Karara Iron Ore Project Mine Life Extension:

Fauna assessment of proposed disturbance areas, 2020 and 2024

Matriarchal cluster of Northern Shield-backed Trapdoor Spider; at least 12 burrows (one open to show entrance) (M. Bamford).

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Executive Summary

Introduction

Karara Mining Limited (KML) operates the Karara Iron Ore Project (KIOP), incorporating mining of KML's Karara, Terapod and Blue Hills North deposits on Karara Station, 55 km north-east of Perenjori. The project includes processing infrastructure and a rail terminal immediately to the west of the Karara mine, with associated waste rock dump and tailings storage facilities. KML proposes to expand the KIOP for the mine life operations. Bamford Consulting Ecologists (BCE) was commissioned to undertake the assessment of fauna values and potential impacts upon fauna in relation to the proposed KIOP Mine Life Extension (MLE) development envelope and disturbance footprint, with a focus on species of conservation significance. The current report presents the results of this fauna assessment. Sections of the development envelope were visited by BCE in June 2020, June/July 2024 and November 2024; different areas were prioritised during each time period.

The purpose of the fauna impact assessment is to provide government agencies with the information they need to decide upon the significance of impacts of a proposed development, and to provide information to proponents to help them to develop appropriate strategies for avoiding and minimising impacts of their activities. A formal impact assessment is outside the scope of the current report, but will rely on information on the fauna assemblage and its environment (fauna values) provided in the current report. Fauna values include:

- Assemblage characteristics: uniqueness, completeness and richness;
- Species of conservation significance;
- Recognition of ecotypes or vegetation/substrate associations (VSAs) that provide habitat for fauna, particularly those that are rare, unusual and/or support significant fauna;
- Patterns of biodiversity across the landscape; and
- Ecological processes upon which the fauna depend.

Target species

Within both project areas, targeted vertebrate species of conservation significance were the Malleefowl *Leipoa ocellata* (Vulnerable under EPBC Act; Vulnerable (S2D3) under WA BC Act), the Western Spiny-tailed Skink *Egernia stokesii badia* (Endangered under EPBC Act; Vulnerable (S2D3) under WA BC Act), the Southern Whiteface *Aphelocephala leucopsis* (Vulnerable under EPBC Act), the Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Vulnerable (S2D3) under WA BC Act), Inland Long-eared Bat *Nyctophilus major tor* (Priority 4 DBCA) and Long-tailed Dunnart *Antichinomys (Sminthopsis) longicaudata* (Priority 4 DBCA). Targeted invertebrate species included trapdoor spiders of the genus *Idiosoma*. Two trapdoor spiders of conservation significance are known to occur within the Mine Area and may also be present in the Wheatbelt Area. The Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (Priority 3, DBCA) has been found to be abundant in the KIOP area and the Ornate Trapdoor Spider *Idiosoma formosum* (Endangered (S2D2) under WA BC Act), was collected by BCE in 2015 and was targeted in the current studies.

The Wheatbelt Area is within the range of Carnaby's Black-Cockatoo and so this species was considered in relation to this project area.

Survey area description

The project areas that are the focus of the current assessment correspond to two broad areas of proposed disturbance (equivalent to the Targeted Survey Areas described by Umwelt (2025)), within an extensive development envelope that is c. 13,557 ha in size and stretches from Karara mine in the east to Yandanooka in the west. The Mine Area comprises several areas of proposed disturbance supporting native vegetation in the vicinity of the existing Karara mine development and infrastructure. These proposed disturbance areas of the Mine Area total c. 1446 ha in size and the surrounding area is comprised of continuous native vegetation. The Wheatbelt Area comprises a linear area, approximately 30 km long, which is mostly previously cleared but overlaps with small sections of remnant native vegetation. This long, narrow project area is c. 76 ha in size and occurs within a landscape which is mostly cleared for agriculture and where remnant native vegetation is heavily fragmented and isolated. Both project areas are in the Mid-West region of Western Australia (DBCA, 2024a); the Mine Area is approximately 210-230 km east-southeast of Geraldton and the Wheatbelt Area is approximately 100 km southwest of Geraldton.

Within 40 km of the Mine Area there are state-listed Threatened and Priority Ecological Communities, Important Wetlands, Environmentally Sensitive Areas, protected terrestrial reserves and Key Biodiversity Areas. Some of these sensitive sites are adjacent to or overlap with the Mine Area. Within 40 km of the Wheatbelt Area there are state-listed Threatened Ecological Communities, Environmentally Sensitive Areas and protected terrestrial reserves.

Key fauna values

Vegetation and Substrate Associations (VSAs). The development envelope overall encompasses 12 major VSAs which are differentially represented in each project area, as summarised in the following table:

VSA	ha in entire DE	ha in Mine Area	ha in Wheatbelt Area
1 Breakaways and Rocky Ridges	913.0	103.2	0.0
2 Acacia Shrubland over Granite	112.3	3.8	0.0
3 Acacia Tall Shrubland	2114.8	232.8	2.3
4 Acacia Shrubland with Sand Pine	2443.7	389.6	0.0
5 Mixed Acacia and Tall Thicket (Acacia and Melaleuca)	2599.7	315.6	0.0
6 Acacia Low Shrubland on Gravelly Rises	455.7	110.0	0.0
7 York Gum Open Woodland	1903.0	274.4	3.7
8 *Eucalyptus clelandiorum* Woodland/Forest	64.3	0.0	0.0
9 Chenopod Shrubland/Salt Lakes/Clay Pans	186.0	0.0	0.0
10 Cleared Land	2754.4	16.5	61.7
11 Creeklines	4.7	0.0	4.7
12 Planted Eucalypts	3.9	0.0	3.6
Water	1.6	0.0	0.0
TOTAL	**133 557 ha**	**1 446 ha**	**76 ha**

Fauna assemblage.

Mine Area The desktop study identified 257 vertebrate fauna species as potentially occurring across the mine development envelope: 7 frogs, 54 reptiles, 167 birds, and 24 native and 5 introduced mammals. Of these, 3 frogs, 47 reptiles, 102 birds and 20 native and 5 introduced mammals have been confirmed in the greater Karara area. The fauna assemblage of the Mine Area is moderately intact (but lacking several mammal species) and rich. The confirmed reptile and bird assemblages are particularly species-rich, which is a reflection of the long period of time over which investigations have been carried out. While this confirmed assemblage comes from surveys over a large area, the mine development envelope is also extensive and covers a wide range of environments. The assemblage is broadly typical of the southern interior of Western Australia and is notable for the presence of species that have declined in the wheatbelt.

Wheatbelt Area The desktop study identified 252 vertebrate fauna species as potentially occurring across the Wheatbelt Area: 6 frogs, 48 reptiles, 168 birds, and 25 native and 5 introduced mammals. Many of these species would occur infrequently and in low numbers and therefore the number of confirmed species is low. The expected assemblage is depauperate with a large number of species likely to occur only intermittently and in small numbers. Many of the species expected as residents or to occur regularly are tolerant of or even dependent upon disturbed landscapes; some may occur only in fields and in degraded native vegetation. It is thus an assemblage with a high proportion of 'disturbance' species, but particularly where there is intact native vegetation there will be species that have generally declined across the wheatbelt.

Species of conservation significance. Three broad levels of conservation significance are used in this report:

- Conservation Significance 1 (CS1) – species listed under State or Commonwealth Acts.
- Conservation Significance 2 (CS2) – species listed as Priority by DBCA but not listed under State or Commonwealth Acts.
- Conservation Significance 3 (CS3): Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

Mine Area. Across the KIOP area, 34 conservation significant vertebrates are expected to be present, and a number of conservation significant invertebrates have been confirmed. More conservation significant invertebrates (SREs) are predicted to be associated with granite and rocky hill areas. Significant species of greatest interest, because they are resident or likely to be resident in the development envelope surrounding the Mine Area, are:

- Malleefowl. Listed under state (Schedule 3; Vulnerable) and federal legislation (Vulnerable). Present throughout but breeding habitat limited as much of the development envelope lies low in the landscape rather than close to ridges where sandy loam to gravelly soils are favoured for nest-mound construction. Despite this, some evidence of birds displaced by past clearing now breeding in areas of what might be sub-optimal breeding habitat within the development envelope.
- Western Spiny-tailed Skink. Listed under state (Schedule 3; Vulnerable) and federal legislation (Endangered). Greatest availability of colony sites in York Gum Woodlands (VSA 8) which are patchily distributed within and outside the mine area development envelope. The population may be undergoing a decline, perhaps due to predation from feral Cats and Little Crows attracted to the existing Karara landfill site, which is within the approved waste rock dump footprint close to the proposed northern extension area.

- Gilled Slender-bluetongue. Listed under state (Schedule 3; Vulnerable) legislation. Apparently restricted to rocky landscapes across the KIOP area, which will include parts of the mine area development envelope.
- Northern Shield-backed Trapdoor Spider. Listed as Priority 3 by DBCA (thus not under legislation). Very extensive distribution across the broader KIOP area and usually associated with gravelly loam soils of the ironstone ridges and associated slopes, but surveys in 2020 and 2024 found it to also be more widespread low in the landscape on sandy loam to loam soils.
- Ornate Trapdoor Spider. Listed under state legislation (Schedule 2 Division 2; Endangered). Abundant in heavy loam/sand soils low in the landscape. Previously known from very few records but may be widespread and abundant in suitable soils.

Wheatbelt Area. The assemblage includes 33 vertebrate species of conservation significance; most of which will be present only very intermittently and in small numbers. Of most interest is where species occur as residents or use remnant native vegetation regularly. Significant species of greatest interest are:

- Malleefowl. Listed under state (Schedule 3; Vulnerable) and federal legislation (Vulnerable). May be resident only in Koolanooka hills but may use corridors of remnant native vegetation (including degraded roadside vegetation in the disturbance footprint) to move through the landscape.
- Western Spiny-tailed Skink. Listed under state (Schedule 3; Vulnerable) and federal legislation (Endangered). Likely to be confined to small patches of suitable habitat along road verges, with remnant vegetation along verges possibly allowing for some dispersal.
- Gilled Slender-bluetongue. Recorded in Koolanooka Hills and probably still resident. Unlikely elsewhere but may rely on verge remnant vegetation for dispersal.
- Trapdoor spiders. The Northern Shield-backed and Ornate Trapdoor Spider may both be present in large areas of remnant vegetation and/or along road verges, but they may also have disappeared due to habitat degradation and fragmentation. Other significant trapdoor spider species are known from the broader region and if they were present, they would occur in areas of remnant native vegetation.
- CS3 birds. A suite of birds that has declined dramatically in the general wheatbelt may persist in the larger areas of remnant vegetation and may utilise road verge vegetation.

Patterns of biodiversity.

Mine Area. The extensive nature of acacia shrublands (elements of VSAs 3 to 6) means that patterns of biodiversity may be moderately uniform within the Mine Area and surrounding DE, but distinctive patterns can be expected around rocky hills and the granite outcrop. SRE invertebrates may be associated with these features. Patterns of distribution of significant species are important as noted above: Malleefowl tending to nest in well-drained soils high in the landscape, Western Spiny-tailed Skink potential colony sites in generally in York Gum woodland (VSA 7), and differences in distribution and abundance of the two listed trapdoor spiders in relation to soil type.

Wheatbelt Area. Patterns of biodiversity in the wheatbelt in general are strongly associated with the distribution of remnant native vegetation. Large patches of remnant vegetation with a range of landscapes, such as low rocky hills and slopes are likely to support more species than small remnants, road reserves and around salt lakes where the environment is less variable. The large and more complex remnants likely to be key for conservation significant species. Within the disturbance footprint of the Wheatbelt Area, remnant vegetation along roadsides will be of value for fauna, even when degraded.

Key ecological processes.

Mine Area. Surface and sub-surface drainage may have local effects on vegetation, notably close to granites and ironstone ridges where runoff occurs, but also low in the landscape where water accumulates on flats and in salt lakes. Feral Cats and over-abundant Little Crows may be affecting native fauna, in particular close to the existing Karara landfill site.

Wheatbelt Area. Habitat fragmentation and the presence/absence of connectivity are likely to be the key ecological processes affecting the fauna assemblage in the wheatbelt development envelope, including the Wheatbelt Area itself. Feral and over-abundant native species area also likely to be important.

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1 Introduction

1.1 Overview

Karara Mining Limited (KML) operates the Karara Iron Ore Project (KIOP), incorporating mining of KML's Karara, Terapod and Blue Hills North deposits on Karara Station, 55 km north-east of Perenjori. The project includes processing infrastructure and a rail terminal immediately to the west of the Karara mine, with associated waste rock dump and tailings storage facilities. KML proposes to expand the KIOP for mine life operations. Bamford Consulting Ecologists (BCE) was commissioned to undertake the assessment of fauna values and potential impacts upon fauna in relation to the proposed KIOP Mine Life Extension (MLE) development envelope and disturbance footprint, with a focus on species of conservation significance. The current report addresses two broad areas of proposed disturbance (see Figure 1-1); a set of proposed disturbance areas in the vicinity of the existing Karara mine (referred to as the 'Mine Area') and a corridor of proposed disturbance 100 km to the west of the existing Karara mine (referred to as the 'Wheatbelt Area'). These two areas of disturbance footprint lie within a development envelope that extends a distance of over 100km from east of the exiting mine to near the town of Morawa in the Wheatbelt. While the focus is on the project areas (Mine Area and Wheatbelt Area), the investigations encompassed the entire development envelope with desktop searches extending beyond this.

