnostic criteria can be Tuart Woodlands and Forests.	No regrowth of native understorey has occurred or is possible.
Sampling protocol	Design	Is the sampling consistent with what is described in Section 3.4.3♦?	Yes – all areas with Tuarts were surveyed on site including sampling from 10m x 10m quadrats
	Timing of surveys, seasonal variation and post-disturbance surveys	Is the sampling consistent with what is described in Section 3.4.4♦(evidence must be provided)? Has any disturbance or other factors which may impact on the outcome of the survey been identified (fire, drought)?	Yes. Further sampling in spring not necessary as it will not lead to a change in condition category rating

Other characteristics♦	Information	Relevant content to be discussed in the referral (Refer to Section 3.4 of the Approved Conservation Advice for a complete explanation of these)	Detailed comments. Use as much space as you need to fully answer the question#
Other guidance for impact assessment and mitigation (see section 3.4.5)	Size and/or area to boundary ratio	What is the size/area to boundary ratio? **Note:** A map/diagram should be provided with the location and shape of the proposal site in context to the surrounding area.	Not determined
	Species recruitment	What evidence exists of recruitment of overstorey and understory species? Does the site have a range of Tuart tree age cohorts? Are very large trees and/or tree hollows present?	Some younger Tuarts but not considered regrowth, rather natural recruitment of plants in a stable tree community. Several large (>0.5m dbh) Tuarts present, none with a hollow.
	Faunal habitat	What habitat does the site provide for fauna (e.g. water, variety in substrate, nest hollows)? What fauna does the site support?	Habitat for avifauna
	Combination of species	Does the site contain a unique combination of species?	No intact native understorey present, only some scattered individual plants.
	Species richness	What is the species richness of the site? Is it high? Note: this should include both flora and fauna.	Understorey native species richness ranges from 0-3 in 10m x 10m quadrats which is extremely low for Tuart vegetation
	Other listed species	Are any other EPBC Act listed species located on the site?	No listed flora. Potential breeding habitat for Black Cockatoos occurs on the site, but no actual breeding habitat.
	Soil surface characteristics	Is there presence of cryptogams, soil crust, leaf litter, intact proteaceous root mats or other indicators of a low level of soil disturbance?	Leaf litter and mulch present.

♦ Further information is provided in the Approved Conservation Advice.
Comments should include references to appropriate supporting information and data. The response which includes the information does not need to be presented in table form.

3.4.2 Results

The result of the Tuart Woodland TEC assessment is as follows:

- One patch of Tuart woodland occurs on the site, as determined using tree canopies and a perimeter 30m around the outer edge of the canopies;
- The vegetation condition is rated as Poor on the Tuart Woodland TEC scale
- The size of the Tuart patch within the site is 5.495ha, and at least 6.71ha when considering the extension to the west; and
- The Tuart patch meets the definition of the Tuart Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community, as the size of the patch is larger than the 5ha minimum required for a patch of Tuart in Poor condition to be the TEC.

4 BLACK COCKATOO HABITAT ASSESSMENT

4.1 Black Cockatoo Species

4.1.1 Forest Red-tailed Black Cockatoo

Forest Red-tailed Black Cockatoos *(Calyptorhynchus banksii naso*) are endemic to the humid to sub-humid south-west of Western Australia (SEWPaC, 2012). The range of Forest Red-tailed Black Cockatoos is bound by Gingin in the north to Mt Helena, Christmas Tree Well, West Dale, North Bannister, Mt Saddleback, Kojonup, Rocky Gully, upper King River and Green Range (east of Albany) (SEWPaC, 2012; DoE, 2016). Forest Red-tailed Black Cockatoos nest in tree hollows with a depth of 1-5m, that are predominately Marri, Jarrah and Karri and feed primarily on the seeds of Marri and Jarrah (Johnstone and Kirkby, 2011).

The site is within the modelled distribution for Forest Red-tailed Black Cockatoos (SEWPaC, 2012).

4.1.2 Carnaby's Black Cockatoo

Carnaby's Black Cockatoos (*Calyptorhynchus latirostris*) are found in the south-west of Australia from Kalbarri through to Ravensthorpe. The species has a preference for feeding on the seeds of Banksia, Dryandra, Hakea, Eucalyptus, Grevillea, Pinus and Allocasuarina spp. Carnaby's Black Cockatoos are nomadic, often moving toward the coast after breeding. The species breeds in tree hollows that are 2.5 – 12m above the ground and have an entrance of 23-30cm with a depth of 1-2.5m. Nesting mostly occurs in smooth-barked trees (eg. Salmon Gum, Wandoo, Red Morrell). Eggs are laid from July to October, with incubation lasting 29 days (DoE, 2014).

The site is within the modelled distribution and outside of the known breeding range for Carnaby's Black Cockatoos (SEWPaC, 2012).

4.1.3 Baudin's Black Cockatoo

Baudin's Black Cockatoos *(Calyptorhynchus baudinii)* are most common in the far south-west of Western Australia. The species is known to breed from the southern forests north to Collie and east to near Kojonup. Baudin's Black Cockatoo is typically found in vagrant flocks and utilises the taller, more open Jarrah and Marri woodlands where it feeds mainly on Marri seeds and various Proteaceous species (Johnstone and Kirkby, 2011).

The site is within the modelled distribution for Baudin's Black Cockatoos (SEWPaC, 2012).

4.2 Black Cockatoo Habitat Assessment

4.2.1 Methodology

PGV Environmental undertook a Black Cockatoo Habitat Assessment in accordance with the *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) and the methodology that is outlined in the SPRAT Database for each of the Black Cockatoo species for Black Cockatoo Habitat Assessments.

A site visit was undertaken by PGV Environmental on 1 July 2021.

The extent, type and quality of the vegetation present, including the presence and extent of plants known to be used by Black Cockatoos, was investigated during the assessment. The quality of the vegetation was determined in the context of foraging habitat for Black Cockatoos. During the site visit a search for feeding signs or feeding debris such as chewed Tuart (*Eucalyptus gomphocephala*) nuts was undertaken.

The assessment also searched for evidence of roosting including areas of droppings, moulted feathers, feather down or clippings from branches under trees.

Breeding habitat was assessed using the definition in the Black Cockatoo Referral Guidelines, which is trees of species known to support breeding within the range of the Black Cockatoo species that either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) to develop a nest hollow. For the relevant tree species on the site, Tuart, the suitable DBH is 500mm. The assessment recorded all trees within the site that have a DBH of 500mm or greater. The location, species, trunk DBH and any other important descriptive information about each tree located within the site was recorded. The presence of hollows or spouts was recorded, and any potential large hollows were examined using 20x binoculars from the ground.

