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# ASSESSMENT OF FLORA AND VEGETATION VALUES

**JINKAS-DATATINE SURVEY AREA**

**BADGEBUP, WA**

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Prepared By



**Mattiske** Consulting Pty Ltd

Prepared For

**Ausgold Limited**

**SEPTEMBER 2021**

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## LIST OF ABBREVIATIONS

- Ausgold:** Ausgold Limited
- BAM Act:** *Biosecurity and Agriculture Management Act 2007* (WA)
- BC Act:** *Biodiversity Conservation Act 2016* (WA)
- BOM:** Bureau of Meteorology
- DotEE:** Department of the Environment and Energy
- DBCA:** Department of Biodiversity, Conservation and Attractions
- EP Act:** *Environmental Protection Act 1986* (WA)
- EPA:** Environmental Protection Authority
- EPBC Act:** *Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
- Eucalypt Woodlands:** Eucalypt Woodlands of the Western Australian Wheatbelt (TEC)
- IBRA:** Interim Biogeographical Regionalisation for Australia
- Mattiske:** Mattiske Consulting Pty Ltd
- NVIS:** National Vegetation Information System
- PEC:** Priority ecological community
- TEC:** Threatened ecological community
- PRIMER:** Plymouth Routines in Multivariate Ecological Research v7
- WAH:** Western Australian Herbarium

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## EXECUTIVE SUMMARY

Mattiske Consulting Pty Ltd was commissioned in August 2019 by Ausgold Limited to conduct a desktop study to evaluate the potential flora and vegetation values of their tenements in the Jinkas mine-Datatine area, southern wheatbelt region of Western Australia, ahead of a field survey in the same area. The proposed survey areas are within the Katanning Gold Project and comprise three existing mining and exploration tenements (M70/211, M70/488 and E70/2928) operated by Ausgold Limited, approximately 30 km northeast of Katanning, WA. The field survey included several components: an assessment of the flora values, an assessment of the remnant vegetation and an assessment of native vegetation patches in order to determine whether they form part of the "Eucalypt Woodlands of the Western Australian Wheatbelt" threatened ecological community.

Various databases were used to identify the possible occurrence of flora (including introduced, threatened and priority taxa) and threatened and priority ecological communities within the Jinkas-Datatine area. Historical documentation of the floristics and vegetation mapping of the region, along with results of previous flora and vegetation surveys in the area (in particular those by Mattiske Consulting Pty Ltd in 2017 and early 2019), were reviewed.

The proposed survey area is located within the Avon Botanical Subdistrict (*Avon Wheatbelt 2 - Katanning* IBRA subregion), which has a dry warm Mediterranean climate with cool, wet winters and hot, dry summers. Geologically, it is situated in an Archaean-aged greenstone belt within the Yilgarn craton, which hosts the existing gold mine. The topography is comprised of a gently undulating plateau of low relief where broad lateritic uplands (with extensive sandplains) grade to long gentle slopes with occasional bedrock outcrops and then to broad, low gradient valley floors with chains of salt lakes. The soils of the area can be broadly defined as sandy gravels, saline wet soils and loamy earths.

The vegetation of the Jinkas-Datatine area is described using botanical districts, land systems, pre-European vegetation and recently mapped vegetation communities. There has been extensive clearing of the native vegetation within the tenements, as the current dominant land use is cropping and grazing; only 16 % of the pre-European native vegetation extent remains in the Shire of Katanning. In general, the remnant native vegetation can be summarised as being dominated by open *Eucalyptus* species woodlands, with thickets of *Acacia acuminata* and Casuarinaceae species on and around rocky outcrops, occasional mixed Proteaceae-Myrtaceae species heath communities on sandplains, and Chenopodiaceae species-rich shrubland on saline soils. A total of ten vegetation communities, eight Eucalypt woodland and two mixed Proteaceous-Myrtaceae heath vegetation communities, have previously been mapped in the area.

A total of 243 vascular plant taxa could potentially be found within the proposed survey areas, seven of which are listed threatened species at federal or state level, and ten as priority species at state level. Of the priority flora species, four are assessed as having a High likelihood of occurrence in Jinkas-Datatine area. A total of 31 introduced plant taxa that could possibly occur in the proposed survey area were identified, of which four are categorised as significant weeds (both Weeds of National Significance and Declared Pests). A further six species are of concern due to their High ecological impact and Rapid invasiveness rankings.

The Threatened Ecological Community "Eucalypt Woodlands of the Western Australian Wheatbelt", identified as Critically Endangered at Commonwealth level and Priority 3 at state level, is known from previous surveys to have a high probability of occurrence in the Jinkas-Datatine survey area. Two Priority 1 Ecological Communities as listed at state level ("Brown Mallet (*Eucalyptus astringens*) communities in the western Wheatbelt on alluvial flats" and "Red Morrel (*Eucalyptus longicornis*) woodland of the Wheatbelt"), which form sub-elements of the Eucalypt Woodlands ecological community, may also occur within the proposed survey area.

A detailed field assessment of the flora and vegetation of each vegetation patch in the Jinkas-Datatine survey area was undertaken by two botanists from Mattiske in November 2019, and each vegetation patch

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mapped was assessed against the criteria for the Eucalypt Woodlands TEC. A total of 57 sampling sites within 13 remnant vegetation patches across the Jinkas-Datatine survey area were surveyed.

A total of 98 vascular plant taxa were recorded within the survey areas, dominated by the Myrtaceae and Poaceae families. Species-accumulation curve analysis indicates that approximately 73% of the flora species potentially present within the Jinkas-Datatine survey area were recorded. None of the recorded taxa are listed threatened species at federal or state level, or priority species at state level. Three of the taxa represent potential range extensions. Of the species recorded in this survey, 25 are introduced. None of these are Declared Pests. However, six are ranked as having a High ecological impact and Rapid invasiveness in the region.

Nine vegetation communities were defined in the Jinkas-Datatine survey area, and comprised one heathland, two shrublands and six woodland communities. Within the survey area, the *Acacia* shrubland community S3 was the most common, making up 32.7% of the remnant vegetation areas within the survey area, followed by the Eucalypt woodland communities W10 (27.5%), W11 (15.2%) and W12 (11.7%), with the remaining five vegetation communities (three Eucalypt woodlands, one shrubland and one heathland) making up 12.9%. Species richness varied across the communities, from an average 6.4 species in the planted Eucalypt woodland community W11 to 17.5 species in the heathland community S1. The Keighery vegetation condition was generally Degraded across the entire survey area, with a small amount of variation from Completely Degraded to Good.

The thirteen remnant vegetation patches were divided into 23 sub-patches for assessment against the criteria for the "Eucalypt Woodlands of the Western Australian Wheatbelt" Threatened Ecological Community. Two of the sub-patches are ranked as "Highly Likely", two as "Potential", and 19 as "Not Likely" to form part of the Threatened Ecological Community. The two patches that were ranked as "Highly Likely" are *Eucalyptus wandoo* woodlands, one at Jacksons, and one at Datatine. Those ranked as "Potential" are two remnants of *Eucalyptus loxopheba* woodland, one a sub-patch within the greater *Acacia* shrubland at Cleggs, and one a patch immediately across the road to the north.

The two PECs that had the potential to exist within the Eucalyptus Woodlands TEC, Brown Mallet and Red Morrel vegetation communities (both Priority 1) were not recorded within the vegetation patches surveyed in November 2019.

Clearing of native vegetation requires a permit under the *EP Act*, unless an exemption applies, as prescribed in either Schedule 6 of the *EP Act* or *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Adequate time to apply for and receive a clearing permit for any exploration and ongoing mining activities should be allowed for when planning.

Guidelines on Buffer Zone width at the edge of a remnant vegetation patch assessed as forming part of the TEC are still not clear, despite clarification being sought from the Australian Government; until such time as the guidelines have been changed, the 40 m Buffer Zone should be used.

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## 1. INTRODUCTION

Mattiske Consulting Pty Ltd (Mattiske) was commissioned in August 2019 by Ausgold Limited (Ausgold) to conduct an assessment to evaluate the flora and vegetation values within the Jinkas mine-Datatine area, located within the southern wheatbelt region, 30 km northeast of Katanning, WA (Figure 1). Ausgold wishes to extend the mineral resource known to exist in the area (Ausgold Limited 2019).

### 1.1. Location and Scope of Project

Gold was first discovered in the Katanning area in 1979, and small-scale open-cut mining of the Jinkas and Dingo (immediately south of Jinkas) deposits took place from 1995-1997. Ausgold first acquired tenements in the area in 2009. In 2017 Ausgold reinterpreted the geological model for the area and now wishes to take initial steps to expand the resource through a regional surface drilling program (Ausgold Limited 2019). Several parts of the Katanning Gold Project are required to be surveyed; the areas around the existing Jinkas pit and the Datatine target are the subject of this assessment. Ausgold Limited requested that eleven vegetation patches of varying sizes within the Jinkas-Datatine survey area be assessed during this survey.

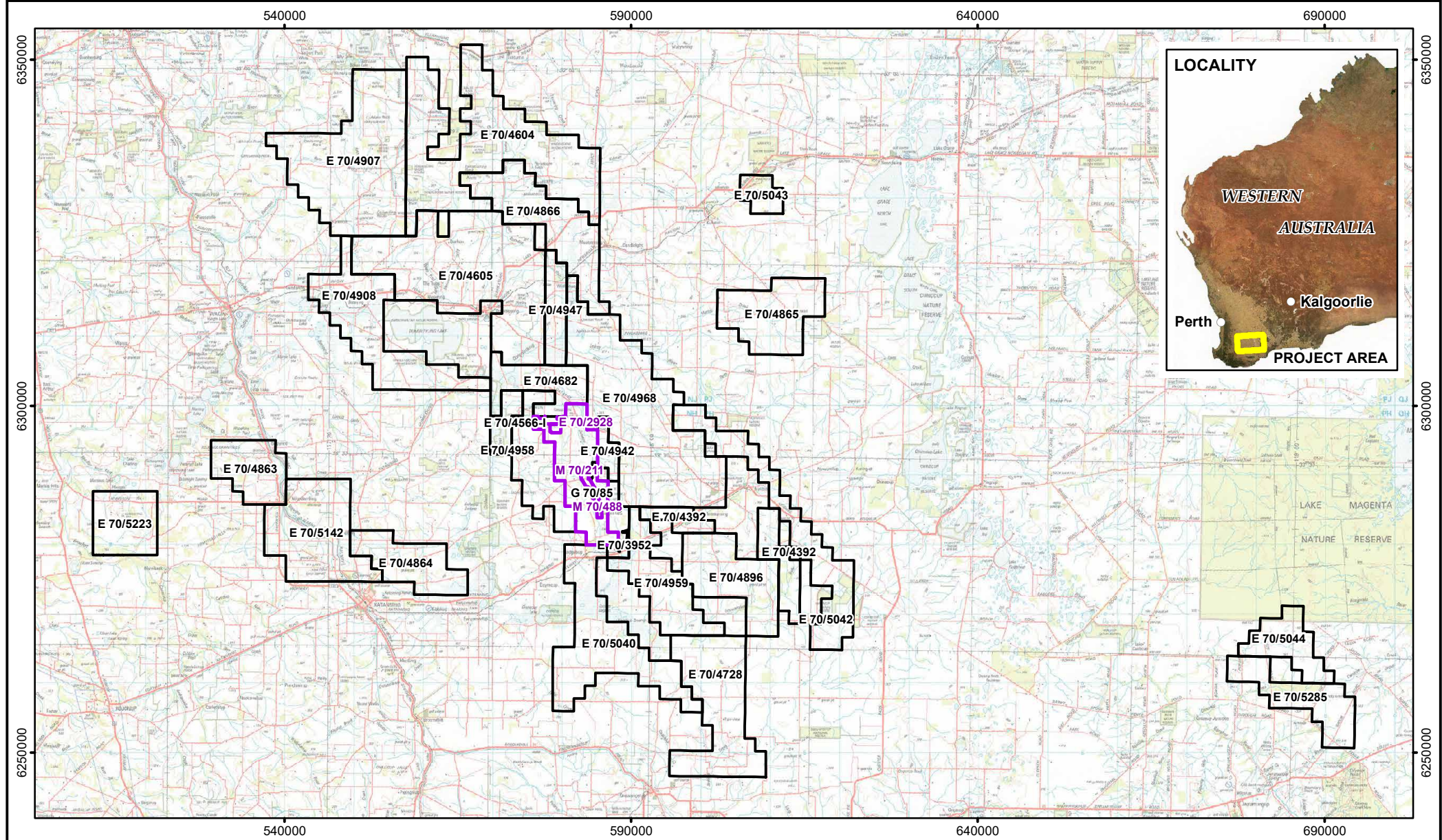
The Jinkas-Datatine survey area comprises mining tenements M70/211 and M70/488, and exploration tenement E70/2928; its total area is 11,195 ha (Figure 2). Parts of this survey area have previously been surveyed by Mattiske, in October 2017 and February 2019 (Mattiske 2018, 2019a, 2019b).

The Katanning-Nyabing road runs just to the south of the Jinkas-Datatine survey area, from Katanning in the west to Nyabing in the east. Warren Road runs almost west-east through the centre of the survey area and Datatine Rd South runs south-north through the middle of the northern half of the survey area. Several minor roads allow further access to other parts of the survey area (Figure 2).

This report describes the previously recorded and potential flora and vegetation values of the proposed Jinkas-Datatine survey area and places them within a local and regional context.

The field survey included several components: an assessment of the flora values, an assessment of the remnant vegetation and an assessment of native vegetation patches in order to determine whether they form part of the "Eucalypt Woodlands of the Western Australian Wheatbelt" threatened ecological community. Details of the flora species, vegetation communities and vegetation patches in the survey area are described in this report.





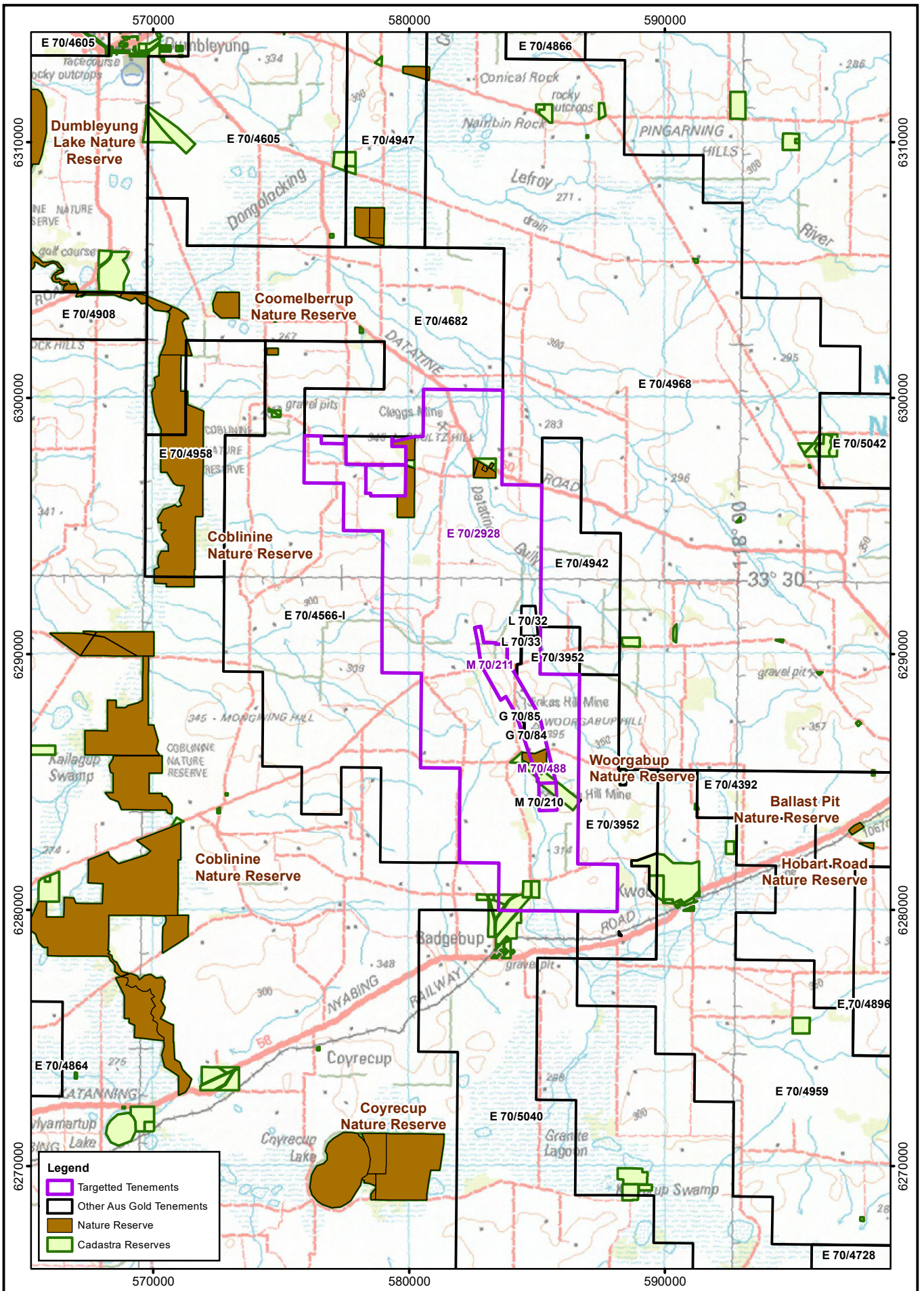
Legend  
 Targetted Tenements  
 Other Aus Gold Tenements

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 Scale: 1:750,000  
 MGA94 (Zone 50)  
 CAD Ref: a2561\_JD07  
 Date: December 2019 Rev: A A4

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**Katanning Gold Project  
 Locality**  
 Jinkas-Datane Tenements (E70/2928, M70/211, M70/488)

Figure:  
1



**Legend**

- Targetted Tenements
- Other Aus Gold Tenements
- Nature Reserve
- Cadastra Reserves

N  
 0 2 4 km  
 Scale: 1:200,000  
 MGA94 (Zone 50)  
 CAD Ref: a2561\_JD01  
 Date: October 2019    Rev: A | A4


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**Katanning Gold Project**  
**DBCA Managed Lands**  
 Jinkas-Datatine Tenements (E70/2928, M70/211, M70/488)

Figure:  
1

## 1.2. Environmental Legislation and Guidelines

The following key Commonwealth (federal) legislation relevant to this survey is the:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The following key Western Australian (state) legislation relevant to this survey includes the:

- *Biodiversity Conservation Act 2016* (BC Act);
- *Biosecurity and Agriculture Management Act 2007* (BAM Act) and *Regulations 2013*;
- *Environmental Protection Act 1986* (EP Act); and
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

Furthermore, key Western Australian guidelines relevant to this survey are the:

- *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority [EPA] 2016a); and
- *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b).

Commonwealth guidelines for the “Eucalypt Woodlands of the Western Australian Wheatbelt” TEC are:

- *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt* (DotEE 2015a); and
- *Approved Conservation Advice - Appendices for the Eucalypt Woodlands of the Western Australian Wheatbelt* (DotEE 2015b).

Definitions of flora and vegetation terminology commonly used throughout this report are provided in Appendix A. Guidelines relating to the Eucalypt Woodlands TEC are given in Appendices B and C.

## 2. OBJECTIVES

The objective of this survey was to undertake a detailed flora and vegetation assessment of the vegetation patches located within the Jinkas-Datatine survey area, including:

- A search of the Department of Biodiversity, Conservation and Attractions (DBCA) and Department of the Environment and Energy (DotEE) databases to both determine the flora likely to occur within the survey area, and the potential for the survey area to contain either flora, vegetation or ecological communities of conservation significance; and
- A review of relevant historical and contemporary documentation and reports related to the survey area, including but not limited to vegetation surveys, rangeland surveys, soil and geological surveys, in order to enable the survey area to be placed in context;
- Undertake a detailed field survey of each proposed survey area, and collect and identify the vascular plant species present;
- Review the conservation status of the vascular plant species recorded by reference to current literature and listings by the DBCA and plant collections held at the Western Australian State Herbarium (WAH), and listed by the DotEE under the EPBC Act;
- Define and map the vegetation communities within each survey area;
- Identify and record the location of any threatened and priority flora located within each survey area;
- Identify and record the locations of any Declared Pest organisms within each survey area;
- Define and prepare a vegetation map of the vegetation communities within each survey area;
- Provide descriptions of the vegetation communities present within each survey area and evaluate their regional significance;

- Assess native vegetation patches against criteria for the “Eucalypt Woodlands of the Western Australian Wheatbelt” TEC;
- Determine the likelihood that a vegetation patch forms part of the “Eucalypt Woodlands of the Western Australian Wheatbelt” TEC; and
- Prepare a report summarising the findings.

### 3. METHODS

#### 3.1. Desktop Assessment

The NatureMap (Department of Parks and Wildlife 2007-) and *EPBC Act* Protected Matters Search Tool (DotEE 2019a) databases were used to identify the possible occurrence of flora (including threatened and priority taxa) and threatened and priority ecological communities within the proposed Jinkas-Datatine survey area.

Searches within both NatureMap and the *EPBC Act* Protected Matters Search Tool used a rectangular area that represented the extents of the tenements of the survey area, plus a 2' buffer. The geographic coordinates of the corner points of the rectangle (not including the buffer) were:

33° 25' 59.6" S, 117° 48' 59.7" E  
33° 25' 59.6" S, 117° 56' 58.6" E  
33° 36' 57.9" S, 117° 56' 58.6" E  
33° 36' 57.9" S, 117° 48' 59.7" E

The TPFL database of threatened and priority flora and ecological communities and the WAH database (DBCA 2019a) were searched by CAD Resources (Carine, WA). Any flora recorded by Mattiske in their 2017 and 2019 surveys were included. The results of these searches are discussed in sections 3.4 and 3.5. The likelihood that these species would occur within the survey areas was determined using the following criteria:

- Known records within a rectangle around the proposed survey area, plus a buffer (as described in above). More recent, proximal and numerous records were ranked higher.
- Potential presence of suitable habitat and landforms for the species within the survey area (e.g. soil type, bedrock type, topography, drainage lines, vegetation).

The likelihood was ranked Low, Medium or High.

In addition, historical documentation and vegetation mapping of the region that provide resource material for the floristics and vegetation of the Jinkas-Datatine survey area was reviewed, for example: Beard's map and accompanying documentation (1980) of the vegetation of the Dumbleyung area; Beard's (1990) overview of the Avon Botanical District; Percy et al.'s (2000) survey of the land resources of the Katanning area; Beecham's (2001) description and overview of biodiversity values for the Avon Wheatbelt-2 IBRA subregion; Tille's (2006) soil-landscape mapping for the Western Australian rangelands and interior; and Mattiske's (2018, 2019a, 2019b) reports on their flora and vegetation surveys in the Katanning Gold Project area. Nomenclature of flora species was checked against and is consistent with Florabase (WAH 1998-).

Remnant native vegetation patches to be assessed against criteria for the Eucalypt Woodlands TEC were selected and ranked prior to the field survey. Ausgold supplied an aerial photographic map of the survey areas overlain with the locations of proposed exploration and development activities, which helped determine priorities for the field survey. Detailed aerial photographic maps of the proposed project area, along with tenement boundaries, were prepared and supplied by CAD Resources. The vegetation patches identified by Ausgold were examined to determine their size using Google Earth Pro (Google Inc. 2017).

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### 3.2. Previous Flora and Vegetation Surveys

Mattiske conducted a detailed flora and vegetation survey of approximately 179 ha around the Jinkas pit, Woorgabup Nature Reserve (within the rifle range to the southeast) and associated remnant vegetation in October 2017 (Mattiske 2018) for Ausgold Exploration Pty Ltd. These areas mostly fall within the proposed Jinkas-Datatine survey area. Data were recorded from multiple foot traverses and 76 quadrats were surveyed in detail. A total of 148 vascular plant taxa, representative of 98 genera and 42 families were recorded in that survey. No threatened or priority flora species, as listed at Commonwealth or State level, were recorded. Nineteen weed species, none of which are Weeds of National Significance or Declared Pest organisms, were recorded in the survey area. Eight Eucalypt woodland and two mixed Proteaceous-Myrtaceae heath vegetation communities were mapped in the survey area.

In February 2019, Mattiske (2019a) completed a reconnaissance survey for Ausgold Limited of 74 remnant vegetation patches in a priority area of approximately 80 km<sup>2</sup> west of the Jinkas pit, with an emphasis on identifying Threatened Ecological Communities, in particular "Eucalypt Woodlands of the Western Australian Wheatbelt". Of the 74 remnant patches surveyed, 48 are fully within the proposed Jinkas-Datatine survey area, and another 4 are partially within it. Data from the sites outside the survey area proposed here have been used in this desktop report to provide further local context. No threatened or priority listed flora were recorded during the survey.

Results from the previous surveys are further described in section 4.5.2.

### 3.3. Field Survey – Vegetation Mapping

A detailed field assessment of the flora and vegetation of each vegetation patch in the Jinkas-Datatine survey area was undertaken by the principal botanist and one experienced botanist from Mattiske from the 4<sup>th</sup> to the 6<sup>th</sup> of November 2019 in accordance with methods outlined in *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). All botanists held valid collection licences to collect flora for scientific purposes, issued under the BC Act.

Aerial photographic maps of the broader survey area were prepared and supplied by CAD Resources. Vegetation patches to be surveyed were selected using aerial photographic maps and field observations.

A total of 57 sampling sites of approximately 20 x 20 m across the Jinkas-Datatine survey area were surveyed to sample all vegetation types, with replication, and to adequately assess each vegetation patch against the criteria for the threatened ecological community within the survey. Although it is recommended in the *Technical Guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b) to sample at least three sites within each vegetation community, some communities were allocated less than three sites. This was because the vegetation community was either small in area due to the small size of each vegetation patch, or because the vegetation community had been adequately surveyed in previous mapping.

Flora and vegetation were described and sampled systematically at each sampling site, and additional opportunistic collections were undertaken wherever previously unrecorded plants were observed. At each site the following floristic and environmental parameters were recorded:

- GPS location (GDA94 datum, zone 50H);
- Local site topography;
- Soil type and other characteristics;
- Outcropping rocks and their type;
- Percentage litter cover and type, and percentage bare ground;
- Approximate time since fire;

- Vegetation condition (based on Keighery 1994);
- A description of the vegetation; and
- For each vascular plant species, the average height and the percentage cover (of both alive and dead material) over the sampling site.

Botanists searched for Threatened and Priority flora in an opportunistic manner, on foot and en-route to survey sites.

All plant specimens collected during the field surveys were dried and processed in accordance with the requirements of the WAH. The plant species were identified based on taxonomic literature and through comparison with pressed specimens housed at the WAH. Where appropriate, plant taxonomists with specialist skills were consulted. Nomenclature of the species recorded is in accordance with the WAH (1998-).

### 3.4. Field Survey – Threatened Ecological Community Assessment

Each vegetation patch mapped in the Jinkas-Datatine survey area was assessed against the criteria for the Eucalypt Woodlands TEC which has previously been identified as potentially occurring in the area (Mattiske 2018, 2019a, 2019b). Google Earth Pro (Google Inc. 2017) was used prior to the field survey to determine the area of each patch.

At each site the TEC criteria factors as listed in Table 1 were recorded. Where a Eucalypt species was unknown it was photographed and a specimen collected for later identification.

**Table 1: Threatened Ecological Community criteria factors** (adapted from DotEE 2015a)

PARAMETER	VALUES
<i>Key Factors</i>	
Crown cover of the canopy >10%	Y / N
Key species of the canopy are Eucalypts as listed in Approved Conservation Advice	Y / N / unsure Dominant species if known
Native understorey present	% cover native Native growth forms Dominant species if known
Exotic species understorey cover %	<10, 10-30, 31-50, 51-70, >70
Probability of patch being a TEC	Highly Likely, Potential, Not a TEC
<i>Contra-indicators</i>	
Dominant presence of Eucalypts with mallee growth form	Y / N / unsure
Dominant presence of non-Eucalypts in the canopy	Y / N / unsure
Shrublands/Herblands (sparse tree canopy)	Y / N / unsure
Woodlands dominated by Eucalypts that are restricted to granite outcrops and rocky rises	Y / N / unsure
<i>Condition Thresholds</i>	
Keighery condition	PR, EX, VG, G, D
Mature tree presence	Absent / Present
Mature tree density (per 0.5 ha)	< 5 / 5+

### 3.5. Survey Timing

According to the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b), the field survey was undertaken during the optimal time period, which is approximately in spring (September-November). However, rainfall was low (71 % of the long-term average) in the three

months prior to the field survey (Bureau of Meteorology [BOM] 2019). As a result, many plants were not flowering and many grass taxa were dead, limiting the number of confirmed species identifications. Furthermore, potential annual species were likely under represented.

### 3.6. Statistical Analysis

A species accumulation curve, based on accumulated species versus sites surveyed was prepared to provide an indication of the level of adequacy of the survey effort, using the software *EstimateS* (Colwell 2013). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness (Chao 2004). When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered to be adequate.

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites on the basis of their species composition (Clarke and Gorley 2015). No transformation was applied to the data set. Annual species were excluded from analysis, and taxa which were identified to more than one subspecies or variety level were revised to the specific level to reduce the tendency to create further statistical variation in the analysis that was considered unwarranted. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering, Similarity Profile and Similarity Percentages. Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

### 3.7. Survey Limitations

A general assessment was made of the current survey against a range of factors that may have limited the outcomes and conclusions of this report (Table 2).