The Mine Area consists of relatively undisturbed, intact native vegetation, compared to the Wheatbelt Area which is mostly previously cleared and occurs in a landscape of heavily fragmented native vegetation. These project areas therefore differ significantly in terms of their geographic location as well as the environments present, which has a large impact on the fauna assemblage, including the suite of conservation significant species, expected in each area. Conservation significant species include those listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and/or the Western Australian *Biodiversity Conservation Act 2016* (WA BC Act)), those listed as Priority species by the Department of Biodiversity, Conservation and Attractions (DBCA), or those not formally listed but considered of local conservation significance. These categories are expanded on in Appendix 3.

Within both project areas, targeted species of conservation significance were the Malleefowl *Leipoa ocellata* (Vulnerable under EPBC Act; Vulnerable (S2D3) under WA BC Act), the Western Spiny-tailed Skink *Egernia stokesii badia* (Endangered under EPBC Act; Vulnerable (S2D3) under WA BC Act), the Southern Whiteface *Aphelocephala leucopsis* (Vulnerable under EPBC Act), and trapdoor spiders of the genus *Idiosoma*. The Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Vulnerable (S2D3) under WA BC Act) was included among the target species and has previously been found in the area by BCE, but is a small and cryptic lizard that can be difficult to find. Also considered were two species listed as priority by DBCA: Inland Long-eared Bat *Nyctophilus major tor* and Long-tailed Dunnart *Antichinomys (Sminthopsis) longicaudata.* Since 2004, BCE has done multiple targeted and detailed fauna investigations in the region surrounding the Mine Area (see section 2.2.2).

Two trapdoor spiders of conservation significance are known to occur within the Mine Area and may also be present in the Wheatbelt Area. The Northern Shield-backed Trapdoor Spider *Idiosoma clypeatum* (Priority 3, DBCA) has been found to be abundant in the KIOP area, usually occurring in gravelly loam soils close to ironstone ridges (W. J. Bancroft & Bamford, 2018), while a second species, the Ornate Trapdoor Spider *Idiosoma formosum* (Endangered (S2D2) under WA BC Act), was collected by BCE in 2015 and was targeted in the current studies.

The Wheatbelt Area is within the range of Carnaby's Black-Cockatoo (Endangered under EPBC Act; Endangered (S2D2) under WA BC Act), and so this species was taken into consideration for this area.

1.2 Description of Project areas

The overall development envelope comprises 13,557 ha and is made up of four broad areas (as defined by Umwelt, 2025):

- Karara Area: from east of Mungada Ridge National Park; encompassing the Karara mine site, airstrip and camp
- Yandanooka Pipeline: linear corridor extending west along Mungada Road to Koolanooka Hills
- Tilley Siding: small, disjunct area west of the western end of Yandanooka Pipeline; north of Morawa near Tilley Station
- Borefield Corridor: linear corridor that extends west from near Bowgarder Nature Reserve to near Yandanooka.

The project areas that are the focus of the current assessment correspond to two broad areas of proposed disturbance, as shown in Figure 1-1. These project areas are equivalent to the Targeted Survey Areas described by Umwelt (2025). Both project areas are in the Mid-West region of Western Australia (DBCA, 2024a); the Mine Area is approximately 210-230 km east-southeast of Geraldton and the Wheatbelt Area is approximately 100 km southwest of Geraldton (Figure 1-1).

The Mine Area comprises several areas of proposed disturbance supporting native vegetation in the vicinity of existing development and infrastructure. These proposed disturbance areas of the Mine Area total c. 1446 ha in size. The surrounding area is comprised of continuous native vegetation.

The Wheatbelt Area comprises a linear area, approximately 30 km long, which is mostly previously cleared but overlaps with small sections of remnant native vegetation. This long, narrow project area is c. 76 ha in size and occurs within a landscape which is mostly cleared for agriculture and where remnant native vegetation is heavily fragmented and isolated. This project area is located within the 'Borefield Corridor', c. 100 km to the west of the Mine Area, in the wheatbelt near Yandanooka.

Yandanooka Pipeline, Tilley Siding and the bulk of the Borefield Corridor are areas of no or minimal impact but which support existing development, including corridors that link the two project areas. They lie within the Development Envelope and thus were included in the database review.

A range of terms is used through this report to refer to the spatial environment including and around the project areas; these are defined below and illustrated in Figure 1-1:

- Project areas – two areas of proposed disturbance. These are the areas to which the results of the desktop assessment are directed and the areas within which field investigations were focused. Boundaries for the proposed disturbance areas which make up the project areas were provided by Umwelt.
    - Mine Area: this project area comprises several areas of proposed disturbance in the vicinity of the existing Karara mine.

    - Wheatbelt Area: this project area comprises a long, linear corridor and is located c. 100 km west of the Mine Area, in the wheatbelt.
- Development envelope – The entire area of interest within which the two disturbance areas lie, extending for over 100km from east of the exiting mine to near Morowa.
- Study area – the area from which database records are sourced for the desktop assessment. For the current report, this is a 40 km buffer around the boundary of the entire development envelope (see Figure 1-1); as described in Section 2.2, the species list obtained from this study area was interpreted separately based on the geography and ecology of each project area.

Note that for the purposes of mapping and discussions regarding contextual environmental background information (presented in the following sections), a 15 km buffer around the boundary of each project area was used; this is based upon guidance for regional context from the EPA (EPA, 2016c).

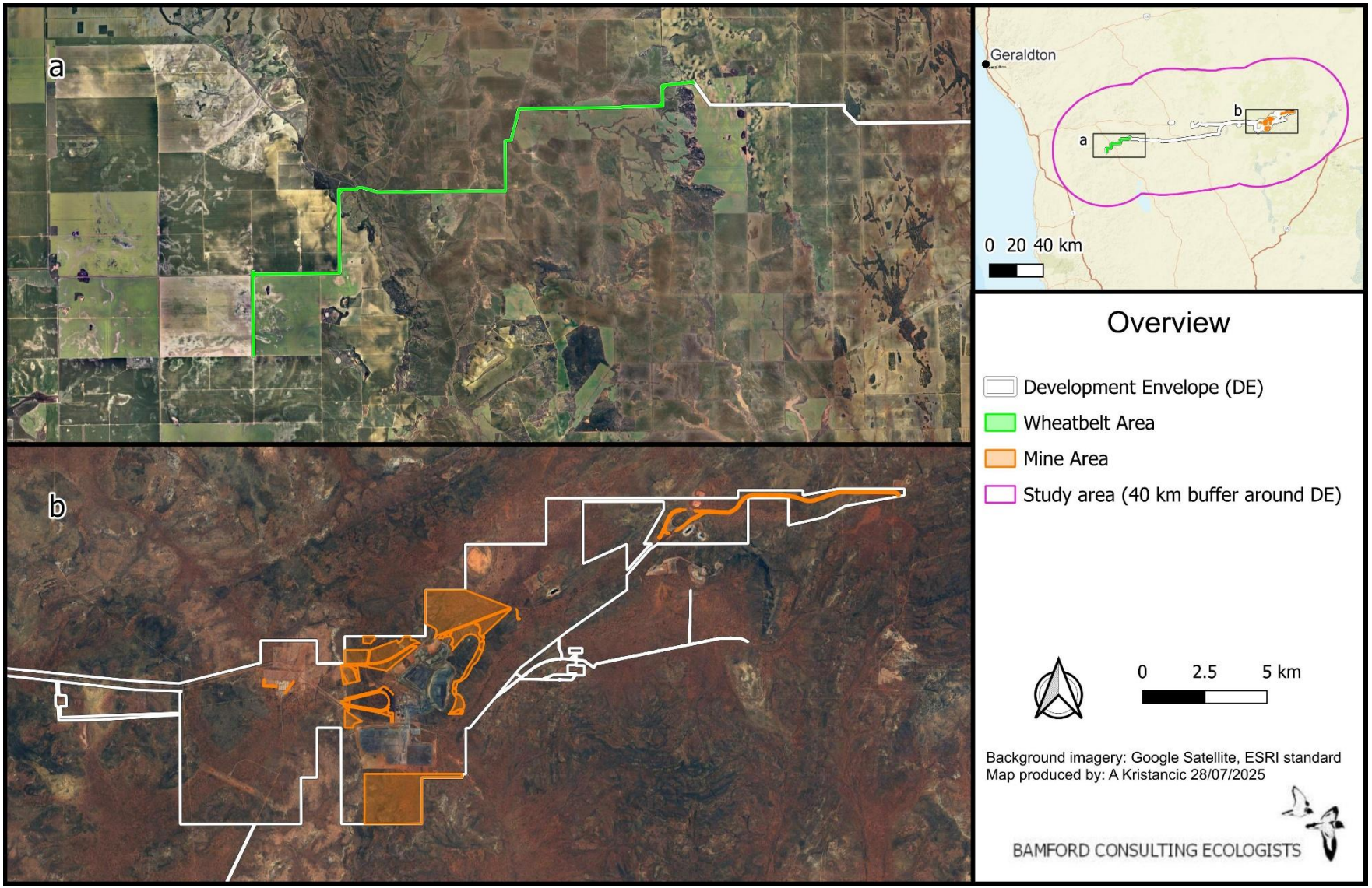

Figure 1-1. Location of the development envelope and project areas.

1.2.1 Interim Biogeographic Regionalisation of Australia (IBRA)

The Interim Biogeographic Regionalisation for Australia v7 (DCCEEW, 2023a), recognises 27 bioregions within Western Australia, which are classified on the basis of climate, geology, landforms, vegetation and fauna (Thackway & Cresswell, 1995). The Mine Area is located within the Tallering (YAL02) subregion of the Yalgoo bioregion, while the Wheatbelt Area is located across the Lesueur Sandplain (GES02) subregion of the Geraldton Sandplains bioregion and the Ancient Drainage (AVW01) subregion of the Avon Wheatbelt bioregion (Figure 1-2).

1.2.1.1 Mine Area

Desmond and Chant (2003b) described the Yalgoo bioregion as follows. The Yalgoo bioregion is characterised by low woodlands to open woodlands dominated by *Eucalyptus, Acacia* and *Callitris* species on red sandy plains. Desmond and Chant list several 'at risk' fauna species from the Yalgoo bioregion, including the Western Spiny-tailed Skink, Malleefowl, Carnaby's Black-Cockatoo, Slender-billed Thornbill, Peregrine Falcon and Western Major Mitchell's (Pink) Cockatoo, and the bioregion is also home to several significant geological features (such as ironstone ranges and granite outcrops) that are associated with endangered flora and/or invertebrates. The Yalgoo bioregion falls into the Southern Climatic Region (EPA, 2020) and the climate is arid to semi-arid warm Mediterranean (Desmond & Chant, 2003b). Average rainfall for the station closest to the survey area is 260 mm (Station: Yalgoo, Number 007091, BOM, 2025).

1.2.1.2 Wheatbelt Area

Desmond and Chant (2003a) described the Lesueur Sandplain (GS3) subregion as follows. The Geraldton Sandplains bioregion is dominated by proteaceous scrub-heaths on an undulating, lateritic sandplain, with York Gum and Jam woodlands on outwash plains. The Lesueur Sandplains subregion consists of a mosaic of lateritic mesas, sandplains, coastal sands and limestones supporting shrub-heaths rich in endemics. Desmond and Chant note several 'rare vertebrates' known from the subregion; excluding species found only on islands, these include Peregrine Falcon, Malleefowl, Carnaby's Black-Cockatoo, Carpet Python, Black-striped Burrowing Snake and Western Spiny-tailed Skink.

Beecham (Beecham, 2001) described the Ancient Drainage (AW01) subregion as follows. The Avon Wheatbelt bioregion is a gently undulating landscape of low relief, consisting of proteaceous scrubheaths on residual lateritic uplands and sandplains, and mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands on Quaternary alluvials and eluvials. The Ancient Drainage subregion is an ancient peneplain with no connected drainage. Chains of salt lakes represent the remnants of ancient drainage systems, which may function in very wet years.

Both bioregions (Avon Wheatbelt and Geraldton Sandplains) fall into the Southern Climatic Region (EPA, 2020). The climate of the Ancient Drainage subregion is Semi-arid (Dry) Warm Mediterranean (Beecham, 2001) while the climate of the Lesueur Sandplains subregion is Mediterranean (Desmond & Chant, 2003a). Average rainfall for the station closest to the project area is 402 mm (Station: Yandanooka, Number 8143, BOM, 2025).