4.3 Results

4.3.1 Foraging

One native plant species was recorded on the site by PGV Environmental that is recognised as foraging habitat for Black Cockatoos (Davies 1966; Saunders 1980; Johnstone and Storr 1998; Johnstone and Kirkby 1999; Valentine and Stock, 2008; Groom 2011; Johnstone *et al*., 2011; SEWPaC, 2012; Johnstone, *et al.*, 2013; Johnstone *et al*., 2016) as shown in Table 2 (Figure 3).

Table 2: Foraging Species for Black Cockatoos Recorded on the Site

Species	Common Name
Eucalyptus gomphocephala	Tuart

Tuart was the dominant species in the remnant vegetation. The understorey was largely cleared of native vegetation.

The use of this flora species by each Black cockatoo species and their foraging value is shown in Table 3.

Table 3: Foraging Value for each Black Cockatoos Species

Species	Common Name	Carnaby's Black Cockatoo	Forest red-tailed Black Cockatoo	Baudin's Black Cockatoo
Eucalyptus gomphocephala	Tuart	Low	None	None

There was no evidence of foraging by Black Cockatoos on the site.

The extent of foraging is estimated at 1.4ha which is calculated using an average of 70% canopy cover for the Tuart trees on the site (Figure 3).

The Black Cockatoo Referral Guidelines refer to the quality of the foraging habitat as an important characteristic in determining the significance of the impact. However, there is no guidance as to how the quality is determined in the Black Cockatoo Referral Guidelines other than specifying that 'quality' foraging habitat refers to the use of the habitat by Black Cockatoos rather than the overall quality of the vegetation which would normally be described using understorey as well as tree canopy.

The foraging habitat on the site is considered to be low quality foraging habitat for Carnaby's Black Cockatoo. Forest Red-tailed Black Cockatoos and Baudin's Cockatoo are not known to forage on Tuart Trees (Johnstone *et al*., 2011; SEWPaC, 2012; Johnstone, *et al.*, 2013; Johnstone *et al*., 2016).

4.3.2 Roosting

The site does not contain a known roosting site for Black Cockatoos. There was no evidence of roosting observed during the site assessment on 1 July 2021.

The closest known roosting sites are within 3km of the site (Figure 4) (DoP, 2011).

4.3.3 Breeding

Black Cockatoos are known to breed in hollows of large eucalypts. The Black Cockatoo Referral Guidelines define trees of certain species with a DBH of 500mm or greater as breeding habitat regardless of the presence or not of hollows. The theory behind this definition is the concept that while the trees may not currently contain hollows, they are mature enough that in the next 50 years or so a hollow might form and be of use to Black Cockatoos for the purposes of breeding.

The site is outside of the known breeding range for Carnaby's Black Cockatoo. Tuart Trees are not a recognised species that Baudin's Cockatoo will use for breeding (Johnstone *et al*., 2011; SEWPaC, 2012; Johnstone, *et al.*, 2013; Johnstone *et al*., 2016).

The survey recorded 58 Tuart trees with a DBH ≥500mm. None of the trees had hollows visible form the ground. Consequently, no recent or old evidence of breeding in hollows was observed on the site (Figure 4).

4.4 Regional Context

The site has protected Black Cockatoo habitat to the north and west in the RIZ conservation area and to the east in Bush Forever Site No. 349 - Leda and Adjacent Bushland, and to the south in Bush Forever Site No. 356 Lake Cooloongup, Lake Walyungup and Adjacent Bushland (Figure 4).

The areas requiring investigation as foraging habitat within 12km of the site is estimated to be around 7,434ha (DBCA, 2021). The amount of Tuart Woodland proposed to be cleared (1.4ha) represents 0.02% of the Black Cockatoo habitat in a 12km radius. The 12km radius is used as this is the distance a Black Cockatoo male bird will fly up to from a nest in search of food during chick rearing times.

4.5 Significance of Impact

According to the *EPBC Act Significant Impact Guidelines 1.1* (DoE, 2013), the significance of the impact on Black Cockatoos depends on the sensitivity, value and quality of the environment and the intensity, duration, magnitude and geographic extent of the impacts. The category of listing (for example;

Endangered, Vulnerable or Migratory) determines the significant impact criteria for listed flora and fauna species and ecological communities.

This Black Cockatoo Habitat Assessment assumes all of the foraging and potential breeding trees on the site would be cleared. Using this assumption, the clearing would result in approximately 1.4ha of foraging habitat and 58 potential breeding trees being cleared.

The following assessments are for Forest Red-tailed and Baudin's Black Cockatoos which are listed as Vulnerable and Carnaby's Black Cockatoos which are listed as Endangered.

Forest Red-tailed Black Cockatoo and Baudin's Black Cockatoo

The impact on Forest Red-tailed Black and Baudin's Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the *Significant Impact Guidelines 1.1* for the impact on a Vulnerable species and is shown below:

• *Lead to a long-term decrease in the size of an important population of a species*

In the *Significant Impact Guidelines 1.1* an important population is defined as "a population that is necessary for a species' long-term survival and recovery" and may be "key source populations either for breeding or dispersal, populations that are necessary for maintaining genetic diversity, and/or populations that are near the limit of the species' range".

There was no evidence of breeding occurring on the site and the surrounding area contains habitat for foraging, roosting, and breeding for Black Cockatoos that utilise the site.

Clearing 1.4ha of native vegetation on the site would not impact on the long-term survival or recovery of the species due to the large amount of Black Cockatoo habitat in the surrounding area.

• *Reduce the area of occupancy of an important population*

There was no evidence found of Forest Red-tailed or Baudin's Black Cockatoos breeding or roosting on the site. Clearing the site will not impact on these species as they don't utilise Tuart Trees for foraging.

Clearing 1.4ha of native vegetation from the site would not reduce the area of occupancy of the population.

• *Fragment an existing important population into two or more populations*

There are large areas of suitable habitat within 500m of the site that provide foraging and potential breeding habitat. Forest Red-tailed and Baudin's Black Cockatoos are highly mobile and can fly large distances between foraging areas.

Clearing 1.4ha of native vegetation from the site will not fragment the existing population.

• *Adversely affect habitat critical to the survival of a species*

There was no evidence that Forest Red-tailed and Baudin's Black Cockatoos breed on the site and Tuart Trees are not a recognised species of tree that they nest in. There are large areas of foraging habitat within 500m of the site.

Clearing the site would not adversely affect habitat critical to the survival of the species.