**Table 2: Potential limitations affecting the conclusions made in this report**

Potential survey limitation	Impact on current survey
Availability of contextual information at a regional and local scale	<b>Not a limitation.</b> The region has been mapped at various scales and perspectives, from regional biodiversity (Beecham 2001), vegetation mapping (Beard 1980, 1990), and land systems (Percy et al. 2000, Tille 2006) to local vegetation mapping, where Mattiske has completed two botanical surveys in the immediate vicinity in the last three years (Mattiske 2018, 2019a, 2019b).
Competency/experience of team carrying out survey; experience in the bioregion surveyed	<b>Not a limitation.</b> The principal botanist has extensive experience working in a range of botanical districts throughout the state and the experienced botanist has recently completed surveys in the WA Wheatbelt region. The majority of the plants observed in the field were collected for formal identification and were compared with specimens at the WAH where required.

**Table 2: Potential limitations affecting the conclusions made in this report** (continued)

Potential survey limitation	Impact on current survey
Proportion of flora collected and identification issues	<b>Potential limitation.</b> The timing of the survey was optimal for surveys of flora and vegetation in the region (EPA 2016b). However, due to lower than average rainfall preceding the field survey, it was estimated that approximately 73 % of the potential flora species that may be present in the survey area were recorded (refer to Section 5.1 of this report). Of the 98 taxa recorded within the Jinkas-Datatine survey area, 11 species (11 %) were unable to be confidently identified to species level due to the absence of sufficient taxonomic characters to enable accurate identification. This creates limitations in statistical analysis.
Survey effort and extent of survey	<b>Not a limitation.</b> Generally, the survey area was thoroughly covered. Vegetation patches to be surveyed were predetermined by Ausgold Limited, and additional sites were selected based on in field observations. Low replication of some vegetation communities was unavoidable given their limited extent within the survey area.
Access restrictions within survey area	<b>Not a limitation.</b> Most vegetation patches could be accessed by vehicle through roads or fields. Where immediate vehicle access was restricted (e.g. due to presence of crops in fields) vegetation patches were accessed entirely by foot.
Survey timing, rainfall, season of survey	<b>Potential limitation.</b> While survey timing was considered optimal (EPA 2016b), rainfall in the three months prior to the surveys was lower than the long term average (see section 3.5). Perennial species were used to statistically analyse vegetation communities. The majority of vegetation communities' dominant structural components were able to be analysed.
Disturbances (fire/flood/clearing)	<b>Potential Limitation.</b> Many portions of the survey area were affected by grazing (stock or kangaroos), reducing the diversity of the understorey and introducing weed species. In general, this did not affect the ability to determine the probability of a vegetation patch forming part of the Eucalypt Woodlands TEC; however, it did make it more difficult to distinguish vegetation communities.
Data and statistical analysis	<b>Not a limitation.</b> Measures were taken to improve the robustness of data and analysis (see section 3.6).

### 3.8. Vegetation Descriptions

Vegetation communities were described at the association level of the National Vegetation Information System (NVIS) classification framework, as defined by the Executive Steering Committee for Australian Vegetation Information (2003; Appendix A5). This is consistent with the *Technical guidance – Flora and vegetation surveys for environmental impact assessment* (EPA 2016b). Vegetation communities were described and mapped using a combination of aerial imaging, previous vegetation mapping, statistical analysis and field observations.

### 3.9. Vegetation Condition

Within the survey area the vegetation condition was ranked as either Pristine, Excellent, Very Good, Good Degraded or Completely Degraded as per the vegetation condition scale developed by Keighery (1994), as recommended by the EPA (2016b).



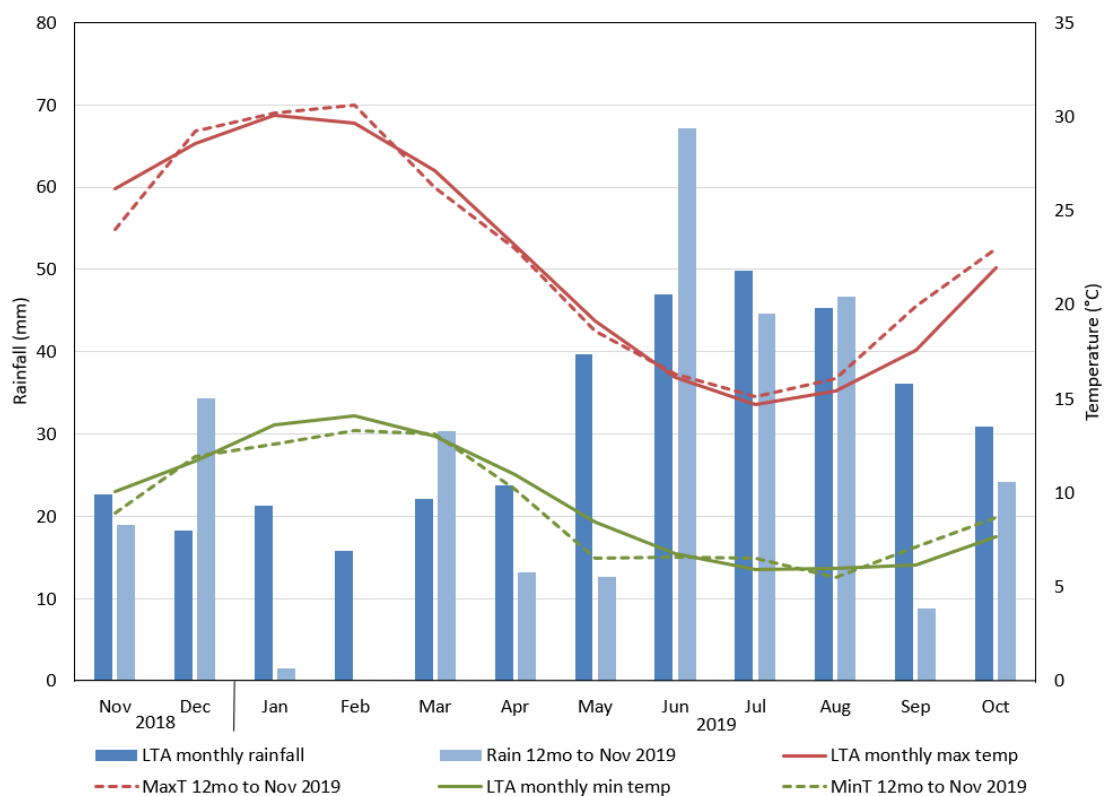
## 4. DESKTOP ASSESSMENT RESULTS

The climate, geology, soils and landforms all influence the vegetation of the area and are described in this section. Potential flora, including threatened, priority and introduced species are described, along with possible vegetation communities, and placed within a local and regional context.

### 4.1. Climate

The Avon Botanical District is characterised by a dry, warm Mediterranean climate with cool winters and hot, dry summers, with rain falling in winter (Beard 1990). The proposed Jinkas-Datatine survey area receives an average rainfall of 381 mm (Badgebup Weather Station average 1989-2019; BOM 2019).

The nearest BOM weather stations with the most complete climate data are Badgebup Station (ID 010508) for rainfall data, which is located approximately 2 km south of the southern end of the proposed Jinkas-Datatine survey area, and Katanning Station (ID 010916) for temperature data, which is located approximately 30 km southwest of the project area (BOM 2019). Rainfall and air temperature data for the twelve months to October 2019 and averaged over the long-term (1989-2019 for rainfall; 1999-2019 for temperature) are shown in Figure 3. Total rainfall for the 12 months to November 2019 was 303 mm, lower than the long-term average annual rainfall of 376 mm. September 2019 was considerably drier than usual, with 9 mm of rain versus the 30-year average of 36 mm, and October 2019, with 24 mm, was also drier than the long term average of 31 mm. This may result in a poorer than average cover of annual flora species for the proposed survey.



**Figure 3: Climatic data for the Jinkas-Datatine survey area, WA (BOM 2019)**

Long term average (LTA - years 1989-2019) and last twelve months of monthly rainfall data from the Badgebup weather station (ID 010508) and long term average (LTA – years 1999-2019) and last twelve months of mean monthly maximum and minimum temperature data from the Katanning weather station (ID 010916).

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## 4.2. Geology, Topography and Soils

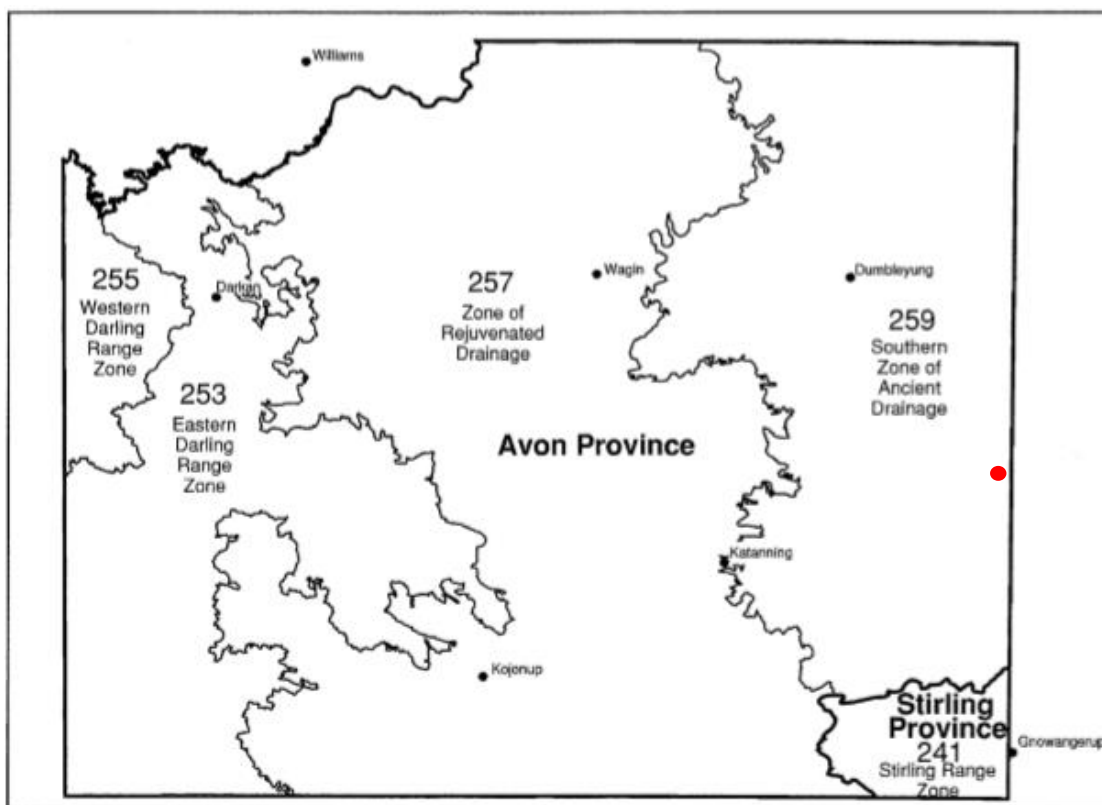
The Southern Wheatbelt region is underlain by rocks of the Yilgarn Craton which are mostly Archaean granite and gneiss. The Archaean rocks are dissected by numerous fault and shear zones and dolerite dykes. Areas of Archaean migmatite and gneiss are associated with Archaean greenstone belts, which contain a mix of metamorphosed mafic-ultramafic and felsic volcanics and metasediments. The Archaean bedrock has been extensively weathered and laterite has formed in many places. It is often covered by Tertiary and Quaternary alluvial, colluvial and Aeolian deposits (Tille 2006).

Geologically, the KGP is located in the Archaean Katanning greenstone belt. Gold mineralisation is concentrated in three north-northwest trends related to shear zones. Post-mineralisation deformation has led to the formation of pipe-like structures within fold hinges that host high-grade deposits (Ausgold Limited 2019).

In general, landforms in the region comprise a gently undulating plateau of low relief where broad lateritic uplands (with extensive sandplains) grade to long gentle slopes with occasional bedrock outcrops and then to broad, low gradient valley floors (Beard 1980, Beecham 2001, Tille 2006). Chains of salt lakes occur throughout the zone as remnants of ancient drainage systems (Percy et al. 2000).

The soils of the proposed survey area comprise the sandy gravels of the East Katanning soil-landscape system, the saline wet soils of the Coblinine system, and loamy earths and sandy gravels of the Datatine system (Percy & Richardson 1999). These soil-landscape systems are described in more detail in section 4.3.2.

Soil-landscape zones of Western Australia's rangelands and arid interior were defined by Tille (2006) and of the agricultural zone near Katanning by Percy et al. (2000), and describe an area using various physical and biological aspects. The proposed Jinkas-Datatine survey area is situated in the soil-landscape zone 'Southern Zone of Ancient Drainage' within the 'Avon' soil-landscape province (Percy et al. 2000, Tille 2006) (Figure 4). The Southern Zone of Ancient Drainage comprises an ancient peneplain with little relief and no connected drainage. Chains of lakes occur throughout the zone as remnants of ancient drainage systems. An example of this is the saline Coblinine system between Lakes Dumbleyung and Coyrecup; however, this system has only become saline since the 1940s (Percy et al. 2000). Soils are mostly grey shallow loamy or sandy duplexes, and the subsoils are clayey, sodic, neutral to alkaline and often calcareous. The rises and low hills are covered by sandy gravels with some deep sands. Soils in the broad plains of the Coblinine system are commonly salt-affected sandy and loamy duplexes. The vegetation of the Southern Zone of Ancient Drainage is comprised of *Eucalyptus wandoo* and *Allocasuarina huegeliana* or *E. salmonophloia*, *E. longicornis* and *E. loxophleba* woodlands in the west, grading to mallee and heath communities in the east. The species *Eucalyptus astringens*, *E. gardneri*, *E. platypus* and *E. occidentalis* are also common.



**Figure 4: Soil-landscape provinces and zones in the vicinity of the proposed Jinkas-Datatine survey area (Percy et al. 2000)**

The centre of the proposed survey area is shown by a red dot.

### 4.3. Regional Vegetation

The proposed Jinkas-Datatine survey area lies within the Avon Botanical District of the South-West Botanical Province (Beard 1990). More recently, the vegetation of Western Australia has been assigned to bioregions and subregions under the Interim Biogeographical Regionalisation for Australia (IBRA, v7) (DotEE 2019b), with the project area being situated within the *AVW2 – Katanning* subregion of the Avon Wheatbelt Bioregion. Vegetation within this subregion is described as including 'woodland of Wandoo [*Eucalyptus wandoo*], York Gum [*E. loxophleba*] and Salmon Gum [*E. salmonophloia*] with Jam [*Acacia acuminata*] and Casuarina [Casuarinaceae spp.], with the *Eucalyptus* woodlands being of high floristic diversity (Beecham 2001).

Several studies describe the vegetation of the proposed Jinkas-Datatine survey area (e.g., Beard 1980, Beard 1990, Percy et al. 2000); some of these are summarised below.

#### 4.3.1. Botanical Districts

The survey area lies within the Avon Botanical District in the South-West Province. Typical vegetation of the District includes *Eucalyptus* woodlands comprising *E. loxophleba*, *E. salmonophloia* and *E. wandoo* on loams, scrub-health on sandplains, *Acacia - Casuarina* thickets on ironstone and halophytes on saline soils (Beard 1990).

The vegetation of the Avon Wheatbelt region includes mixed eucalypt, *Allocasuarina huegeliana*, and Jam [*Acacia acuminata*]-York Gum [*Eucalyptus loxophleba*] woodlands on alluvial soils and Proteaceous shrubland with many endemic species occurring on lateritic uplands and sandplains (Beecham 2001).

Beard (1980) described the general vegetation type occurring in the area as: *Dryandra* [*Banksia*] dominated heath on laterite residuals (uplands); *E. astringens*, *E. falcata* and *E. gardneri* mallet woodland and low woodland on degraded laterite and laterite wash; woodland of *Eucalyptus loxophleba*, *E. longicornis*, *E. salmonophloia* and *E. wandoo* with small patches of mallees on undulating country; teatree and samphire on salt flats; and scrub-heath and low woodland on low-level sandplains. More detailed vegetation types that would likely occur in the survey area include:

- a) Heath: *Dryandra* spp. [*Banksia* spp.] dominant.
- b) Mallee: Shrubland of *Eucalyptus eremophila* and *E. redunca*.
- c) Woodland: Woodland of *Eucalyptus wandoo*, *E. loxophleba* and *E. longicornis*.
- d) Succulent Steppe: Thickets of *Eucalyptus occidentalis* and *Casuarina* spp. with *Melaleuca* spp. shrubs and *Arthrocnemum* spp. [chenopod] shrubs.

#### 4.3.2. Land systems

Mapping of the soil landscapes of the Agricultural Area of Western Australia (the southwest of the state, from Geraldton to Esperance) was started in the 1980s by the Department of Agriculture (Tille 2006). The Department of Agriculture established a hierarchy of soil-landscape map units which maintains a consistent approach with different scales of mapping and varying levels of complexity of soils and landscapes. Soil-landscape units are defined on landform and the pattern of geology, soil and vegetation within the landform and are delineated with the aid of remote sensing techniques such as aerial photographs (Percy et al. 2000).

A total of three soil-landscape systems are intersected by the proposed Jinkas-Datatine survey area (Table 3; Figure 5).

##### ***Cobline System***

Dominantly *Eucalyptus salmonophloia* or *E. Wandoo* woodland with *Eucalyptus* spp. mallees. Other trees include *E. loxophleba*, *E. occidentalis*, *E. longicornis* and *Acacia acuminata*. Common shrubs include *Melaleuca* spp., *Exocarpos aphylla* and *Hakea preissii*. Salt-tolerant vegetation is common, including *Tecticornia* spp.

##### ***Datatine System***

Dominantly *Eucalyptus loxophleba* with *Acacia acuminata*, *E. salmonophloia* and/or *E. longicornis*. Other trees include *E. wandoo*, *Allocasuarina huegeliana* and *Eucalyptus* spp. mallees. Common shrubs include *Dryandra/Banksia* spp., *Gastrolobium* spp., *Melaleuca* spp. and *Exocarpos aphylla*.

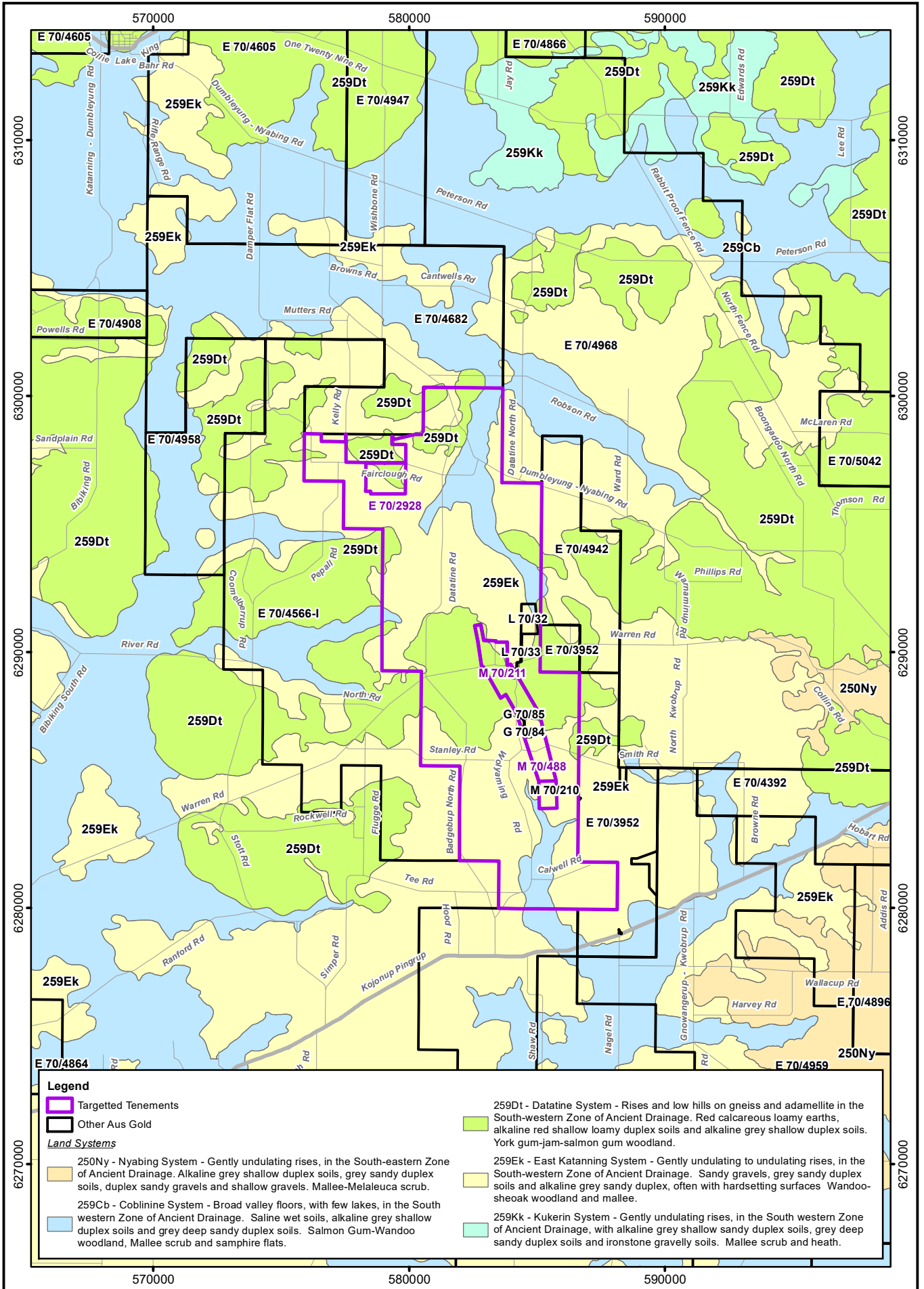
##### ***East Katanning System***

Dominantly *Eucalyptus wandoo* associated with *Allocasuarina huegeliana*, also *Eucalyptus* spp. mallees. Other trees include *E. longicornis*, *E. loxophleba*, *E. salmonophloia*, *Acacia acuminata*, *E. occidentalis*, *E. astringens*, *E. platypus*, *Nuytsia floribunda* and *Banksia grandis*. Common shrubs include *Leptospermum erubescens*, *Gastrolobium* spp., *Dryandra/Banksia* spp., *Jacksonia sternbergiana*, *Xanthorrhoea* spp., *Melaleuca* spp. and various heath species.

**Table 3: Soil-landscape systems of the proposed Jinkas-Datatine survey area (Percy et al. 2000)**

^ A description of the vegetation of each land system is presented after Table 3.

System	Landforms	Soils	Geology	Vegetation <sup>^</sup>	Area inside survey area (ha)	Current extent (ha)	Survey % of current extent
Coblinine (259Cb)	Broad alluvial and lacustrine plains of 1-7 km width, including lakes, swamps, dunes, lunettes.	Saline wet soils, also alkaline grey shallow sandy and loamy duplex soils.	Alluvial sand, silt and clay; lacustrine deposits; quartz sand deposits.	Dumblebung system (Beard 1980).	1,336	107,481	0.7
Datatine (259Dt)	Gently undulating to undulating rises and low hills associated with gneiss rock outcrops, including some valley flats and alluvial plains.	Red loamy calcareous earths and alkaline red shallow loamy duplex soils.	Gneiss with intrusions of granite, gneiss. Dolerite dykes common.	Dumblebung system (Beard 1980).	2,773	57,991	2.4
East Katanning (259Ek)	Gently undulating to undulating rises.	Sandy gravels and grey sandy duplexes, also grey shallow and deep sandy duplex soils with yellow and grey sodic subsoils.	Colluvium with minor deposits of alluvium and small areas of granite.	Dumblebung system (Beard 1980).	7,086	101,588	6.5



**Legend**

Targetted Tenements

Other Aus Gold

**Land Systems**

- 250Ny - Nyabing System - Gently undulating rises, in the South-eastern Zone of Ancient Drainage. Alkaline grey shallow duplex soils, grey sandy duplex soils, duplex sandy gravels and shallow gravels. Mallee-Melaleuca scrub.
- 259Cb - Coblinine System - Broad valley floors, with few lakes, in the South western Zone of Ancient Drainage. Saline wet soils, alkaline grey shallow duplex soils and grey deep sandy duplex soils. Salmon Gum-Wandoo woodland, Mallee scrub and samphire flats.
- 259Dt - Datatine System - Rises and low hills on gneiss and adamellite in the South-western Zone of Ancient Drainage. Red calcareous loamy earths, alkaline red shallow loamy duplex soils and alkaline grey shallow duplex soils. York gum-jam-salmon gum woodland.
- 259Ek - East Katanning System - Gently undulating to undulating rises, in the South-western Zone of Ancient Drainage. Sandy gravels, grey sandy duplex soils and alkaline grey sandy duplex, often with hardsetting surfaces Wandoo-sheoak woodland and mallee.
- 259Kk - Kukerin System - Gently undulating rises, in the South western Zone of Ancient Drainage, with alkaline grey shallow sandy duplex soils, grey deep sandy duplex soils and ironstone gravelly soils. Mallee scrub and heath.



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Scale: 1:200,000  
MGA94 (Zone 50)

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**Katanning Gold Project  
Land Systems**

Jinkas-Datatine Tenements (E70/2928, M70/211, M70/488)

Figure:  
**2**

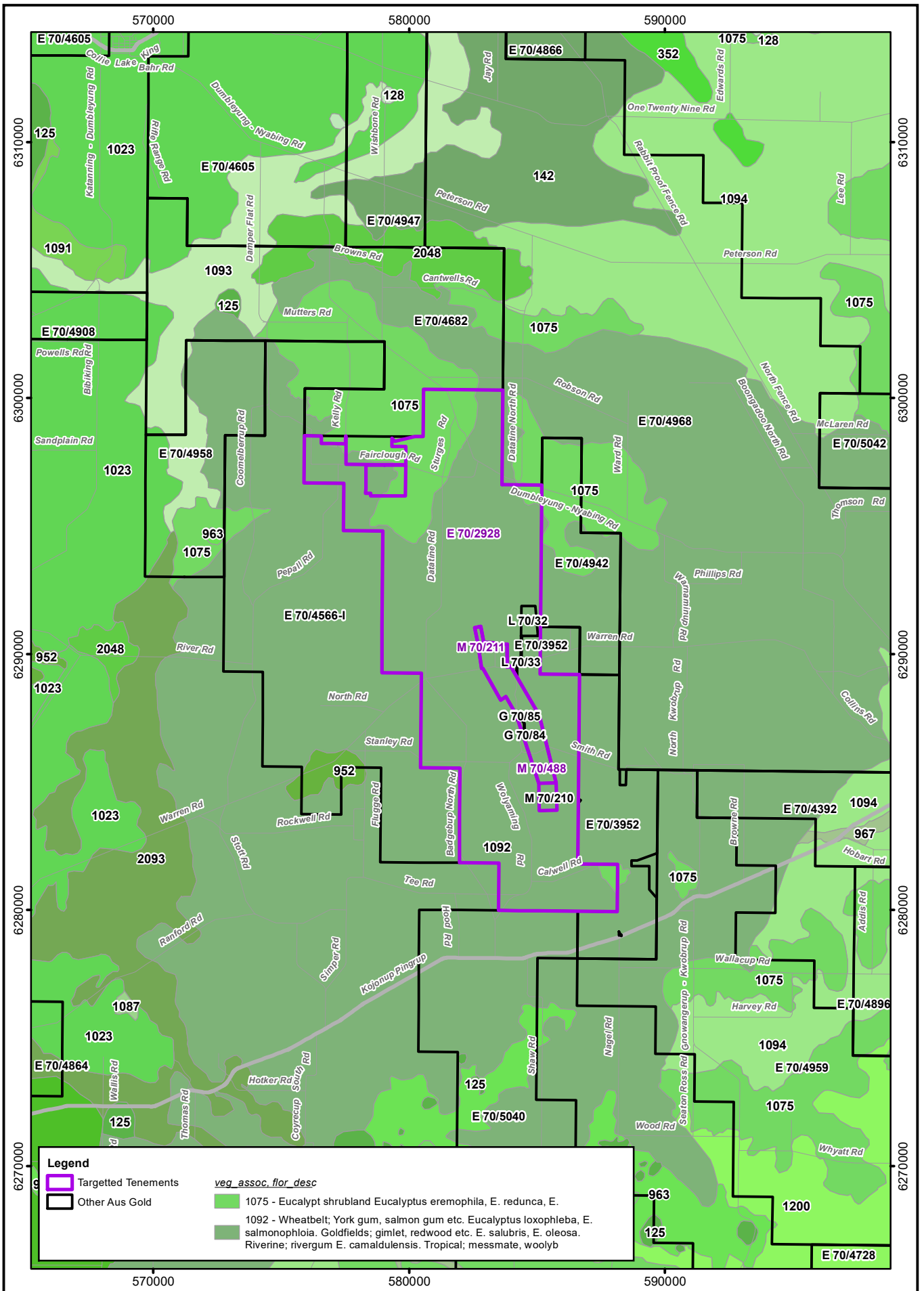
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### 4.3.3. Pre-European Vegetation

The Pre-European vegetation mapping compiled by Beard et al. (2013) indicates that the proposed Jinkas-Datatine survey area lies within the Dumbleyung system. The Pre-European vegetation is described in further detail in Table 4 (DBCA 2019b, Shepherd et al. 2002) and shown in Figure 4. Most of the area was covered by *Eucalyptus* spp. mid woodland (System Association 1092.1), although there were pockets of mallee shrublands and heathlands.