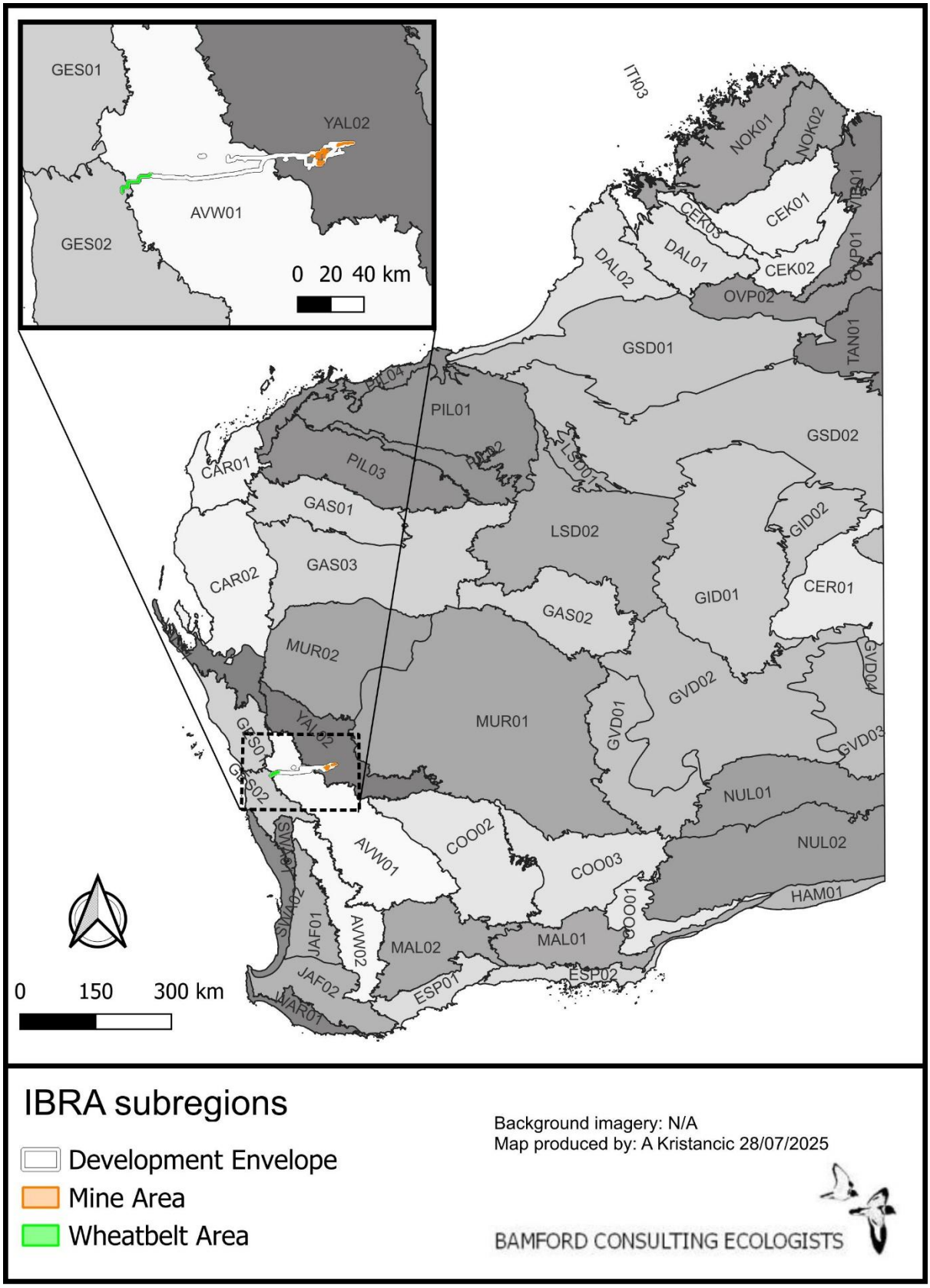

Figure 1-2. Location of project areas within the Interim Biogeographic Regionalisation for Australia (IBRA) subregions.

1.2.2 Soil-Landscape Mapping and Pre-European Vegetation

Mapping of a project area in relation to broad scale datasets provides useful context regarding the current and historical landscape of the project area and surrounds. A dataset of soil-landscape mapping across Western Australia is provided by DPIRD (2024c). Beard *et al.* (2013) have described and mapped the original vegetation presumed to have existed across Western Australia prior to European settlement and this dataset is provided by DPIRD (2024b). Umwelt (2025) has prepared comprehensive information and mapping of these datasets across the entire development envelope and this is therefore not repeated here.

The Mine Area and Wheatbelt Area are shown in relation to these datasets in Figure 1-3 to Figure 1-6.

1.2.2.1 Mine Area

The landscape within 15 km of the Mine Area is made up of 31 land systems (Figure 1-3). This project area itself overlaps with eleven land systems (DPIRD, 2024c):

- **Campsite system:** Alluvial plains supporting eucalypt woodlands with halophytic understoreys and acacia shrublands.
- **Carnegie system:** Salt lakes with fringing saline alluvial plains, kopi dunes and sandy banks, supporting halophytic shrublands and acacia tall shrublands.
- **Challenge system:** Gently undulating gritty and sandy surfaced plains, occasional granite hills, tors and low breakaways, supporting acacia shrublands and occasional halophytic shrublands
- **Doney system:** Calcareous alluvial plains with eucalypt woodlands adjacent to salt lake systems.
- **Joseph system:** Undulating yellow sandplain supporting dense mixed acacia, melaleuca and casuarina shrublands with patchy mallees.
- **Moriarty system:** Low greenstone rises and stony plains supporting chenopod shrublands with patchy eucalypt overstoreys.
- **Nerramyne system:** Undulating plains of sandy-surfaced laterite and weathered granite with low remnant plateaux, breakaways and rises supporting acacia shrublands.
- **Pindar A system:** Loamy plains surrounded by sandplain supporting York gum woodlands and acacia shrublands.
- **Tallering system:** Prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks supporting bowgada and other acacia shrublands.
- **Tealtoo system:** Level to gently undulating loamy plains with fine ironstone gravel mantles supporting dense acacia shrublands.
- **Yowie system:** Sandy plains supporting tall shrublands of mulga and bowgada with patchy wanderrie grasses.

Within 15 km of the Mine Area, there are 13 Pre-European vegetation associations (DPIRD, 2024b). There is also a salt lake within the development envelope, but outside the proposed disturbance areas that make up the Mine Area. Five pre-European vegetation associations, within two broad vegetation

types (Beard et al., 2013; DPIRD, 2024b), overlap with this project area (vegetation association descriptions from DBCA, 2025):

- **Vegetation type 13: Scrub with open woodland or scattered trees.** This vegetation type is composed mostly of *Acacia* spp. with emergent *Eucalyptus* spp. and Sheoak (Beard et al., 2013).
    - **Vegetation association 355:** Shrublands; bowgada & jam scrub with scattered York gum & red mallee.
    - **Vegetation association 363:** Shrublands; bowgada scrub with scattered cypress pine.
    - **Vegetation association 364:** Shrublands; bowgada scrub with scattered eucalypts & cypress pine.
- **Vegetation type 15: Scrub, open scrub or sparse scrub.** This vegetation type is composed of shrubs greater than 1m in height, with projected foliage cover of 10-30% (for scrub), <10% (for open scrub) or negligible cover (sparse scrub). *Acacia* spp. are dominant in this vegetation type; in the Yalgoo bioregion this a combination of *A. ramulosa* and *A. linophylla* (referred to as 'bowgada'), in association with *A. acuminata*, *A. murrayana*, *A. victoriae* and/or *A. grasbyi* (Beard et al., 2013).
    - **Vegetation association 358:** Shrublands; bowgada & *Acacia quadrimarginea* on stony ridges
    - **Vegetation association 420:** Shrublands; bowgada & jam scrub.

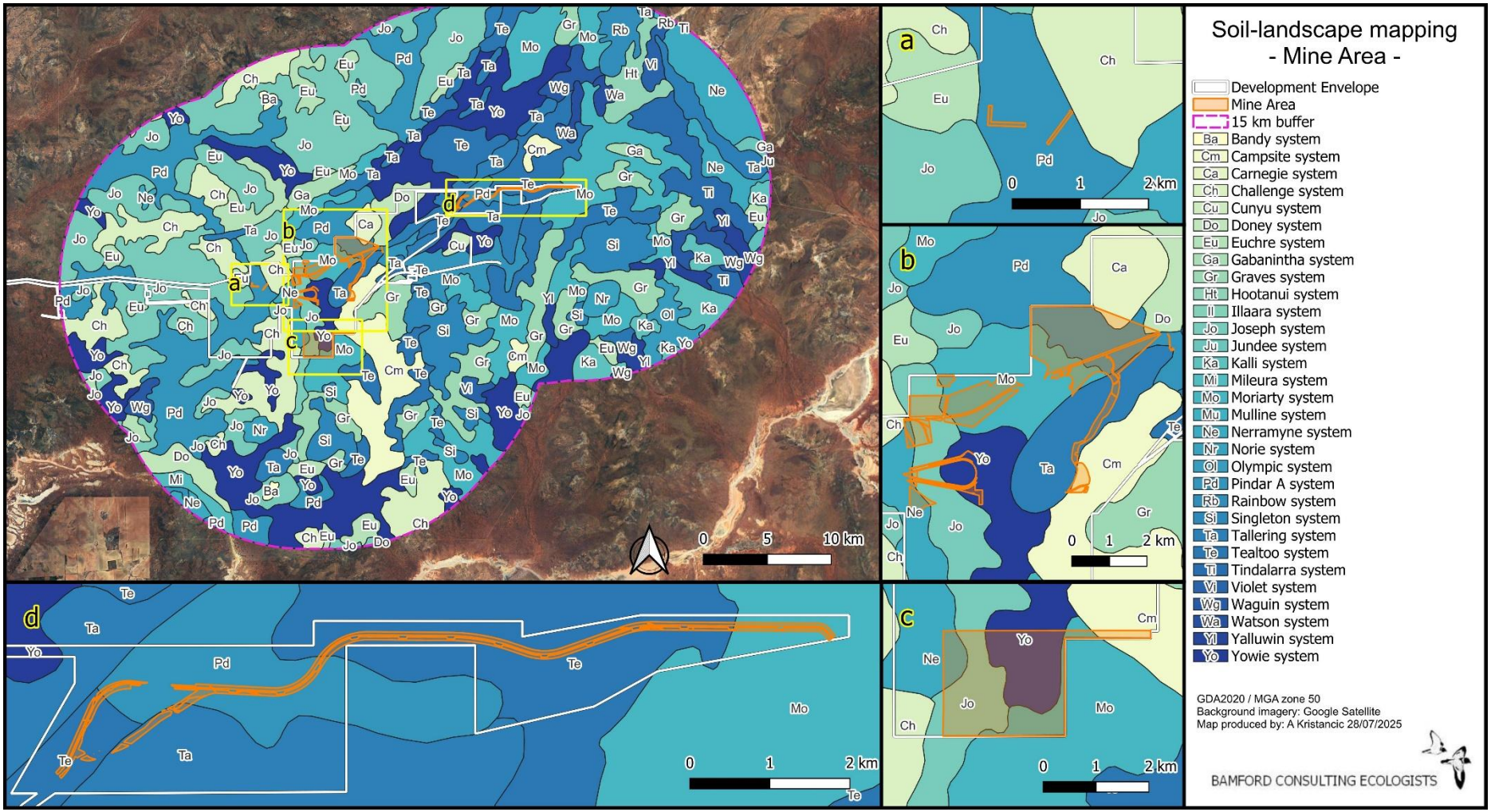

Figure 1-3. Soil-landscape mapping (DPIRD, 2024c) within 15km of the Mine Area boundary.

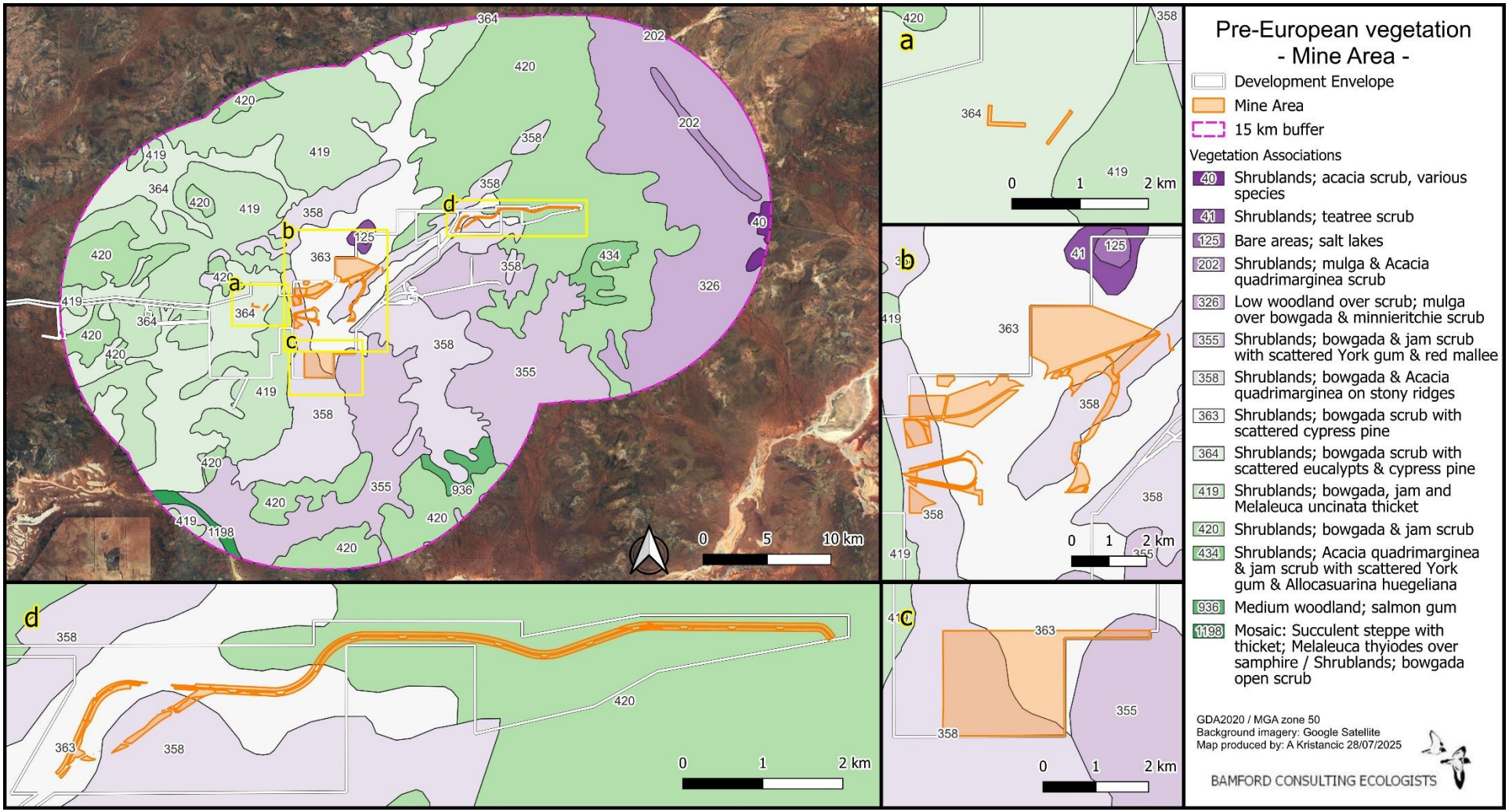

Figure 1-4. Pre-European vegetation associations (DPIRD, 2024b) within 15km of the boundaries of the Mine Area. Descriptions are from (DBCA, 2025).