• *Disrupt the breeding cycle of an important population*

There was no evidence that Forest Red-tailed or Baudin's Black Cockatoos breed on the site, there were no suitable hollows for breeding.

Clearing native vegetation from the site would not disrupt the breeding cycle.

• *Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The large areas (7,434ha) of high quality foraging and breeding habitat located in the surrounding region and within 500m of the site would prevent the population from declining.

Clearing native vegetation will not reduce the availability or quantity of foraging habitat as neither of the species forage on Tuart Trees.

• *Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat*

Clearing the site will not result in invasive species being introduced, therefore would not result in this outcome.

• *Introduce disease that may cause the species to decline*

Clearing the site will not result in disease being introduced, therefore would not result in this outcome.

• *Interfere substantially with the recovery of the species*

The Forest Red-tailed and Baudin's Black Cockatoos may pass through the site however they don't forage in Tuart Trees. Therefore, the clearing of approximately 1.4ha of foraging habitat on the site would not interfere substantially with the recovery of the species.

In accordance with the criteria set out in the *Significant Impact Guidelines 1.1* the conclusion of this assessment is that development of the site would not have a significant impact on Forest Red-tailed Black Cockatoos or Baudin's Black Cockatoos.

Carnaby's Black Cockatoo

The impact on Carnaby's Black Cockatoos from clearing the Black Cockatoo habitat on the site has been assessed against the criteria set out in the Significant Impact Guidelines 1.1 for the impact on an Endangered species and is shown below:

• *Lead to a long-term decrease in the size of a population*

There was no evidence of breeding occurring on the site and the site is outside of the known breeding range for the species. The surrounding region contains native vegetation suitable for foraging, roosting, and breeding habitat for Carnaby's Black Cockatoos. The Tuart Trees provide a low quality foraging habitat for Carnaby's Black Cockatoos.

Clearing 1.4ha of native vegetation on the site would not impact on the long term survival or recovery of the species due to the large amount of Carnaby's Black Cockatoo habitat in the surrounding area.

• *Reduce the area of occupancy of the species*

There was no evidence of Carnaby's Black Cockatoos breeding or roosting on the site. Clearing will reduce the area of foraging available, however the large areas of higher-quality foraging and breeding habitat located in the surrounding Bush Forever Sites and the RIZ conservation area within 500m of the site would prevent the population from declining

Clearing 1.4ha of native vegetation on the site would not reduce the area of occupancy of the population.

• *Fragment an existing population into two or more populations*

There are large areas of suitable habitat within 500m of the site that provide foraging and potential breeding habitat. Carnaby's Black Cockatoos are highly mobile and can fly large distances between foraging areas.

Clearing 1.4ha of native vegetation on the site will not fragment the existing population.

• *Adversely affect habitat critical to the survival of a species*

There was no evidence that Carnaby's Black Cockatoos breed on the site and there are large areas of habitat within 500m of the site.

Clearing on the site would not adversely affect habitat critical to the survival of the species.

• *Disrupt the breeding cycle of a population*

The site contained no evidence of breeding and there were no trees that contained suitable hollows/spouts therefore clearing of the site would not result in this outcome.

• *Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline*

The large areas of high-quality foraging and breeding habitat located in the surrounding region within 200m of the site would prevent the population from declining.

Clearing native vegetation will not reduce the availability or quantity of foraging habitat when considered in terms of the 7,434ha within 12km surrounding the site.

• *Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*

Clearing of the site will not result in the establishment of an invasive species harmful Carnaby's Black Cockatoos.

• *Introduce disease that may cause the species to decline*

Clearing of the site will not cause disease to be introduced therefore will not result in this outcome.

• *Interfere with the recovery of the species*

Carnaby's Black Cockatoos have access to suitable habitat (7,434ha) protected within 500m and 12km of the site. Therefore, the clearing of approximately 1.4ha of foraging habitat and 58 potential breeding habitat trees on the site would not interfere substantially with the recovery of the species.

In accordance with the criteria set out in the *Significant Impact Guidelines 1.1* the conclusion of this assessment is that development of the site would not have a significant impact on Carnaby's Black Cockatoos.

4.6 Black Cockatoo Referral Guidelines

The *EPBC Act referral guidelines for three threatened Black Cockatoo species: Carnaby's cockatoo (endangered) Calyptorhynchus latirostris Baudin's cockatoo (vulnerable) Calyptorhynchus baudinii Forest red-tailed Black Cockatoo (vulnerable) Calyptorhynchus banksii naso* (SEWPaC, 2012) (Black Cockatoo Referral Guidelines) contain several steps to determine whether or not a referral is required. These steps are:

1. The definition of habitat (breeding, roosting and foraging – Table 1 in the Black Cockatoo Referral Guidelines);
2. A description of the type of action that may have a high or low risk of being a significant impact and therefore require referral (Table 3 in the Black Cockatoo Referral Guidelines);
3. Formulation of a mitigation strategy to reduce the scale of impact; and
4. A flowchart to assist in decision making on whether or not an action should be referred.

Step 1 Black Cockatoo Habitat

There is approximately 1.4ha of foraging habitat (Carnaby's Black Cockatoo only) on the site.

The site contains 58 trees that are considered to be potential breeding trees (Carnaby's Black Cockatoo only). There is no evidence of breeding or roosting on the site.

Step 2 Level of Impact

Foraging

According to Table 3 in the Black Cockatoo Referral Guidelines the clearing of more than 1ha of quality foraging habitat has a high risk of causing a significant impact. Degradation of more than 1ha of quality habitat by things such as altered hydrology or fire regimes has an uncertain risk. The significance of degradation depends on the type of degradation and the quality of the habitat.

The site contained approximately 1.4ha of foraging habitat for Black Cockatoos. Tuart trees provide low quality foraging for Carnaby's Black Cockatoo and the other two species of Black Cockatoos don't

forage on Tuart Trees. Clearing the site will lead to the loss of more than 1ha of low quality foraging habitat and is unlikely to result in a significant impact according to the guidelines.

Roosting

The Black Cockatoo Referral Guidelines consider the clearing of a known roosting site as a high risk of being a significant impact. Anecdotally, there is no evidence of roosting on the site and there was no evidence of roosting found during the site visit on 1 July 2021. The risk of a significant impact on a known roosting site is considered to be low.

Breeding

According to Table 3 in *the Black Cockatoo Referral Guidelines* the clearing of any known nesting tree has a high risk of being a significant impact. A known nesting tree is defined in the Black Cockatoo Referral Guidelines as any existing tree in which breeding has been recorded or suspected. There are no known nesting trees that occur on the site and therefore there is no risk of a significant impact on known breeding habitat of Black Cockatoos.