**Table 4: Pre-European vegetation of the proposed Jinkas-Datatine survey area (DBCA 2019b)**

NUMBER	DESCRIPTION	PRE-EUROPEAN EXTENT INSIDE PROPOSED SURVEY AREA (HA)	TOTAL CURRENT EXTENT (HA)	TOTAL CURRENT EXTENT AS PROPORTION OF TOTAL PRE-EUROPEAN EXTENT (%)	TOTAL % REMAINING IN AVON WHEATBELT 2 IBRA SUBREGION (IN DUMBLEYUNG VEG SYSTEM)	TOTAL % REMAINING IN SHIRE OF KATANNING (IN DUMBLEYUNG VEG SYSTEM)
1075.2	Open mallee shrubland of <i>Eucalyptus eremophila</i> , <i>E. redunca</i> and other <i>Eucalyptus</i> spp.	1,261	1,053	14.3	14.3	35.8
1092.1	Medium woodland of <i>Eucalyptus wandoo</i> , <i>E. longicornis</i> , <i>E. loxophleba</i> , <i>E. salmonophloia</i> .	9,933	7,315	9.4	9.4	8.2



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**Katanning Gold Project**  
**Pre European Vegetation**  
 Jinkas-Datatine Tenements (E70/2928, M70/211, M70/488)  
 Figure: **3**



#### 4.3.4. Vegetation Communities

In their 2017 vegetation mapping around the Jinkas pit, reserve R24072 within the rifle range to the southeast and associated remnant vegetation, Mattiske (2018) defined 10 vegetation communities; eight Eucalypt woodland and two mixed Proteaceous-Myrtaceae heath vegetation communities (Table 5).

**Table 5: Vegetation communities previously mapped around the Jinkas pit and southeast by Mattiske (2018)**

CODE	DESCRIPTION	VEGETATION CONDITION (KEIGHERY 1994)	SPECIES RICHNESS (AVERAGE ± STD ERROR)
W1	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> with occasional <i>Eucalyptus salmonophloia</i> over <i>Acacia acuminata</i> over <i>Vittadinia gracilis</i> , <i>Stackhousia monogyna</i> and a range of herbs and grasses on lower slopes and valley floors with sandy loams and some clays.	Very Good - Excellent	12.75 ± 0.4
W2	Open Woodland of <i>Eucalyptus loxophleba</i> over <i>Acacia acuminata</i> and <i>Allocasuarina huegeliana</i> over a range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Completely Degraded – Degraded, Very Good	11.08 ± 0.83
W3	Woodland of <i>Eucalyptus wandoo</i> over dense stands of <i>Allocasuarina huegeliana</i> with patches of <i>Banksia sessilis</i> and <i>Acacia acuminata</i> over <i>Hakea lissocarpha</i> , <i>Xanthorrhoea drummondii</i> and <i>Stackhousia monogyna</i> over a range of herbs and grasses on slopes and undulating hills with sandy-clays and gravels.	Excellent	17.92 ± 1.31
W4	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over <i>Allocasuarina huegeliana</i> over <i>Dodonaea humifusa</i> , <i>Rhagodia preissii</i> subsp. <i>preissii</i> over <i>Neurachne alopecuroidea</i> , <i>Austrostipa hemipogon</i> and a wide range of herbs and grasses on mid and upper slopes of undulating hills with sandy-clays and gravels.	Completely Degraded – Very Good – Excellent	19.33 ± 1.82
W5	Open Woodland of <i>Eucalyptus wandoo</i> over <i>Allocasuarina huegeliana</i> over <i>Gastrolobium trilobum</i> , <i>Dodonaea humifusa</i> and <i>Xanthorrhoea drummondii</i> over <i>Neurachne alopecuroidea</i> , <i>Austrostipa hemipogon</i> , <i>Velleia trinervis</i> and a wide range of herbs and grasses on upper slopes and ridges of undulating hills with sandy-clays and gravels.	Excellent	16.71 ± 1.15
W6	Open Woodland of <i>Eucalyptus loxophleba</i> over <i>Acacia acuminata</i> and dense stands of <i>Allocasuarina huegeliana</i> over <i>Acacia erinacea</i> over <i>Stackhousia monogyna</i> , <i>Stypandra glauca</i> , <i>Neurachne alopecuroidea</i> and a wide range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Completely Degraded – Very Good, Excellent	15.50 ± 2.4
W7	Open Woodland of <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over <i>Gastrolobium trilobum</i> , <i>Acacia acuminata</i> , <i>Acacia erinacea</i> , <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Hakea lissocarpha</i> , <i>Billardiera fusiformis</i> and patches of <i>Melaleuca atroviridis</i> and <i>Xanthorrhoea drummondii</i> over <i>Austrostipa hemipogon</i> , <i>Dampiera lavandulacea</i> , <i>Neurachne alopecuroidea</i> , <i>Desmocladius asper</i> , <i>Lomandra</i> spp. and a wide range of herbs and grasses on slopes and broader valley floors with sandy loams and some clays.	Excellent	19.57 ± 1.99

**Table 5: Vegetation communities previously mapped around the Jinkas pit and southeast by Mattiske (2018) (continued)**

CODE	DESCRIPTION	VEGETATION CONDITION (KEIGHERY 1994)	SPECIES RICHNESS (AVERAGE ± STD ERROR)
W8	Woodland of <i>Eucalyptus astringens</i> subsp. <i>astringens</i> and <i>Eucalyptus kondininensis</i> with some <i>Eucalyptus gardneri</i> subsp. <i>gardneri</i> and occasional <i>Eucalyptus wandoo</i> and <i>Eucalyptus longicornis</i> over dense thickets of <i>Melaleuca atroviridis</i> over <i>Gastrolobium trilobum</i> , <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Beaufortia bracteosa</i> and <i>Daviesia ?incrassata</i> subsp. <i>teres</i> over a range of herbs and grasses on upper slopes and ridges with sandy gravels and clays.	Completely Degraded, Good - Excellent	8.00 ± 1.08
S1	Closed Heath of <i>Banksia armata</i> var. <i>ignicida</i> , <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> , <i>Allocasuarina humilis</i> , <i>Gastrolobium trilobum</i> , <i>Grevillea insignis</i> subsp. <i>insignis</i> over <i>Hibbertia exasperata</i> , <i>Melaleuca subtrigona</i> , <i>Melaleuca pungens</i> , <i>Petrophile seminuda</i> , <i>Xanthorrhoea drummondii</i> and <i>Tetrapora preissiana</i> with patches of emergent <i>Eucalyptus incrassata</i> , <i>Eucalyptus dorrienii</i> and <i>Eucalyptus hebetifolia</i> over <i>Stackhousia monogyna</i> over a range of herbs and grasses on shallow upper slopes and ridges with sandy gravels and clays.	Excellent	17.00 ± 2.2
S2	Open Heath of <i>Acacia lasiocarpa</i> var. <i>sedifolia</i> , <i>Banksia sessilis</i> , <i>Banksia armata</i> var. <i>ignicida</i> , <i>Banksia squarrosa</i> subsp. <i>squarrosa</i> , <i>Beaufortia bracteosa</i> , <i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i> , <i>Dodonaea caespitosa</i> , <i>Dodonaea humifusa</i> , <i>Hakea lissocarpha</i> , <i>Hakea trifurcata</i> , <i>Melaleuca atroviridis</i> and <i>Xanthorrhoea drummondii</i> with patches of emergent <i>Eucalyptus kondininensis</i> , <i>Eucalyptus ?thamnoides</i> , <i>Eucalyptus wandoo</i> and <i>Allocasuarina huegeliana</i> over dense shrub layer and a range of herbs and grasses on shallow upper slopes and ridges with sandy gravels and clays.	Excellent	23.00 ± 3.4

It was noted that there is some overlap in the Eucalypt woodlands with the various dominant *Eucalyptus* tree species overlapping in some localised areas as well as a range of mallee species being associated with different communities. It was apparent that in many instances there was a gradual change in overstorey and understorey species in response to site conditions, and that the complexity of the communities reflected the inherent complexity of the landform and soils. The most marked change was from the woodlands to the heath communities.

The condition of the vegetation mapped by Mattiske (2018) varied from Completely Degraded (mainly near the rifle range and associated tracks and several borrow pits) through Degraded to Good, Very Good and Excellent (Keighery 1994). It was noted that despite the proximity of agricultural operations many of the areas of heath, shrublands and Eucalypt woodlands on the slopes and ridges remain relatively undisturbed and in excellent condition.

Mattiske (2018) suggested that "there is a need to recognize the link between the heath and shrubland communities and the utilization of these areas by the threatened and listed Black Cockatoo. Further, some of the heath communities in the Katanning Gold survey area have the potential to support some of the Priority flora species that occur on shallow lateritic and sandy ridges. Whilst no Threatened or Priority flora species were recorded in these heath communities further targeted searching may be justified in different seasons to check for other species that may be present."

#### 4.4. Potential Flora

A total of 243 vascular plant taxa, representative of 131 genera and 49 families (Appendix D), have the potential to occur within the proposed Jinkas-Datatine survey area (see section 3.1 for methodology). The most commonly represented families were Myrtaceae (46 taxa), Proteaceae (28 taxa) and Asteraceae (25 taxa). The most commonly represented genera were *Eucalyptus* (26 taxa), *Acacia* (11 taxa) and *Banksia* (10 taxa).

In comparison, Matiske (2018) in October 2017 recorded 148 vascular plant taxa, comprising 98 genera and 42 families, with 19 introduced taxa and no threatened or priority flora recorded. Species accumulation curve analysis indicated that approximately 66% of the flora species potentially present within the Katanning Gold Project survey area were recorded during that survey. It was noted that as annual species were regularly present and flowering the estimate may be higher than 66%; additional targeted searching for species should be undertaken if exploration activities commence in the southern part of that survey area (as it was less disturbed than the northern part).

##### 4.4.1. Potential Threatened and Priority Flora

Seven threatened flora species, pursuant to section 179 of the *EPBC Act* and as listed by DotEE (2019c) or pursuant to Part 2, Division 1 and Subdivision 2 of the *BC Act* and as listed by DBCA (2018a) are likely to occur in the proposed Jinkas-Datatine survey area (Appendices D, E). These taxa are:

- Endangered: *Adenanthos pungens* subsp. *effusus*, *Banksia oligantha*, *Darwinia oxylepis*, *Darwinia wittwerorum*, *Diuris purdiei*, *Roycea pycnophylloides*
- Vulnerable: *Adenanthos pungens* subsp. *pungens*

A total of ten priority flora species as listed by DBCA (2018b) have the potential to occur within the two survey areas (Appendices D, E). These taxa are:

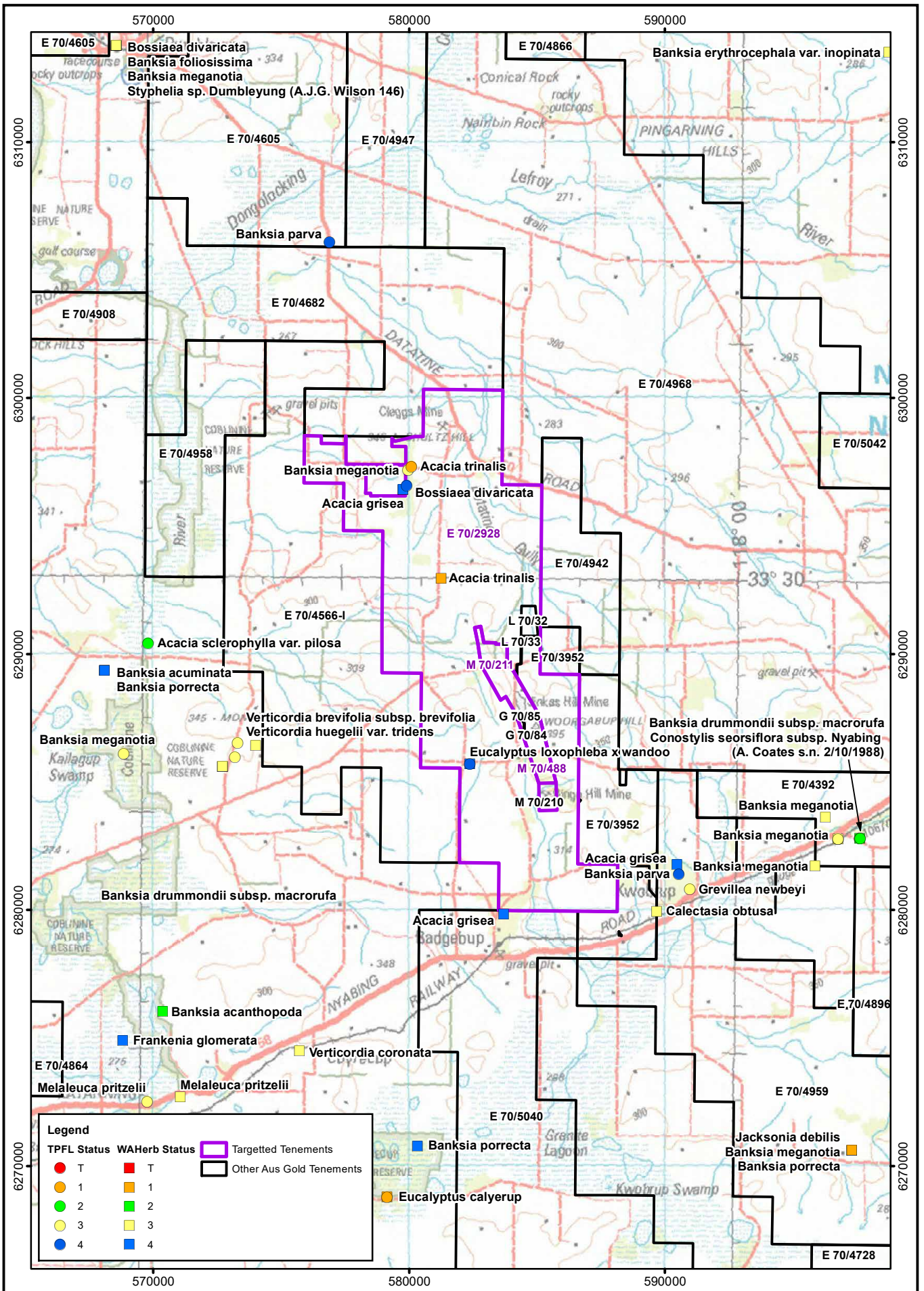
- Priority 1: *Acacia trinalis*
- Priority 3: *Banksia meganotia*, *Calectasia obtusa*, *Grevillea newbeyi*, *Verticordia brevifolia* subsp. *brevifolia*, *Verticordia huegelii* var. *tridens*
- Priority 4: *Acacia grisea*, *Banksia parva*, *Bossiaea divaricata*, *Eucalyptus loxophleba* x *wandoo*

All of the potential threatened flora species were identified by the EPBC Act Protected Matters Search Tool (DotEE 2019a) and all of the potential priority species by the NatureMap search (Department of Parks and Wildlife 2007-); none was observed in the general area in the two previous Matiske (2018, 2019a, 2019b) flora surveys. Searches of the DBCA databases (DBCA 2019a) in the same search area resulted in the same ten priority taxa listed above (Figure 7).

Four of the potential threatened and priority species, *Acacia trinalis* (P1), *Acacia grisea* (P4), *Bossiaea divaricata* (P4) and *Eucalyptus loxophleba* x *wandoo* (P4) were ranked as having a High likelihood of occurrence in the proposed survey area; all of these taxa have been recorded in, on the boundary of, or within 5 km of the proposed survey area. Additionally, nine species were assessed as having a Medium likelihood and three species have a Low likelihood of occurrence (all three of which were found in the EPBC Act search and have not been recorded in the vicinity of the proposed survey area).

Ten of the seventeen potential threatened and priority species flower during October, and nine in November.

All potential threatened and priority flora are listed in Appendix E, along with their State Conservation Codes (see Appendix A for definitions), a description and an assessment of the likelihood of their occurrence in the proposed survey area. The locations of known occurrences in the Jinkas-Datatine area and surrounds area are shown in Figure 7.



#### 4.4.3. Potential Introduced (Weed) Species

A total of 31 introduced taxa from 15 families and 30 genera may potentially exist in the proposed survey areas, based on NatureMap (Department of Parks and Wildlife 2007-), the *EPBC Act* Protected Matters Search Tool (DotEE 2019a) search results (section 2.1 and Appendix D) and records from Mattiske's previous (2018, 2019a, 2019b) surveys.

Four of the potential introduced taxa are listed as both Weeds of National Significance (DotEE 2019d) and Declared Pest organisms pursuant to the *BAM Act* (Department of Primary Industries and Regional Development 2019). Three of these, *\*Asparagus asparagoides*, *\*Solanum eleagnifolium* and *\*Tamarix aphylla* are subject to section 22(2) of the *BAM Act* and have a keeping category of 'Exempt'; the other, *\*Chrysanthemoides monilifera*, is subject to section 12 of the *BAM Act*, has a control category of 'C1 – Exclusion' and a keeping category of 'Prohibited' (see Appendix A for definitions). Both *\*Chrysanthemoides monilifera* and *\*Tamarix aphylla* are also Wheatbelt Region Priority Alert Weeds (Department of Parks and Wildlife 2014). It should be noted that none of these four species has been recorded within the proposed survey area; all were identified by the *EPBC Act* search as potentially occurring due to the likelihood of suitable habitat being present in the area searched.

The remaining 27 potential introduced taxa are listed as Permitted Organisms pursuant to section 11 of the *BAM Act* (Department of Primary Industries and Regional Development 2019)(see Appendix A for definitions). Six other of these taxa (four of which are grasses) have been ranked as having both High Ecological Impact and Rapid Invasiveness in the Wheatbelt region by the DBCA's weed prioritisation process (Department of Parks and Wildlife 2014): *\*Aira caryophyllea*, *\*Arctotheca calendula*, *\*Avena barbata*, *\*Briza maxima*, *\*Bromus diandrus* and *\*Romulea rosea*.

During the Mattiske survey in 2017, 20 introduced flora species were recorded, and in the 2019 survey one introduced flora species was recorded (Appendix D). None of these are Weeds of National Significance or Declared Pests.

#### 4.5. Potential Threatened and Priority Ecological Communities

Potential Threatened and Priority Ecological Communities in the vicinity of the proposed survey area were identified using the searches as detailed in section 2.1. The Threatened Ecological Community "Eucalypt Woodlands of the Western Australian Wheatbelt" has previously been identified as potentially occurring in the area (Mattiske 2018, 2019a, 2019b) and was the focus of Mattiske's 2019 survey.

##### 4.5.1. Database Searches

One TEC was identified by the *EPBC Act* Protected Matters Search Tool as having the potential to exist in the proposed Jinkas-Datatine survey area. The TEC "Eucalypt Woodlands of the Western Australian Wheatbelt" (Eucalypt Woodlands) is categorised under the *EPBC Act* by the Australian Government (2015; DotEE 2019e) as Critically Endangered. The same ecological community is listed by the Western Australian government as a Priority 3 Ecological Community (DBCA 2019c).

Three Priority Ecological Communities (PECs) as listed at State level by DBCA (2019c) form sub-elements of the Eucalypt Woodlands TEC:

- Brown Mallet (*Eucalyptus astringens*) communities in the western Wheatbelt on alluvial flats (Priority 1): Near York and on the Arthur River on grey clays the understorey is dominated by *Melaleuca viminea* over sedges (*Gahnia trifida*) and bunch grasses. At Kojonup and near Tambellup on brown clays sparse shrubs and succulent shrubs (*Disphyma crassifolium*) dominate the understorey.
- Red Morrel (*Eucalyptus longicornis*) woodland of the Wheatbelt (Priority 1): Tall open woodlands of *Eucalyptus longicornis* found in the Wheatbelt on lateritic, ironstone or granitic soil types.

Sometimes found with *E. salmonophloia* or *E. loxophleba* woodlands and has very little understorey. It is also found directly above lake systems in the central and eastern Wheatbelt. The landscape unit in which it is found is valley floors, usually adjacent to saline areas.

- Yate (*Eucalyptus occidentalis*) dominated alluvial claypans of the Jingalup soil system (Priority 2).

These areas are recommended as priorities for protection (DotEE 2015a). The Brown Mallet and Red Morrel communities could potentially be found in the proposed survey area; however, the Jingalup soil system does not occur in the area (see section 4.3.2).

The Australian Government (DotEE 2015a) sets out the criteria for a vegetation patch to be categorised as part of the Eucalypt Woodlands TEC in *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt* (DotEE 2015a). These criteria are summarised in Appendices B and C.

#### 4.5.2. Previous Surveys

In their February 2019 survey, Matiske (2019a) surveyed remnant patches of vegetation in the Katanning Gold Project area and assessed them against the criteria described above in order to evaluate the presence and extent of the Eucalypt Woodlands TEC. The methodology for that survey is described in Matiske (2019a). Preliminary results were presented in March 2019 (Matiske 2019a), and revised results were prepared in December 2019 (Matiske 2019b). In summary, eleven patches are ranked as "Highly Likely a TEC", three as "Potential TEC", and 63 as "Not Likely a TEC". Those patches ranked as "Not Likely a TEC" failed to meet the Key TEC Criteria, predominantly because they were too small, did not have sufficient tree canopy cover or they were completely lacking native understorey (Matiske 2019b).

The 2017 survey conducted by Matiske was for the purposes of vegetation mapping. Using the methodology adopted in 2019, results were analysed for conformance with the Eucalypt Woodlands TEC criteria. As the survey was not designed specifically to assess remnant vegetation against the criteria, some data necessary for this analysis were not collected in the field; however, using a few assumptions, an evaluation can be made, knowing there is some uncertainty in the results. Ten vegetation communities were interpreted to occur in the survey areas (Matiske 2018); of these two to five (16-46% of the total survey area) are Highly Likely or have Potential to form part of the TEC.

#### 4.5.3. Government Advice

In March 2019, following the February 2019 survey by Matiske, the methodology used for the TEC survey was submitted by Matiske to the DotEE for assessment, and clarifications were sought on a number of the TEC criteria and the width of the buffer zone for this TEC. In April 2019, a response to the proposed methodology, along with clarifications on the issues of understorey variability and condition ratings, was received in April 2019 from DotEE Ecological Communities Section (Dr. John Vranjic, 12 April). The memorandum *Evaluation of the flora and vegetation values of remnant vegetation patches that have the potential to be the Threatened Ecological Community (TEC) – "Eucalypt Woodlands of the Western Australian Wheatbelt"* (Matiske 2019b) presents a summary of the response from DotEE.

#### 4.6. Other Areas of Conservation Significance

There are three nature reserves within the proposed Jinkas-Datatine survey area. These are listed in Table 6 and shown in Figure 2. All three of the reserves are vested in the Conservation and Parks Commission (Conservation and Parks Commission 2019).

**Table 6: Nature Reserves within the proposed Jinkas-Datatine survey area**  
(Conservation and Parks Commission 2019).

NAME	TENEMENT & LOCATION	PURPOSE	AREA (HA)	STATUS
Unnamed WA19075	E70/2928 – northwest of the tenement, on Fairclough Rd, 1.2 km west of intersection with Sturges Rd/Datatine Rd South.	Conservation of flora and fauna	136	IUCN 1a Nature Reserve
Unnamed WA12645	E70/2928 – northeast of the tenement, on Datatine Rd North, 1.7 km southeast of intersection with Sturges Rd.	Conservation of flora and fauna	40	IUCN 1a Nature Reserve
Woogabup Nature Reserve	E70/2928 and M70/2928 – northern end of Rifle Range (previously surveyed by Mattiske (2018)).	Conservation of flora and fauna	49	IUCN VI 5(1)(g) Reserve

Two nationally important wetlands (DotEE 2019f), are located near the proposed Jinkas-Datatine survey area. Lake Dumblebung, the largest naturally occurring permanent water body in Western Australia, is located approximately 15 km to the northwest of the proposed survey area. The lake is “a major drought refuge for waterbirds and the most important drought refuge for waterfowl in the inland of south-western Australia” (DotEE 2019f). The lake and its ecosystems are under threat from algal blooms, increased siltation, increased salinity due to drainage and groundwater pumping in the catchment, and human disturbance (recreational motor boats). Approximately 10 km to the southeast of the proposed survey area is Coyrecup Lake. This is also, at times, a “major drought refuge area for waterfowl in south-western Australia” and some of the surrounding vegetation has a restricted distribution in the southwest of the state (DotEE 2019f). This lake is also threatened by increasing salinity and siltation, algal blooms, human disturbance and also excessive inundation due to rising water tables. These two lakes are connected by a north-south chain of ephemeral salt lakes and saline wetlands that make up the northward-flowing Cobline River system (within the Cobline Nature Reserve), which lies around 5 km west of the proposed survey area.

#### 4.6.1. Aboriginal Heritage and Native Title

There is one registered Aboriginal Heritage Site inside the proposed survey area: Jinker/Jinka Hill, which encompasses the Jinkas pit and immediate surrounds. Features listed for the site include historical features, man-made structures, a modified tree and a camp. This site is not a protected area but it is gender restricted to male access only (Department of Planning, Lands and Heritage 2019).

The proposed Jinkas-Datatine survey area is in the centre of the Wagyl Kaip & Southern Noongar Indigenous Land Use Agreement (WI2015/007) (Conservation and Parks Commission 2019).

#### 4.6.2. Other Heritage Places

There are three other heritage places are located within the proposed Jinkas-Datatine survey area). These are (Department of Planning, Lands and Heritage 2019):

- Badgebup (ID 22354) – Historical, Camp, Meeting Place, Water Source. On southwest boundary of E70/2928 (only partially in tenement).
- Kwobrup (ID 22358) - Historical, Camp, Birth Place, Hunting Place, Meeting Place. On southeast boundary of E70/2928 (only partially in tenement).
- Wurgabup Hunting Grounds (ID 22676) – Historical, Camp, Hunting Place. Covers most of the proposed survey area and a similar size outside.

None of these sites are protected areas (Department of Planning, Lands and Heritage 2019).



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## Jinkas-Datatine Project

### Survey Sites November 2019

Figure: 8



## 5. FIELD SURVEY RESULTS

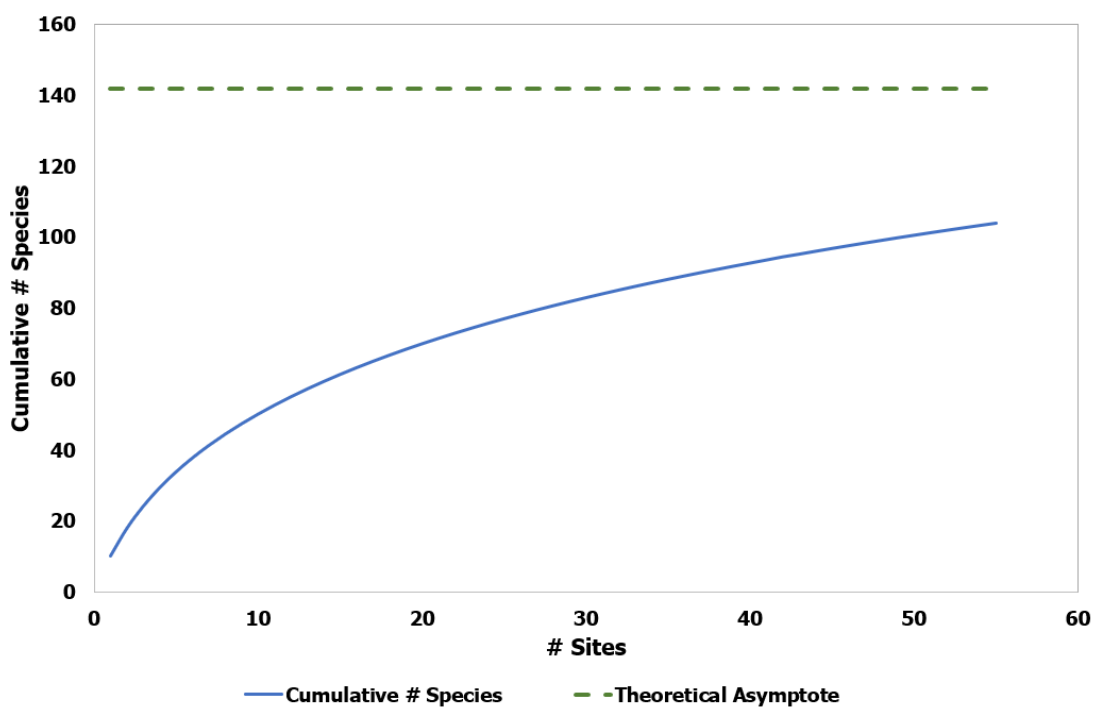
A total of 57 sampling sites within 13 remnant vegetation patches across the Jinkas-Datatine survey area were surveyed in November 2019 by two botanists from Mattiske (see Figure 8 and Appendix F for locations). At four sites only general observations were made, to confirm what was observed elsewhere in a large vegetation patch. Two additional sites from the 2017 survey (Mattiske 2018) were located within the vegetation patches assessed in this survey; the results from these are included in those below, unless otherwise stated.

### 5.1. Flora

A total of 98 vascular plant taxa (and one lichen taxon) were recorded within the survey areas in November 2019. An additional 6 taxa were recorded in the two sites from the 2017 survey. Overall, a total of 104 vascular plant taxa from 68 genera and 28 families were recorded. The majority of taxa recorded were representative of the Myrtaceae (25 taxa), Poaceae (16 taxa), Asteraceae (12 taxa) and Fabaceae (11 taxa) families. The most commonly represented genera were *Eucalyptus* (20 taxa), *Acacia* (4 taxa) and *Austrostipa* (4 taxa). The taxa recorded at each site in the survey are listed in Appendix G.