1.2.2.2 Wheatbelt Area

The landscape within 15 km of the Wheatbelt Area is made up of more than 60 subsystems or phases within five zones: 220, 222, 224, 226 and 271 (Figure 1-5). The project area itself overlaps with twelve subsystems within four zones (DPIRD, 2024c, 2024d):

- **Zone 220 (Southern Victoria Sandplain Zone)**
  - **Eradu 1 subsystem:** Level to gently undulating sandplain; deep, yellow siliceous clayey sands and pale sands over ferruginous gravel.
- **Zone 222 (Dandaragan Plateau Zone):**
  - **Mooladara Hill 1 subsystem:** Level to gently undulating sandplain with long gentle gradients with shallow valleys; yellow and pale deep sands or sands over gravel.
  - **Mooladara Hill 5 subsystem:** Gently inclined hill slopes; Yellow and pale deep sands and some gravels.
- **Zone 226 (Lockier Zone):**
  - **Mount Scratch 1 subsystem:** Undulating to rolling rises with numerous drainage lines, shallow stony soils on hill crests and gravelly loams.
  - **Mount Scratch 2 subsystem:** Line of rolling low hills; duplexes, loams and clays, often rocky or alkaline.
  - **Mount Scratch 3 subsystem:** Slopes and undulating rises; loamy earths and duplexes, some saline.
  - **Mullingarra 2 subsystem:** Rocky outcrops, hill crests and isolated knolls; shallow stony soils with occasional lateritic remnants and silicified pallid zone material. Shallow rocky and gravelly soils.
  - **Mound Budd 3 subsystem:** Very gently to gently inclined lower footslopes with cracking brown alkaline clays and minor areas of sandy loam gradational soils.
  - **Yandanooka 1 subsystem:** Stream bed and immediate alluvial plain of rivers and creeks of the Yandanooka Valley. Well drained red sands and moderately well to poorly drained sandy loamy duplex soils.
  - **Yandanooka 2 subsystem:** Low rises of yellowish red and red sandy soils over sandstone.
  - **Yandanooka 3 subsystem:** Alluvial plain and lower slopes of the Yandanooka Valley. Sandy loam duplex soils and red and brown clays.
  - **Yandanooka 5 subsystem:** Alluvial plain of well drained red sands and loams.
- **Zone 271 (Irwin River Zone):**
  - **Dalgooka 5 subsytem:** Undulating sandplain; yellow, deep sand and sandy earths.

Within 15 km of the Wheatbelt Area, there are 14 Pre-European vegetation associations (Figure 1-6). Four of these vegetation associations, within three broad vegetation types (DPIRD, 2024b), overlap with the project area and are described as follows (from DBCA, 2025):

- **Vegetation type 4: Woodland.** In the Avon Wheatbelt bioregion, this vegetation type is generally comprised of York Gum, sometimes with Salmon Gum, over Jam (*Acacia acuminata*) and *Allocasuarina huegeliana* (Beard et al., 2013).

- **Vegetation association 352:** Medium woodland; York gum.

- **Vegetation type 13: Scrub with open woodland or scattered trees.** This vegetation type is composed mostly of *Acacia* spp. with emergent *Eucalyptus* spp. and Sheoak (Beard et al., 2013).
  - **Vegetation association 354: S**hrublands; jam and *Acacia rostellifera* (+ hakea) scrub with scattered York gum
- **Vegetation type 18: Scrub-heath.** Mixed heath (dominated by species from the family Myrtaceae) with scattered tall shrubs of *Acacia* spp. and/or species from the family Proteaceae. In the Geraldton Sandplains and Avon Wheatbelt bioregions this vegetation type has a rich and diverse composition, which varies according to soils and landscape position (Beard et al., 2013).
  - **Vegetation association 379:** Shrublands; scrub-heath on lateritic sandplain in the central Geraldton Sandplain Region.
  - **Vegetation association 380:** Shrublands; scrub-heath on sandplain.

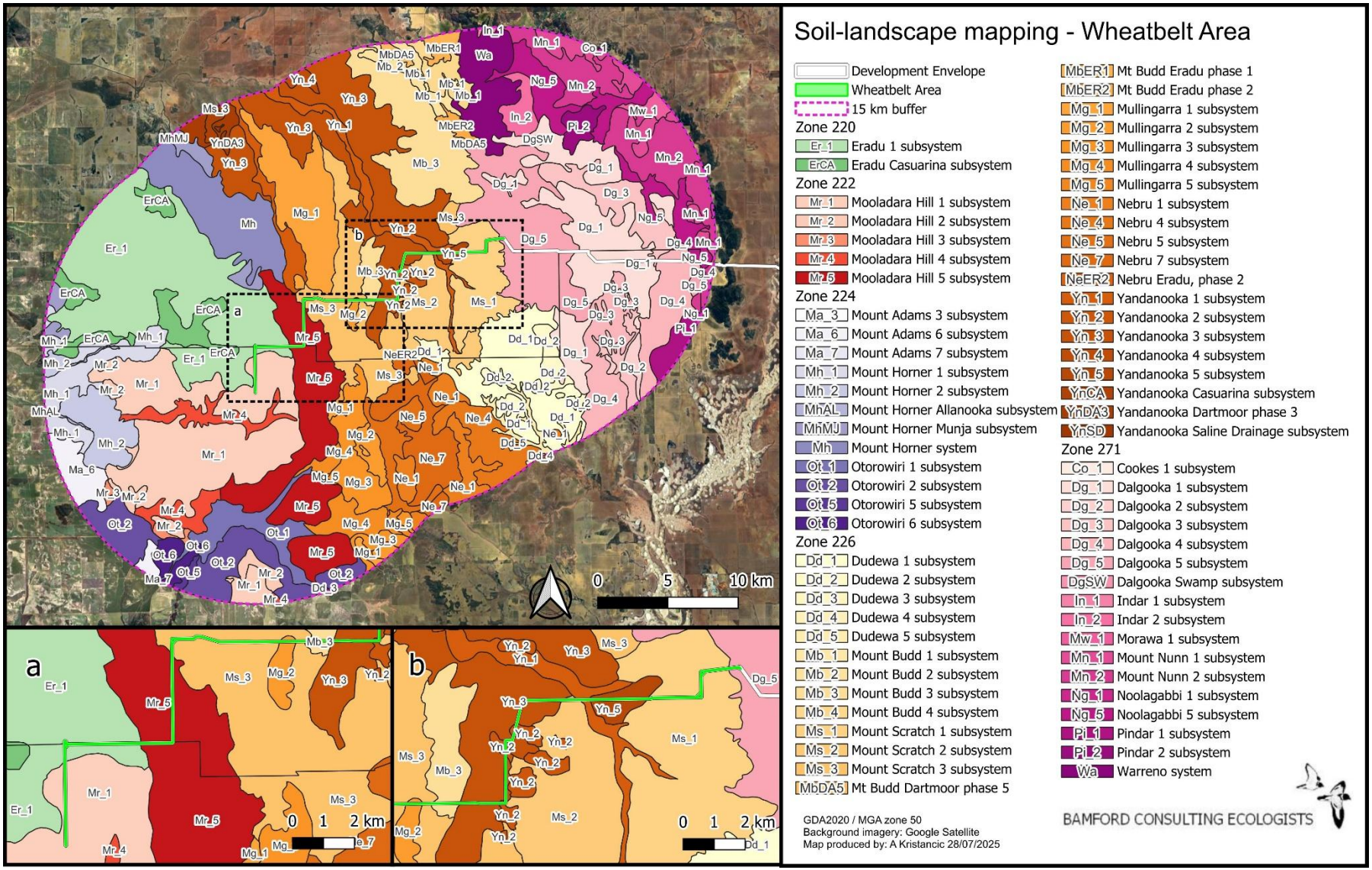

Figure 1-5. Soil-landscape mapping (DPIRD, 2024c) within 15km of the Wheatbelt Area boundary.

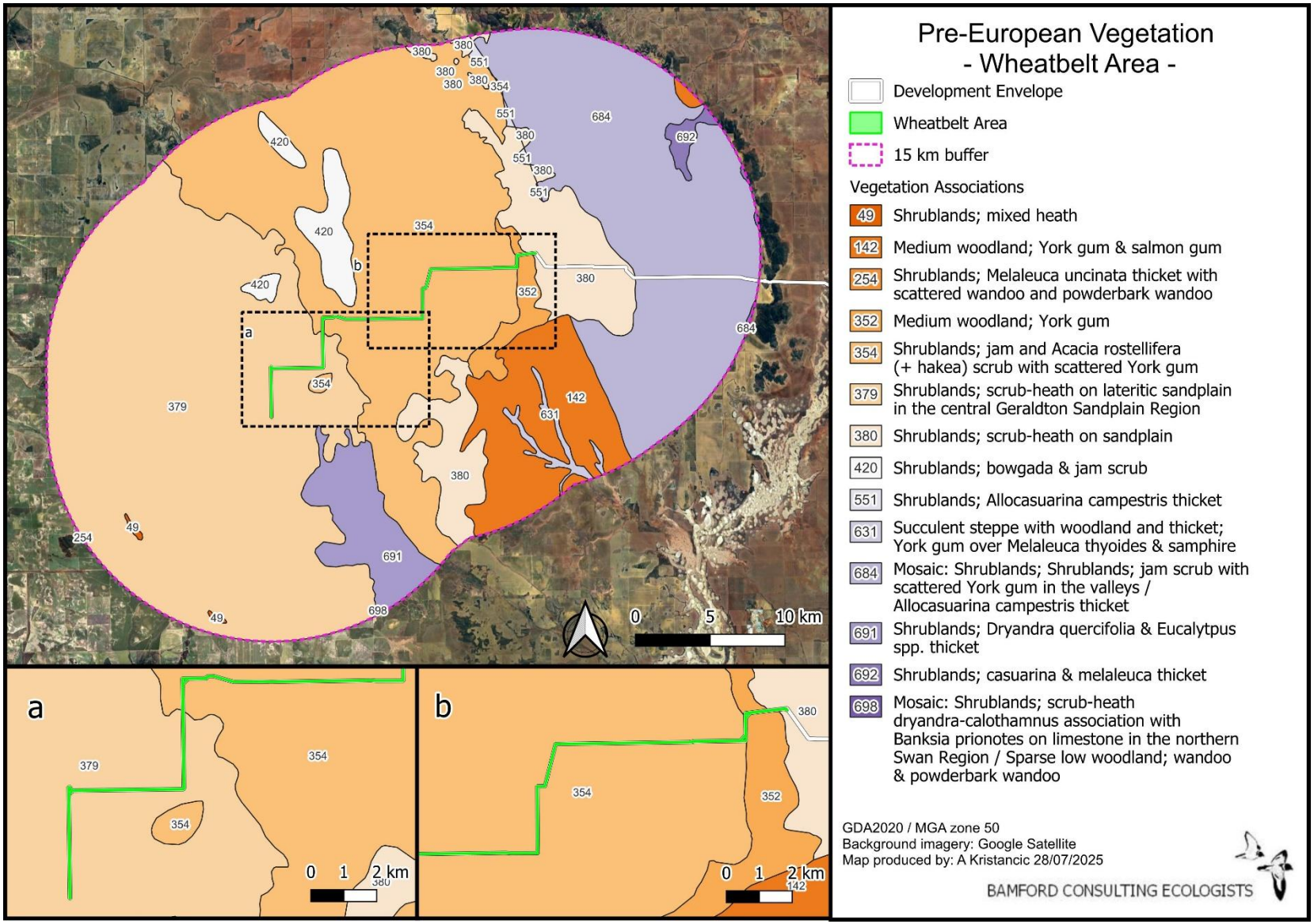

Figure 1-6. Pre-European vegetation associations (DPIRD, 2024b) within 15km of the Wheatbelt Area boundary. Descriptions are from (DBCA, 2025).

1.2.3 Land use and tenure

1.2.3.1 Mine Area

The dominant land uses within the Yalgoo bioregion are grazing (native pastures), conservation, UCL and Crown reserves and mining (Desmond & Chant, 2003b). The project area itself consists of several parcels of remnant vegetation within the vicinity of the Karara mine. It lies within former pastoral lease Karara Station, now owned by the DBCA.

1.2.3.2 Wheatbelt Area

The dominant land uses within the Lesueur Sandplains subregion are dry land agriculture, conservation and UCL and Crown reserves (Desmond & Chant, 2003a), while for the Ancient Drainage subregion the dominant land uses are dryland agriculture, grazing (improved pastures), conservation, rural residential and mining (Beecham, 2001). The project area itself consists of a long, linear area which primarily follows existing roads (thus within existing road reserves but in some cases crossing privately-owned land).