The *Black Cockatoo Referral Guidelines* also consider that the clearing or degradation of any part of a vegetation community known to contain breeding habitat is likely to have a high risk of a significant impact. In Table 1 of the *Black Cockatoo Referral Guidelines* breeding habitat is defined as woodlands, forests or isolated trees that contain or consist of live or dead trees of certain species with either a DBH of or greater than 500mm or the presence of suitable nest hollows.

The site contains 58 Tuart trees with a DBH of or greater than 500mm none of which contained hollows/spouts suitable for Black Cockatoos. Baudin's Black Cockatoos are not known to breed in Tuart Trees and the Site is outside of the known breeding range for Carnaby's Black Cockatoo.

According to the Black Cockatoo Referral Guidelines the risk of a significant impact on breeding habitat of Carnaby's Black Cockatoos is high.

Surrounding Habitat

According to the Black Cockatoo Referral Guidelines clearing of vegetation that results in a gap of greater than 4km between patches of Black Cockatoo habitat (foraging, roosting or breeding) has a high risk of having a significant impact.

Clearing the native vegetation will not create large gaps between native vegetation therefore the risk is considered to be low.

Step 3 Mitigation

The consideration of a mitigation strategy during the determination of the level of impact and requirement to refer is allowed by the *Black Cockatoo Referral Guidelines* and setting in place the best practice mitigation strategy may reduce the level of impact and in turn the risk of a significant impact. Mitigation strategies include avoiding impact, managing impact so that there is no net decline in habitat and monitoring the effectiveness of mitigation.

This assessment is based on the entire 1.4ha of low quality foraging habitat and all 58 potential breeding habitat trees being cleared. There is no alternative for the vegetation clearing if the Lots are developed for general industry in line with the zoning under the MRS and TPS.

Step 4 Referral Advice

The Decision Making flowchart in Figure 1 of the Black Cockatoo Referral Guidelines was applied to the site without consideration of mitigation strategies and is shown in sequence below:

1. Could the impacts of your action occur within the modelled distribution of the black cockatoos? – YES
2. Could the impacts of your action affect any black cockatoo habitat or individuals? - YES
3. Have you surveyed for black cockatoo habitat using the recommended methods? – YES
4. Could your action have an impact on black cockatoos or their habitat? – YES
5. Is your impact mitigation best practice so that it may reduce the significance of your impacts on black cockatoos? Prioritise impact avoidance over impact minimisation - NO

RESULT – Referral Recommended: Risk of resulting in significant impact.

5 SUMMARY AND CONCLUSIONS

5.1 Tuart Woodland TEC Assessment

The Tuart Woodland TEC Assessment concludes the following:

1. A total of 127 established (DBH ≥15cm) Tuart trees were recorded on Lots 12 and 13 Lodge Road. Seven Tuarts planted for landscaping at the southern end of the shed were not included;
2. The Tuart trees occurred in one patch as defined by the Tuart Woodland TEC Conservation Advice;
3. Native understorey species richness was very low with only three species recorded in the whole patch and 0-3 (average 1.7) in the four 10m x 10m quadrats sampled. The number of introduced species was higher (7-19) and the percentage cover of introduced species was far higher than native with 22-82% compared to 0-10% for native species;
4. The condition of the Tuart vegetation was rated as Completely Degraded according to the Keighery vegetation scale;
5. The condition category of the Tuart Woodland patch was rated as Poor according to the Conservation Advice condition category scale;
6. The size of the Tuart Woodland patch on site was measured as:
    - 5.495ha
7. The size of the Tuart Woodland patch on site and extending off-site into the RIZ Conservation Area is at least 6.71ha; and
8. Despite the almost complete absence of native understorey species, the Tuart patch meets the criteria of being the Tuart Woodlands and Forests of the Swan Coastal Plain TEC due to the size of the patch being larger than 5ha.

The Tuart Woodland TEC is listed as Critically Endangered under the Commonwealth EPBC Act. Any proposal that is likely to have a significant impact on a Critically Endangered TEC is required to be referred to the Commonwealth Department of Agriculture, Water and the Environment (DAWE) for consideration for assessment.

The significance of an impact is determined by the EPBC Act Significant Impact Guidelines 1.1. A reduction in the extent of an ecological community is one of the seven actions that is likely to have a significant impact. There is no threshold to the amount of vegetation that can be cleared before it is considered significant.

A referral of a proposed impact on the Tuart Woodland TEC on the site should highlight the Poor condition of the patch due to the almost absent native understorey, and the large area of Tuart Woodland TEC in the adjoining RIZ Conservation Area that is in very good condition.

5.2 Black Cockatoo Habitat Assessment

The Black Cockatoo Habitat Assessment identified 1.4ha of foraging habitat (Tuart only) on the site consisting of Tuart trees. There was not any evidence of foraging by Black Cockatoos was observed on the site.

The site does not contain a known roosting site and no evidence was observed that the site has been used as roosting habitat.

The site does not contain known breeding sites and no evidence of breeding was recorded on the site. There were 58 potential breeding habitat trees (all Tuart) recorded on site, none of which had hollows visible from the ground.

Clearing of the site will result in the loss of 1.4ha of Black Cockatoo habitat. According to the EPBC Act Significant Impact Guidelines, the impact on Forest Red-tailed Black Cockatoos, Baudin's Black Cockatoo and Carnaby's Black Cockatoos is not likely to be significant. The site is unlikely to be used by Forest Red-tailed Black Cockatoos and Baudin's Black Cockatoo as they are not known to forage in Tuart Trees.

However, in accordance with the Black Cockatoo Referral Guidelines the clearing of Black Cockatoo habitat is likely to have a high risk of being a significant impact due to the loss 1.4ha low quality foraging habitat and 58 potential breeding trees. Referral to the Department of Agriculture, Water and the Environment under the EPBC Act is therefore recommended.