A species accumulation curve was used to evaluate the sampling adequacy and is presented in Figure 9. The incidence-based coverage estimator of species richness was 141.86. Based on this value and the total of 104 species recorded, approximately 73% of the flora species potentially present within the Jinkas-Datatine survey area were recorded.

Eleven taxa were unable to be confidently identified to species level. Lower than average rainfall in spring prior to the survey may have inhibited the development of sufficient taxonomic characters (e.g. flowers, fruit) to enable accurate identification.



**Figure 9: Species accumulation curve for sites surveyed within the Jinkas-Datatine survey area, November 2019**

### 5.1.1. Threatened and Priority Flora

No threatened flora species pursuant to Part 2, Division 1, Subdivision 2 of the BC Act and as listed by DBCA (2018a), or pursuant to section 179 of the EPBC Act or listed by the DotEE (2019c) were recorded within the Jinkas-Datatine survey area.

No priority flora species, as listed by the DBCA (2018b), were recorded within the Jinkas-Datatine survey area. None of the four priority species ranked prior to the field survey as having a High likelihood of occurrence within the survey area (see section 4.4.1) were recorded; none of the previously recorded locations within the tenements of the survey area were visited during the November 2019 field survey, as all locations fell within reserves of various kinds (nature, cadastra, timber and road), which were not priority areas for this field survey.

### 5.1.2. Other Significant Flora

One species recorded within the Jinkas-Datatine survey areas, *\*Eucalyptus camaldulensis*, represents an extension to its currently known distribution based on WAH data on FloraBase (WAH 1998- ). However, it is likely that this taxon was planted in the survey areas; it species occurred at five sites, all within vegetation patch 5, which was recorded as being planted. Two other species, both unable to be confirmed due to lack of fertile material, represented potential extensions to their known range: *\*Eucalyptus ?utilis*, which was recorded in vegetation patches 2 and 5, both noted as being planted; and *\*?Diplachne fusca*, which was recorded in four patches all within drainage channels.

### 5.1.3. Introduced (Weed) Species and Declared Pest (Plant) Organisms

Of the 104 flora taxa recorded in the Jinkas-Datatine survey areas in November 2019, 25 are introduced species (Appendix G). Two of the introduced taxa are planted Eucalypts. None of these species are Declared Pests pursuant to section 22 of the BAM Act according to DPIRD (2019).

Six of the recorded introduced taxa are ranked by the DBCA's weed prioritisation process (Department of Parks and Wildlife 2014) as having both High Ecological Impact and Rapid Invasiveness in the Wheatbelt region: *\*Aira caryophyllea*, *\*Arctotheca calendula*, *\*Avena barbata*, *\*Briza maxima*, *\*Bromus diandrus* and *\*Mesembryanthemum nodiflorum*. The first five of these were predicted to occur in the survey areas in the desktop study (see section 4.4.2).

## 5.2. Vegetation Mapping

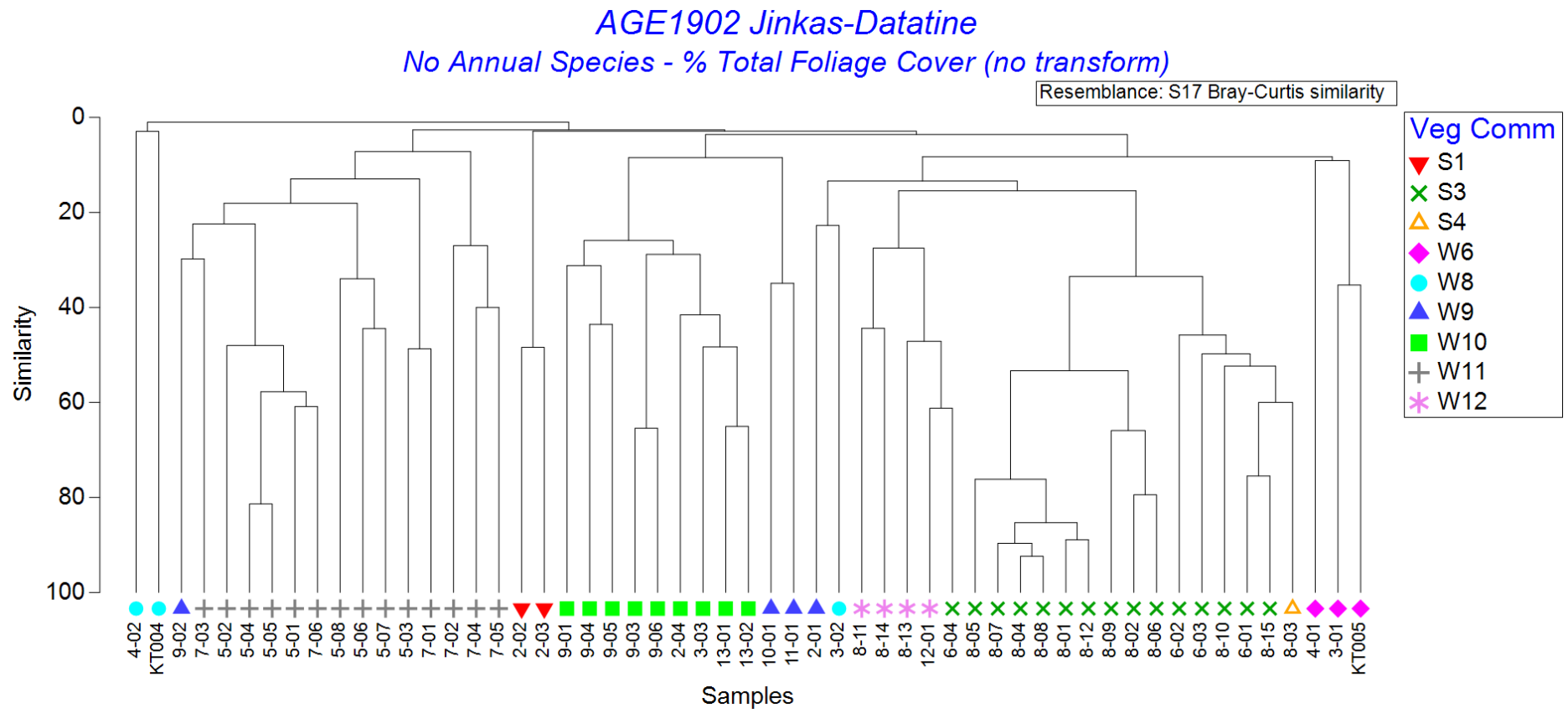
### 5.2.1. Statistical Analysis

Cluster analysis derived from a species-by-site resemblance matrix (Bray-Curtis similarity) grouped survey sites into discrete clusters based on species composition (dissimilarity/distance increased) (Clarke and Gorley 2015). No transformation was applied to the total foliage cover data. Annual species were excluded from analysis. Three *Eucalyptus* species (*E. astringens*, *E. loxophleba* and *E. wandoo*) which were identified to more than one subspecies or variety level were revised to the specific level to reduce the tendency to create further statistical variation in the analysis that was considered unwarranted (e.g. *Eucalyptus loxophleba* subsp. *loxophleba* was revised to *Eucalyptus loxophleba*). PRIMER statistical analysis was used in conjunction with survey site descriptions, site photos and aerial photographs; combining these methods increased the understanding of survey site inter-relations and thus the ability to accurately delineate those sites based on species composition.

The PRIMER analysis identified six significantly associated groups of mapping sites. Three more groups were defined based on the occurrence of particular species and landforms (Figure 10). All vegetation

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communities except two, the heath community S1 (two sites) and the granite outcrop community S4 (one site) which had limited extent within the survey area, had three or more representative sites surveyed. Two sites from the 2017 survey, KT004 and KT005 (Mattiske 2018), which were located inside vegetation patches assessed in this survey, were included in the statistical analysis. Survey site 4-03 from this survey and site KT004 are co-located (on top of Jinkas Hill); only general observations were made at 4-03 and hence in this report the data from KT004 are used. Site 4-01 from this survey and KT005 are very near each other; KT005 was used to provide additional data in an area where the vegetation appeared to change significantly within a small area (Jinkas Hill). An attempt was made to descriptively match the vegetation communities defined in 2017; community S1 was identified as occurring in the November 2019 survey area, as were woodland communities W6 and W8. Six new vegetation communities were defined: S3, S4, W9, W10, W11 and W12.



**Figure 10: Dendrogram of Bray-Curtis similarity matrix transformed foliage cover data for sites within the Jinkas-Datatine survey areas, November 2019**

### 5.1.1. Vegetation Communities

A summary of the nine vegetation communities delineated within the 2019 Jinkas-Datatine survey areas is presented below (Table 7; Figures 11.1 – 11.2). Vascular plant species recorded in each vegetation community are listed in Appendix H. Vegetation community descriptions, topographic and edaphic information and representative photos are shown in Appendix I.

Within the survey area, vegetation community S3 was the most common, making up 32.7% of the survey area, followed by community W10 (27.5%), W11 (15.2%) and W12 (11.7%), with the remaining five vegetation communities making up 12.9% (Figures 11.1 -11.2; Table 8).

Community S1 comprises a heath community dominated by *Banksia armata* var. *armata* and Myrtaceae species shrubs and has the highest species richness ( $17.5 \pm 1.5$  species/site) of any of the vegetation communities; it appears restricted to a laterite breakaway in the southern part of the survey area. Vegetation communities S3 and S4 are *Acacia acuminata* shrublands over Asteraceae-rich forblands. Community S4 occurs on the edges of granite outcrop; the vegetation is a lithic complex and as such contains a number of species not recorded in other communities in the survey area, including a fern and a lichen.

The woodland community W6 is dominated by *Allocasuarina huegeliana* over grasses, whereas W8 is dominated by a variety of *Eucalyptus* species trees, including some mallet species, with chenopod shrubs in the understorey. Community W9 is a mixed mallee woodland, with *Eucalyptus* species over grasses. The canopy of the mid woodland of community W10 is dominated by *Eucalyptus wandoo* along with occasional *E. salmonophloia*, and is marginally in a better condition than other communities, with the second highest species richness ( $15.1 \pm 1.3$  species/site). Community W11 is mostly planted along minor drainage lines, and comprises a low woodland of *Eucalyptus spathulata* and *E. ?sargentii* subsp. *sargentii* with *Casuarina obesa* over introduced grasses. Vegetation community W12 occurs on saline drainage lines within and adjacent to community S3 and comprises *Eucalyptus loxophleba* over *Acacia acuminata* with salt tolerant grasses and chenopod shrubs.

**Table 7: Description of vegetation communities within the JINKAS-DATATINE survey area, November 2019**

Vegetation communities are described at the association level of the NVIS classification framework, as defined by the ESCAVI (2003) (Appendix A).

VEGETATION COMMUNITY	SURVEY SITES	VEGETATION DESCRIPTION
S1	2-02, 2-03	Mid heathland of <i>Banksia armata</i> var. <i>armata</i> , <i>Leptospermum oligandrum</i> and <i>Beaufortia incana</i> with emergent isolated clumps of <i>Eucalyptus dorrienii</i> low mallee trees over grassland of <i>Austrostipa</i> species and mixed introduced species and sparse formland of mixed introduced species on breakaways with outcropping laterite and gravelly, sandy soils.
S3	6-01 to 6-04, 8-01, 8-02, 8-04 to 8-10, 8-12, 8-15	Tall shrubland of <i>Acacia acuminata</i> with occasional emergent low <i>Eucalyptus loxophleba</i> and <i>Allocasuarina</i> species trees over low grassland of <i>*Avena barbata</i> , <i>*Bromus diandrus</i> , <i>*Ehrharta longiflora</i> , <i>*Vulpia muralis</i> and <i>Austrostipa</i> spp. with low isolated clumps of <i>*Ursinia anthemoides</i> and <i>Waitzia acuminata</i> var. <i>acuminata</i> forbs and occasional chenopod shrubs on mid slopes and ridges with occasional granite outcrops on cream-caramel-red-brown sandy, loamy and clay soils.
S4	8-03	Lithic complex including tall open shrubland of <i>Acacia acuminata</i> over low grassland of mixed introduced species and <i>Austrostipa variabilis</i> with low open formland of <i>Waitzia acuminata</i> var. <i>acuminata</i> , <i>Crassula decumbens</i> var. <i>decumbens</i> and <i>Gnephosis drummondii</i> on the edges of granite outcrops on sandy loams. Associated species not seen in other communities include <i>Stypandra glauca</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> and <i>Xanthoparmelia</i> sp.
W6	3-01, 4-01, KT005	Woodland of <i>Allocasuarina huegeliana</i> over isolated clumps of tall <i>Acacia acuminata</i> shrubs over grassland of <i>Austrostipa elegantissima</i> , <i>Austrostipa hemipogon</i> and mixed introduced species and isolated low mixed shrubs on mid and upper slopes with rare laterite outcrops on sandy, loamy and clay soils.
W8	4-02, KT004, 3-02	Woodland of <i>Eucalyptus</i> species trees over sparse mid shrubland of <i>Maireana brevifolia</i> and <i>Gastrolobium trilobum</i> over open low grassland of <i>*Ehrharta longiflora</i> , <i>*Bromus diandrus</i> and <i>*Lolium perenne</i> with low chenopod shrubs and forbs on mid and upper slopes with occasional outcrops of laterite or granite with brown sandy, loamy and gravelly soils.
W9	2-01, 9-02, 10-01, 11-01	Mid mallee woodland of mixed <i>Eucalyptus</i> species with isolated clumps of <i>Eucalyptus</i> species trees over open grassland of <i>Austrostipa</i> species, <i>*Ehrharta longiflora</i> and other mixed grass species with isolated clumps of low mixed forbs on slopes with occasional outcrops and grey-brown clay loam soils.
W10	9-01, 9-03 to 9-06, 2-04, 3-03, 13-01, 13-02	Mid woodland of <i>Eucalyptus wandoo</i> and occasional <i>E. salmonophloia</i> over open grassland of <i>*Bromus diandrus</i> , <i>*Vulpia muralis</i> and mixed <i>Austrostipa</i> species with isolated clumps of low <i>*Ursinia anthemoides</i> and <i>Lomandra</i> species forbs on lower and mid slopes with rare laterite outcrops on grey-caramel clay loam soils.
W11	5-01 to 5-08, 7-01 to 7-06	Low woodland of <i>Eucalyptus spathulata</i> , <i>Eucalyptus ?sargentii</i> subsp. <i>sargentii</i> and <i>Casuarina obesa</i> over low open grassland of <i>*Avena barbata</i> , <i>*Bromus diandrus</i> , <i>*Ehrharta longiflora</i> and <i>*Hordeum marinum</i> with low isolated chenopod forbs in minor drainage channels with red-caramel clay loamy soils. Many trees are planted.
W12	8-11, 8-13, 8-14, 12-01	Low open woodland of <i>Eucalyptus loxophleba</i> over tall isolated <i>Acacia acuminata</i> shrubs and mid isolated chenopod shrubs over low grassland of <i>*Diplachne fusca</i> and <i>*Hordeum marinum</i> and low sparse mixed formland in saline drainage channels on grey sandy and loamy clays with rare outcrops of granite.



**Legend**

- Survey Sites
- ▭ Targetted Tenements

**Vegetation**

- W9
- W10

N

0 100 200 m

Scale: 1:12,500  
MGA94 (Zone 50)

CAD Ref: a2561\_JD09  
Date: August 2021

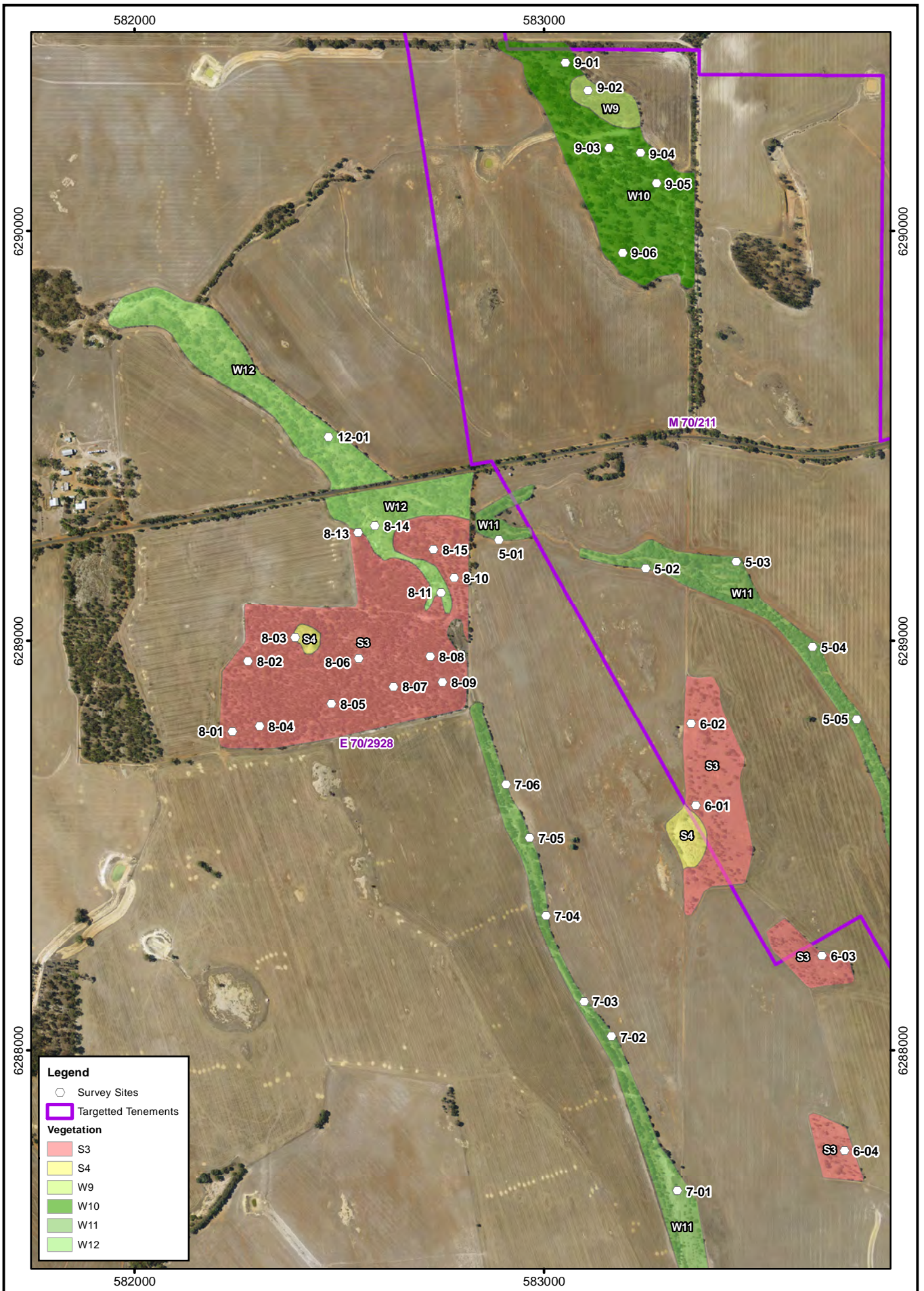
Rev: A | A4

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**Jinkas-Datatine Project**  
**Vegetation Mapping**  
Sheet 1 of 3

Figure:  
**11.1**



**Legend**

- Survey Sites
- ▭ Targetted Tenements

**Vegetation**

- S3
- S4
- W9
- W10
- W11
- W12

N

0 100 200 m

Scale: 1:12,500  
MGA94 (Zone 50)

CAD Ref: a2561\_JD09  
Date: August 2021

Rev: A | A4

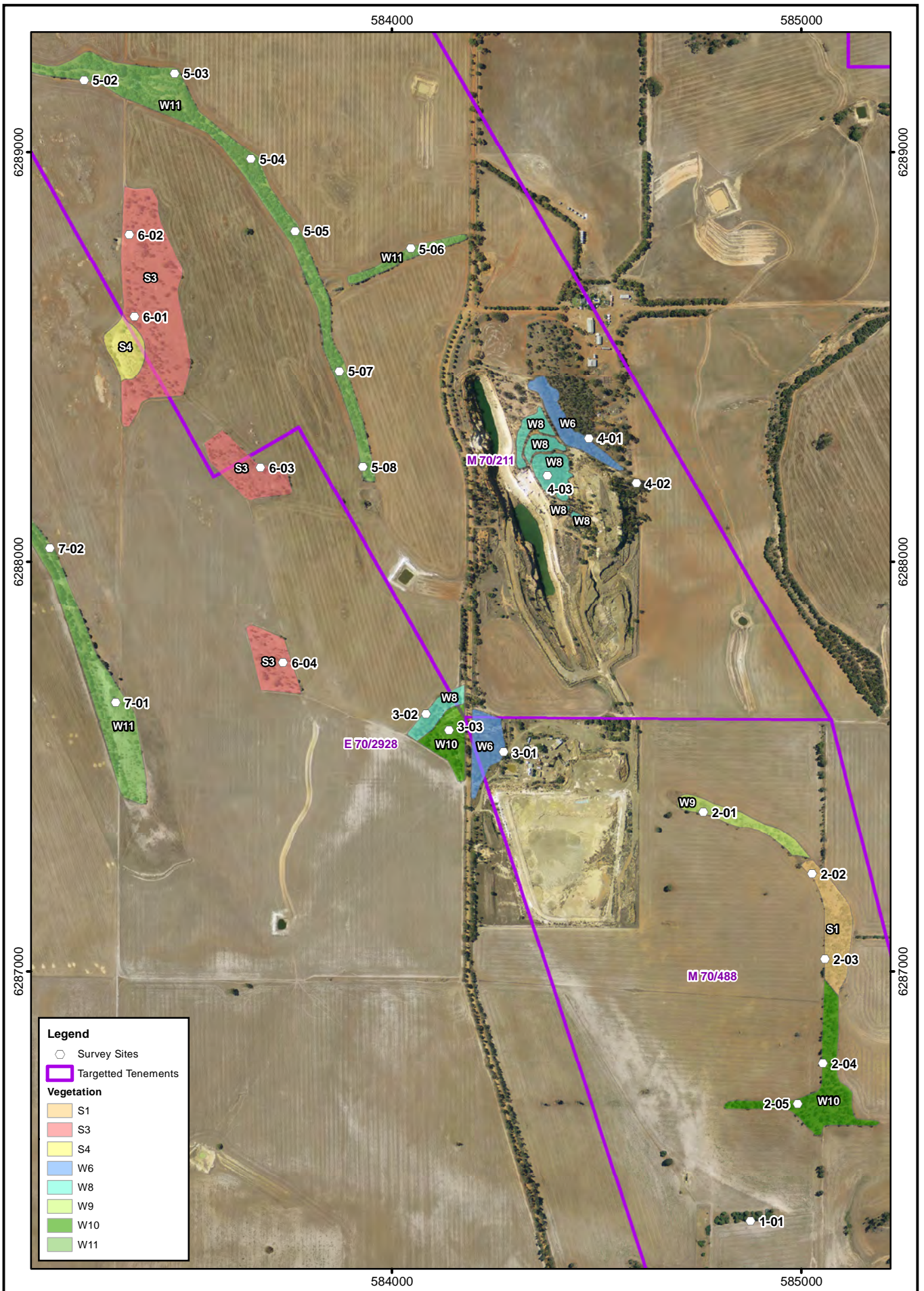
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**Jinkas-Datatine Project**  
**Vegetation Mapping**  
Sheet 2 of 3

Figure:  
**11.2**





**Legend**

- Survey Sites
- ▭ Targetted Tenements

**Vegetation**

- S1
- S3
- S4
- W6
- W8
- W9
- W10
- W11

N  
0 100 200 m  
Scale: 1:12,500  
MGA94 (Zone 50)

CAD Ref: a2561\_JD09  
Date: August 2021

Rev: A | A4

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**Jinkas-Datatine Project  
Vegetation Mapping**

Sheet 3 of 3

Figure:  
**11.3**

**Table 8: Aerial coverage of each vegetation community within the remnant vegetation areas in the Jinkas-Datatine survey areas, November 2019**

VEGETATION COMMUNITY	AREA WITHIN SURVEY AREA (HA)	PERCENTAGE OF REMNANT AREAS WITHIN SURVEY AREA (%)
S1	1.7	1.8
S3	32.0	32.7
S4	1.4	1.4
W6	2.2	2.3
W8	2.4	2.5
W9	4.8	4.9
W10	26.9	27.5
W11	14.9	15.2
W12	11.5	11.7

### 5.2.2. Vegetation Condition

Vegetation across the entire survey area had an average condition of Degraded on the Keighery (1994) scale. This reflects the predominant land uses in the area of cropping and grazing; the basic vegetation structure in remnant patches has generally been severely impacted by disturbances such as grazing, trampling, partial clearing and invasion by aggressive weed species. In some areas, particularly the hilltop parts of the *Acacia*-dominated community S3 and parts of the planted drainage line community W11, the condition was ranked as Completely Degraded. The best vegetation condition recorded within the survey areas was Good. Areas in this condition generally comprised parts of the larger vegetation patches; parts of the large *Acacia* shrubland patch 8 (community S3), parts of the *Eucalyptus wandoo* woodlands (community W10) in the Datatine area (patch 13) and at Jackson (patch 9), and parts of the *Eucalyptus loxophleba* woodlands around salty drainage lines (community W12).

## 5.3. Threatened and Priority Ecological Communities

### 5.3.1. Threatened Ecological Communities

Instances of the TEC "Eucalypt Woodlands of the Western Australian Wheatbelt" (Eucalypt Woodlands), listed by the DotEE (2019e) as Critically Endangered and by the DBCA (2019c) as a Priority 3 PEC, were identified as occurring in the Jinkas-Datatine survey areas. The TEC is described in section 4.5.

A total of 13 remnant vegetation patches identified prior to the field survey were surveyed using 57 survey sites; data from two sites from the 2017 survey (KT004 and KT005; Mattiske 2018), which were located inside one of the vegetation patches assessed in this survey, were included. Once in the field, several patches were divided into sub-patches based on observable differences in vegetation; this resulted in a total of 23 sub-patches that were assessed against the TEC criteria. A review of the remnants against the TEC criteria led to the following assessment: two sub-patches are ranked as "Highly Likely a TEC", two as "Potential TEC", and 19 as "Not Likely a TEC", see Table 9 and Appendix J.

Those patches ranked as "Not Likely a TEC" failed to meet the Key TEC Criteria, the main reasons being that: the Key Eucalypt Species defined as part of the TEC criteria (Appendix C) were not present or if they were present they were not dominant in the canopy; or the areas were very disturbed and good or degraded condition; or the sub-patch size was too small (<2 ha). Additionally, several sub-patches were completely lacking native understorey. Many also contained features listed as Contra-indicators, e.g. their

canopy was dominated (or co-dominated) by mallee growth forms (rather than tree forms) or by non-Key Eucalypt Species.

The two vegetation patches that were assessed as "Potential TEC" met the Key TEC criteria and the Contra-indicators. However, uncertainties exist in the density of the mature tree canopy for both patches. Patch 8-13 is a sub-patch within the *Acacia acuminata* shrublands of Patch 8, and as such its area is difficult to define (it is given here as 2.9 ha, but could be as small as 1.3 ha depending on definition of its boundaries). Patch 12 is assessed as having "Degraded" condition and the cover of introduced understorey species is high (51-70 %); if mature tree density is greater than 5 per 0.5 ha (this is marginal) and the area in the centre of the salty drainage line (vegetation is mostly grasses, not mature trees) can be counted as part of the total area, then Patch 12 does form part of the TEC.

The dominant tree canopy species in the two patches that were ranked as "Highly Likely a TEC" were all Key Eucalypt Species (six species at patch 9 and four species at patch 13). Six of the Key Species were collected in the field and identified in Perth; the other three species (*Eucalyptus occidentalis*, *E. salmonophloia* and *E. salubris*) were clearly identifiable in the field. The "Highly Likely a TEC" ranked patches had introduced understorey coverage that ranged from <10 % to >70 % and Keighery (1994) vegetation condition that ranged from Degraded to Good. Patch sizes for the Highly Likely vary from 10.7 to 12.2 ha (none were roadside patches).

### 5.3.2. Priority Ecological Communities

The two PECs that had the potential to exist within the Eucalyptus Woodlands TEC (Brown Mallet and Red Morrel vegetation communities) were not specifically searched for during this survey. However, occurrences of both Brown mallet (*Eucalyptus astringens*) (3 patches) and Red Morrel (*Eucalyptus longicornis*) (4 patches) trees were recorded.

*Eucalyptus astringens* is the dominant canopy species in part of patch 3W (site 3-02), where it occurs at the base of a slope. It is also dominant at site 9-01 in patch 9, where it occurs on a mid-slope. Given that neither patch is on alluvial flats, the landscape unit in which it is stated as occurring (DBCA 2019c), the Brown Mallet PEC can be considered as not occurring within the vegetation patches surveyed in November 2019.

Only in patch 4-02 was *Eucalyptus longicornis* recorded as being dominant. This patch is located at the base of a steep slope, but could not be considered to be a valley floor, the landscape unit in which it is stated as occurring (DBCA 2019c). On the basis of this, it can be interpreted that the Red Morrel PEC does not occur within the vegetation patches surveyed in November 2019.

It is possible that these PECS could occur within additional vegetation outside the Jinkas-Datatine survey areas that were not surveyed in November 2019, but determination of their presence would require targeted survey effort in a wider area near the Jinkas-Datatine survey areas.

**Table 9: Summary of the likelihood of remnant native vegetation patches in the Jinkas-Datatine survey areas forming part of the Eucalypt Woodlands TEC**

Table shows Highly Likely and Potential TEC patches only (see Appendix J for details and Figures 12.1-12.3 for locations).