1.2.4 Recognised sensitive sites

1.2.4.1 Mine Area

A number of recognised sensitive sites occur within 40 km of the Mine Area, including state-listed Threatened and Priority Ecological Communities (TECs and PECs) (DBCA, 2023b, 2023d), Important Wetlands (DBCA, 2023a) and Environmentally Sensitive Areas (ESAs) (DWER, 2023b, 2023a) and protected areas (DCCEEW, 2022). The project area in relation to these sensitive sites is shown in Figure 1-7. The proposed development envelope and parts of the Mine Area overlap with patches of state-listed Priority Ecological Communities (which coincide in part with banded ironstone ridges of the Tallering Land system), and with the protected area of Karara (gazettal in progress). According to the DBCA TECs and PECs database (database information provided by Umwelt), parts of the Mine Area overlap with the Blue Hills (Mount Karara/Mungada Ridge/Blue Hills) vegetation assemblages (banded ironstone formation) which is listed as Priority 1 by DBCA.

The Mine Area is entirely within the Key Biodiversity area of Karara and Lochada; this area is significant for several bird species including Malleefowl (KBA, 2025).

There are 12 state and territory reserves within 40 km of the project area, six of which are within 15 km of the project area boundary (DCCEEW, 2022, 2024). There are no Ramsar Sites (DBCA, 2023c), within 40 km of the project area.

Based on output from the Protected Matters Search Tool (DCCEEW, 2024) the Mine Area does not appear to overlap with any federally-listed Threatened Ecological Communities; the closest of these is Eucalypt Woodlands of the Western Australian Wheatbelt, which is c. 12 km to the south-west and overlaps with parts of the development envelope to the west of the Mine Area.

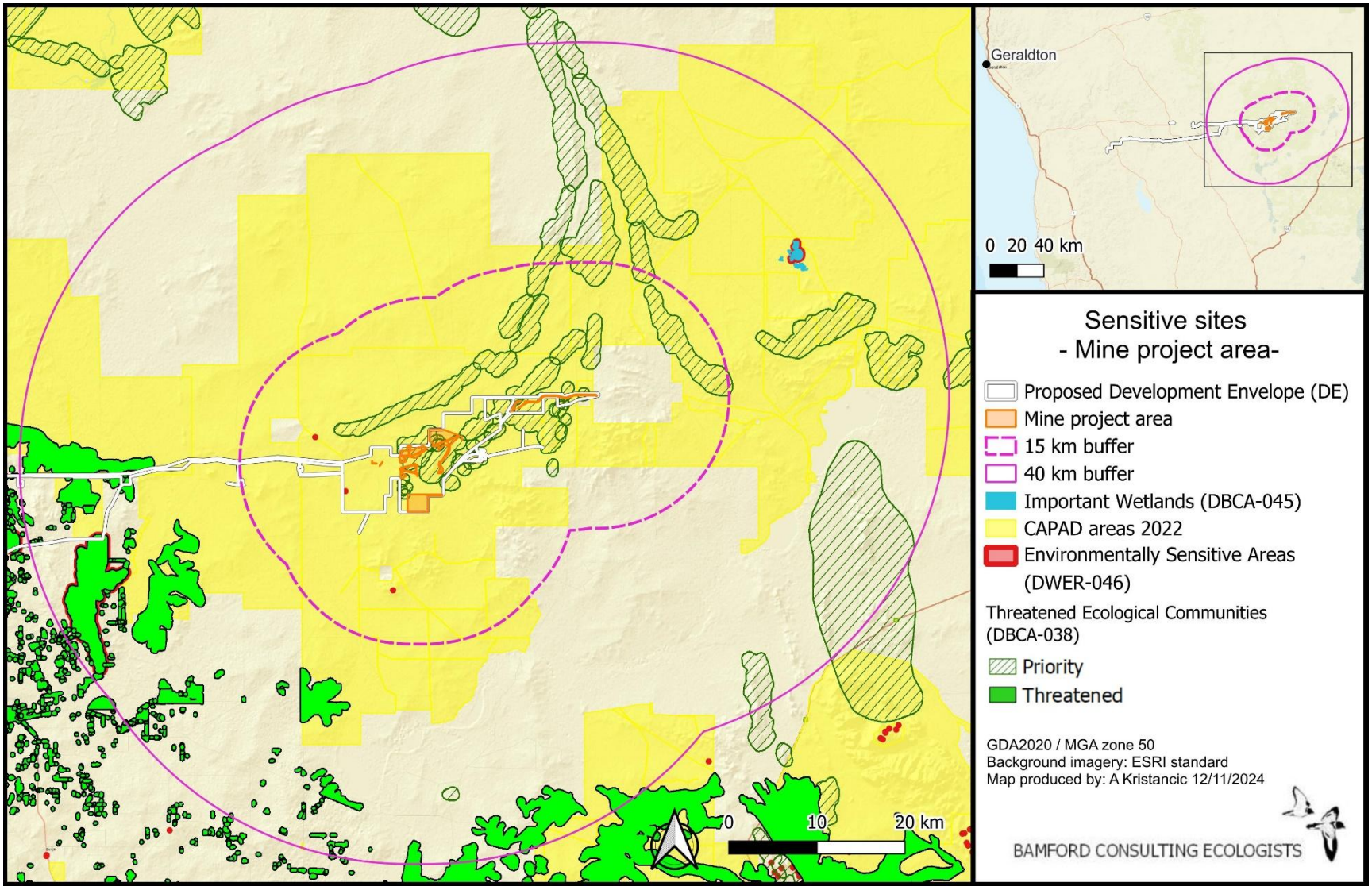

Figure 1-7. Important Wetlands (DBCA, 2023a), protected areas (Collaborative Australian Protected Areas Database; DCCEEW, 2022), Environmentally Sensitive Areas (DWER, 2023a) and state-listed Threatened Ecological Communities (DBCA, 2023d) within 40 km of the Mine Area.

1.2.4.2 Wheatbelt Area

A number of recognised sensitive sites occur within 40 km of the Wheatbelt Area, including state-listed Threatened Ecological Communities (TECs) (DBCA, 2023b, 2023d), Environmentally Sensitive Areas (ESAs) (DWER, 2023b, 2023a) and protected areas (DCCEEW, 2022). The project area in relation to these sensitive sites is shown in Figure 1-8. The eastern extent of the Wheatbelt Area appears to overlap with patches of state-listed Threatened Ecological Communities.

There are no Key Biodiversity Areas (KBA, 2025), Ramsar Sites (DBCA, 2023c) or Important Wetlands (DBCA, 2023a) within 40 km of the project area.

There are 23 state and territory reserves within 40 km of the project area, two of which are within 15 km of the project area boundary (DCCEEW, 2022, 2024). Based on output from the Protected Matters Search Tool (DCCEEW, 2024) the project area may overlap with the 'Eucalypt Woodlands of the Western Australian Wheatbelt' community, a federally-listed Threatened Ecological Community.

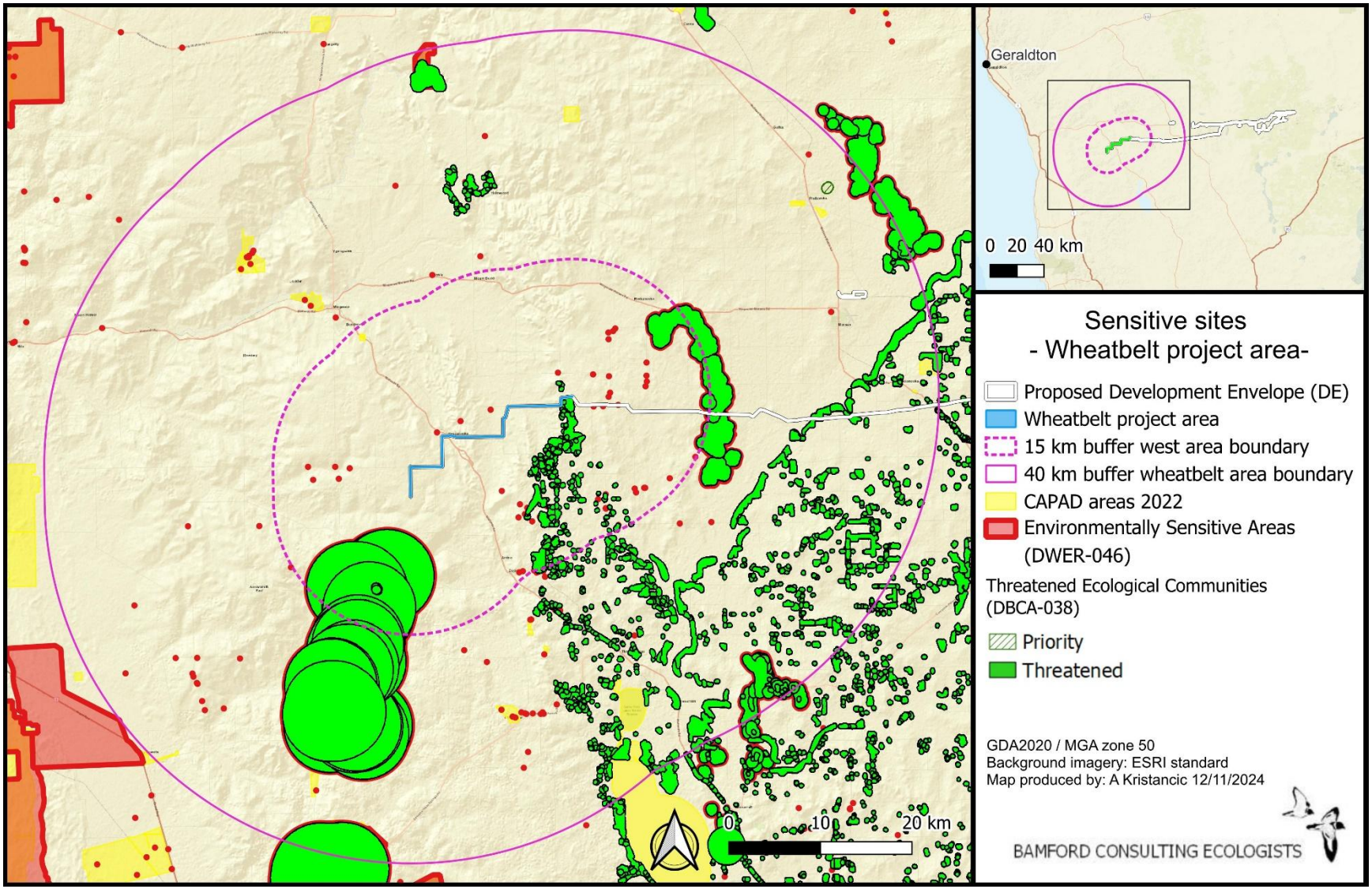

Figure 1-8. Important Wetlands (DBCA, 2023a), protected areas (Collaborative Australian Protected Areas Database; DCCEEW, 2022), Environmentally Sensitive Areas (DWER, 2023a) and state-listed Threatened Ecological Communities (DBCA, 2023d) within 40 km of the Wheatbelt Area.

1.2.5 Regional development and extent of native vegetation

The calculations in each section below are based on the Native Vegetation Extent dataset provided by DPIRD (2024a) which gives a broad indication of vegetation remaining in a project area and the surrounding landscape. To provide more detail concerning areas that provide habitats for fauna, BCE describes and provides maps of vegetation and substrate associations (VSAs); this is described in more detail in Section 2.4.

1.2.5.1 Mine Area

Existing development within 15 km of the boundary of the Mine Area consists of the Karara mine and associated infrastructure, the SinoSteel Mungada mine, Karara airport, and a network of roads (mostly unsealed). Figure 1-9 illustrates the existing extent of land clearing and development in a 15 km buffer around the project area. The land area within this buffer is c. 170,840 ha. Of this, c. 170,322 ha of native vegetation remains (DPIRD, 2024a); therefore existing land clearing or development (c. 518 ha) encompasses c. 0.3% of the total land area within 15 km. The 1446 ha of proposed disturbance that makes up the Mine Area represents 0.8% of the remaining native vegetation within 15 km.

1.2.5.2 Wheatbelt Area

Existing development within 15 km of the boundary of the Wheatbelt Area is extensive and consists primarily of land cleared for agriculture, plus a network of sealed and unsealed roads. Figure 1-10 illustrates the existing extent of land clearing and development in a 15 km buffer around the project area. The land area within this buffer is c. 141,421 ha. Of this, c. 17,073 ha of native vegetation remains (DPIRD, 2024a); therefore existing land clearing or development (c. 124,348 ha) encompasses c. 88% of the total land area within 15 km. The 76 ha of proposed disturbance that makes up the Wheatbelt Area represents 0.4% of the remaining native vegetation within 15 km.