6 REFERENCES

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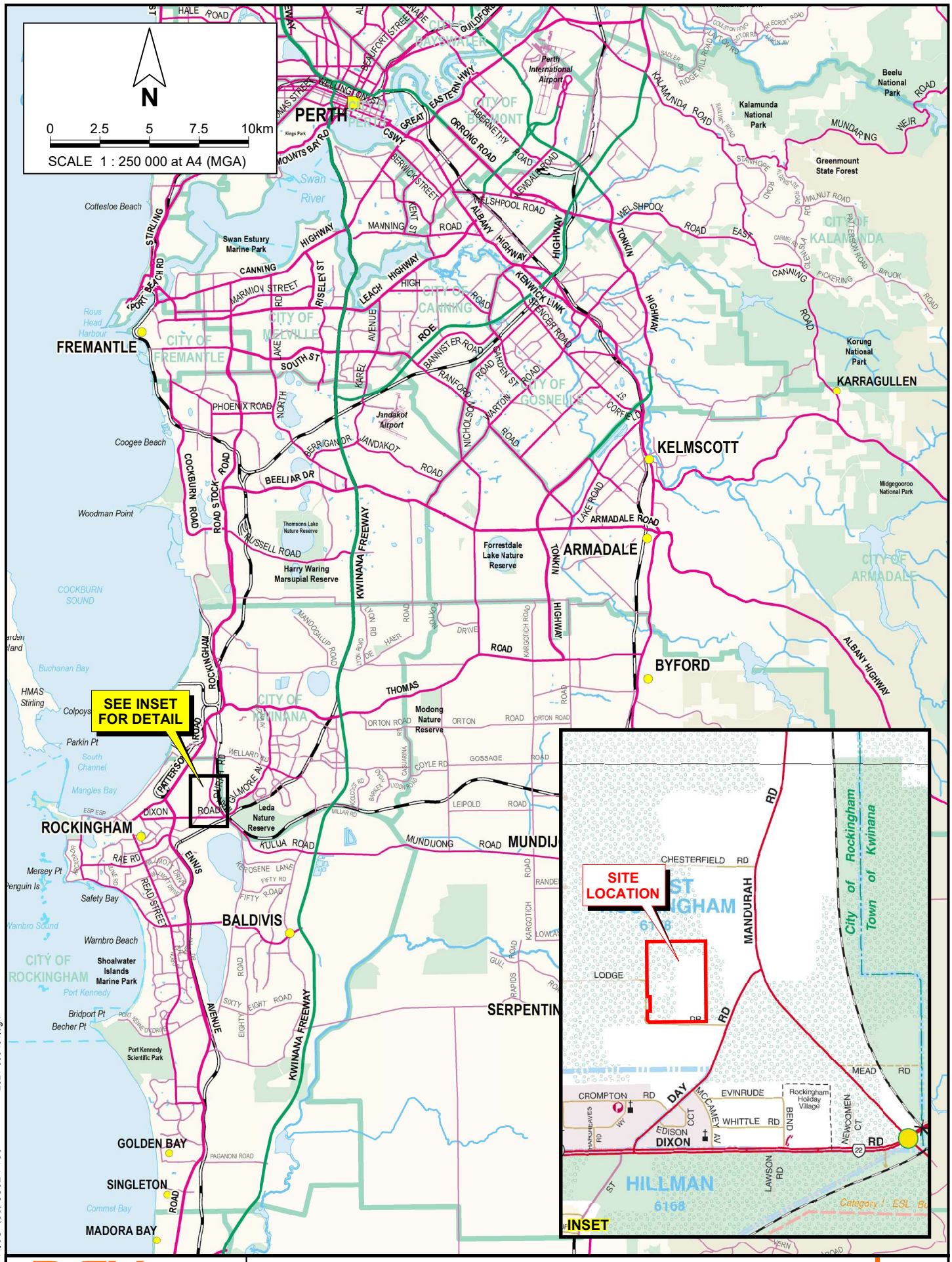
FIGURES



pgv ENVIRONMENTAL

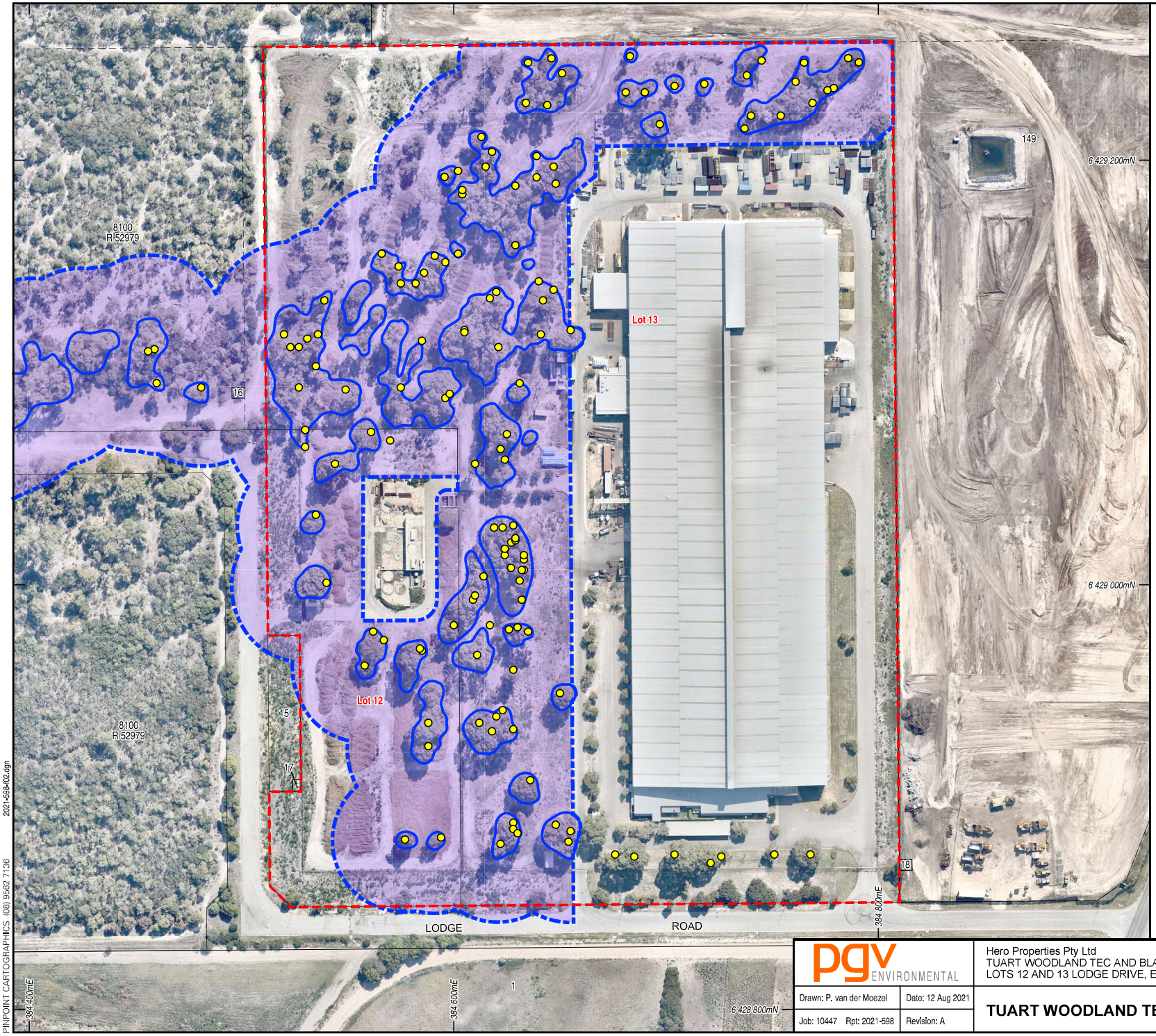
Hero Properties Pty Ltd
TUART WOODLAND TEC ASSESSMENT
LOTS 12 AND 13 LODGE ROAD, EAST ROCKINGHAM