PATCH NUMBER	# SITES	PATCH AREA (ha)	PATCH LOCATION	VEG COMM	POSITIVE FACTORS	NEGATIVE FACTORS	OTHER FACTORS
<b>Highly Likely a TEC</b>							
9	5 of 6 (not 9-02)	12.2	Jackson	W10	Key Species present (6) Vegetation Condition = Good	High introduced understorey cover (one site 51-70%, another >70%) Very low native understorey cover (<5%)	One site (of 6 total) is not a TEC due to dominant mallees
13	2 of 2	10.7	Datatine	W10	Key Species present (3) Many mature trees	Crown cover over entire patch marginal (~10%) Vegetation condition = Degraded Very low native understorey cover (<5%)	Many birds present
<b>Potential TEC</b>							
8-13	1	2.9	Clegg	W12	Key Species present (1) Very low introduced understorey cover (<10%)	Low density of mature trees (many mallees and immature trees) Vegetation condition = Degraded Low native understorey cover (<10%)	Sub-patch within Patch 8 (Acacia shrubland) Difficult to define sub-patch area
12	1	5.4	Clegg	W12	Key Species present (1)	Crown cover marginal (~10%) across entire width High introduced understorey cover (51-70%) Vegetation condition = Degraded Low native understorey cover (<10%)	Marginal density of mature trees Many sections planted
					Low introduced understorey cover (10-30%) Vegetation Condition = Good	Very low native understorey cover (<5%)	



**Legend**

- Survey Sites

**TEC Status**

- Highly likely a TEC
- Not Likely a TEC

N

0 100 200 m

Scale: 1:12,500  
MGA94 (Zone 50)

CAD Ref: a2561\_JD10  
Date: September 2021    Rev: A    A4

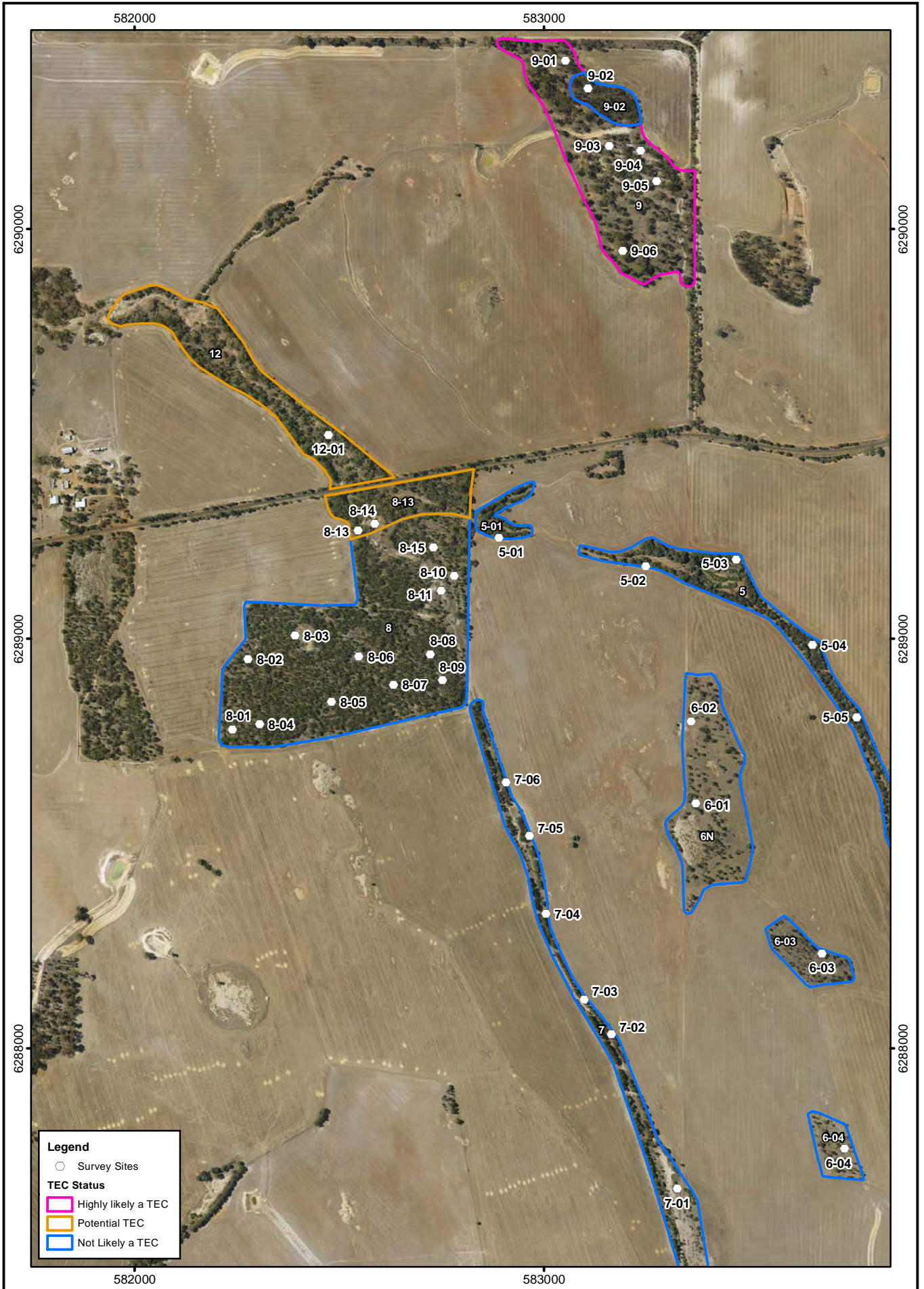


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**Jinkas-Datatine Project**  
**TEC Likelihood**  
Sheet 1 of 3

Figure:  
**12.1**



**Legend**

- Survey Sites
- TEC Status**
- Highly likely a TEC
- Potential TEC
- Not Likely a TEC

0 100 200 m  
Scale: 1:12,500  
MGA94 (Zone 50)

CAD Ref: a2561\_JD10  
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**Jinkas-Datatine Project**  
**TEC Likelihood**  
Sheet 2 of 3

Figure:  
**12.2**



**Legend**  
 ○ Survey Sites  
**TEC Status**  
 □ Not Likely a TEC

0 100 200 m  
 Scale: 1:12,500  
 MGA94 (Zone 50)

CAD Ref: a2561\_JD10  
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**Jinkas-Datatine Project**  
**TEC Likelihood**  
 Sheet 3 of 3

Figure:  
**12.3**

## 6. DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

Mattiske Consulting Pty Ltd was commissioned in August 2019 by Ausgold Limited to conduct an assessment to evaluate the flora and vegetation values within the Jinkas mine-Datatine area, located within the southern wheatbelt region, 30 km northeast of Katanning, WA. This report includes two parts: a description of the previously recorded and potential flora and vegetation values of the proposed Jinkas-Datatine survey area and their local and regional context; and the findings of a field survey that was conducted in November 2019. The field survey included several components: an assessment of the flora values, an assessment of the remnant vegetation and an assessment of native vegetation patches in order to determine whether they form part of the "Eucalypt Woodlands of the Western Australian Wheatbelt" threatened ecological community.

A large number of flora species (243 vascular plant taxa) have been recorded or could potentially be found within the proposed Jinkas-Datatine survey area. Seven of these taxa are listed threatened species at federal or state level, and ten are listed as priority species at state level. Four of the priority taxa have a High likelihood of occurring in the proposed survey area. These are: *Acacia trinalis* (P1), *Acacia grisea* (P4), *Bossiaea divaricata* (P4) and *Eucalyptus loxophleba* x *wandoo* (P4), all of which have been recorded in, on the boundary of, or within 5 km of the proposed survey areas.

Searches identified 31 introduced plant taxa that could possibly occur in the project area. Four of these, none of which have been recorded within the proposed survey area, are categorised as significant - both Weeds of National Significance and Declared Pests. Another six of the potential introduced taxa have both High ecological impact and Rapid invasiveness rankings.

The vegetation in and around the proposed survey area has been described by several authors with slightly different perspectives, including botanical subdistricts, soil-landscape zones, land systems and vegetation communities. In general, remnant native vegetation can be summarised as being dominated by open *Eucalyptus* species woodlands, with thickets of *Acacia acuminata* and *Casuarina* species on and around rocky outcrops, occasional mixed Proteaceae-Myrtaceae species heath communities on sandplains, and Chenopodiaceae species-rich shrubland on saline soils. Very little (approximately 13 %) of the pre-European vegetation is still present in the Avon Wheatbelt 2 IBRA subregion (DBCA 2019b); typical of the Wheatbelt, only small, discontinuous remnant patches of native vegetation remain in the proposed Jinkas-Datatine survey area. Ten vegetation communities (eight woodlands and two heathlands) have been previously mapped by Mattiske Consulting Pty Ltd (2018).

The Threatened Ecological Community "Eucalypt Woodlands of the Western Australian Wheatbelt", listed as Critically Endangered at Commonwealth level and as Priority 3 at State level, has a very high likelihood of occurring within the proposed survey area. Three Priority Ecological Communities listed at State level comprise sub-elements of the TEC; two of these may potentially occur in the proposed survey area. Remnant patches of native vegetation in and around the proposed Jinkas-Datatine survey area were assessed against the TEC criteria by Mattiske Consulting Pty Ltd in February 2019. Subsequent to that survey, the DotEE provided clarification on aspects of the TEC criteria. The implication of the clarification was that some patches surveyed and assessed in February 2019 (Mattiske 2019a) needed to be re-evaluated. This re-evaluation was completed in December 2019 (Mattiske 2019b).

Three nature reserves, established for the conservation of flora and fauna, exist within the proposed Jinkas-Datatine survey area. Two nationally important wetlands, along with their interconnecting drainage system, are located within 15km of the proposed survey area. Impacts on these conservation significant areas should be considered when planning activities within the proposed survey area.

A detailed field assessment of the flora and vegetation of each vegetation patch in the Jinkas-Datatine survey area was undertaken by two botanists from Mattiske in November 2019. Additionally, each vegetation patch mapped was assessed against the criteria for the Eucalypt Woodlands TEC. A total of 57 sampling sites within 13 remnant vegetation patches across the Jinkas-Datatine survey area were



surveyed. Data from two sites of the Matiske 2017 survey, both of which were located inside vegetation patches in this survey, were included in the analysis.

A total of 104 vascular plant taxa were recorded within the survey areas, with the majority representative of the Myrtaceae (25 taxa), Poaceae (16 taxa), Asteraceae (12 taxa) and Fabaceae (11 taxa) families. Species-accumulation curve analysis indicates that approximately 73 % of the flora species potentially present within the Jinkas-Datatine survey area were recorded.

No threatened flora listed at Commonwealth or State level nor priority flora listed at State level were recorded in this survey. None of the four priority species ranked prior to the field survey as having a High likelihood of occurrence within the survey area were recorded; this is likely due to the fact that previous nearby records of these taxa were in reserve lands, and hence offered a higher level of protection than the vegetation patches surveyed in November 2019.

Three species recorded within the Jinkas-Datatine survey area represent potential extensions to their known range; however, two of these species occurred in vegetation patches noted to have been mostly planted.

A total of 25 vascular plant taxa recorded in this survey are introduced species; none are Declared Pests. Six of the weed species, five of which were predicted to occur in the survey areas in the desktop study, are ranked as having a High Ecological Impact and Rapid Invasiveness in the Wheatbelt region according to DBCA's weed prioritisation process. Given the number of significant and potentially significant weed species that could occur in the proposed survey areas, protocols to ensure weeds are not further spread through the remaining native vegetation of the area should be developed and followed when carrying out any activities in the Jinkas-Datatine area.

Statistical analysis grouped survey sites into six discrete clusters based on species composition. Three more groups were defined based on the occurrence of particular species and landforms. The nine vegetation communities defined comprised one heathland community, two shrublands and six woodlands. Seven of the nine defined vegetation communities contained three or more survey sites (two were of too small an area to permit three sites). Three of the defined communities descriptively matched those from the 2017 survey (S1, W6, W8) and six were newly defined (S3, S4, W9, W10, W11, W12).

Within the survey area, vegetation community S3 was the most widespread, making up 32.7% of the remnant vegetation areas within the survey area. It comprises *Acacia acuminata* shrublands, with one large densely vegetated patch (patch 8) on a slope and three smaller sparsely vegetated patches on a ridge. Community W10 (27.5%) is interpreted to occur in two large and two smaller patches and is dominated by *Eucalyptus wandoo*; it has the second highest species richness of any of the vegetation communities. Vegetation community W11 (15.2%) is a low woodland of *Eucalyptus spathulata* and *E. ?sargentii* subsp. *sargentii* and is generally planted along drainage lines. W12 (11.7%) occurs along saline drainage lines and is dominated by *E. wandoo*, over salt tolerant grasses and chenopod shrubs. The remaining five vegetation communities make up 12.9% of the vegetation surveyed. Community S1 is a heath community that occurs on a laterite breakaway; it has the highest species richness of any of the vegetation communities. S4 (like S3) is comprised of *Acacia acuminata* shrublands, but is restricted to the edges of granite outcrops. The woodland community W6 is *Allocasuarina huegeliana*-dominated. W8 has a variety of *Eucalyptus* species trees, including some mallet species. Community W9 is a mixed mallee woodland, with *Eucalyptus* species over grasses.

The Keighery (1994) vegetation condition is generally Degraded across the entire survey area, with some patches being ranked as Completely Degraded and some of the larger patches as Good; the effects of cropping and grazing are very apparent throughout the Jinkas-Datatine survey area.

The thirteen remnant vegetation patches were divided into 23 sub-patches for assessment against the Eucalypt Woodlands TEC criteria. Using a defined methodology, two of the patches are ranked as "Highly Likely a TEC", two as "Potential TEC", and nineteen as "Not Likely a TEC". The KT004 patch on Jinkas,

although it had potential, is unlikely to be a TEC due to the restricted areas of the W8 community and also the total size of 1.017ha in good condition. The two patches that were ranked as “Highly Likely a TEC” are the vegetation patch 9 at Jacksons, and patch 13 at Datatine. These are part of the vegetation community W10 (patches 9 and 13). Those ranked as “Potential TEC” are 8-13, a sub-patch within the greater *Acacia* shrubland patch 8, and patch 12 immediately to the north of patch 8. These patches are both part of vegetation community W12.

The extent of the communities located immediately north-east and east of Jinkas Hill includes 1.79ha of W8 and 1.06ha of W6. Of the latter areas on Jinkas Hill, 1.017ha of the 1.79ha of W8 vegetation community is in good condition, the remainder 0.770ha is degraded and 0.778ha of the W6 vegetation community is in good condition and 0.278ha is degraded. In the wider Katanning Gold Mine area 19.126ha of W8 occurs in excellent condition and 2.214ha and 2.056ha of W6 occur as excellent and good condition respectively. The area adjacent to the former mining area at Jinkas Hill areas are surrounded by previous mining and associated disturbance areas.

The two PECs that had the potential to exist within the Eucalyptus Woodlands TEC, Brown Mallet and Red Morrel vegetation communities (both Priority 1) were not recorded within the vegetation patches surveyed in November 2019; determination of their presence would require further survey effort.

Clearing of native vegetation requires a permit under the *EP Act*, unless an exemption applies, as prescribed in either Schedule 6 of the *EP Act* or *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. Several principles apply with regard to the assessment of an application to clear native vegetation by the Department of Water and Environmental Regulation (2019; Appendix A6). Adequate time to apply for and receive a clearing permit for any exploration and ongoing mining activities should be allowed for when planning.

Regarding Buffer Zones around the edge of a vegetation patch forming part of the Eucalypt Woodlands TEC, Mattiske (2019b) believes that consideration should be given to the canopy species found at the edge of a patch. Where vegetation has been surveyed by suitably qualified botanists the Buffer Zone should be adjusted based on the species recorded; for example, where *Acacia acuminata* grows at the edge of a vegetation patch, the buffer zone could be narrower than the 40 m recommended for the Eucalypt Woodlands TEC. If a patch has not been physically surveyed, the 40 m Buffer Zone should be used. Guidelines on Buffer Zone width at the edge of a remnant vegetation patch assessed as forming part of the TEC are still not clear, despite clarification being sought from the Australian Government (Mattiske 2019b); until such time as the guidelines have been changed, the 40 m Buffer Zone should be used.

## 7. ACKNOWLEDGEMENTS

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## 8. PERSONNEL

The following Mattiske Consulting Pty Ltd personnel were involved in this project:

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Dr EM Mattiske	Managing Director & Principal Ecologist	Planning, managing, fieldwork, reporting	FB62000019
Ms E Chetwin	Experienced Botanist	Data collation, fieldwork, reporting	FB62000026
Mr B Ellery	Senior Botanist	Assisting with plant identifications	N/A

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## APPENDIX A1: THREATENED AND PRIORITY FLORA DEFINITIONS

Under section 179 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), **threatened flora** are categorised as extinct, extinct in the wild, critically endangered, endangered, vulnerable and conservation dependent (Table A1.1).

**Table A1.1 Federal definition of threatened flora species**

**Note:** Adapted from section 179 of the EPBC Act.

CODE	CATEGORY	DEFINITION
<b>Ex</b>	<b>Extinct</b>	Species which at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.
<b>ExW</b>	<b>Extinct in the Wild</b>	Species which is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
<b>CE</b>	<b>Critically Endangered</b>	Species which at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
<b>E</b>	<b>Endangered</b>	Species which is not critically endangered and it is facing a very high risk of extinction in the wild in the immediate or near future, as determined in accordance with the prescribed criteria.
<b>V</b>	<b>Vulnerable</b>	Species which is not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
<b>CD</b>	<b>Conservation Dependent</b>	Species which at a particular time if, at that time, the species is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.

The *Biodiversity Conservation Act 2016* (BC Act) provides for (amongst other things) the protection of flora that is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future in Western Australia under Part 10 (Division 2).

**Threatened flora** are listed in the *Wildlife Conservation (Rare Flora) Notice 2018* (under Part 2, Division 1, Subdivision 2 of the BC Act; Department of Biodiversity, Conservation and Attractions (DBCA) 2018a) and are categorised under Schedules 1-3. A flora species is defined as **threatened** if it is facing an extremely high risk of extinction in the wild in the immediate, near or medium-term future, pursuant to sections 20, 21 and 22 of the BC Act (DBCA 2019d). Threatened species are categorised as critically endangered, endangered, and vulnerable (Table A1.2).

**Table A1.2 State definition of threatened flora species**

**Note:** Adapted from DBCA (2019d).

CODE	CATEGORY	DEFINITION
CR	<b>Critically endangered</b>	Species considered to be facing an extremely high risk of becoming extinct in the wild (listed under Schedule 1 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).
EN	<b>Endangered</b>	Species considered to be facing a very high risk of becoming extinct in the wild (listed under Schedule 2 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).
VU	<b>Vulnerable</b>	Species considered to be facing a high risk of becoming extinct in the wild (listed under Schedule 3 of the <i>Wildlife Conservation (Rare Flora) Notice 2018</i> ).



**Priority flora** species are defined as “possibly threatened species that do not meet the survey criteria, or are otherwise data deficient” or species that are “adequately known, are rare but not threatened, meet criteria for near threatened or have recently been removed from the threatened species list” for other than taxonomic reasons” (DBCA 2019d). **Priority species are not afforded any protection under state or federal legislation**, however are considered significant under the Environmental Protection Authority’s *Environmental Factor Guideline: Flora and Vegetation* (Environmental Protection Authority (EPA) 2016a). DBCA categorises priority flora into four categories: Priority 1; Priority 2, Priority 3 and Priority 4 (Table A1.3).

**Table A1.3: State definition of priority flora species**

**Note:** Adapted from DBCA (2019d).

CODE	CATEGORY	DEFINITION
<b>P1</b>	<b>Priority 1:</b> Poorly-known species	Known from one or a few locations (< 5) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation; or are otherwise under threat of habitat destruction or degradation. In urgent need of further survey.
<b>P2</b>	<b>Priority 2:</b> Poorly-known species	Known from one or a few locations (< 5). Some occurrences are on lands managed primarily for nature conservation. In urgent need of further survey.
<b>P3</b>	<b>Priority 3:</b> Poorly-known species	Known from several locations and the species does not appear to be under imminent threat; or from few but widespread locations with either a large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. In need of further survey.
<b>P4</b>	<b>Priority 4:</b> Rare, Near Threatened, and other species in need of monitoring	<p><b>a) Rare</b> - Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p><b>b) Near Threatened</b> - Species that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.</p> <p><b>c) Other</b> - Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

## APPENDIX A2: THREATENED AND PRIORITY ECOLOGICAL COMMUNITY DEFINITIONS

Under section 181 of the EPBC Act, **threatened ecological communities** are categorised as critically endangered, endangered and vulnerable (Table A2.1).

**Table A2.1** Federal definition of threatened ecological communities

**Note:** Adapted from section 181 and section 182 of the EPBC Act.

CATEGORY	DEFINITION
<b>Critically Endangered</b>	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future.
<b>Endangered</b>	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future.
<b>Vulnerable</b>	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future.

The *Biodiversity Conservation Act 2016* (BC Act) provides for (amongst other things) some protection of ecological communities at risk of collapse in Western Australia under Part 3 (Division 2).

**Threatened ecological communities** (TECs) are listed in the *List of Threatened Ecological Communities endorsed by the Western Australian Minister for Environment (28 June 2018)* (under Part 2, Division 2, Subdivision 1 of the BC Act; DBCA 2018c). An ecological community is defined as **threatened** if it is facing an extremely high risk of collapse in the immediate, near or medium-term future, pursuant to sections 28, 29 and 30 of the BC Act. Threatened ecological communities are categorised as critically endangered, endangered, and vulnerable (Table A2.2). Some of these TECs are also endorsed by the Federal Minister as threatened, and some of these are listed under the EPBC Act and therefore afforded legislative protection at the Commonwealth level.

**Table A2.2 State definition of threatened ecological communities**

**Note:** Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
CR	<b>Critically Endangered</b>	An ecological community will be listed as CR when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;</li> <li>2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or</li> <li>3. The ecological community is highly modified with potential of being rehabilitated in the immediate future.</li> </ol>
EN	<b>Endangered</b>	An ecological community will be listed as EN when it has been adequately surveyed and is not CR, but is facing a very high risk of total destruction in the near future. The ecological community must meet <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short term future, or is unlikely to be substantially rehabilitated in the short term future due to modification;</li> <li>2. The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area; or</li> <li>3. The ecological community is highly modified with potential of being rehabilitated in the short term future.</li> </ol>
VU	<b>Vulnerable</b>	An ecological community will be listed as VU when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet <b>any one or more of</b> the following criteria: <ol style="list-style-type: none"> <li>1. The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;</li> <li>2. The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution; or</li> <li>3. The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.</li> </ol>

**Priority ecological communities (PECs)** are defined as possible threatened ecological communities that do not meet the stringent survey criteria for the assessment of threatened ecological communities, and are listed by DBCA (2019c) in the *Priority Ecological Communities for Western Australia – Version 28 (17 January 2019)*. Similarly to priority flora, PECs are not afforded legislative protection, however are considered significant under the EPA's (2016a) *Environmental Factor Guideline: Flora and Vegetation*. The Department of Biodiversity, Conservation and Attractions categorises priority ecological communities into five categories: Priority 1; Priority 2, Priority 3, Priority 4 and Priority 5 (Table A2.3).

**Table A2.3 State definition of priority ecological communities**

**Note:** Adapted from Department of Environment and Conservation (2013).

CODE	CATEGORY	DEFINITION
P1	<b>Priority 1</b> (Poorly known ecological communities)	Ecological communities that are known from very few, restricted occurrences (generally $\leq 5$ occurrences or a total area of $\leq 100$ ha). Most of these occurrences are not actively managed for conservation (e.g. located within agricultural or pastoral lands, urban areas, or active mineral leases) and for which immediate threats exist.
P2	<b>Priority 2</b> (Poorly known ecological communities)	Communities that are known from few small occurrences (generally $\leq 10$ occurrences or a total area of $\leq 200$ ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation.
P3	<b>Priority 3</b> (Poorly known ecological communities)	<ol style="list-style-type: none"> <li>1. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation;</li> <li>2. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat; or</li> <li>3. Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.</li> </ol>
P4	<b>Priority 4</b> (Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring)	<ol style="list-style-type: none"> <li>1. Rare – Communities known from few occurrences that are considered to have been adequately surveyed, sufficient knowledge is available, and are considered not to be currently threatened.</li> <li>2. Near Threatened – Communities considered to have been adequately surveyed and do not qualify for Conservation Dependent, but are close to qualifying for Vulnerable.</li> <li>3. Communities that have been removed from the list of threatened communities during the past five years.</li> </ol>
P5	<b>Priority 5</b> (Conservation Dependent ecological communities)	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

## APPENDIX A3: CATEGORIES AND CONTROL MEASURES OF DECLARED PEST (PLANT) ORGANISMS IN WESTERN AUSTRALIA

Section 22 of Western Australia's *Biosecurity and Agriculture Management Act 2007* (BAM Act) makes provision for a plant taxon to be listed as a declared pest organism in respect to parts of, or the entire State. According to the BAM Act, a declared pest is defined as a prohibited organism (section 12), or an organism for which a declaration under section 22 (2) of the Act is in force. Under the *Biosecurity and Agriculture Management Regulations 2013* (WA), declared pest plants are placed in one of three control categories, C1 (exclusion), C2 (eradication) or C3 (management), which determines the measures of control which apply to the declared pest (Table A4.1). The current listing of declared pest organisms and their control category is through the Western Australian Organism List (Department of Primary Industries and Regional Development 2019).

**Table A3.1 Categories and control measures of declared pest (plant) organisms**

**Note:** Adapted from *Biosecurity and Agriculture Management Regulations 2013*.

CONTROL CATEGORY	CONTROL MEASURES
<p style="text-align: center;"><b>C1 (Exclusion)</b></p> <p>'(a) Category 1 (C1) — Exclusion: if in the opinion of the Minister introduction of the declared pest into an area or part of an area for which it is declared should be prevented.'</p> <p>Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.</p>	<p>In relation to a category 1 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;"><b>C2 (Eradication)</b></p> <p>'(b) Category 2 (C2) — Eradication: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is feasible.'</p> <p>Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.</p>	<p>In relation to a category 2 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to destroy, prevent or eradicate the declared pest.</p>
<p style="text-align: center;"><b>C3 (Management)</b></p> <p>'(c) Category 3 (C3) — Management: if in the opinion of the Minister eradication of the declared pest from an area or part of an area for which it is declared is not feasible but that it is necessary to:</p> <p><b>(i)</b> alleviate the harmful impact of the declared pest in the area; or</p> <p><b>(ii)</b> reduce the number or distribution of the declared pest in the area; or</p> <p><b>(iii)</b> prevent or contain the spread of the declared pest in the area.'</p> <p>Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.</p>	<p>In relation to a category 3 declared pest, the owner or occupier of land in an area for which an organism is a declared pest or a person who is conducting an activity on the land must take such of the control measures specified in subregulation (1) as are reasonable and necessary to:</p> <p><b>(a)</b> alleviate the harmful impact of the declared pest in the area for which it is declared; or</p> <p><b>(b)</b> reduce the number or distribution of the declared pest in the area for which it is declared; or</p> <p><b>(c)</b> prevent or contain the spread of the declared pest in the area for which it is declared.</p>

## APPENDIX A4: OTHER DEFINITIONS

### Environmentally sensitive areas

Environmentally sensitive areas are declared by the State Minister under section 51B of the *Environmental Protection Act 1986* (EP Act) and are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*, gazetted 8 April 2005 (Department of Water and Environmental Regulation 2019). Specific environmentally sensitive areas that may be relevant to this report include: a defined wetland and the area within 50 metres of the wetland; the area covered by vegetation within 50 metres of rare flora; the area covered by a threatened ecological community – further areas and information are described in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

### Conservation significant flora

Under the *Environmental Factor Guideline: Flora and Vegetation* (EPA 2016a), flora may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority species;
- locally endemic or associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; or
- relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

### Conservation significant vegetation

Under the *Environmental Factor Guideline: Flora and Vegetation* (EPA 2016a), vegetation may be considered significant for a range of reasons, including, but not limited to the following:

- being identified as threatened or priority ecological communities;
- restricted distribution;
- degree of historical impact from threatening processes;
- a role as a refuge; or
- providing an important function required to maintain ecological integrity of a significant ecosystem.