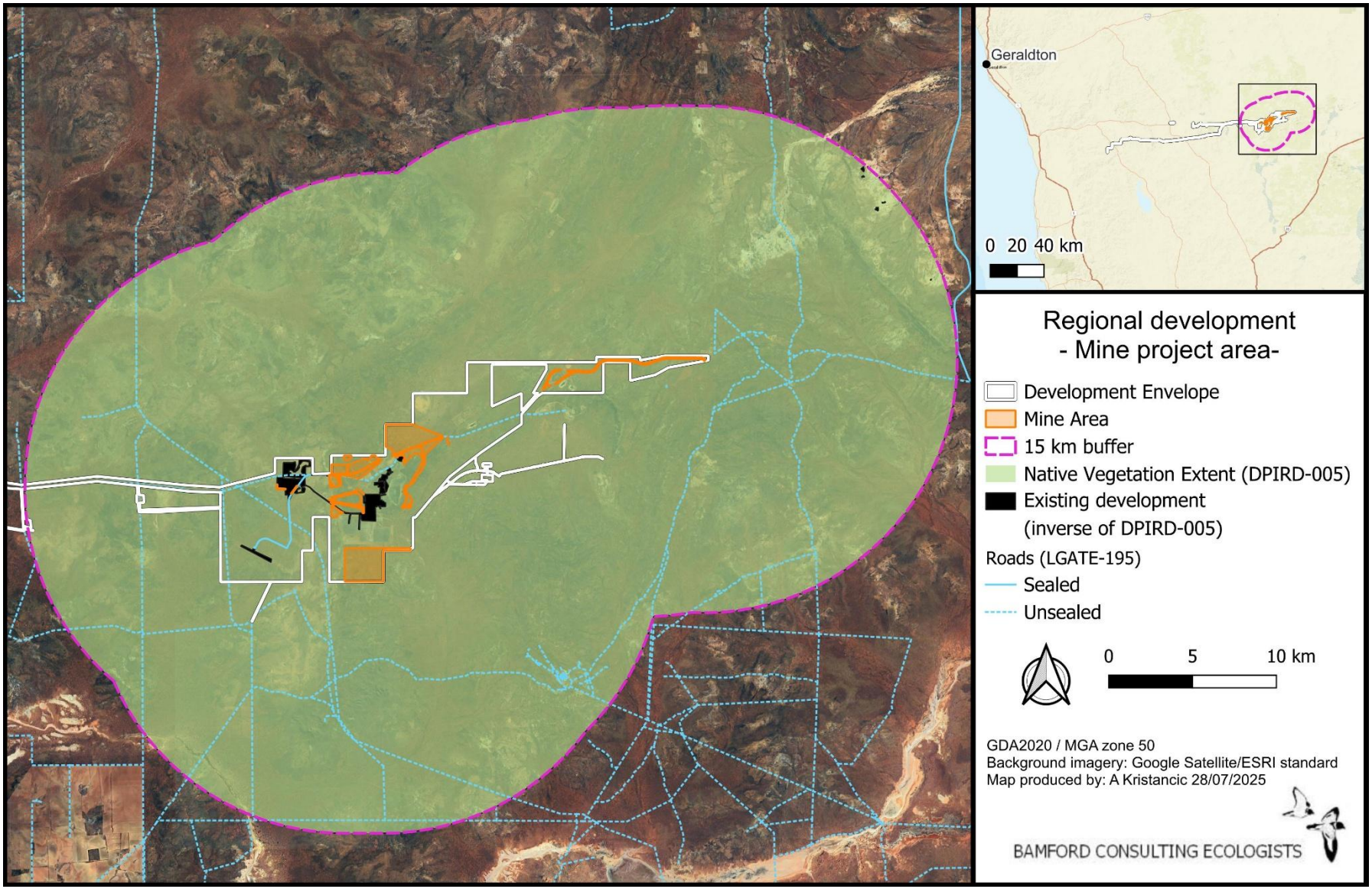

Figure 1-9. Estimated existing development within 15 km of the Mine Area. Native vegetation extent is from DPIRD (2024a).

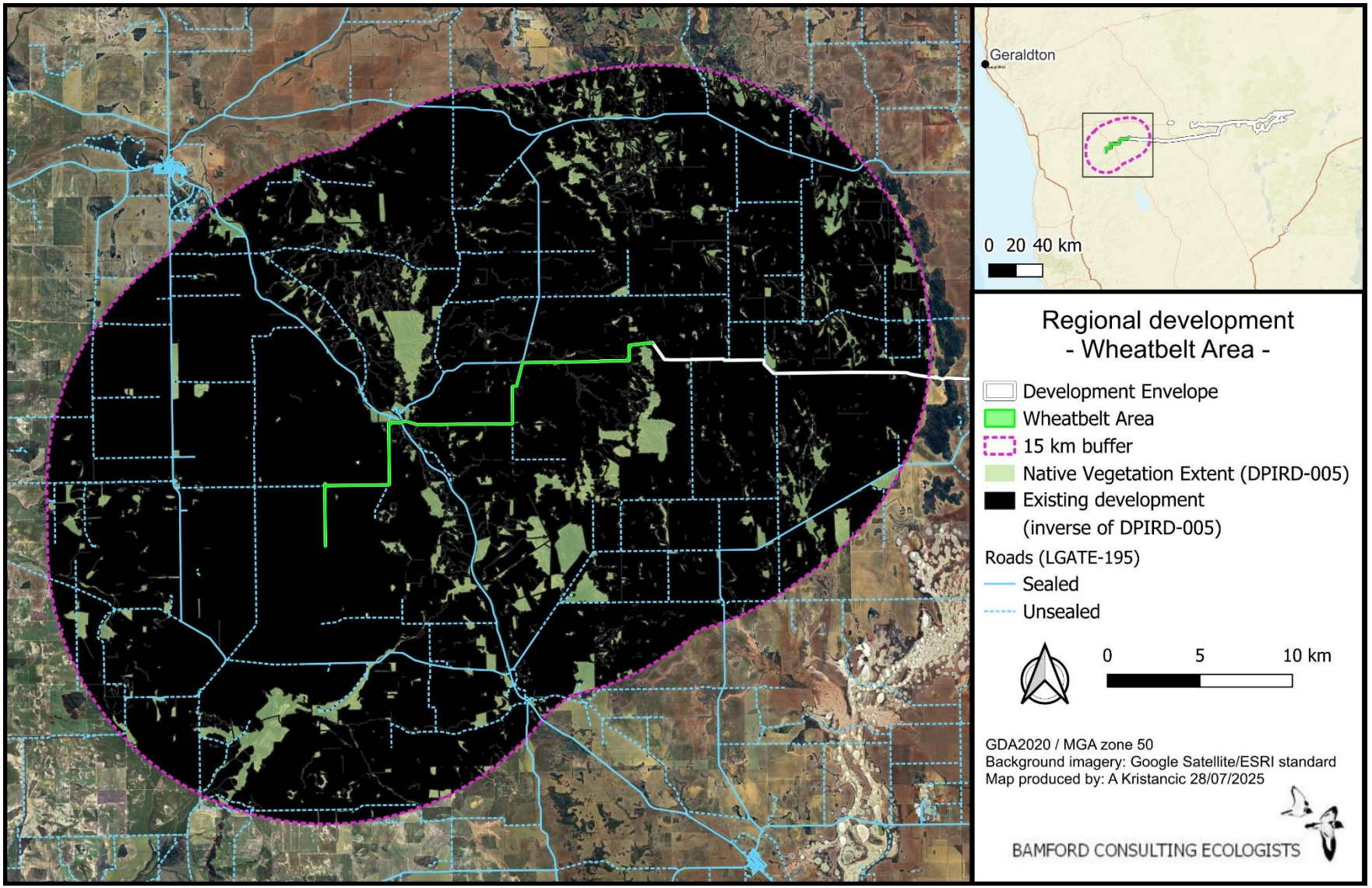

Figure 1-10. Estimated existing development within 15 km of the Wheatbelt Area. Native vegetation extent is from DPIRD (2024a).

2 Methods

2.1 Overview

The approach taken by BCE to describing fauna values for use in fauna impact assessment has been developed with reference to guidelines and recommendations set out by the Western Australian Environmental Protection Authority (EPA) on fauna surveys and environmental protection (EPA, 2002, 2016a, 2016b, 2020), and Commonwealth biodiversity legislation (DotE, 2013; DSEWPaC, 2013). The EPA (2020) proposes three levels of investigation that differ in the approach to field investigations, a basic level (formerly referred to as Level 1) being a review of data and (usually) a site reconnaissance to place data into the perspective of the site, a detailed survey (formerly level 2) that involves data review and comprehensive field sampling of the entire fauna assemblage, and a targeted survey that has a focus on significant species in addition to a data review. The level of assessment recommended by the EPA is determined by the size and location of the proposed disturbance, the sensitivity of the surrounding environment in which the disturbance is planned, and the availability of pre-existing data. Guidance for field investigations methods is provided by the EPA (2020) and by Bamford *et al.* (2013).

The approach taken for the current investigations was a targeted survey, but extensive previous studies carried out for KIOP by BCE (see below) mean that detailed (level 2) surveys have been conducted in the immediate area, as well as multiple desktop reviews.

2.2 Desktop Assessment

2.2.1 Sources of Information

An updated database review was carried out in October 2024; the search area for this was a 40 km buffer around the entire development envelope, in order to capture information relevant to each of the project areas (Mine Area and Wheatbelt Area). The most recent database review sourced information from BirdData, Atlas of Living Australia, Naturemap, DBCA threatened and priority fauna database and the EPBC Protected Matter Search tool, as well as BCE records from surveys from around the Mine Area between 2004-2020, and from around the Wheatbelt Area in 1991 (Read 1992).

2.2.2 Previous fauna surveys

BCE has been involved in fauna investigations to inform impact assessment and monitoring for KIOP and in the immediate Karara/Mungada area since 2004, including two level 2 studies and targeted work on significant species: Malleefowl, Shield-backed Trapdoor Spiders, Western Spiny-tailed Skinks, the Gilled Slender Blue-tongue and significant invertebrates. Studies included an annual, 10-year monitoring study of ongoing impacts upon trapdoor spiders form 2010 to 2019. In addition, BCE has undertaken level 1 and targeted studies for other clients at nearby sites, including Rothsay to the south and in the Golden Grove/Minjar area to the east. In the period 2009 to 2024, 21 field surveys were undertaken in the broader Karara area, including exploration areas (see Appendix 9), and as a result of these multiple studies, the vertebrate fauna assemblage and even some elements of the invertebrate fauna assemblage are unusually well-known. The majority of these surveys have taken place within 10km of the proposed disturbance areas that make up the Mine Area (Figure 2-1). Note that this figure does not include all previous BCE surveys but is intended to show that the fauna

assemblage has been well studied in this area. Sampling and monitoring for spiders, and searching or Malleefowl mounds and Western Spiny-tailed Skinks, has occurred more or less throughout the development envelope.

In the vicinity of the Wheatbelt Area, BCE undertook a level 2 (Detailed) fauna survey near Perenjori in 1991 (Read 1992), and studies around Perenjori, Mingenew and Coorow for CBH in 2023 (Kristancic *et al.* 2023a, 2023b, 2024).

Details of major surveys undertaken by BCE and by some other consultancies in the general area are presented in Table 2.1. Note this is not a complete list of BCE reports for the project. The listed reports are intended to demonstrate the comprehensiveness of field investigations and therefore review and management reports are not included, and nor are rapid assessments of small impact areas (such as about 20 small exploration areas which were each inspected for significant species and provided opportunities for general fauna observations). Studies done nearby for other businesses, such as in the Rothsay area and for Minjar Gold along the Warrierdar Copper Mine Road, have not been included. These were all targeted and basic surveys.

There were two periods of detailed sampling (*sensu* EPA 2020): a single season (summer 2004) in 2004 (Bamford & Wilcox, 2004) and a three-season but with most trapping in April and October in 2006 (W. Bancroft & Bamford, 2007). Sampling sites were within a few hundred metres to c. 10km of the Mine Area. The number of ground vertebrates recorded in these surveys by all means (trapping, searching and observation) ranged from 24 species (April 2006) to 28 species (October 2006). Given that the EPA (2020) recommends seven-night trapping periods, examination of species accumulation is warranted as traps were run for only five nights. The April 2006 session recorded 16 species in traps, with only one species (a very widespread gecko) added after the third night. The October 2006 session recorded 18 species of which 10 had not been recorded in April, but with only one species (a common skink) added after the third night. It is highly unlikely that not trapping beyond five nights had a significant impact on species accumulation. Furthermore, 14 reptile species were found only by hand-searching, while four species trapped in 2004 were not found by trapping or searching in 2006. The species recorded only by hand-searching in 2006 thus represent 32% of the known small terrestrial vertebrate assemblage. Of two conservation significant reptiles in the area, one was found only by hand-searching in 2006 and only by trapping (funnel trap) in 2004. Since the sampling of 2006, four additional reptile species have been found by hand searching, so the proportion of the known small, terrestrial vertebrate assemblage recorded only by hand-searching stands at 38%.

Investigations in the general area have included multiple targeted studies on key significant species (Malleefowl, Woolley's Pseudantechinus, Western Spiny-tailed Skink, Gilled Slender-bluetongue, Northern Shield-backed Trapdoor Spider and searching for SRE invertebrates). Some of these studies had extended into the current Mine Area. These studies have included monitoring of the Malleefowl, Western Spiny-tailed Skink and Northern Shield-backed Trapdoor Spider. Monitoring of the Malleefowl and skink has been conducted by KML personnel and students from Curtin University, and has included use of motion-sensitive cameras for extended periods; these were not used in the initial detailed fauna surveys of 2004 and 2006. These multiple surveys, while targeted, allowed for the accumulation of additional fauna observations with the result that the Karara project area has a remarkable list of confirmed vertebrate species. BCE has maintained an ongoing annotated species list which includes 3 frogs, 48 reptiles, 112 birds and 16 native mammals (Appendix 9).

Table 2.1. Previous surveys within c. 20km of the project areas.