Drawn: P. van der Moezel | Date: 12 Aug 2021
Job: 10447 Rpt: 2021-598 | Revision: A

SITE LOCATION

Figure 1

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-598-f01.dgn



N

0 20 40 60 80 100m

SCALE 1 : 1 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Tuart Tree Location
- Tuart Tree Canopy
- 30m Perimeter Around Tuart Canopies
- Tuart Woodland TEC

CADASTRAL SOURCE: Landgate, July 2021.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-598-f02.dgn

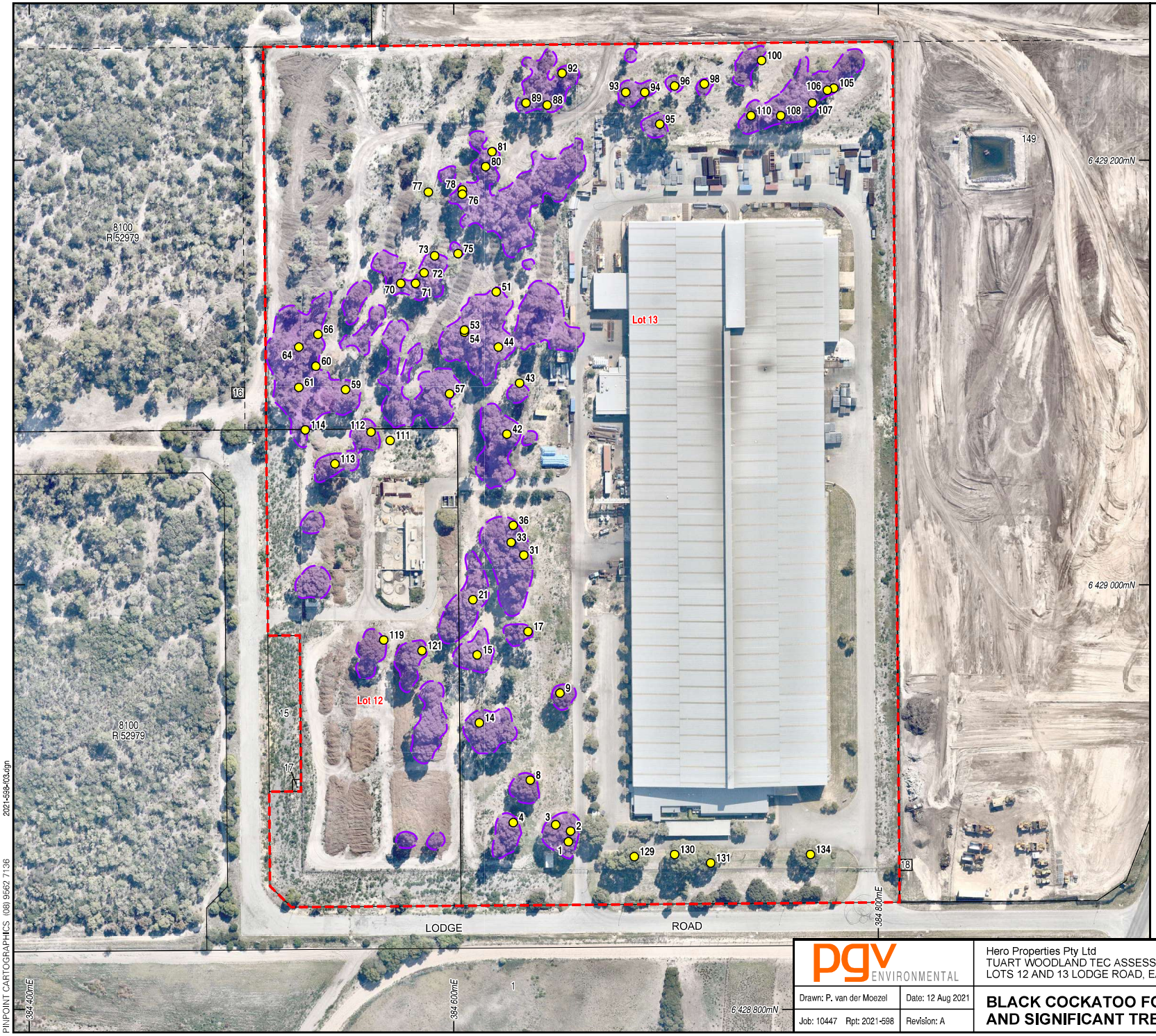
pgv ENVIRONMENTAL

Hero Properties Pty Ltd
TUART WOODLAND TEC AND BLACK COCKATOO HABITAT ASSESSMENTS
LOTS 12 AND 13 LODGE DRIVE, EAST ROCKINGHAM

Drawn: P. van der Moezel | Date: 12 Aug 2021
Job: 10447 Rpt: 2021-598 | Revision: A

TUART WOODLAND TEC

Figure 2



N

0 20 40 60 80 100m

SCALE 1 : 1 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Foraging Habitat

Significant Trees (>50cm DBH)

- Tuart (*Eucalyptus gomphocephala*)
- 94 Tree Number

CADASTRAL SOURCE: Landgate, July 2021.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-598-f03.dgn