## APPENDIX A5: NVIS STRUCTURAL FORMATION TERMINOLOGY

**Note:** Adapted from ESCAVI (2003).

COVER CHARACTERISTICS							
Foliage cover*	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover**	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% cover***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

GROWTH FORM	HEIGHT RANGES (m)	STRUCTURAL FORMATION CLASSES						
		closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree, palm	<10, 10-30, >30	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree mallee	<3, <10, 10-30	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
shrub, cycad, grass-tree, tree-fern	<1, 1-2, >2	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
mallee shrub	<3, <10, 10-30	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
heath shrub	<1, 1-2, >2	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs
chenopod shrub	<1, 1-2, >2	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
samphire shrub	<0.5, >0.5	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
hummock grass	<2, >2	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
tussock grass	<0.5, >0.5	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grassland	isolated clumps of tussock grasses	tussock grasses
other grass	<0.5, >0.5	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
sedge	<0.5, >0.5	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
rush	<0.5, >0.5	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
forb	<0.5, >0.5	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
fern	<1, 1-2, >2	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumps of ferns	ferns
bryophyte	<0.5	closed bryophyteland	bryophyteland	open bryophyteland	sparse bryophyteland	isolated bryophytes	isolated clumps of bryophytes	bryophytes
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	<10, 10-30, >30	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
aquatic	0-0.5, <1	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
seagrass	0-0.5, <1	closed seagrass bed	seagrass bed	open seagrass bed	sparse seagrasses	isolated seagrasses	isolated clumps of seagrasses	seagrasses

## APPENDIX A6: CLEARING PRINCIPLES

**Note:** Adapted from Schedule 5 of the EP Act.

PRINCIPLE	ASSESSMENT
<b>A</b>	<i>Native vegetation should not be cleared if it comprises a high level of biological diversity.</i>
<b>B</b>	<i>Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.</i>
<b>C</b>	<i>Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora.</i>
<b>D</b>	<i>Native vegetation should not be cleared if it comprises the whole or part of, or is necessary for the maintenance of a threatened ecological community.</i>
<b>E</b>	<i>Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.</i>
<b>F</b>	<i>Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.</i>
<b>G</b>	<i>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.</i>
<b>H</b>	<i>Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.</i>
<b>I</b>	<i>Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface and underground water.</i>
<b>J</b>	<i>Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.</i>



## **APPENDIX B: Criteria for determination of the “Eucalypt Woodlands of the Western Australian Wheatbelt” TEC**

The Australian Government Department of the Environment and Energy’s (DotEE) criteria for a vegetation patch to be categorised as part of the Eucalypt Woodlands TEC (DotEE 2015a, b) are summarised in this appendix.

### **Key Criteria**

Eucalypt Woodlands are situated on the flatter landscapes and lower rises of the Wheatbelt. The woodlands are dominated by a complex mosaic of several eucalypt species with a tree or mallee form over a highly variable understorey (DotEE 2015a). The Key Criteria for determining whether a vegetation patch is part of the Eucalypt Woodlands of the WA Wheatbelt TEC are:

1. The crown cover of the tree canopy in a mature woodland must be at least 10 %.
2. The key Eucalypt species that dominate or co-dominate the vegetation patch must be those listed in Table E1 of Appendix E (adapted from Table 2a, DotEE 2015a).
3. Other canopy species (mostly Eucalypts) may be present in association with these key species but cannot occur as dominant or co-dominant species. These associated canopy species are listed in Table E2 of Appendix E (adapted from Table 2a, DotEE 2015a).
4. Native understorey must be present.

### **Contra-indicators**

If any of the following features occur in the vegetation patch, then it is not likely to be a TEC (DotEE 2015a):

1. Woodlands dominated by a mallee form (rather than tree form) in the canopy.
2. Tree canopy dominated by non-Eucalypt species (e.g. Acacia or Allocasuarina species).
3. Vegetation patch comprised of shrublands or herblands in which the tree canopy is very sparse to absent.
4. Woodlands dominated by eucalypts that are restricted to granite outcrops and rocky rises.

### **Condition Thresholds**

The condition thresholds for the ecological community acknowledge the small, highly fragmented nature of the remnant vegetation patches, and the fact that these patches may still have conservation value, despite their size. Additionally, older, mature tree are recognised as providing important habitat for other species in the ecological community, particularly fauna that require nesting hollows. The thresholds are intended to exclude degraded patches (e.g. isolated paddock trees, small stands of trees used as shelterbelts) from protection requirements (DotEE 2015a).

If the remnant vegetation patch meets the Key Criteria for being a Eucalypt Woodlands TEC, and does not have any Contra-indicators, then the Condition Thresholds listed in Table B1 (adapted from Table 3, DotEE 2015a) apply. Patches are categorised depending on their condition, loosely related to (but not determined by) the Keighery (1994) scale (six-point scale ranging from ‘Pristine’ to ‘Completely Degraded’) or the Roadside Condition Value (RCV) (Roadside Conservation Committee 2002) scale (four-point scale from ‘High’ to ‘Low’). For each category, the introduced understorey species cover and mature tree presence and density criteria must apply plus one of either patch width or patch area, depending on whether the patch is a roadside remnant or not.

**Table B1: Condition Thresholds for remnant vegetation patches to be considered as the Eucalypt Woodlands of the Western Australian Wheatbelt TEC (adapted from DotEE 2015a)**

Category and likely Condition (Keighery or RCV)	Cover of introduced species (as % of total vegetation cover in understorey) AND	Mature trees <sup>1</sup> presence & density AND	Minimum patch area (non-roadside patches) OR	Minimum patch width (roadsides only) <sup>2</sup>
<b>A:</b> Pristine / Excellent / Very Good or a High RCV	0 - 30 %	Present or Absent	≥2 ha	5 m
<b>B:</b> Good or Medium-High RCV AND retains important habitat features.	31 – 50 %	Present with ≥5 trees per 0.5 ha	≥2 ha	5 m
<b>C:</b> Good or a Medium-High RCV	31 - 50 %	Absent or Present with <5 trees per 0.5 ha	≥5 ha	5 m
<b>D:</b> Degraded - Good or a Medium-Low to Medium-High RCV BUT retains important habitat features	51 - 70 %	Present with ≥5 trees per 0.5 ha	≥5 ha	5 m

<sup>1</sup> Mature trees have a diameter at breast height (dbh) of 30 cm or above.

<sup>2</sup> The width here is based on the native understorey component rather than width of the tree canopy. Some allowance must be made for small breaks or variations in native species cover along narrow, linear patches. A break in the native vegetation cover of 50 m or more indicates that separate patches are present. Where main roads bisect otherwise continuous vegetation, the native vegetation on each side of the road is considered a separate patch.

### Buffer Zones

A buffer zone is recommended around the outside of ecological community patches in order to minimise the risk of damage to the community by nearby actions (DotEE 2015a). The recommended minimum buffer zone for the Eucalypt Woodlands TEC is "40 m from the edge of the patch as determined from the outer edge of the tree canopy" (DotEE 2015a). This distance is recommended in order to protect the roots of trees, which for many species in the Eucalypt Woodlands TEC, can spread quite a way from the trunk.

A larger buffer zone may be applied, where practical, to protect patches of high conservation value (DotEE 2015a). However, as the buffer zone is advisory only and not part of the TEC, existing land uses within the buffer zone (e.g. cropping, ploughing, grazing, spraying etc.) may continue. It is requested that care be taken in these areas to minimise the risk of any significant adverse impacts extending into the adjacent TEC patch (DotEE 2015a).

**APPENDIX C: DOMINANT AND CO-DOMINANT EUCALYPT SPECIES OF THE WA WHEATBELT WOODLANDS TEC**

Adapted from *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt* - Table 2 (DotEE 2015a)

"x" indicates plant identified to subspecies level; "s" indicates plant identified to species level only.

GENUS	SPECIES	COMMON NAME	NOV 2019	PREVIOUS SURVEYS KGP AREA
<b>Table E1) Key Eucalypt species.</b> One or more of these species are dominant or co-dominant within a given patch of the ecological community.				
<i>Eucalyptus</i>	<i>accedens</i>	powder-bark; powder-bark wandoo		
<i>Eucalyptus</i>	<i>aequioperta</i>	Welcome Hill gum		
<i>Eucalyptus</i>	<i>alipes</i>	Hyden mallet		
<i>Eucalyptus</i>	<i>astringens</i> subsp. <i>astringens</i>	brown mallet	x	x
<i>Eucalyptus</i>	<i>capillosa</i>	wheatbelt wandoo		x
<i>Eucalyptus</i>	<i>densa</i> subsp. <i>densa</i>	narrow-leaved blue mallet		
<i>Eucalyptus</i>	<i>extensa</i>	yellow mallet		x
<i>Eucalyptus</i>	<i>falcata</i>	Silver mallet		x
<i>Eucalyptus</i>	<i>gardneri</i> subsp. <i>gardneri</i>	Blue mallet		x
<i>Eucalyptus</i>	<i>goniocarpa</i>	Lake King mallet		
<i>Eucalyptus</i>	<i>kondininensis</i>	Kondinin blackbutt		
<i>Eucalyptus</i>	<i>longicornis</i>	red morrel	x	x
<i>Eucalyptus</i>	<i>loxophleba</i> subsp. <i>loxophleba</i>	York gum	x	s
<i>Eucalyptus</i>	<i>melanoxydon</i>	black morrel		
<i>Eucalyptus</i>	<i>mimica</i> subsp. <i>continens</i>	hooded mallet		
<i>Eucalyptus</i>	<i>mimica</i> subsp. <i>mimica</i>	Newdegate mallet		
<i>Eucalyptus</i>	<i>myriadena</i>	small-fruited gum; blackbutt		
<i>Eucalyptus</i>	<i>occidentalis</i>	flat-topped yate	x	
<i>Eucalyptus</i>	<i>ornata</i>	ornamental silver mallet; ornate mallet		
<i>Eucalyptus</i>	<i>recta</i>	Mt Yule silver mallet; Cadoux mallet		
<i>Eucalyptus</i>	<i>rudis</i> subsp. <i>rudis</i>	flooded gum		
<i>Eucalyptus</i>	<i>salicola</i>	salt gum; salt salmon gum		
<i>Eucalyptus</i>	<i>salmonophloia</i>	salmon gum	x	x
<i>Eucalyptus</i>	<i>salubris</i>	gimlet	x	
<i>Eucalyptus</i>	<i>sargentii</i> subsp. <i>sargentii</i>	salt river gum	x	x
<i>Eucalyptus</i>	<i>singularis</i>	ridge-top mallet		
<i>Eucalyptus</i>	<i>spathulata</i> subsp. <i>spathulata</i>	swamp mallet	s	s
<i>Eucalyptus</i>	<i>spathulata</i> subsp. <i>salina</i>	Salt River mallet	s	s
<i>Eucalyptus</i>	<i>urna</i>	merrit		
<i>Eucalyptus</i>	<i>wandoo</i> subsp. <i>pulverea</i>	wandoo		
<i>Eucalyptus</i>	<i>wandoo</i> subsp. <i>wandoo</i>	wandoo	x	x

**APPENDIX C: DOMINANT AND CO-DOMINANT EUCALYPT SPECIES OF THE WA WHEATBELT WOODLANDS TEC**

Adapted from *Approved Conservation Advice (including listing advice) for the Eucalypt Woodlands of the Western Australian Wheatbelt* - Table 2 (DotEE 2015a)

"x" indicates plant identified to subspecies level; "s" indicates plant identified to species level only.

GENUS	SPECIES	COMMON NAME	NOV 2019	PREVIOUS SURVEYS KGP AREA
<b>Table E2) Associated canopy species</b> These may be present within the ecological community but are not dominant or co-dominant. The list is not comprehensive and presents the more common taxa encountered.				
<i>Acacia</i>	<i>acuminata</i>	jam	x	x
<i>Allocasuarina</i>	<i>huegeliana</i>	rock sheoak	x	x
<i>Corymbia</i>	<i>calophylla</i>	marri		
<i>Eucalyptus</i>	<i>annulata</i>	prickly-fruited mallee		
<i>Eucalyptus</i>	<i>arachnaea</i> subsp. <i>arachnaea</i>	black-stemmed mallee		
<i>Eucalyptus</i>	<i>arachnaea</i> subsp. <i>arrecta</i>	black-stemmed mallet		
<i>Eucalyptus</i>	<i>armillata</i>	flanged mallee		
<i>Eucalyptus</i>	<i>calycogona</i> subsp. <i>calycogona</i>	square-fruited mallee		
<i>Eucalyptus</i>	<i>camaldulensis</i> subsp. <i>arida</i>	river red gum		
<i>Eucalyptus</i>	<i>celastroides</i> subsp. <i>virella</i>	wheatbelt mallee	x	
<i>Eucalyptus</i>	<i>cylindriflora</i>	Goldfields white mallee		
<i>Eucalyptus</i>	<i>decipiens</i>	redheart; moit		
<i>Eucalyptus</i>	<i>drummondii</i>	Drummond's mallee		
<i>Eucalyptus</i>	<i>eremophila</i>	sand mallee		
<i>Eucalyptus</i>	<i>erythronema</i> subsp. <i>erythronema</i>	red-flowered mallee		
<i>Eucalyptus</i>	<i>erythronema</i> subsp. <i>inornata</i>	yellow-flowered mallee		
<i>Eucalyptus</i>	<i>eudesmioides</i>	Kalbarri mallee		
<i>Eucalyptus</i>	<i>flocktoniae</i> subsp. <i>flocktoniae</i>	Flockton's mallee		
<i>Eucalyptus</i>	<i>gittinsii</i> subsp. <i>illucida</i>	northern sandplain mallee		
<i>Eucalyptus</i>	<i>incrassata</i>	ridge-fruited mallee		
<i>Eucalyptus</i>	<i>kochii</i> subsp. <i>plenissima</i>	Traying mallee		
<i>Eucalyptus</i>	<i>leptopoda</i> subsp. <i>leptopoda</i>	Merredin mallee; Tammin mallee		
<i>Eucalyptus</i>	<i>loxophleba</i> subsp. <i>gratia</i>	Lake Grace mallee		s
<i>Eucalyptus</i>	<i>loxophleba</i> subsp. <i>lissophloia</i>	smooth-barked York gum		s
<i>Eucalyptus</i>	<i>loxophleba</i> subsp. <i>supralaevis</i>	blackbutt York gum		s
<i>Eucalyptus</i>	<i>macrocarpa</i>	mottlecah		
<i>Eucalyptus</i>	<i>marginata</i>	jarrah		
<i>Eucalyptus</i>	<i>moderata</i>	redwood mallee		
<i>Eucalyptus</i>	<i>obtusiflora</i>	Dongara mallee		
<i>Eucalyptus</i>	<i>olivina</i>	olive-leaved mallee		
<i>Eucalyptus</i>	<i>orthostemon</i>	diverse mallee		
<i>Eucalyptus</i>	<i>perangusta</i>	fine-leaved mallee		
<i>Eucalyptus</i>	<i>phaenophylla</i>	common southern mallee		
<i>Eucalyptus</i>	<i>phenax</i> subsp. <i>phenax</i>	white mallee		x
<i>Eucalyptus</i>	<i>pileata</i>	capped mallee		
<i>Eucalyptus</i>	<i>platypus</i> subsp. <i>platypus</i>	moort		
<i>Eucalyptus</i>	<i>polita</i>	Parker Range mallet		
<i>Eucalyptus</i>	<i>sheathiana</i>	ribbon-barked mallee		x
<i>Eucalyptus</i>	<i>sporadica</i>	Burngup mallee		
<i>Eucalyptus</i>	<i>subangusta</i> subsp. <i>subangusta</i>	grey mallee		
<i>Eucalyptus</i>	<i>tenera</i>	glazed mallee		
<i>Eucalyptus</i>	<i>tephroclada</i>	Holleton mallee		
<i>Eucalyptus</i>	<i>thamnoides</i>	brown mallee	x	
<i>Eucalyptus</i>	<i>transcontinentalis</i>	redwood		
<i>Eucalyptus</i>	<i>vegrandis</i>	Ongerup mallee; Cranbrook mallee		
<i>Eucalyptus</i>	<i>wubinensis</i>	Wubin mallee		
<i>Eucalyptus</i>	<i>yilgarnensis</i>	yorrel		

**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

\* denotes introduced species. SCC is State Conservation Code, FCC is Federal Conservation Code (see Appendix A for definitions). Database searches - NatureMap and Protected Matters Search Tool (PMST) (see section 3.1 for details). AGE1901 and AGE1701 denote taxa recorded in previous surveys in the vicinity (see section 3.2 for details).

FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
AIZOACEAE	<i>Carpobrotus modestus</i>			x				Aug-Nov
	<i>Disphyma crassifolium</i>			x				Jan-Feb or May, Aug-Dec
AMARANTHACEAE	* <i>Amaranthus caudatus</i>			x				Mar-Jun
	<i>Ptilotus humilis</i>			x				Sep-Nov
	<i>Ptilotus manglesii</i>						x	Sep-Jan
	<i>Ptilotus polystachyus</i>						x	Apr-Nov, Jan
ANACARDIACEAE	* <i>Schinus molle</i>						x	Apr, Jul-Oct
APIACEAE	<i>Actinotus humilis</i>			x				Oct-Dec or Jan
	<i>Daucus glochidiatus</i>						x	Aug-Jan
ARALIACEAE	<i>Hydrocotyle pilifera</i>			x				Aug-Nov
	<i>Trachymene cyanopetala</i>			x				Aug-Nov
	<i>Trachymene pilosa</i>			x			x	Aug-Nov
ASPARAGACEAE	* <i>Asparagus asparagoides</i>				x			Aug-Sep
	<i>Laxmannia squarrosa</i>						x	Sep-Nov
	<i>Lomandra effusa</i>			x				Jun-Aug
	<i>Thysanotus patersonii</i>						x	Jul-Nov
ASTERACEAE	* <i>Arctotheca calendula</i>			x			x	Aug-Nov
	<i>Asteridea asteroides</i>			x				Aug-Nov
	<i>Blennospora phlegmatocarpa</i>			x				Sep-Oct
	<i>Brachyscome ciliaris</i>			x			x	Jan-Dec
	<i>Brachyscome iberidifolia</i>			x				Jul-Nov
	* <i>Carduus pycnocephalus</i>						x	Oct-Dec
	* <i>Chrysanthemoides monilifera</i>				x			Jun-Oct
	<i>Gnephosis tenuissima</i>			x				Aug-Dec
	* <i>Hypochaeris glabra</i>			x			x	Jan-Dec
	<i>Lagenophora huegelii</i>						x	Jul-Dec
	<i>Lawrencella rosea</i>						x	Jul-Oct
	<i>Olearia rudis</i>						x	Jul-Nov
	<i>Ozothamnus lepidophyllus</i>			x				Jun or Aug-Dec, Jan-Feb
	<i>Podolepis lessonii</i>						x	Aug-Jan
<i>Podotrochea gnaphalioides</i>			x				Aug-Nov	

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\* denotes introduced species. SCC is State Conservation Code, FCC is Federal Conservation Code (see Appendix A for definitions). Database searches - NatureMap and Protected Matters Search Tool (PMST) (see section 3.1 for details). AGE1901 and AGE1701 denote taxa recorded in previous surveys in the vicinity (see section 3.2 for details).

FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
ASTERACEAE (continued)	<i>Pterochaeta paniculata</i>						x	Jul-Nov
	<i>Rhodanthe citrina</i>			x			x	Aug-Dec
	<i>Rhodanthe manglesii</i>						x	Aug-Oct
	<i>Rhodanthe polycephala</i>						x	Sep-Oct
	* <i>Sonchus oleraceus</i>						x	Jan-Dec
	* <i>Ursinia anthemoides</i>			x			x	Jul-Dec
	<i>Vittadinia gracilis</i>						x	Jan-Dec
	<i>Waitzia acuminata</i>			x				Jul-Dec or Jan
	<i>Waitzia acuminata</i> var. <i>acuminata</i>						x	Jul-Jan
	<i>Waitzia suaveolens</i> var. <i>suaveolens</i>						x	Sep-Jan
BORYACEAE	<i>Borya sphaerocephala</i>						x	Aug-Oct
BRASSICACEAE	* <i>Carrichtera annua</i>				x			Sep-Nov
CARYOPHYLLACEAE	* <i>Petrorhagia dubia</i>			x			x	Mar, Jul-Dec
CASUARINACEAE	<i>Allocasuarina huegeliana</i>			x			x	May-Jan
	<i>Casuarina obesa</i>			x			x	Jan-Dec
CELASTRACEAE	<i>Stackhousia monogyna</i>						x	Jun-Dec
CHENOPODIACEAE	* <i>Chenopodium album</i>			x				Mar-Apr, Oct-Dec
	<i>Chenopodium desertorum</i> subsp. <i>microphyllum</i>						x	Aug, Oct, Dec, Jan
	<i>Enchylaena lanata</i>			x				Aug-Oct
	<i>Enchylaena tomentosa</i>			x				May-Sep
	<i>Rhagodia preissii</i> subsp. <i>preissii</i>						x	Apr, Jun, Aug-Oct
	<i>Roycea pycnophylloides</i>	T	EN			x		Sep
	<i>Salicornia quinqueflora</i>			x				Oct-Dec, Feb-Apr
	<i>Tecticornia lepidosperma</i>			x			Sep-Nov	
COLCHICACEAE	<i>Wurmbea sinora</i>			x				Jul-Sep
CRASSULACEAE	<i>Crassula colorata</i>						x	Aug-Oct
	<i>Crassula exserta</i>			x				Aug-Dec
CUPRESSACEAE	<i>Callitris roei</i>						x	Mar, Jun-Jul

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FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
CYPERACEAE	<i>Chorizandra enodis</i>						x	Jul-Nov
	<i>Lepidosperma humile</i>						x	Jun
	<i>Lepidosperma leptostachyum</i>						x	Apr-Jun
	<i>Lepidosperma sanguinolentum</i>			x				June-Sep
	<i>Lepidosperma</i> sp.					x		-
	<i>Lepidosperma</i> sp. Bandalup Scabrid (N. Eveleigh 10798)						x	Mar, May-Jul, Nov
	<i>Schoenus armeria</i>			x				Sep-Nov
	<i>Tetralia</i> sp. Mt Madden (C.D. Turley 40 BP/897)						x	Oct-Nov, Mar-Apr
DASYPOGONACEAE	<i>Calectasia obtusa</i>	P3		x				Aug-Sep
DILLENACEAE	<i>Hibbertia exasperata</i>						x	Jun-Oct
	<i>Hibbertia hibbertioides</i> var. <i>hibbertioides</i>						x	Jun-Dec
DROSERACEAE	<i>Drosera leucoblata</i>			x				Aug-Nov
	<i>Drosera purpurascens</i>			x				Jul-Sep
FABACEAE	<i>Acacia acuminata</i>			x			x	Jun-Oct
	<i>Acacia crassistipula</i>			x				Jul-Aug
	<i>Acacia erinacea</i>						x	Jun-Oct
	<i>Acacia grisea</i>	P4		x				Jun-Aug
	<i>Acacia lasiocarpa</i> var. <i>sedifolia</i>						x	Jun-Sep
	<i>Acacia lineolata</i> subsp. <i>lineolata</i>			x				Aug-Sep
	<i>Acacia microbotrya</i>						x	Mar-Aug
	<i>Acacia myrtifolia</i>			x			x	May-Jan
	<i>Acacia pycnocephala</i>						x	May-Sep
	<i>Acacia sphacelata</i> subsp. <i>sphacelata</i>			x				Apr-Sep
	<i>Acacia trinalis</i>	P1		x				Sep
	<i>Bossiaea divaricata</i>	P4		x				Sep
	<i>Bossiaea eriocarpa</i>						x	Jul-Nov
<i>Daviesia angulata</i>						x	Mar-Sep	
<i>Daviesia articulata</i>							Sep	
<i>Daviesia scoparia</i>				x		x	Sep-Nov	
<i>Gastrolobium trilobum</i>							x	Jul-Nov

**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

\* denotes introduced species. SCC is State Conservation Code, FCC is Federal Conservation Code (see Appendix A for definitions). Database searches - NatureMap and Protected Matters Search Tool (PMST) (see section 3.1 for details). AGE1901 and AGE1701 denote taxa recorded in previous surveys in the vicinity (see section 3.2 for details).

FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
GOODENIACEAE	<i>Dampiera lavandulacea</i>						x	Jul, Sep-Nov
	<i>Dampiera sacculata</i>						x	May, Jul-Nov
	<i>Velleia trinervis</i>						x	Aug-Jan
HAEMODORACEAE	<i>Conostylis seorsiflora</i> subsp. <i>seorsiflora</i>			x			x	Sep-Oct
HALORAGACEAE	<i>Glischrocaryon aureum</i>						x	Jun-Nov, Jan-Mar
HEMEROCALLIDACEAE	<i>Caesia micrantha</i>						x	Sep-Nov
	<i>Dianella revoluta</i>			x			x	Aug-Jan, Apr
	<i>Stypandra glauca</i>						x	Aug-Nov
IRIDACEAE	<i>Patersonia juncea</i>						x	Aug-Nov
	<i>Patersonia occidentalis</i>						x	Aug-Jan
	* <i>Romulea rosea</i>			x			x	Aug-Nov
JUNCEAE	<i>Juncus subsecundus</i>						x	Oct-Jan
LAMIACEAE	<i>Prostanthera serpyllifolia</i> subsp. <i>microphylla</i>						x	Apr, Jun-Dec
LINACEAE	<i>Linum marginale</i>						x	Oct-Jan
MALVACEAE	<i>Androcalva cuneata</i>			x				Sep-Jan
MONTIACEAE	<i>Calandrinia calyptrata</i>						x	Aug-Dec
	<i>Calandrinia corrigioloides</i>			x				Aug-Nov
	<i>Calandrinia eremaea</i>			x				Aug-Oct
MYRTACEAE	<i>Beaufortia bracteosa</i>						x	Aug-Dec
	<i>Calothamnus quadrifidus</i> subsp. <i>quadrifidus</i>						x	Jun-Oct
	<i>Calytrix leschenaultii</i>						x	Jun-Nov
	<i>Chamelaucium ciliatum</i>						x	Jan-Dec
	<i>Darwinia oxylepis</i>	T	EN		x			Aug-Nov
	<i>Darwinia wittwerorum</i>	T	EN		x			Sep-Dec
	<i>Ericomyrtus serpyllifolia</i>			x			x	Apr, Aug-Nov
	<i>Eucalyptus annulata</i>			x				Jun or Aug-Dec, Jan-Feb
	<i>Eucalyptus astringens</i> subsp. <i>astringens</i>					x	x	Nov-Dec
<i>Eucalyptus capillosa</i>					x		Dec or Jan-May	



**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

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FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD	
MYRTACEAE (continued)	<i>Eucalyptus dorrienii</i>						x	Jan-Feb, Aug, Oct-Nov	
	<i>Eucalyptus extensa</i>			x		x		Mar	
	<i>Eucalyptus falcata</i>			x		x		Aug-Dec, Jan-May	
	<i>Eucalyptus gardneri</i> subsp. <i>gardneri</i>						x	Feb-Sep	
	<i>Eucalyptus ?hebetifolia</i>					x		Dec, Jan, Mar	
	<i>Eucalyptus incrassata</i>						x	Aug-Dec, Jan-Apr	
	<i>Eucalyptus kondininensis</i>						x	Jul-Aug, Oct-Dec	
	<i>Eucalyptus longicornis</i>					x	x	Dec-Feb	
	<i>Eucalyptus loxophleba</i>					x	x	Jul-Feb	
	<i>Eucalyptus loxophleba</i> subsp. <i>lissophloia</i>						x	Sep-Feb	
	<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i>				x			Jul-Dec or Jan	
	<i>Eucalyptus loxophleba</i> x <i>wandoo</i>	P4			x			Nov	
	<i>Eucalyptus marginata</i> subsp. <i>marginata</i>				x			Jun-Dec or Jan	
	<i>Eucalyptus phaenophylla</i> subsp. <i>interjacens</i>				x			Jan-Mar, Sep-Nov	
	<i>Eucalyptus phenax</i> subsp. <i>phenax</i>						x	Feb	
	<i>Eucalyptus pluricaulis</i> subsp. <i>porphyrea</i>				x			Mar-Aug	
	<i>Eucalyptus salmonophloia</i>						x	x	Aug-Dec
	<i>Eucalyptus sargentii</i> subsp. <i>sargentii</i>						x		Oct-Dec or Jan
	<i>Eucalyptus sheathiana</i>						x		Jan-Apr
	<i>Eucalyptus ?spathulata</i>						x		Oct, Jan-Feb
	<i>Eucalyptus uncinata</i>						x		Jan-Apr
	<i>Eucalyptus vegrandis</i> subsp. <i>vegrandis</i>				x				Jan-Feb or May
	<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>						x	x	Dec or Jan-May
	<i>Leptospermum erubescens</i>							x	Jul-Nov
	<i>Melaleuca atroviridis</i>							x	Apr, Sep, Dec-Feb
	<i>Melaleuca fulgens</i> subsp. <i>fulgens</i>				x				Aug-Dec
	<i>Melaleuca halmaturorum</i>				x				Aug-Oct
	<i>Melaleuca pungens</i>							x	Jul-Nov, Jan
	<i>Melaleuca pungens</i> var. <i>pungens</i>							x	Jul-Nov
	<i>Melaleuca subtrigona</i>							x	Sep-Dec
	<i>Melaleuca tuberculata</i> var. <i>tuberculata</i>				x				Jul-Nov
	<i>Rinzia fumana</i>							x	Jul-Oct
	<i>Tetrapora preissiana</i>							x	Sep-Nov
<i>Verticordia brevifolia</i> subsp. <i>brevifolia</i>	P3			x				Oct-Nov	

**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

\* denotes introduced species. SCC is State Conservation Code, FCC is Federal Conservation Code (see Appendix A for definitions).

Database searches - NatureMap and Protected Matters Search Tool (PMST)

(see section 3.1 for details). AGE1901 and AGE1701 denote taxa recorded in previous surveys in the vicinity (see section 3.2 for details).

FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
MYRTACEAE (continued)	<i>Verticordia grandiflora</i> <i>Verticordia huegelii</i> var. <i>tridens</i>	P3		x			x	Aug-Dec Sep-Nov
ORCHIDACEAE	<i>Caladenia doutchiaie</i> <i>Caladenia erythronema</i> <i>Caladenia multiclavia</i> <i>Caladenia pendens</i> subsp. <i>pendens</i> <i>Caladenia roei</i> <i>Caladenia x exoleta</i> <i>Cyanicula gemmata</i> <i>Diuris purdiei</i> <i>Diuris setacea</i> <i>Elythranthera brunonis</i> <i>Paracaleana triens</i> <i>Pterostylis macroscelus</i> <i>Pterostylis picta</i> <i>Pterostylis vittata</i> <i>Thelymitra graminea</i>	T	EN	x x x x x x x x x x x x x x	x			Aug-Oct Aug-Nov Sep-Oct Aug-Oct Aug-Oct Aug-Oct Sep-Oct Sep-Oct Oct-Dec Aug-Oct Sep-Nov Sep Sep-Nov May-Sep Sep-Oct
OROBANCHACEAE	* <i>Orobanche minor</i>						x	Sep-Dec
OXALIDACEAE	* <i>Oxalis corniculata</i>						x	May, Aug-Nov
PAPAVERACEAE	* <i>Fumaria muralis</i> subsp. <i>muralis</i>			x				Jun-Dec
PITTOSPORACEAE	<i>Billardiera fusiformis</i>						x	Nov-Feb
POACEAE	* <i>Aira caryophyllea</i> <i>Austrostipa elegantissima</i> <i>Austrostipa hemipogon</i> <i>Austrostipa macalpinei</i> <i>Austrostipa</i> sp. Marchagee (B.R. Maslin 1407) <i>Austrostipa tenuifolia</i> <i>Austrostipa trichophylla</i> * <i>Avellinia michelii</i> * <i>Avena barbata</i> * <i>Briza maxima</i>			x x x x x x x x x x x		x	x x x	Oct-Nov Aug-Jan Oct-Feb Aug-Dec Sep-Dec Jul-Nov Aug-Nov Aug-Oct Aug-Oct Sep-Oct

**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

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FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
POACEAE (continued)	* <i>Bromus diandrus</i>						x	Aug-Nov
	* <i>Cenchrus ciliaris</i>				x			Feb-Oct
	* <i>Ehrharta longiflora</i>			x			x	Jul-Nov
	* <i>Hordeum hystrix</i>						x	Sep-Jan
	* <i>Lolium perenne</i>						x	Sep-Dec
	<i>Neurachne alopecuroidea</i>						x	Jul-Nov
	Poaceae sp.					x		-
	* <i>Puccinellia ciliata</i>					x		Oct-Nov
	<i>Rytidosperma caespitosum</i>						x	Jun-Nov
	<i>Rytidosperma setaceum</i>					x	x	Sep-Dec
	* <i>Vulpia myuros</i>						x	Jul-Nov
	<i>Vulpia</i> sp.				x			Jul-Dec
PRIMULACEAE	* <i>Lysimachia arvensis</i>						x	Jun-Nov
PROTEACEAE	<i>Adenanthos pungens</i> subsp. <i>effusus</i>	T	EN		x			Aug-Nov
	<i>Adenanthos pungens</i> subsp. <i>pungens</i>	T	VU		x			Aug-Nov
	<i>Banksia armata</i> var. <i>ignicida</i>			x			x	Jun-Oct
	<i>Banksia dallanneyi</i> var. <i>dallanneyi</i>						x	Jun-Sep
	<i>Banksia parva</i>	P4		x				Jun-Jul
	<i>Banksia zyocephala</i>			x				Aug-Sep
	<i>Banksia meganotia</i>	P3		x				Oct
	<i>Banksia oligantha</i>	T	EN		x			Oct-Nov
	<i>Banksia sessilis</i>						x	Apr-Nov
	<i>Banksia sphaerocarpa</i> var. <i>caesia</i>						x	Jan-Jul, Oct
	<i>Banksia squarrosa</i> subsp. <i>squarrosa</i>						x	Jun-Nov
	<i>Banksia violacea</i>			x				May/Aug/Oct-Dec or Jan-Mar
	<i>Conospermum croniniae</i>			x				May or Jul-Nov
	<i>Grevillea hookeriana</i> subsp. <i>hookeriana</i>			x				Apr-Nov or Jan
	<i>Grevillea insignis</i> subsp. <i>insignis</i>						x	Jan, Jun-Nov
	<i>Grevillea newbeyi</i>	P3		x				Jan/Jun/Sep-Nov
	<i>Hakea cygna</i> subsp. <i>cygna</i>			x				May-Jun, Aug-Sep
	<i>Hakea ferruginea</i>						x	Jul-Nov
<i>Hakea laurina</i>						x	Apr-Aug	
<i>Hakea lissocarpha</i>						x	May-Sep	
<i>Hakea marginata</i>						x	Aug-Oct	

**APPENDIX D: SUMMARY OF VASCULAR PLANT TAXA WITH THE POTENTIAL TO OCCUR IN THE JINKAS-DATATINE SURVEY AREA**

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FAMILY	SPECIES	SCC	FCC	Nature Map	PMST	AGE 1901	AGE 1701	FLOWERING PERIOD
PROTEACEAE (continued)	<i>Hakea multilineata</i>			x				Jun-Sep
	<i>Hakea pandanica</i> subsp. <i>crassifolia</i>			x				Sep-Nov
	<i>Isopogon teretifolius</i>						x	Aug-Nov
	<i>Persoonia quinquenervis</i>			x				Jul-Dec or Feb
	<i>Petrophile antecedens</i>			x				Jul or Sep
	<i>Petrophile brevifolia</i>			x				May-Dec
	<i>Petrophile seminuda</i>						x	Aug-Nov
RESTIONACEAE	<i>Desmodcladus asper</i>						x	Aug-Nov
	<i>Lepidobolus preissianus</i> subsp. <i>preissianus</i>						x	Oct
	<i>Lepidobolus preissianus</i> subsp. <i>volubilis</i>						x	Sep-Nov
RHAMNACEAE	<i>Cryptandra arbutiflora</i> var. <i>arbutiflora</i>						x	Jun-Oct
RUTACEAE	<i>Boronia subsessilis</i>			x				May-Sep or Jan
	<i>Phebalium tuberculosum</i>						x	Jun-Oct
SANTALACEAE	<i>Choretrum ?glomeratum</i>						x	Feb-May, Jul, Nov-Dec
SAPINDACEAE	<i>Dodonaea bursariifolia</i>			x				Sep-Dec
	<i>Dodonaea caespitosa</i>						x	Feb, Apr-Nov
	<i>Dodonaea humifusa</i>						x	Mar-May
	<i>Dodonaea viscosa</i> subsp. <i>angustissima</i>						x	May-Oct
SOLANACEAE	* <i>Solanum elaeagnifolium</i>				x			Nov-Dec, Jan-Mar
	* <i>Solanum triflorum</i>			x				Mar-May
STYLIDIACEAE	<i>Stylidium neglectum</i>			x				Nov
	<i>Stylidium piliferum</i>						x	Sep-Nov
	<i>Stylidium repens</i>						x	Jan-Dec
	<i>Stylidium zeicolor</i>			x			x	Oct-Nov
TAMARICACEAE	* <i>Tamarix aphylla</i>				x			Feb or May
XANTHORRHOEACEAE	<i>Chamaescilla corymbosa</i>						x	Jul-Dec
	<i>Xanthorrhoea drummondii</i>			x			x	Sep-Nov

**APPENDIX E: LIKELIHOOD OF CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE JINKAS DATATINE SURVEY AREA**

**Note:** SCC denotes State Conservation Code (Department of Biodiversity, Conservation and Attractions 2019d) and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt, ESP – Esperance Plains, GES – Geraldton Sandplains, JAF – Jarrah Forest, MAL – Mallee, SWA – Swan Coastal Plain. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.1 for ranking criteria). Information from Florabase (WAH 1998-), DBCA TPFL and WAH databases (DBCA 2019a).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Adenanthos pungens</i> subsp. <i>effusus</i>	Proteaceae	T	EN	Description: Prostrate shrub to 1.5 m Habitat: Upper slopes of salt lake depressions, seasonally inundated swales. Flower colour: Pink Flowering period: Apr-Nov Soils: White siliceous sands. IBRA Distribution: AVW, JAF Florabase records: 30	Medium: Survey area contains suitable habitat Nearest locations are ~50 km W of the survey area on sand in shrubland/heathland (FB: 2016-2000).
<i>Banksia oligantha</i>	Proteaceae	T	EN	Description: Shrub to 3.5 m Habitat: Sand dunes and flats, ephemeral salt creek systems. Flower colour: Red-cream-yellow Flowering period: Oct-Nov Soils: White, yellow or brown sand over laterite. IBRA Distribution: AVW, JAF Florabase records: 16	Medium: Survey area contains suitable habitat. Nearest locations are ~50 km W of the survey area on sandy flats in Banksia woodland (FB: 2007, 2003).
<i>Darwinia oxylepis</i>	Myrtaceae	T	EN	Description: Erect, dense shrub to 1.5 m Habitat: Gullies, steep lower slopes. Flower colour: Dark red Flowering period: Aug-Nov Soils: Sandy loam, rocky soils, colluvium, peat sands. IBRA Distribution: ESP (small area in western Stirling Ranges) Florabase records: 29	Low: Area contains no suitable habitat. Nearest populations in the western Stirling Ranges, ~ 85 km S of the survey area.
<i>Darwinia wittwerorum</i>	Myrtaceae	T	EN	Description: Erect, single-stemmed shrub to 1 m Habitat: Hill tops, steep slopes, gullies, roadsides. Flower colour: Green, white, pink Flowering period: Sep-Dec Soils: Yellow clay loam, sandy clay, rocky soils. IBRA Distribution: ESP (small area in western Stirling Ranges) Florabase records: 29	Low: Some potentially suitable habitat (roadsides). Nearest populations in the western Stirling Ranges, ~ 85 km S of the survey area.
<i>Diuris purdiei</i>	Orchidaceae	T	EN	Description: Tuberos, perennial herb to 0.35 m Habitat: Winter-wet swamps, burnt wet areas in Jarrah/Marri forest Flower colour: Yellow-brown Flowering period: Sep-Oct Soils: Grey-black sand IBRA Distribution: JAF, SWA (Perth metropolitan) Florabase records: 24	Low: Survey area contains no suitable habitat (rocky hillslopes). All populations are in Perth metro area, nearest ~ 200 km NW of the survey area.

**APPENDIX E: LIKELIHOOD OF CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE JINKAS DATATINE SURVEY AREA**

**Note:** SCC denotes State Conservation Code (Department of Biodiversity, Conservation and Attractions 2019d) and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt, ESP – Esperance Plains, GES – Geraldton Sandplains, JAF – Jarrah Forest, MAL – Mallee, SWA – Swan Coastal Plain. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.1 for ranking criteria). Information from Florabase (WAH 1998-), DBCA TPFL and WAH databases (DBCA 2019a).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Roycea pycnophylloides</i>	Chenopodiaceae	T	EN	Description: Tuberos, perennial herb in mats to 1 m wide Habitat: Saline flats Flower colour: Orange red stamens, maroon styles (dioecious) Flowering period: Sep-Apr Soils: Gritty sand, gypsum. IBRA Distribution: AVW, MAL Florabase records: 58	Medium: Survey area contains suitable habitat. Nearest location is ~40 km E of the survey area on saline flats around a salt lake on sand with chenopod shrubland (FB: 2000).
<i>Adenanthos pungens</i> subsp. <i>pungens</i>	Proteaceae	T	VU	Description: Erect shrub to 3 m Habitat: Sand dunes, hillsides. Flower colour: Pink/red Flowering period: Aug to Nov Soils: White/grey or pink sand, rocky soils, gypsum. IBRA Distribution: AVW, ESP, MAL Florabase records: 31	Medium: Survey area contains suitable habitat. Nearest locations are ~40 km E of the survey area around a salt lake on sand/sandy loam in tall shrubland (FB: 2016, 2014).
<i>Acacia trinalis</i>	Fabaceae	P1	-	Description: Bushy shrub to 4 m Habitat: Salt lakes and flats, seasonally and perennially inundated areas. Flower colour: Yellow Flowering period: September Soils: Brown sand, clay loam. IBRA Distribution: AVW, MAL Florabase records: 18	High: Survey area contains suitable habitat. Nearest location is in the survey area (E70/2928) (FB-1992) and next nearest ~25 km NE of the survey area on flats in sandy soil with shrubland/heath (FB: 2004).
<i>Banksia meganotia</i>	Proteaceae	P3	-	Description: Straggly or erect prickly shrub to 1 m Habitat: Gentle slopes with shrubland/heath. Flower colour: Yellow Flowering period: October Soils: Sand, sandy loam or clay loam over laterite. IBRA Distribution: AVW, ESP, MAL Florabase records: 38	Medium: Survey area contains suitable habitat. Nearest two locations are both ~7 km E of the survey area on a low plain with sand/sandy loam and low woodland/mallee heath (FB-1994, 1993).
<i>Calectasia obtusa</i>	Dasypogonaceae	P3	-	Description: Erect low herb to 0.4 m high, with aerial roots Habitat: Flats. Flower colour: Blue Flowering period: August to September Soils: Sand, clay loam, gravel, laterite. IBRA Distribution: AVW, ESP, JAF, MAL Florabase records: 20	Medium: Survey area contains suitable habitat. Nearest location ~2 km E of survey area (FB: 1966) and ~35 km S of survey area in clay loam.

**APPENDIX E: LIKELIHOOD OF CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE JINKAS DATATINE SURVEY AREA**

**Note:** SCC denotes State Conservation Code (Department of Biodiversity, Conservation and Attractions 2019d) and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt, ESP – Esperance Plains, GES – Geraldton Sandplains, JAF – Jarrah Forest, MAL – Mallee, SWA – Swan Coastal Plain. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.1 for ranking criteria). Information from Florabase (WAH 1998-), DBCA TPFL and WAH databases (DBCA 2019a).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Grevillea newbeyi</i>	Proteaceae	P3	-	Description: Bushy, intricately branched shrub to 1.5 m Habitat: Gentle slopes, plains in mallee woodland/shrubland and heath. Flower colour: Pink/Pink-red-cream Flowering period: Jun-Nov Soils: Clay loam, sandy gravelly soils. IBRA Distribution: AVW, MAL Florabase records: 35	Medium: Survey area contains suitable habitat. Nearest locations are ~15 km E of the survey area on a gentle slope with old disturbance in open mallee shrub (FB: 2006) and ~18 km N of the survey area on a plain in sand with mallee woodland (FB: 1993).
<i>Verticordia brevifolia</i> subsp. <i>brevifolia</i>	Myrtaceae	P3	-	Description: Compact, dense shrub to 0.4 m Habitat: Disturbed area, roadsides. Well-drained areas in full sun. Flower colour: Yellow-orange Flowering period: Oct-Nov Soils: Brown-red gravelly loam, clay. IBRA Distribution: AVW, JAF, MAL Florabase records: 19	Medium: Survey area contains suitable habitat. Nearest locations are ~7 km E of the survey area on an upper slope in loam/gravel with heath/grassland (FB: 1997), and ~14 and ~18 km E of the survey area in loamy clay with open mallee (both FB: 1999).
<i>Verticordia huegelii</i> var. <i>tridens</i>	Myrtaceae	P3	-	Description: Slender, woody shrub to 0.6 m Habitat: Seasonally inundated swamps Flower colour: Green-yellow/red Flowering period: Sep-Nov Soils: Sand or gravelly loam. IBRA Distribution: AVW, ESP, JAF, SWA Florabase records: 32	Medium: Survey area contains suitable habitat. Nearest location is ~ 7 km W of the survey area on a road verge in gravelly loam in scrub (FB: 1984).
<i>Acacia grisea</i>	Fabaceae	P4	-	Description: Spreading or compact shrub to 0.6 m Habitat: Undulating plains, slopes. Flower colour: Yellow Flowering period: Jun-Aug Soils: Lateritic gravelly loamy soils. IBRA Distribution: AVW, ESP, JAF, MAL Florabase records: 29	High: Survey area contains suitable habitat. Nearest locations are one on the S boundary of the survey area on a gently undulating plain in loamy/sandy clay with E. wandoo (FB: 1986), and one ~2 km E of the survey area on a slope in disturbed low heath on gravelly loam (FB: 1992).
<i>Banksia parva</i>	Proteaceae	P4	-	Description: Upright shrub to 1.5 m Habitat: Gentle lower slopes, flats in shrubland/heath. Flower colour: Yellow Flowering period: Jun-Jul Soils: Grey sand, sandy loam, gravelly clay loam. IBRA Distribution: AVW, ESP, JAF, MAL Florabase records: 21	Medium: Survey area contains suitable habitat. Nearest location ~30 km E of the survey area on SE slope in sandy loam with low mallee woodland (FB: 2000).

**APPENDIX E: LIKELIHOOD OF CONSERVATION SIGNIFICANT PLANT SPECIES POTENTIALLY OCCURRING WITHIN THE JINKAS DATATINE SURVEY AREA**

**Note:** SCC denotes State Conservation Code (Department of Biodiversity, Conservation and Attractions 2019d) and FCC denotes Federal Conservation Code (*EPBC Act*) (refer to Appendix A for definitions). IBRA Distribution: AVW – Avon Wheatbelt, ESP – Esperance Plains, GES – Geraldton Sandplains, JAF – Jarrah Forest, MAL – Mallee, SWA – Swan Coastal Plain. Ranking of Likelihood of occurrence in survey area is on a Low, Medium or High scale (see Section 3.1 for ranking criteria). Information from Florabase (WAH 1998-), DBCA TPFL and WAH databases (DBCA 2019a).

Species	Family	SCC	FCC	Description and Habitat	Likelihood of Occurrence
<i>Bossiaea divaricata</i>	Fabaceae	P4	-	Description: Erect, spindly shrub to 0.6 m Habitat: Upland flats and gentle upper slopes Flower colour: Yellow-brown-red Flowering period: Sep Soils: Sandy lateritic soil. IBRA Distribution: AVW, ESP, MAL Florabase records: 25	High: Survey area contains suitable habitat. One location ~15 km NW of survey area (FB: 1991), one ~15 km N of the survey area in a salty drainage channel (FB: 1992) and one on NW boundary of the survey area (FB: 1992) on a slope in open mallee scrub.
<i>Eucalyptus loxophleba x wandoo</i>	Myrtaceae	P4	-	Description: (Mallee) or tree, 4-20 m, bark rough black-brown on trunk Habitat: Drainage lines, flats and gentle slopes. Flower colour: N/A Flowering period: Nov Soils: Sandy clay or loam IBRA Distribution: AVW, GES, JAF Florabase records: 14	High: Survey area contains suitable habitat. One location (FB: 1993) inside survey area (in E70/2928) on a gently undulating mid-upper slope with red-brown loam, associated with <i>E. salmonophloia</i> and <i>E. loxophleba</i> .



**APPENDIX F: LOCATION OF SITES IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

Datum is GDA94. UTM zone is 50H. \*sites from Mattiske (2018).

SITE	EASTING	NORTHING
2-01	584761	6287388
2-02	585027	6287238
2-03	585058	6287030
2-04	585053	6286775
2-05	584992	6286677
3-01	584273	6287535
3-02	584084	6287629
3-03	584140	6287589
4-01	584482	6288302
4-02	584598	6288192
4-03	584380	6288211
5-01	582890	6289246
5-02	583248	6289176
5-03	583470	6289193
5-04	583656	6288984
5-05	583764	6288808
5-06	584046	6288765
5-07	583872	6288466
5-08	583929	6288232
6-01	583371	6288598
6-02	583359	6288798
6-03	583679	6288230
6-04	583734	6287754
7-01	583326	6287656
7-02	583165	6288033
7-03	583098	6288119
7-04	583005	6288328
7-05	582965	6288518
7-06	582907	6288648
8-01	582239	6288779
8-02	582277	6288950
8-03	582392	6289007
8-04	582305	6288791
8-05	582481	6288845
8-06	582548	6288956
8-07	582632	6288888
8-08	582722	6288962
8-09	582752	6288898
8-10	582781	6289153
8-11	582749	6289117
8-12	582607	6289160
8-14	582587	6289280
8-13	582545	6289263
8-15	582730	6289222
9-01	583053	6290412
9-02	583108	6290343
9-03	583159	6290203
9-04	583236	6290190
9-05	583275	6290116
9-06	583192	6289947

SITE	EASTING	NORTHING
10-01	580935	6295154
11-01	581221	6295544
12-01	582474	6289497
13-01	580513	6295591
13-02	580628	6295353
KT004*	584375	6288269
KT005*	584408	6288360

**APPENDIX G: VASCULAR PLANT SPECIES RECORDED BY SURVEY SITE IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	SITE																										
		2-01	2-02	2-03	2-04	3-01	3-02	3-03	4-01	4-02	5-01	5-02	5-03	5-04	5-05	5-06	5-07	5-08	6-01	6-02	6-03	6-04	7-01	7-02	7-03	7-04	7-05	7-06
AIZOACEAE	* <i>Mesembryanthemum nodiflorum</i>					x																						
AMARANTHACEAE	<i>Ptilotus manglesii</i> <i>Ptilotus polystachyus</i>	x						x																				
ASPARAGACEAE	<i>Lomandra mucronata</i> <i>Lomandra</i> sp.				x			x		x																		
ASTERACEAE	* <i>Arctotheca calendula</i> <i>Gnephosis drummondii</i> * <i>Hypochaeris glabra</i> * <i>Hypochaeris radicata</i> <i>Podolepis capillaris</i> <i>Podolepis lessonii</i> <i>Podotheca</i> sp. <i>Rhodanthe manglesii</i> * <i>Sonchus oleraceus</i> * <i>Ursinia anthemoides</i> <i>Vittadinia gracilis</i> <i>Waitzia acuminata</i> var. <i>acuminata</i>	x	x	x					x													x						
BRASSICACEAE	* <i>Lepidium africanum</i> * <i>Raphanus raphanistrum</i> * <i>Petrorhagia dubia</i> <i>Spergularia marina</i>	x	x	x	x																x							
CASUARINACEAE	<i>Allocasuarina campestris</i> <i>Allocasuarina huegeliana</i> <i>Allocasuarina</i> sp. <i>Casuarina obesa</i>				x			x		x									x	x								
CHENOPODIACEAE	<i>Atriplex</i> sp. <i>Enchylaena tomentosa</i> var. <i>tomentosa</i> <i>Maireana brevifolia</i> <i>Tecticornia</i> sp.							x		x													x	x	x			

**APPENDIX G: VASCULAR PLANT SPECIES RECORDED BY SURVEY SITE IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	SITE																										
		8-01	8-02	8-03	8-04	8-05	8-06	8-07	8-08	8-09	8-10	8-11	8-12	8-13	8-14	8-15	9-01	9-02	9-03	9-04	9-05	9-06	10-01	11-01	12-01	13-01	13-02	KT004
AIZOACEAE	* <i>Mesembryanthemum nodiflorum</i>																											
AMARANTHACEAE	<i>Ptilotus manglesii</i>																	x										
	<i>Ptilotus polystachyus</i>																										x	
ASPARAGACEAE	<i>Lomandra mucronata</i>																	x										
	<i>Lomandra sp.</i>																		x	x		x						
ASTERACEAE	* <i>Arctotheca calendula</i>																											
	<i>Gnephosis drummondii</i>			x																								
	* <i>Hypochoeris glabra</i>	x																										
	* <i>Hypochoeris radicata</i>																											
	<i>Podolepis capillaris</i>																			x	x							
	<i>Podolepis lessonii</i>																											x
	<i>Podotheca sp.</i>																									x		
	<i>Rhodanthe manglesii</i>																											
	* <i>Sonchus oleraceus</i>																											
	* <i>Ursinia anthemoides</i>	x	x		x	x	x	x	x	x			x	x		x	x		x	x						x		
	<i>Vittadinia gracilis</i>																											
	<i>Waitzia acuminata</i> var. <i>acuminata</i>	x	x	x	x	x	x	x					x															
BRASSICACEAE	* <i>Lepidium africanum</i>																											
	* <i>Raphanus raphanistrum</i>																											
	* <i>Petrohragia dubia</i>																											
	<i>Spergularia marina</i>																											
CASUARINACEAE	<i>Allocasuarina campestris</i>	x		x																								
	<i>Allocasuarina huegeliana</i>		x		x	x		x		x			x															x
	<i>Allocasuarina sp.</i>																											
	<i>Casuarina obesa</i>																											
CHENOPODIACEAE	<i>Atriplex sp.</i>								x	x	x		x	x		x		x	x		x	x			x	x		
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>																		x									
	<i>Maireana brevifolia</i>										x	x								x								
	<i>Tecticornia sp.</i>																				x							







**APPENDIX G: VASCULAR PLANT SPECIES RECORDED BY SURVEY SITE IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	SITE																											
		8-01	8-02	8-03	8-04	8-05	8-06	8-07	8-08	8-09	8-10	8-11	8-12	8-13	8-14	8-15	9-01	9-02	9-03	9-04	9-05	9-06	10-01	11-01	12-01	13-01	13-02	KT004	KT005
MYRTACEAE (continued)	* <i>Eucalyptus camaldulensis</i>																						X	X					
	<i>Eucalyptus celastroides</i> subsp. <i>virella</i>																												
	<i>Eucalyptus dorrienii</i>																												
	<i>Eucalyptus gardneri</i> subsp. <i>gardneri</i>																												X
	<i>Eucalyptus ?longicornis</i>																			X	X								
	<i>Eucalyptus loxophleba</i>	X	X	X		X		X	X	X	X	X	X	X	X	X							X		X				
	<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i>																						X						
	<i>Eucalyptus occidentalis</i>																X				X								
	<i>Eucalyptus ?pluricaulis</i>																				X								
	<i>Eucalyptus salmonophloia</i>																X		X			X	X	X				X	
	<i>Eucalyptus salubris</i>																	X				X							
	<i>Eucalyptus ?sargentii</i> subsp. <i>sargentii</i>																	X											
	<i>Eucalyptus spathulata</i>																		X								X		
	<i>Eucalyptus thamnoides</i> ?subsp. <i>megista</i>																												
	<i>Eucalyptus uncinata</i>																	X											
	* <i>Eucalyptus ?utilis</i>																												
	<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>																X		X	X	X	X	X	X	X		X	X	
	<i>Eucalyptus</i> sp.																						X	X			X	X	
	<i>Hypocalymma ?puniceum</i>																												
	<i>Leptospermum oligandrum</i>																												
	<i>Melaleuca brophyi</i>					X																							
<i>Melaleuca scalena</i>																													
ONAGRACEAE	* <i>Oenothera stricta</i>																												
ORCHIDACEAE	* <i>Disa bracteata</i>			X																									
OXALIDACEAE	* <i>Oxalis corniculata</i>																												
PINACEAE	* <i>Pinus</i> sp.																												
PITTOSPORACEAE	<i>Billardiera fusiformis</i>																			X									
POACEAE	* <i>Aira caryophyllea</i>		X				X			X					X				X				X			X	X	X	
	<i>Austrostipa elegantissima</i>					X	X	X	X			X			X	X	X	X	X	X	X	X	X		X	X	X	X	







**APPENDIX H: VASCULAR PLANT SPECIES RECORDED BY VEGETATION COMMUNITY  
IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	VEGETATION COMMUNITY								
		S1	S3	S4	W6	W8	W9	W10	W11	W12
AIZOACEAE	* <i>Mesembryanthemum nodiflorum</i>				X					
AMARANTHACEAE	<i>Ptilotus manglesii</i>							X		
	<i>Ptilotus polystachyus</i>						X	X		
ASPARAGACEAE	<i>Lomandra mucronata</i>							X		
	<i>Lomandra</i> sp.				X		X	X		
ASTERACEAE	* <i>Arctotheca calendula</i>	X					X	X		
	<i>Gnephosis drummondii</i>			X						
	* <i>Hypochaeris glabra</i>		X							
	* <i>Hypochaeris radicata</i>		X					X		
	<i>Podolepis capillaris</i>							X		
	<i>Podolepis lessonii</i>				X					
	<i>Podotrochea</i> sp.							X		
	<i>Rhodanthe manglesii</i>		X						X	
	* <i>Sonchus oleraceus</i>		X				X			
	* <i>Ursinia anthemoides</i>	X	X		X			X		X
	<i>Vittadinia gracilis</i>				X			X		
	<i>Waitzia acuminata</i> var. <i>acuminata</i>		X	X						
BRASSICACEAE	* <i>Lepidium africanum</i>		X							
	* <i>Raphanus raphanistrum</i>	X					X	X		
	* <i>Petrorhagia dubia</i>	X					X			
	<i>Spergularia marina</i>								X	
CASUARINACEAE	<i>Allocasuarina campestris</i>							X		
	<i>Allocasuarina huegeliana</i>		X	X	X					
	<i>Allocasuarina</i> sp.		X		X	X				
	<i>Casuarina obesa</i>								X	
CHENOPODIACEAE	<i>Atriplex</i> sp.		X			X	X	X	X	X
	<i>Enchylaena tomentosa</i> var. <i>tomentosa</i>		X				X	X		
	<i>Maireana brevifolia</i>		X			X		X		X
	<i>Tecticornia</i> sp.								X	X
COLCHICACEAE	<i>Wurmbea</i> sp.		X	X						
CONVOLVULACEAE	<i>Wilsonia humilis</i>						X			
CRASSULACEAE	<i>Crassula colorata</i>					X				
	<i>Crassula decumbens</i> var. <i>decumbens</i>			X				X		X
CUPRESSACEAE	<i>Callitris roei</i>								X	
CYPERACEAE	<i>Lepidosperma apricola</i> sens. lat.	X					X	X		
	<i>Lepidosperma humile</i>				X					
	<i>Schoenus</i> sp.		X							
FABACEAE	<i>Acacia acuminata</i>	X	X	X	X	X	X	X		X
	<i>Acacia deficiens</i>							X		
	<i>Acacia erinacea</i>				X	X		X		
	<i>Acacia saligna</i>	X	X					X		
	<i>Bossiaea eriocarpa</i>							X		
	<i>Daviesia angulata</i>					X				
	<i>Gastrolobium tricuspdatum</i>	X								
	<i>Gastrolobium trilobum</i>				X	X		X		
	<i>Jacksonia sternbergiana</i>							X		
	* <i>Medicago</i> sp.						X	X		
	* <i>Trifolium angustifolium</i>	X	X							X
FRANKENIACEAE	* <i>Frankenia pulverulenta</i>					X				X