Authors	Description	Alignment with current guidance (EPA 2020)	Limitations
Bamford and Wilcox (2004)	Detailed survey in Mungada area for ATA Environmental. A single summer (February 2004) field trip with five intensive sampling sites. Investigations included hand-searching for SRE invertebrates and reptiles, pitfall (200 trapnights), funnel (500 trapnights) Elliott (250 trapnights) and cage (125 trapnights) trapping, bird censusing (5 sessions at each of the five sites), harp-traps and an Anabat II recorder for bats over two nights, and opportunistic observation.	A detailed survey (*sensu* EPA 2020) with numbers of traps affected by weather conditions and rocky terrain.	No limitations; low number of pitfall traps compensated for by high number of funnel traps. Motion-sensitive cameras were not used as is now standard practice, but were used in other investigations (see below).
Bancroft and Bamford (2007)	Detailed and targeted survey for Gindalbie Metals (now KML) at Mungada, Blue Hills north and Karara in April, August and October 2006. One transect of pitfalls and funnels at each site, consisting of 25 sampling locations (combined trapping and bird census) at 50m intervals. Separate Elliott traplines at Mungada and Karara, and a cage trap line at Mungada. Sampling effort consisted of: pitfalls (April and October) - 760 trapnights; funnels (October) – 380 trapnights; Elliotts (August and October – 500 trapnights; and cage traps (August and October) – 75 trapnights. There were 760 bird point census counts. Other methods employed included recording for bats, human chain searching for Malleefowl mounds and searching for cryptic reptiles and short range endemic invertebrates	A detailed survey and targeted survey for Malleefowl and trapdoor spiders (*sensu* EPA 2020). Traps were run for five nights which was adequate to record the fauna assemblage (see text).	No limitations. Motion-sensitive cameras were not used as is now standard practice, but were used in other investigations (see below).
Bamford and Smith (2007) Bamford and Metcalf (2008)	Targeted surveys for Woolley's Pseudantechinus and the Northern Shield-backed Trapdoor Spider at Karara, Blue Hills North, Jasper Hill, Mungada and Terapod. Investigations into the Pseudantechinus involved Elliott trapping (460 trapnights in 2007 and 380 trapnights in 2008) and searching for scats. Investigations into the spider occurred across the same suite of sites in 2007, but focussed on Karara in 2008. In 2007, 71 quadrats (each 10 x 10m) were searched, while in 2008 88 quadrats. Quadrats were distributed in transects in order to map the distribution and abundance of the species in relation to landscape position.	Targeted survey for two species. Opportunistic observations of other fauna.	None.
Bamford (2008)	Systematic searching for Malleefowl mounds across greater project area using the human chance method with up to 12 people. Parts of the expansion areas being investigated in 2020 were included in the 2008 survey.	Targeted survey. Opportunistic observations of other fauna.	None.

Authors	Description	Alignment with current guidance (EPA 2020)	Limitations
Bamford and Harris (2008) Bamford, Browne-Cooper and Huang (2009).	Broad scale regional surveys for the Western Spiny-tailed Skink to map habitat and record presence/absence. Included parts of the two expansion areas investigated in 2020. The November 2008 (Bamford and Harris 2008) survey searched c. 1300ha and found 45 active or recently active colony sites.	Targeted survey. Opportunistic observations of other fauna.	None.
Bamford and Huang (2009)	Site inspection and walking survey for significant species (Western Spiny-tailed Skink, Malleefowl, and Northern Shield-backed Trapdoor Spider) in July 2012. Area investigated include the current camp and airstrip, an alternative site east of Karara mine, and sections of the Mungada Road towards Perenjori. Quadrats were searched for spiders, potential colony sites checked and mapped for the Western Spiny-tailed Skink, and systematic searching for Malleefowl mounds was undertaken.	Basic and targeted survey for three species. Opportunistic observations of other fauna.	None.
Everard and Bamford (2012)	Site inspection and walking survey for significant species (Western Spiny-tailed Skink, Malleefowl, Major Mitchell's Cockatoo and Northern Shield-backed Trapdoor Spider) in July 2012. Area investigated lies south of the Karara mine and immediately east of the southern expansion area investigated in 2020.	Basic and targeted survey for four species. Opportunistic observations of other fauna.	None.
Basnett and Bamford (2013)	Basic and targeted assessment of the Hinge project area, with searching for Western Spiny-tailed Skink, Malleefowl, Major Mitchell's Cockatoo, Northern Shield-backed Trapdoor Spider and SRE invertebrates. Included use of motion-sensitive cameras. Field investigations took place from December 16th to 20th 2011, 19th – 25th July 2012 and September 27th to October 3rd 2012. Over 100 spider quadrats searched and about 500ha searched for Malleefowl mounds.	Basic and targeted survey for four key significant species. Opportunistic observations of other fauna.	None.
Bamford (2014) Bamford (2017)	Repeat and review of Western Spiny-tailed Skink monitoring. About 50 colony sites have been monitored by KML personnel from 2011, with most colonies originally found in BCE surveys. All monitoring sites were revisited and assessed, and advice provided on recording data and analysing change. Note that a Ph.D, student (Holly Bradley) took over this monitoring in 2018.	Targeted survey.	None. The report did identify ways in which monitoring could be improved.
Bancroft and Bamford (2019)	Monitoring of the Northern Shield-backed Trapdoor Spider and Impact) Karara, Blue Hills North and Terapod) and control (Mungada west and east) sites annually from 2010 to 2019. Detected no long-term off-site impact from mining but found a gradual decline in	Targeted monitoring (not addressed in guidance).	None during the monitoring period. No ongoing monitoring now taking place.

Authors	Description	Alignment with current guidance (EPA 2020)	Limitations
	abundance possibly due to long-term decline in rainfall. Project ceased with government approval		
Biota (2007)	Sampling of troglofauna along Mungada ridge (10 widely-spaced drillholes) and in the vicinity of Terapod to the north of Mungada (one drillhole). A single troglobitic pseudoscorpion (*Tyrannochthonius* sp.) was collected from the drillhole north of Mungada. Three specimens of a possibly troglobitic isopod (slater) were collected from the same drillhole. Report recommended further studies.	Survey consistent with current guidance for subterranean fauna.	None.
Ecologia (2008)	Intensive sampling of subterranean invertebrates undertaken in response to the Biota (2007) preliminary study. Sampling carried out on the iron ridge (Mungada, Karara, Blue Hills North) and from pastoral bores in the unconfined aquifer of the landscape surrounding the ironstone ridges. Subterranean fauna found only in these pastoral bores. Report concluded that the unconfined aquifer would not be affected by mining activity, and that troglofauna habitat in the greater Karara Iron Ore Project area is limited to an area north of Mungada.	Report concluded that sampling was greatly in excess of that required by guidance at the time.	None.
Read 1992	Level 2 fauna survey of remnant native vegetation on private property around Inering, between Carnamah and Perenjori. Two-season survey with pitfall traps, Elliott traps and bird surveys at a suite of sites.	Sampling effort similar to current guidance.	None. While data is over 30 years old, there is no suggestion that this is of material relevance to the determination of a fauna assemblage.
Kristancic *et al.* (2023a; 2024; 2023b)	Level 1 ('Basic') and/or targeted assessment of CBH property at Perenjori, Coorow and Mingenew	Sampling effort consistent with current guidance	None.
BCE	Site inspections of proposed exploration and expansion areas; at least 21 such inspections from 2009 to 2024 (see Appendix 9)	Effectively level 1/Basic with some targeted work	None.

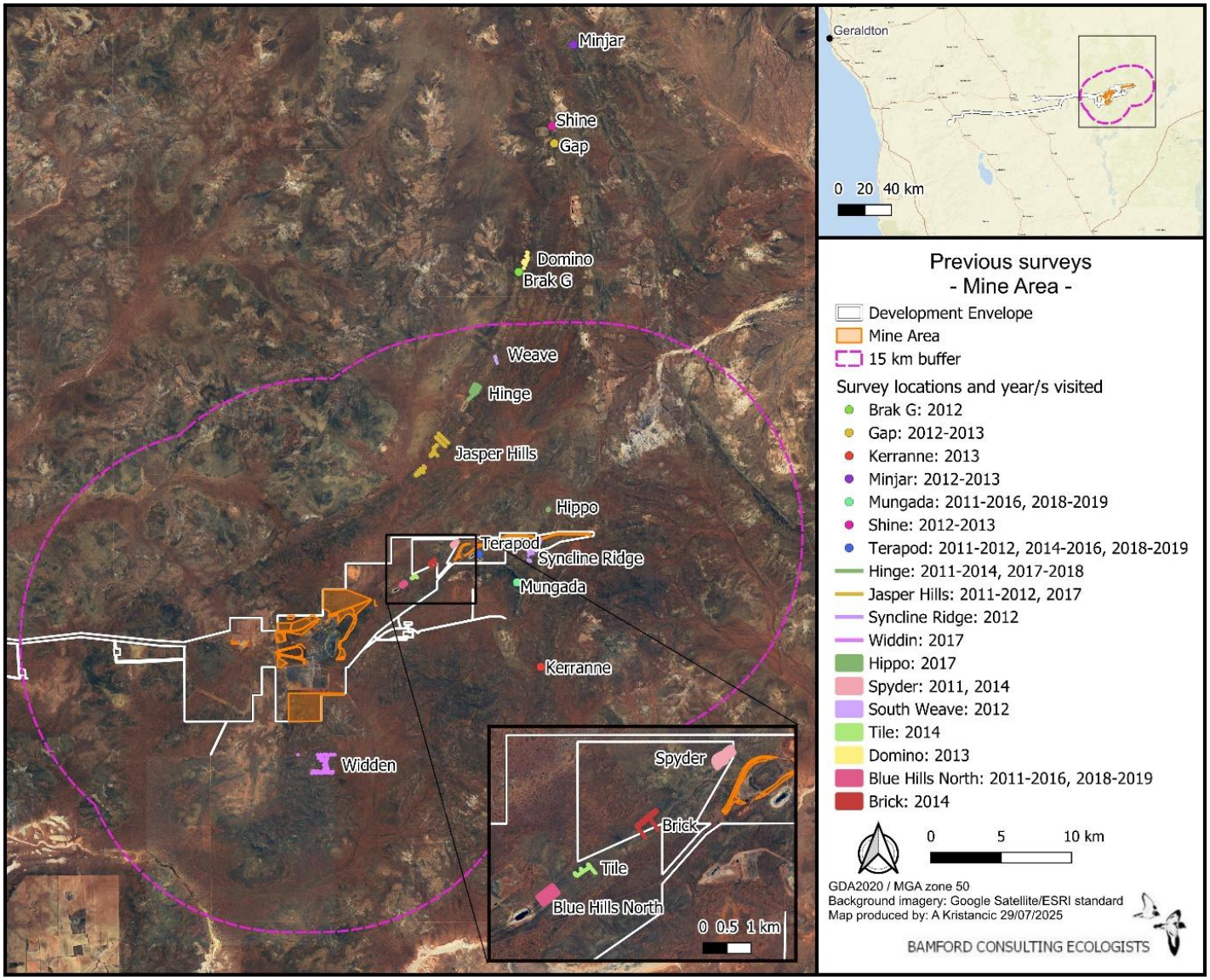

Figure 2-1. Previous BCE fauna surveys undertaken within c. 30 km of the Mine Area.

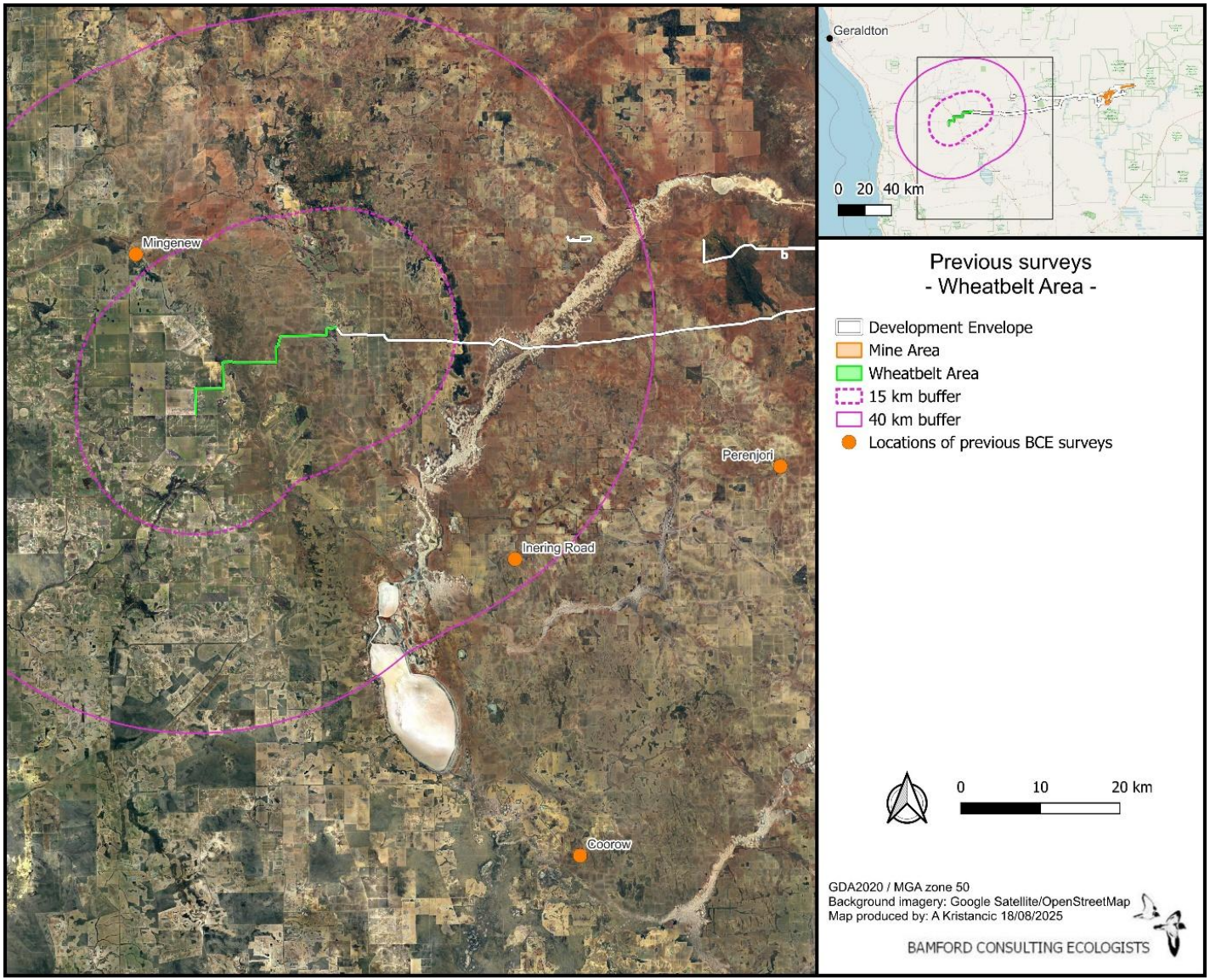

Figure 2-2. Previous BCE fauna surveys undertaken within c. 60 km of the Wheatbelt Area.