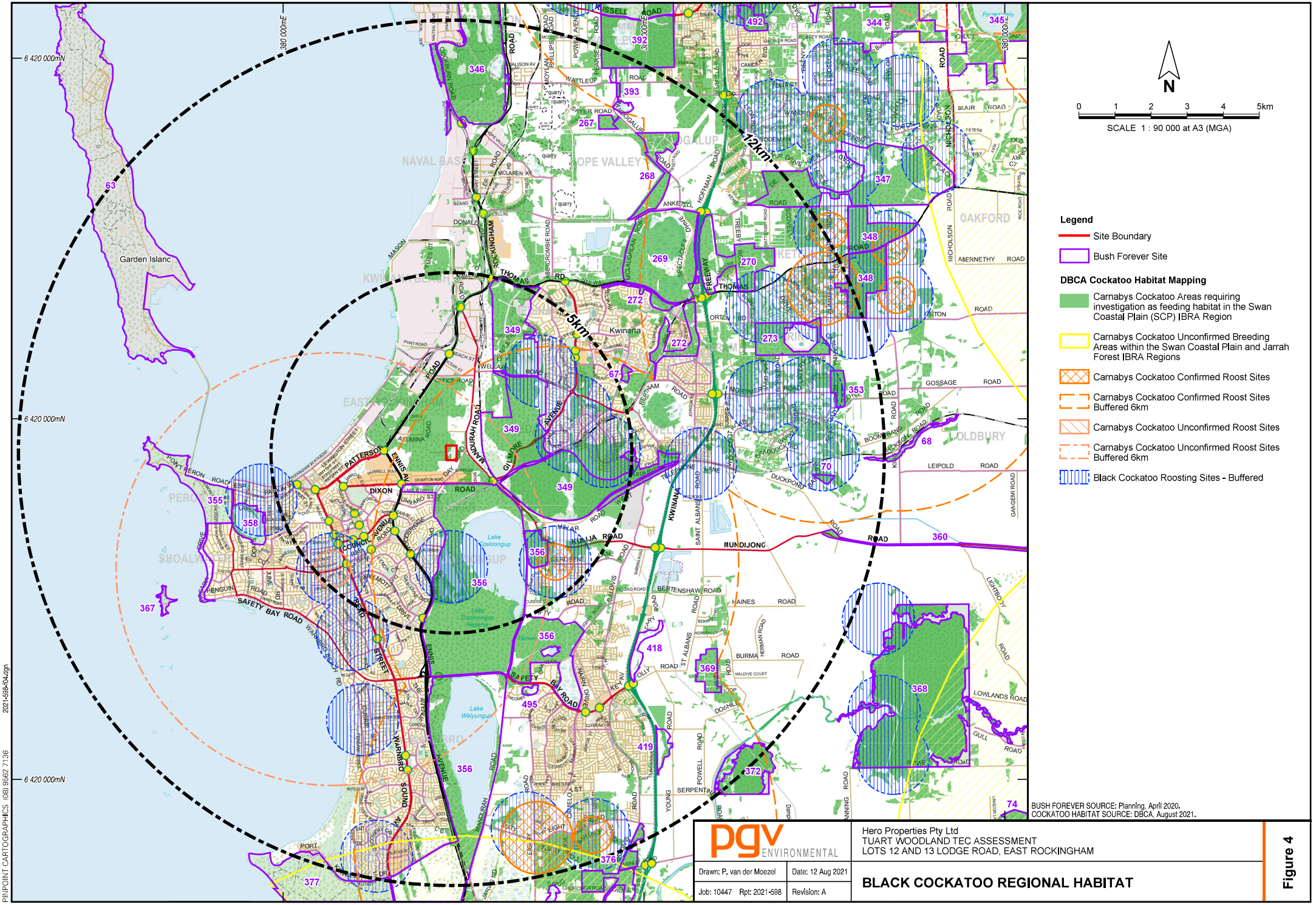
pgv ENVIRONMENTAL

Hero Properties Pty Ltd
TUART WOODLAND TEC ASSESSMENT
LOTS 12 AND 13 LODGE ROAD, EAST ROCKINGHAM

Drawn: P. van der Moezel | Date: 12 Aug 2021
Job: 10447 Rpt: 2021-598 | Revision: A

BLACK COCKATOO FORAGING HABITAT AND SIGNIFICANT TREES

Figure 3



PINPOINT CARTOGRAPHICS (08) 9662 7136 2021-598-04.dgn

pgv ENVIRONMENTAL

Hero Properties Pty Ltd
TUART WOODLAND TEC ASSESSMENT
LOTS 12 AND 13 LODGE ROAD, EAST ROCKINGHAM

Drawn: P. van der Moezel | Date: 12 Aug 2021
Job: 10447 Rpt: 2021-598 | Revision: A

BLACK COCKATOO REGIONAL HABITAT

Figure 4

APPENDIX 1

Quadrat Data

QUADRAT LR1

50 384615 E 6428945 N

Vegetation: *Eucalyptus gomphocephala* (Tuart) Woodland over weeds
Condition: Completely Degraded
Landform: Flat
Soil: Mulch
Date: 15.10.21
Recorder: P. van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	12	25
**Avena fatua*	1.2	10
**Rhamnus alaternus*	1.2	1
**Gomphocarpus fruticosus*	1.1	15
**Schinus terebinthifolius*	1	<1
**Ehrharta longiflora*	1	25
Acacia rostellifera	0.8	1
**Melilotus indicus*	0.6	<1
**Raphanus raphanistrum*	0.6	<1
**Lolium rigidum*	0.5	2
**Sonchus asper*	0.5	1
Acacia saligna	0.5	<1
**Solanum nigrum*	0.4	5
**Trachyandra divaricata*	0.4	<1
**Sonchus oleraceus*	0.4	<1
**Bromus diandrus*	0.4	<1
**Briza minor*	0.4	<1
**Lysimachia arvensis*	0.3	2
**Euphorbia terracina*	0.3	1

SPECIES	HEIGHT (m)	COVER (%)
**Asphodelus fistulosus*	0.3	<1
**Arctotheca calendula*	0.3	<1
**Malva parviflora*	0.2	1
**Oxalis pes-caprae*	0.2	10
**Fumaria capreolata*	0.1	10
**Euphorbia peplus*	0.1	<1
**Trifolium sp*	<0.1	<1
**Taraxacum officinale*	Flat	<1
**Cirsium vulgare*	Flat	<1
**Hypochaeris glabra*	Flat	<1
**Asparagus asparagoides*	Climber	2

* introduced species

QUADRAT LR2

50 384589 E 6428959 N

Vegetation: *Eucalyptus gomphocephala* (Tuart) Woodland over mulch and weeds
Condition: Completely Degraded
Landform: Flat
Soil: Mulch
Date: 15.10.21
Recorder: P. van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	15	20
**Avena fatua*	1	10
**Ehrharta longiflora*	0.7	5
**Rhamnus alaternus*	0.5	1
**Bromus diandrus*	0.4	10
**Sonchus asper*	0.4	<1
**Euphorbia terracina*	0.3	<1
**Medicago polymorpha*	0.3	40
**Fumaria capreolata*	0.3	<1
**Oxalis pes-caprae*	0.2	20
**Sixalix atropurpurea*	0.1	<1
**Lysimachia arvensis*	0.1	<1
**Asparagus asparagoides*	Climber	<1