**APPENDIX H: VASCULAR PLANT SPECIES RECORDED BY VEGETATION COMMUNITY  
IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	VEGETATION COMMUNITY								
		S1	S3	S4	W6	W8	W9	W10	W11	W12
GERANIACEAE	* <i>Erodium botrys</i>		X							
HEMEROCALLIDACEAE	<i>Dianella revoluta</i>				X			X		
	<i>Stypandra glauca</i>			X						
MYRTACEAE	<i>Beaufortia incana</i>	X								
	<i>Eucalyptus astringens</i>				X			X		
	<i>Eucalyptus ?astringens</i> subsp. <i>astringens</i>					X				
	<i>Eucalyptus camaldulensis</i>								X	
	<i>Eucalyptus celastroides</i> subsp. <i>virella</i>						X			
	<i>Eucalyptus dorrienii</i>	X					X	X		
	<i>Eucalyptus gardneri</i> subsp. <i>gardneri</i>					X				
	<i>Eucalyptus ?longicornis</i>				X	X		X		
	<i>Eucalyptus loxophleba</i>		X	X			X		X	X
	<i>Eucalyptus loxophleba</i> subsp. <i>loxophleba</i>								X	
	<i>Eucalyptus occidentalis</i>							X		
	<i>Eucalyptus ?pluricaulis</i>							X		
	<i>Eucalyptus salmonophloia</i>						X	X		
	<i>Eucalyptus salubris</i>						X			
	<i>Eucalyptus ?sargentii</i> subsp. <i>sargentii</i>		X						X	
	<i>Eucalyptus spathulata</i>						X	X	X	
	<i>Eucalyptus thamnoides</i> ?subsp. <i>megista</i>							X		
	<i>Eucalyptus uncinata</i>	X					X		X	
	<i>Eucalyptus ?utilis</i>						X		X	
	<i>Eucalyptus wandoo</i> subsp. <i>wandoo</i>	X			X		X	X	X	
	<i>Eucalyptus</i> sp.						X	X		
<i>Hypocalymma ?puniceum</i>				X						
<i>Leptospermum oligandrum</i>	X									
<i>Melaleuca brophyi</i>		X								
<i>Melaleuca scalena</i>	X			X				X		
ONAGRACEAE	* <i>Oenothera stricta</i>						X			
ORCHIDACEAE	* <i>Disa bracteata</i>			X						
OXALIDACEAE	* <i>Oxalis corniculata</i>		X							
PINACEAE	* <i>Pinus</i> sp.								X	
PITTOSPORACEAE	<i>Billardiera fusiformis</i>							X		
POACEAE	* <i>Aira caryophyllea</i>	X	X	X		X	X	X		
	<i>Austrostipa elegantissima</i>	X	X		X		X	X		
	<i>Austrostipa hemipogon</i>	X			X	X	X	X		
	<i>Austrostipa macalpinei</i>						X	X		
	<i>Austrostipa variabilis</i>	X	X	X	X		X	X		X
	* <i>Avena barbata</i>	X	X		X	X	X	X	X	
	* <i>Briza maxima</i>		X	X						
	* <i>Bromus diandrus</i>		X		X	X	X	X	X	
	* <i>Diplachne fusca</i>								X	X
	* <i>Ehrharta longiflora</i>	X	X	X	X	X	X	X	X	X
	* <i>Hordeum marinum</i>					X	X		X	X
	* <i>Lolium perenne</i>	X	X			X	X	X	X	X
	<i>Neurachne alopecuroidea</i>	X	X	X	X		X	X		X
	<i>Rytidosperma caespitosum</i>					X				
	<i>Rytidosperma setaceum</i>		X		X	X	X	X		X
	* <i>Vulpia muralis</i>		X	X			X	X		X
PROTEACEAE	<i>Banksia armata</i> var. <i>armata</i>	X								
	<i>Petrophile glauca</i>	X								
PTERIDACEAE	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>			X						

**APPENDIX H: VASCULAR PLANT SPECIES RECORDED BY VEGETATION COMMUNITY  
IN THE JINKAS-DATATINE SURVEY AREAS, 2019**

\* denotes introduced species. Survey sites are grouped by vegetation patch.

FAMILY	SPECIES	VEGETATION COMMUNITY								
		S1	S3	S4	W6	W8	W9	W10	W11	W12
RESTIONACEAE	<i>Desmodadus flexuosus</i>							x		
XANTHORRHOEACEAE	<i>Xanthorrhoea drummondii</i>	x								
ZYGOPHYLLACEAE	<i>Roepera</i> sp.							x		

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** S1

**Structural:**

Mid heathland of *Banksia armata* var. *armata*, *Leptospermum oligandrum* and *Beaufortia incana* with emergent isolated clumps of *Eucalyptus dorrienii* low mallee trees over grassland of *Austrostipa* species and mixed introduced species and sparse forbland of mixed introduced species.

**Associated species:**

*\*Arctotheca calendula*, *Austrostipa elegantissima*, *Austrostipa hemipogon*, *Austrostipa variabilis*, *\*Avena barbata*, *\*Ehrharta longiflora*, *Eucalyptus uncinata*, *Gastrolobium tricuspdatum*, *Neurachne alopecuroidea*, *\*Raphanus raphanistrum*, *\*Ursinia anthemoides*.

**Soils and Landforms:** Gravelly and sandy soils on breakaways.

**Outcropping:** Moderate amounts of laterite.

**Condition:** Degraded. Last fire 2-5 years.

**Area:** 1.7 ha

**Proportion of survey area:** 1.7 %

**Number of Sites:** 2

**Species richness:** 17.5 ± 1.5 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 2-02**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** S3

**Structural**

Tall shrubland of *Acacia acuminata* with occasional emergent low *Eucalyptus loxophleba* and *Allocasuarina* species trees over low grassland of *\*Avena barbata*, *\*Bromus diandrus*, *\*Ehrharta longiflora*, *\*Vulpia muralis* and *Austrostipa spp.* with low isolated clumps of *\*Ursinia anthemoides* and *Waitzia acuminata* var. *acuminata* forbs and occasional chenopod shrubs.

**Associated species**

*Allocasuarina huegeliana*, *Atriplex sp.*, *Austrostipa variabilis*, *Neurachne alopecuroidea*.

**Soils and Landforms:** Cream-caramel-red-brown sandy, loamy and clay soils on mid slopes and ridges.

**Outcropping:** Occasional granite outcrops.

**Condition:** (Completely Degraded-) Degraded (-Good). Last fire 6-10 years.

**Area:** 32.0 ha

**Proportion of survey area:** 31.9%

**Number of Quadrats:** 15

**Species richness:** 9.3 ± 0.6 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 8-01**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** S4

**Structural**

Lithic complex including tall open shrubland of *Acacia acuminata* over low grassland of mixed introduced species and *Austrostipa variabilis* with low open forbland of *Waitzia acuminata* var. *acuminata*, *Crassula decumbens* var. *decumbens* and *Gnephosis drummondii*.

**Associated species**

*Allocasuarina hegeliana*, *Eucalyptus loxophleba*, *Stypandra glauca*, *\*Disa bracteata*, *Cheilanthes sieberi* subsp. *sieberi* and *Xanthoparmelia* sp.

**Soils and Landforms:** Sandy loams on the edges of granite outcrops.

**Outcropping:** Granite outcrops.

**Condition:** Degraded.

**Area:** 1.4 ha

**Proportion of survey area:** 1.4 %

**Number of Quadrats:** 1

**Species richness:** 16

**REPRESENTATIVE PHOTOGRAPH**



**Site 8-03**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W6

**Structural**

Woodland of *Allocasuarina huegeliana* over isolated clumps of tall *Acacia acuminata* shrubs over grassland of *Austrostipa elegantissima*, *Austrostipa hemipogon* and mixed introduced species and isolated low mixed shrubs.

**Associated species**

*Dianella revoluta*, \**Ehrharta longiflora*, *Lomandra sp.*, *Neurachne alopecuroidea*.

**Soils and Landforms:** Sandy, loamy and clay soils on mid and upper slopes.

**Outcropping:** Rare laterite outcrops.

**Condition:** Degraded. Last fire 6-10 years.

**Area:** 3.4 ha

**Proportion of survey area:** 3.4 %

**Number of Quadrats:** 3

**Species richness:** 11.7 ± 2.7 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 4-01**



**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W8

**Structural**

Low Woodland of *Eucalyptus* species trees over sparse mid shrubland of *Maireana brevifolia* and *Gastrolobium trilobum* over open low grassland of *\*Ehrharta longiflora*, *\*Bromus diandrus* and *\*Lolium perenne* with low chenopod shrubs and forbs.

**Associated species**

*Atriplex sp.*, *Eucalyptus ?astringens subsp. astringens*, *Eucalyptus gardneri subsp. gardneri*, *Eucalyptus ?longicornis*.

**Soils and Landforms:** Brown sandy, loamy and gravelly soils on mid and upper slopes.

**Outcropping:** Occasional outcrops of laterite or granite.

**Condition:** Degraded. Last fire 6-10 years.

**Area:** 3.7 ha

**Proportion of survey area:** 3.7 %

**Number of Quadrats:** 3

**Species richness:** 9.0 ± 1.2 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 4-02**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W9

**Structural**

Mid mallee woodland of mixed *Eucalyptus* species with isolated clumps of *Eucalyptus* species trees over open grassland of *Austrostipa* species, *\*Ehrharta longiflora* and other mixed grass species with isolated clumps of low mixed forbs.

**Associated species**

*Austrostipa elegantissima*, *A. hemipogon*, *A. variabilis*, *\*Bromus diandrus*, *Eucalyptus celastroides* subsp. *virella*, *E. dorrienii*, *E. salmonophloia*, *E. salubris*, *E. spathulate*, *E. uncinata*, *E. ?utilis*, *E. wandoo*, *\*Lolium perenne*, *Rytidosperma setaceum*.

**Soils and Landforms:** Grey-brown clay loam soils on slopes.

**Outcropping:** Occasional outcrops of granite or laterite.

**Condition:** Degraded. Last fire from 2-20 years.

**Area:** 4.8 ha

**Proportion of survey area:** 4.8 %

**Number of Quadrats:** 4

**Species richness:** 13.8 ± 1.1 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 10-01**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W10

**Structural**

Mid woodland of *Eucalyptus wandoo* and occasional *E. salmonophloia* over open grassland of *\*Bromus diandrus*, *\*Vulpia muralis* and mixed *Austrostipa* species with isolated clumps of low *\*Ursinia anthemoides* and *Lomandra* species forbs.

**Associated species**

*Acacia erinacea*, *Austrostipa elegantissima*, *A. hemipogon*, *A. macalpinei*, *A. variabilis*, *\*Avena barbata*, *\*Ehrharta longiflora*, *\*Lolium perenne*, *Lomandra mucronata*, *Neurachne alopecuroidea*.

**Soils and Landforms:** Grey-caramel clay loam soils on lower and mid slopes.

**Outcropping:** Rare laterite outcrops.

**Condition:** Degraded (-Good). Last fire 2-20 years.

**Area:** 26.9 ha

**Proportion of survey area:** 26.9 %

**Number of Quadrats:** 9

**Species richness:** 15.1 ± 1.3 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 9-04**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W11

**Structural**

Low woodland of *Eucalyptus spathulata*, *Eucalyptus ?sargentii* subsp. *sargentii* and *Casuarina obesa* over low open grassland of *\*Avena barbata*, *\*Bromus diandrus*, *\*Ehrharta longiflora* and *\*Hordeum marinum* with low isolated chenopod forbs. Many trees are planted.

**Associated species**

*Atriplex* sp., *\*?Diplachne fusca*, *Eucalyptus ?utilis*, *E. camaldulensis*, *E. loxophleba*, *Tecticornia* sp.

**Soils and Landforms:** Red-caramel clay loamy soils on minor drainage channels.

**Outcropping:** Absent.

**Condition:** (Completely Degraded -) Degraded.

**Area:** 14.9 ha

**Proportion of survey area:** 14.9 %

**Number of Quadrats:** 13

**Species richness:** 6.4 ± 0.5 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 5-02**

**APPENDIX I: SUMMARY OF VEGETATION COMMUNITIES DEFINED IN THE JINKAS-DATATINE SURVEY AREAS, KATANNING GOLD PROJECT, 2019**

**VEGETATION COMMUNITY DESCRIPTION**

**Vegetation map code:** W12

**Structural**

**Associated species**

Low open woodland of *Eucalyptus loxophleba* over tall isolated *Acacia acuminata* shrubs and mid isolated chenopod shrubs over low grassland of *\*?Diplachne fusca* and *\*Hordeum marinum* and low sparse mixed forbland.

**Soils and Landforms:** Grey sandy and loamy clays with in saline drainage channels.

**Outcropping:** Rare granite outcrops.

**Condition:** Degraded (-Good).

**Area:** 11.5 ha

**Proportion of survey area:** 11.5 %

**Number of Quadrats:** 4

**Species richness:** 8.3 ± 0.8 (s.e.)

**REPRESENTATIVE PHOTOGRAPH**



**Site 8-11**

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E. Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Key Criteria				Contra-indicators			
		Crown cover >10%	Key Eucalypt Species dominant	Associated canopy species not dominant	Native understorey presence	Mallees dominant	Non-Eucalypts dominant	Shrublands or Herblands	Eucalypts restricted to granite & rocky outcrops
<b>Highly Likely a TEC</b>									
9	Was patch JA1 and JA2 in Feb 2019. Five sites (excludes 9-02). Crown cover varies 15-25%. Recorded E. salmon, E. occid, E. wandoo, E. salubris, E. astringens, E. ?longicornis, E. ?loxophleba, E. ?pluricaulis in Nov 2019.	Y	Y	-	<5%	N	N	N	N
13	Two sites. Crown cover 10-15%. E. wandoo, E. salmon recorded in Nov 2019.	Y	Y	-	<5%	N	N	N	N
<b>Potential TEC</b>									
8-13	Crown cover 30%. Recorded E. loxophleba subsp. loxophleba and occasional Acacia acuminata in Nov 2019. Many mallees and immature trees. Surrounds drainage, subpatch at edge of Patch 8 (Acacia acuminata shrubland).	Y	Y	-	<10%	N	N	N	N
12	Was patch L34 in Feb 2019. Strip of vegetation each side (and sometimes within) salty drainage. Planted row on eastern edge in south. Recorded E. loxophleba subsp. loxophleba (~40% mallees). Crown cover ~10% across entire width of patch but greater if consider each side separately. Patch opens out to north, with fewer mature trees.	Y	Y	-	<10%	N	N	N	N

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E.

Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Condition Thresholds					Databases	
		Keighery Condition	Cover (%) of introduced understorey	Mature trees presence	Mature trees density (trees per 0.5 ha)	Patch area (ha)	DBCA TaPEC	Ausgold
<b>Highly Likely a TEC</b>								
9	Was patch JA1 and JA2 in Feb 2019. Five sites (excludes 9-02). Crown cover varies 15-25%. Recorded E. salmon, E. occid, E. wandoo, E. salubris, E. astringens, E. ?longicornis, E. ?loxophleba, E. ?pluricaulis in Nov 2019.	Good	<10 (3 sites) 10-30 (1 site) 51-70 (1 site) >70 (1 site)	Present	5 +	12.2	Y	Y
13	Two sites. Crown cover 10-15%. E. wandoo, E. salmon recorded in Nov 2019.	Degraded	10-30	Present	5 +	10.7	-	-
<b>Potential TEC</b>								
8-13	Crown cover 30%. Recorded E. loxophleba subsp. loxophleba and occasional Acacia acuminata in Nov 2019. Many mallees and immature trees. Surrounds drainage, subpatch at edge of Patch 8 (Acacia acuminata shrubland).	Good	<10	Present	5 +	2.9	Y	Y
12	Was patch L34 in Feb 2019. Strip of vegetation each side (and sometimes within) salty drainage. Planted row on eastern edge in south. Recorded E. loxophleba subsp. loxophleba (~40% mallees). Crown cover ~10% across entire width of patch but greater if consider each side separately. Patch opens out to north, with fewer mature trees.	Degraded	51-70	Present	5 +	5.4	Y	Y

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E. Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Key Criteria				Contra-indicators			
		Crown cover >10%	Key Eucalypt Species dominant	Associated canopy species not dominant	Native understorey presence	Mallees dominant	Non-Eucalypts dominant	Shrublands or Herblands	Eucalypts restricted to granite & rocky outcrops
<b>Not Likely a TEC</b>									
KT004	Crown cover 25%. Key Species <i>E. gardneri</i> subsp. <i>gardneri</i> present in 2017. <i>E. wandoo</i> recorded in Nov 2019. Trees mostly not >30cm DBH but are mallees which do not get this large at maturity. However, given low Intro Understorey Cover then mature trees can be absent.	Y	Y	-	<5%	N	N	N	N
1	Too small. Planted Eucs ( <i>E. platypus</i> - Associated Canopy Species) in short line.	Y	N	N, <i>E. platypus</i>	-	N	N	N	N
2N	Vegetation strip along breakway. Crown cover too low. Northern end less rocky, mallee dominated. Centre rocky, shrub dominated. Recorded <i>E. wandoo</i> , * <i>E. ?utilis</i> , <i>E. dorrieni</i> , <i>E. uncinata</i> in Nov 2019.	N	N	-	10-30% (1 site 51-70%)	Y	N	Y (2 sites - Banksia) N (2 sites)	N
2S	Thin strip of ?planted? Eucs. Crown cover >10%, unlike sites in same strip to North. <i>E. ?wandoo</i> recorded in Nov 2019. Too small an area by itself to make a patch if separate from 2N.	Y	Y	-	10-30%	N	N	N	N
3E	Too small. Triangular patch of mixed Eucs and <i>Allocas</i> trees. Recorded <i>E. wandoo</i> , <i>E. astringens</i> , <i>E. ?longicornis</i> , <i>Allocasuarina huegeliana</i> in Nov 2019. Further from road mallees are dominant.	Y	N	-	<10%	N (western half) Y (eastern half)	Y (western half) N (eastern half)	N	N
3W	Too small. Higher density mallee dominated downslope on the NW side, likely planted. Recorded <i>E. longicornis</i> , <i>E. ?astringens</i> subsp. <i>astringens</i> in Nov 2019. Very open tree dominated on top of the hill (rest of patch), <i>E. wandoo</i> .	Y (downslope site) N (top)	Y both	-	<5%	Y (downslope) N (top)	N	N	N
4N	Too small. Around backside of slope of Jinkas Hill. Non-Eucs ( <i>Casuarinaceae</i> ) dominant.	Y	N	-	10-30%	N	Y	N	N
4S	Too small. Foot of slope backside of Jinkas Hill. Recorded <i>E. longicornis</i> in Nov 2019.	Y	Y	-	<10%	N	N	N	N
5-01	Too small. Drainage east of and connecting to Patch 8. Mallees dominant. Recorded <i>E. loxophleba</i> subsp. <i>loxophleba</i> , <i>E. spathulata</i> , <i>E. ?sargentii</i> subsp. <i>sargentii</i> ) in Nov 2019.	Y	Y	-	N	Y	N	N	N



**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E.

Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Condition Thresholds					Databases	
		Keighery Condition	Cover (%) of introduced understorey	Mature trees presence	Mature trees density (trees per 0.5 ha)	Patch area (ha)	DBCA TaPEC	Ausgold
<b>Not Likely a TEC</b>								
KT004	Crown cover 25%. Key Species <i>E. gardneri</i> subsp. <i>gardneri</i> present in 2017. <i>E. wandoo</i> recorded in Nov 2019. Trees mostly not >30cm DBH but are mallets which do not get this large at maturity. However, given low Intro Understorey Cover then mature trees can be absent.	Degraded - Good	<10	Present	< 5	1.8	Y	?
1	Too small. Planted Eucs ( <i>E. platypus</i> - Associated Canopy Species) in short line.	-	-	-	-	0.3	-	?
2N	Vegetation strip along breakway. Crown cover too low. Northern end less rocky, mallee dominated. Centre rocky, shrub dominated. Recorded <i>E. wandoo</i> , * <i>E. ?utilis</i> , <i>E. dorrienii</i> , <i>E. uncinata</i> in Nov 2019.	Degraded - Good	51-70 (1 site) 10-30 (other 3 sites)	Present	< 5	4.8	Y	?
2S	Thin strip of ?planted? Eucs. Crown cover >10%, unlike sites in same strip to North. <i>E. ?wandoo</i> recorded in Nov 2019. Too small an area by itself to make a patch if separate from 2N.	Degraded	31-50	Present	5 +	0.3	Y	?
3E	Too small. Triangular patch of mixed Eucs and <i>Allocas</i> trees. Recorded <i>E. wandoo</i> , <i>E. astringens</i> , <i>E. ?longicornis</i> , <i>Allocasuarina huegeliana</i> in Nov 2019. Further from road mallees are dominant.	Good	31-50	Present	< 5	1.1	Y	?
3W	Too small. Higher density mallee dominated downslope on the NW side, likely planted. Recorded <i>E. longicornis</i> , <i>E. ?astringens</i> subsp. <i>astringens</i> in Nov 2019. Very open tree dominated on top of the hill (rest of patch), <i>E. wandoo</i> .	Degraded	10-30 (downslope) 31-70 (top)	Absent (downslope) Present (top)	5 + (top)	1.8	Y	?
4N	Too small. Around backside of slope of Jinkas Hill. Non-Eucs ( <i>Casuarinaceae</i> ) dominant.	Degraded	31-50	-	-	1.8	Y	?
4S	Too small. Foot of slope backside of Jinkas Hill. Recorded <i>E. longicornis</i> in Nov 2019.	Degraded	10-30	Present	5 +	0.2	Y	?
5-01	Too small. Drainage east of and connecting to Patch 8. Mallees dominant. Recorded <i>E. loxophleba</i> subsp. <i>loxophleba</i> , <i>E. spathulata</i> , <i>E. ?sargentii</i> subsp. <i>sargentii</i> ) in Nov 2019.	Degraded	31-50	Present	5 +	1.0	Y	Y

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E. Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Key Criteria				Contra-indicators			
		Crown cover >10%	Key Eucalypt Species dominant	Associated canopy species not dominant	Native understorey presence	Mallees dominant	Non-Eucalypts dominant	Shrublands or Herblands	Eucalypts restricted to granite & rocky outcrops
<b>Not Likely a TEC</b>									
5-06	Too small. Thin (~40m) patch of likely planted trees. Introduced species (*E. ?utilis, *E. camaldulensis) dominant and recorded in 2019 along with E. spathulata.	Y	N	-	N	N	N	N	N
5	Long strip of vegetation (width 40-150m) about each side of drainage line, many planted Eucs, some mallees (near-dominant in places). Crown cover just 10% over entire width of strip but up to 50% if consider each side separately. Recorded E. loxophleba subsp. loxophleba, E. spathulata, * E. camaldulensis in Nov 2019.	Y	Y at 5-02, 5-04, 5-05 (but N at 5-03 and 5-07)	-	N	N	N	N	N
6N	Hilltop patch with some outcropping granite. Sparse Acacia shrubland.	N	N	-	<5%	N	Y	Y	N
6-03	Too small. No native understorey. Hilltop patch with some outcropping granite. Recorded E. loxophleba subsp. loxophleba and E. ?sargentii subsp. sargentii in Nov 2019.	Y	Y	-	N	-	N	N	N
6-04	Too small. No native understorey. Hilltop patch with some outcropping granite. Recorded E. loxophleba subsp. loxophleba and E. ?sargentii subsp. sargentii in Nov 2019. Sparse Acacia shrubland.	Y	Y	-	N	-	N	Y	N
7	Long narrow strip of vegetation along each side of drainage line. Crown cover <10-15%, mallees or non-Eucs (Casuarinaceae, Callitris sp.) dominant. Planted. Recorded E. wandoo, E. ?sargentii subsp. sargentii, E. spathulata in Nov 2019.	Y	Y (3 sites), N (3 sites: 7-01, -04, -05)	-	<5%	N	Y (half the sites: 7-01, -04, -05)	N	N
8	Was patch L33 in Feb 2019. Acacia acuminata shrubland with occasional small internal stands or patches of Eucalypt (tree) dominated woodland. Recorded E. loxophleba in Nov 2019 but rarely dominant or enough mature trees.	Y	N	-	<10%	N	Y	Y	N
9-02	Sub patch within patch 9 (Jackson). Too small. Mallees dominant. Recorded E. uncinata (mallee), E. salubris and E. spathulata in Nov 2019.	Y	N	-	10-30%	Y	N	N	N

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E.

Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Condition Thresholds					Databases	
		Keighery Condition	Cover (%) of introduced understorey	Mature trees presence	Mature trees density (trees per 0.5 ha)	Patch area (ha)	DBCA TaPEC	Ausgold
<b>Not Likely a TEC</b>								
5-06	Too small. Thin (~40m) patch of likely planted trees. Introduced species (*E. ?utilis, *E. camaldulensis) dominant and recorded in 2019 along with E. spathulata.	Degraded	<10	-	-	0.7	Y	N
5	Long strip of vegetation (width 40-150m) about each side of drainage line, many planted Eucs, some mallees (near-dominant in places). Crown cover just 10% over entire width of strip but up to 50% if consider each side separately. Recorded E. loxophleba subsp. loxophleba, E. spathulata,* E. camaldulensis in Nov 2019.	Completely Degraded-Degraded	< 10 (2 sites), 10-30 (3sites)	Present (2 sites) Absent (4 sites)	< 5	4.8	Part	Part
6N	Hilltop patch with some outcropping granite. Sparse Acacia shrubland.	Degraded	10-30	Absent	-	6.1	Y	Y
6-03	Too small. No native understorey. Hilltop patch with some outcropping granite. Recorded E. loxophleba subsp. loxophleba and E. ?sargentii subsp. sargentii in Nov 2019.	Completely Degraded	31-50	-	-	1.7	-	-
6-04	Too small. No native understorey. Hilltop patch with some outcropping granite. Recorded E. loxophleba subsp. loxophleba and E. ?sargentii subsp. sargentii in Nov 2019. Sparse Acacia shrubland.	Completely Degraded	>70	Present	< 5	1.4	-	-
7	Long narrow strip of vegetation along each side of drainage line. Crown cover <10-15%, mallees or non-Eucs (Casuarinaceae, Callitris sp.) dominant. Planted. Recorded E. wandoo, E. ?sargentii subsp. sargentii, E. spathulata in Nov 2019.	Completely Degraded - Degraded	Mostly 10-30	Absent (2 sites) Present (4 sites)	< 5	7.8	-	-
8	Was patch L33 in Feb 2019. Acacia acuminata shrubland with occasional small internal stands or patches of Eucalypt (tree) dominated woodland. Recorded E. loxophleba in Nov 2019 but rarely dominant or enough mature trees.	Degraded-Good	Mostly 10-30	Absent (except 2 sites)	N/A (except 2 sites < 5)	24.1	Y	Y
9-02	Sub patch within patch 9 (Jackson). Too small. Mallees dominant. Recorded E.uncinata (mallee), E.salubris and E. spathulata in Nov 2019.	Good	<10	Present	5 +	1.2	Y	Y

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E. Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Key Criteria				Contra-indicators			
		Crown cover >10%	Key Eucalypt Species dominant	Associated canopy species not dominant	Native understorey presence	Mallees dominant	Non-Eucalypts dominant	Shrublands or Herblands	Eucalypts restricted to granite & rocky outcrops
<b>Not Likely a TEC</b>									
10	Too small. Mallees dominant. Too few mature trees. Very small patch of mature E. wandoo and E. salmon at east end. Recorded E. wandoo, E. salmon, E. salubris, E. celastroides subsp. virella, E. ?loxophleba in Nov 2019.	Y	N	Y (E. celastroides subsp. virella)	10-30%	Y	N	N	N
11	Too small. Mallees dominant. No mature trees. Recorded E. salmon, E. celastroides subsp. virella in Nov 2019.	Y	N	Y (E. celastroides subsp. virella)	<10%	Y	N	N	N

**APPENDIX J: DRAFT LIKELIHOOD OF A REMNANT VEGETATION PATCH BEING PART OF THE "Eucalypt Woodlands of the Western Australian Wheatbelt" TEC**

Likelihood is based on TEC Criteria as listed in Appendix D. Key Eucalypt Species are listed in Appendix E.

Cells highlighted orange indicate factors that may not meet criteria; those in red definitely do not meet criteria.

Patch Number	TEC likelihood comments	Condition Thresholds					Databases	
		Keighery Condition	Cover (%) of introduced understorey	Mature trees presence	Mature trees density (trees per 0.5 ha)	Patch area (ha)	DBCA TaPEC	Ausgold
<b>Not Likely a TEC</b>								
10	Too small. Mallees dominant. Too few mature trees. Very small patch of mature E. wandoo and E. salmon at east end. Recorded E. wandoo, E. salmon, E. salubris, E. celastroides subsp. virella, E. ?loxophleba in Nov 2019.	Degraded	51-70	Present	< 5	1.3	Y	?
11	Too small. Mallees dominant. No mature trees. Recorded E. salmon, E. celastroides subsp. virella in Nov 2019.	Degraded	10-30	Absent	-	0.8	Y	?