* introduced species

QUADRAT LR3

50 384623 E 6429172 N

Vegetation: *Eucalyptus gomphocephala* (Tuart) Woodland over mulch and weeds
Condition: Completely Degraded
Landform: Flat
Soil: Mulch
Date: 15.10.21
Recorder: P. van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	15	25
**Rhamnus alaternus*	2	2
**Avena fatua*	1	20
Melaleuca huegelii	1	1
**Gomphocarpus fruticosus*	0.8	1
**Ehrharta longiflora*	0.7	1
**Bromus diandrus*	0.4	5
**Euphorbia terracina*	0.3	<1
**Oxalis pes-caprae*	0.2	2
**Trifolium campestre*	0.2	1
Acacia rostellifera	0.2	<1
**Asphodelus fistulosus*	0.2	<1
**Solanum nigrum*	0.1	<1
**Lysimachia arvensis*	0.1	<1
**Asparagus asparagoides*	Climber	1
Clematis linearifolia	Climber	<1

* introduced species

QUADRAT LR4

50 384722 E 6429230 N

Vegetation: *Eucalyptus gomphocephala* (Tuart) Woodland over weeds
Condition: Completely Degraded
Landform: Flat
Soil: Mulch
Date: 15.10.21
Recorder: P. van der Moezel

QUADRAT (10 x 10m)

SPECIES	HEIGHT (m)	COVER (%)
Eucalyptus gomphocephala	14	20
Spyridium globulosum	1	2
**Rhamnus alaternus*	1	1
**Solanum nigrum*	1	1
**Gomphocarpus fruticosus*	0.8	10
**Ehrharta longiflora*	0.8	50
**Sonchus oleraceus*	0.8	20
Acacia rostellifera	0.7	10
**Bromus diandrus*	0.5	5
**Euphorbia terracina*	0.5	<1
**Euphorbia peplus*	0.2	4
**Lysimachia arvensis*	0.2	1
**Trifolium campestre*	0.2	<1
**Fumaria capreolata*	0.1	1
**Hypochaeris glabra*	Flat	<1
**Taraxacum officinale*	Flat	<1
**Asparagus asparagoides*	Climber	1
Clematis linearifolia	Climber	<1

* introduced species

APPENDIX 2

SIGNIFICANT TREE LOCATIONS

Lots 12 and 13 Lodge Road

Tree No.	Species	Easting	Northing	DBH	2nd branch	3rd branch	Comments		
108	Tuart	384754	6429221	95					
51	Tuart	384620	6429138	94					
94	Tuart	384690	6429232	94					
95	Tuart	384697	6429217	94					
107	Tuart	384769	6429227	93					
98	Tuart	384718	6429236	91					
53	Tuart	384605	6429120	88					
61	Tuart	384527	6429093	86					
76	Tuart	384604	6429184	82					
119	Tuart	384567	6428974	81					
66	Tuart	384536	6429118	79					
73	Tuart	384591	6429155	79					
78	Tuart	384604	6429186	77					
44	Tuart	384621	6429112	74					
89	Tuart	384634	6429227	73					
72	Tuart	384586	6429147	72					
54	Tuart	384605	6429119	70					
64	Tuart	384527	6429112	70					
88	Tuart	384644	6429226	70					
2	Tuart	384655	6428884	69					
129	Tuart	384685	6428872	69					tree in carpark S of big shed
1	Tuart	384654	6428879	68			no hollows or spouts		
42	Tuart	384625	6429071	68					
93	Tuart	384681	6429232	68	44				
75	Tuart	384602	6429156	67					
134	Tuart	384768	6428873	67					tree in carpark S of big shed
4	Tuart	384628	6428888	66					
130	Tuart	384704	6428873	66					tree in carpark S of big shed
113	Tuart	384544	6429057	65					
131	Tuart	384721	6428869	65					tree in carpark S of big shed
106	Tuart	384776	6429233	64	24				
110	Tuart	384740	6429221	63					
111	Tuart	384570	6429068	63					
92	Tuart	384651	6429241	62					
43	Tuart	384631	6429095	60					
77	Tuart	384588	6429185	60					
121	Tuart	384585	6428969	60					
70	Tuart	384575	6429142	59					
81	Tuart	384618	6429204	59					
9	Tuart	384650	6428949	58					
80	Tuart	384615	6429197	58					
114	Tuart	384530	6429073	58					
8	Tuart	384636	6428908	57	20				
59	Tuart	384549	6429092	57					
71	Tuart	384582	6429142	57					
60	Tuart	384535	6429103	56					
112	Tuart	384561	6429072	56					
33	Tuart	384627	6429020	55					
36	Tuart	384628	6429028	55					
3	Tuart	384648	6428887	54					
15	Tuart	384611	6428967	54	53				
17	Tuart	384635	6428978	54					
100	Tuart	384745	6429247	54	30				
14	Tuart	384612	6428935	53					
21	Tuart	384609	6428993	51					
31	Tuart	384633	6429014	51					
57	Tuart	384598	6429090	51	38			32	
96	Tuart	384704	6429235	50					
105	Tuart	384779	6429234	50	42				
7	Tuart	384622	6428878	49					
22	Tuart	384610	6428995	49					
116	Tuart	384535	6429033	49	42	29			
128	Tuart	384676	6428873	49					tree in carpark S of big shed
6	Tuart	384630	6428883	48					
46	Tuart	384655	6429120	48	41				
56	Tuart	384596	6429088	48	27				
97	Tuart	384683	6429249	48					
102	Tuart	384765	6429246	48					
52	Tuart	384617	6429135	47					

Attachment 6

Plan of Clearing Works

N

0 20 40 60 80 100m

SCALE 1 : 1 750 at A3 (MGA)

Legend

- Site Boundary
- Cadastral Boundary
- Easement Boundary
- Clearing Footprint

CADASTRAL SOURCE: Landgate, July 2021.
CONTOUR SOURCE: Dept. of Agriculture, 2000.
AERIAL PHOTOGRAPH SOURCE: NearMap, flown April 2021.

PINPOINT CARTOGRAPHICS (08) 9562 7136 2021-605-alt02.dgn

pgv ENVIRONMENTAL

Hero Properties Pty Ltd
FLORA AND VEGETATION SURVEY
LOTS 12 AND 13 LODGE ROAD, EAST ROCKINGHAM

Drawn: B. Heath	Date: 1 Apr 2022
Job: 10447 Rpt: 2021-605	Revision: A

CLEARING FOOTPRINT

Attachment 3