2.2.3 Interpretation of Species Lists

Species lists generated from the review of sources of information are generous as they include records drawn from a large area and possibly from environments not represented in the survey area. This is especially the case for the current assessment, as the study area from which database records were drawn spans more than 100 km and includes wheatbelt environments through to relatively intact native vegetation. Therefore, the species list generated by the database review has been interpreted separately for the two project areas; the proposed disturbance footprints of the Mine Area and the Wheatbelt Area. For each project area, some species were excluded because that project area is outside their range, or because their ecology, or the environment within the project area, meant that it is highly unlikely that these species will be present. Such species can include, for example, seabirds that might occur as extremely rare vagrants at a terrestrial, inland site, but for which the site is of no importance. Given the high levels of habitat loss and fragmentation in the wheatbelt, some species that are expected in the Mine Area will not be expected in the Wheatbelt Area. Therefore, the list of species expected in each project area was subject to interpretation by assigning each species a predicted status in each project area. This is based upon a combination of observations in the areas and on the known biology and distribution of the species (from the general literature and personal experience). The status categories used are:

- **Resident**: species with a population permanently present in the project area;
- **Regular visitor or migrant**: species that occur within the project area regularly in at least moderate numbers, such as part of an annual cycle;
- **Irregular Visitor**: species that occur within the project area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the project area in at least moderate numbers and for some time;
- **Vagrant**: species that occur within the project area unpredictably, in small numbers and/or for very brief periods. Therefore, the project area is unlikely to be of importance for the species; and
- **Locally extinct**: species that would have been present but have not been recently recorded in the local area and therefore are almost certainly no longer present in project area.

These status categories make it possible to distinguish between vagrant species, which may be recorded at any time but for which the site is not important in a conservation sense, and species which use the site in other ways but for which the site is important at least occasionally. This is particularly useful for birds that may naturally be migratory or nomadic, and for some mammals that can also be mobile or irruptive. Furthermore, this approach recognises that even the most detailed field survey can fail to record species which may be present at the time of survey (but not detected) or absent at the time of survey but present in the future, or may have been previously confirmed as present. The status categories are assigned conservatively. For example, a lizard known from the general area is assumed to be a resident unless there is very good evidence that the site will not support it, and even then, it may be classed as a vagrant rather than assumed to be absent if the site might support dispersing individuals.

2.3 Field Investigations

2.3.1 Survey overview

Three field surveys have been undertaken for this assessment; these include surveys in June 2020, July 2024 and November 2024.

A field survey of two expansion areas was undertaken over the period 19th to 28th June 2020 by the following personnel:

- Dr Mike Bamford (B.Sc. (Hons.) Ph.D.(Biol.)).
- Mr Peter Smith (Assoc. Dip. Agric.).
- Mrs Sarah Smith BSc (Biol.).
- Mr Josh Bamford (B.Sc./B.Mus.(Hons), M.A.).

Two additional field surveys were undertaken in 2024 to investigate additional proposed disturbance areas. The first focused on the mine area and parts of the Wheatbelt Area, and was undertaken over the period 27th June to 3rd July 2024 by the following personnel:

- Dr Mike Bamford (B.Sc. (Hons.) Ph.D.(Biol.)).
- Mrs Mandy Bamford (B.Sc. (Hons). (Zool).
- Mr Peter Smith (Assoc. Dip. Agric.).
- Dr Barry Shepherd (B.Sc. (hons. Enc. Biol). Ph.D. (Ecol).

The second field survey included supplementary investigations in parts of the mine area that were less thoroughly investigated in previous surveys, plus an investigation of the wheatbelt pipeline project area particular in the west. This was undertaken on 7th November 2024 by the following personnel:

- Mr Peter Smith (Assoc. Dip. Agric.).
- Mrs Sarah Smith (BSc (Biol.).

An overview of survey effort in 2020 and 2024 across the entire development envelope is provided in Figure 2-3, and more detailed maps are shown for the mine area (Figure 2-4 to Figure 2-7) and the Wheatbelt Area (Figure 2-8 and Figure 2-9).

The field investigations were carried out under Regulation 27 permit No. No BA27000156 (2020) and BA27001086 (2024). In 2020, two proposed expansion areas were visited and work involved personnel walking across these areas of interest along transects spaced at 400-500m intervals, with the personnel about 30-50 m apart in each transect (Figure 2-5). With five transects across the northern expansion area and six transects across the southern expansion area, and some additional walking between areas of interest, each person walked about 95km as part of the survey. In 2024, areas of interest were more extensive and widespread, and included long but narrow alignments particularly in the wheatbelt. Transects were therefore walked where possible, but observations on fauna and the environment were also made by driving slowly along existing tracks and stopping opportunistically to investigate landscape features (see Figure 2-4 to Figure 2-9). In 2020, personnel walked a total of 380 km (c. 95 km per person) and the transects across the two areas of interest covered over 30% of these areas. In 2024, personnel walked a total of 117 km along

transects (nine transects, each walked by 2-4 people, see Figure 2-4, Figure 2-6 and Figure 2-7) but also undertook extensive driving and regular opportunistic visits throughout.

The combination of this transect and opportunistic visit approach ensures that the personnel saw a large part of the proposed disturbance areas and were able to make observations throughout. Information collected included:

- Environmental familiarisation (vegetation, soils and landform). Notes were made on soil type, presence of rocks, topography and distinctive features such as drainage lines and outcrops. Photographs taken.
- Systematic recording of Malleefowl mounds. Any mounds encountered within transects were recorded (coordinates with a hand-held GPS unit on datum GDA94), photographed and described. Descriptions included width, height, profile and activity status. Profile and activity status based upon national guidelines supplemented with methods developed by BCE (see Appendix 5). Mounds of most importance are those assigned a status of C (active; preparation) or A (active; breeding). June/July is too early for breeding to be taking place (i.e. too early for egg-laying) but mounds likely to be used in the 2020 and 2024 breeding seasons would be under preparation in June of the respective year. Note that some mounds in the area will already have been found in previous surveys.
- Searching for and identification of habitat for the Western Spiny-tailed Skink. This species occurs in small colonies in log piles, usually York Gum but occasionally other large trees such as *Melaleuca* spp. Previous observations by BCE in the area have found that the log piles need a range of shelter sizes, from large hollows to narrow crevices, and are most likely to support the species if the logs are located amongst shrubs such as *Eremophila* spp.. The lizards are difficult to observe, but leave characteristic piles of scats in latrines, making it easy to determine if a log pile is occupied. Potentially suitable log piles were recorded in the walked transects, giving a measure of potentially suitable habitat, and each pile was checked for scats.
- *Idiosoma* spiders; opportunistic surveys (2020 and 2024). These species live in burrows with distinctive lid architecture, including decorations on the lid and a fan of twigs or leaves. While walking transects, burrows were searched for opportunistically and were recorded when found. At the commencement of the 2020 survey, it was not known if the lid architecture could be used to distinguish between the Northern Shield-backed Trapdoor Spider and the Ornate Trapdoor Spider, or if other significant trapdoor spiders might be present. Therefore, in 2020 and less often in 2024 the contents of burrows were checked with a milliscope; the Northern Shield-backed Trapdoor Spider can usually (but not always) be identified in this way by its heavily armoured abdomen that it presents to the intruding milliscope. In 2020, a small number of burrows were also excavated so that spiders could be examined and, if necessary, collected for later identification by specialist. To avoid unnecessary collection, burrows were excavated carefully so that the burrow was left intact and the spider intersected about 15-20cm below the surface. If the spider could be confidently identified, soil around the burrow was back-filled and the spider released into the top of its burrow.
- *Idiosoma* spider systematic surveys (Plate 2-1, 2020 only). In 2020, estimates of spider density were calculated in the two large expansion areas inspected in that year using a transect approach developed and previously used by BCE in assessments for the Shield-

backed Trapdoor Spider in the Karara area (Bamford *et al.* 2013). Spider search transects were 50m by 2m and were selected randomly (based upon pre-selected northings and eastings) to avoid bias. Locations of these systematic spider transects are shown in Figure 2-5 (overview) and in detail in Figure 2-10 and an example of a spider search transect is shown in Plate 2-1. Searching took place 1m either side of the tape measure. All spider burrows were found in each transect, enabling a robust density estimate to be determined.

- *Idiosoma* spider intensive searches (2024). Because of the very large area to be investigated in 2024, a slightly quicker search method (than the transect surveys) for spiders was employed. This involved four people (sometimes only two) searching intently around a point with a radius of up to 50m for at least 10 minutes. It was not a total search, but had high likelihood of detecting spiders if present in the searched area.
- Gilled Slender Blue-tongue (2020 and 2024). This cryptic species was searched for in rocky areas by turning over rocks; it had been previously recorded on Karara and Mungada ridges using this technique.
- Other fauna (2020 and 2024). Opportunistic observations on other fauna were made at all times, including bird sightings and recording evidence such as tracks and scats.

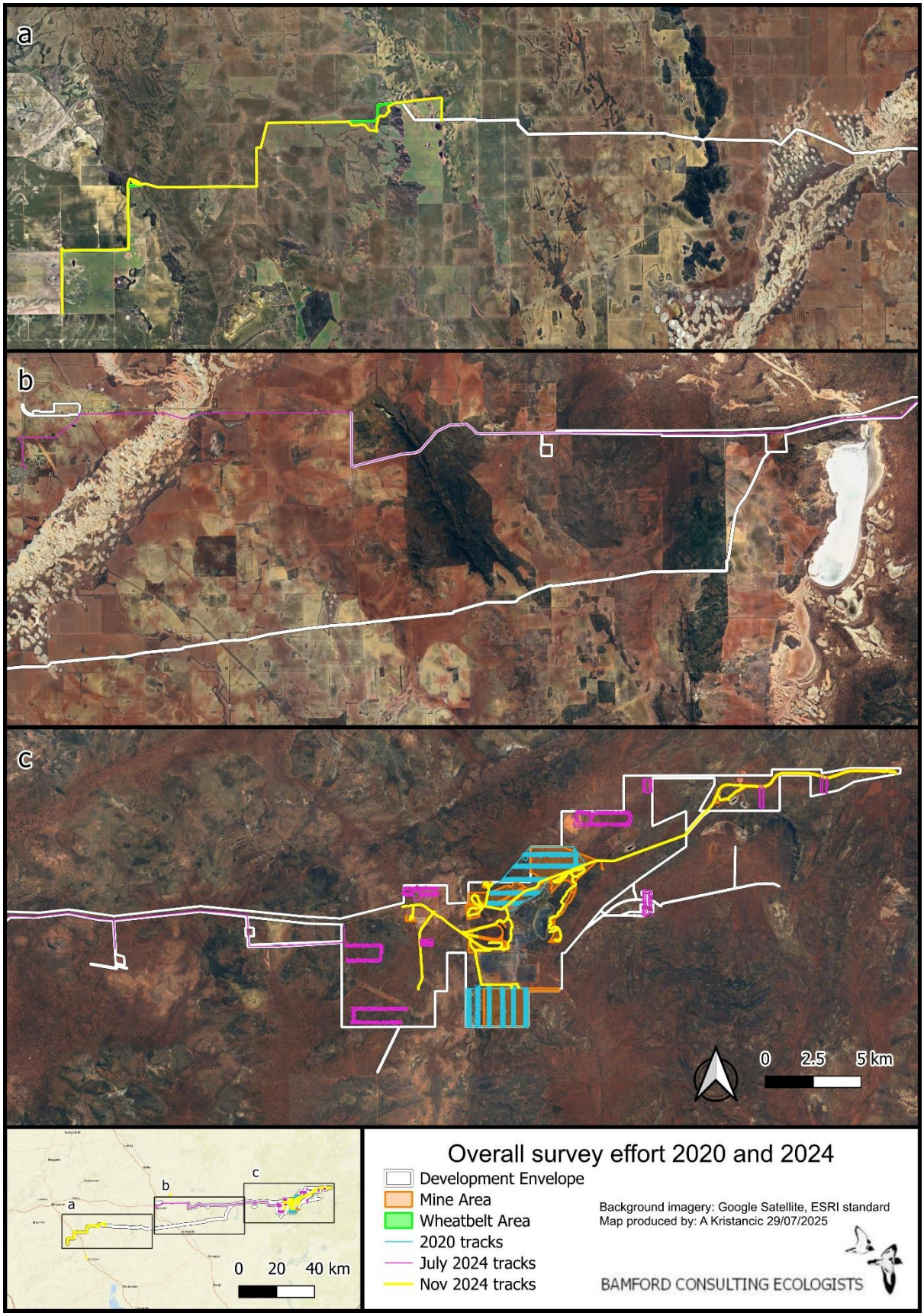

Figure 2-3. Overview of BCE survey effort in 2020 and 2024.

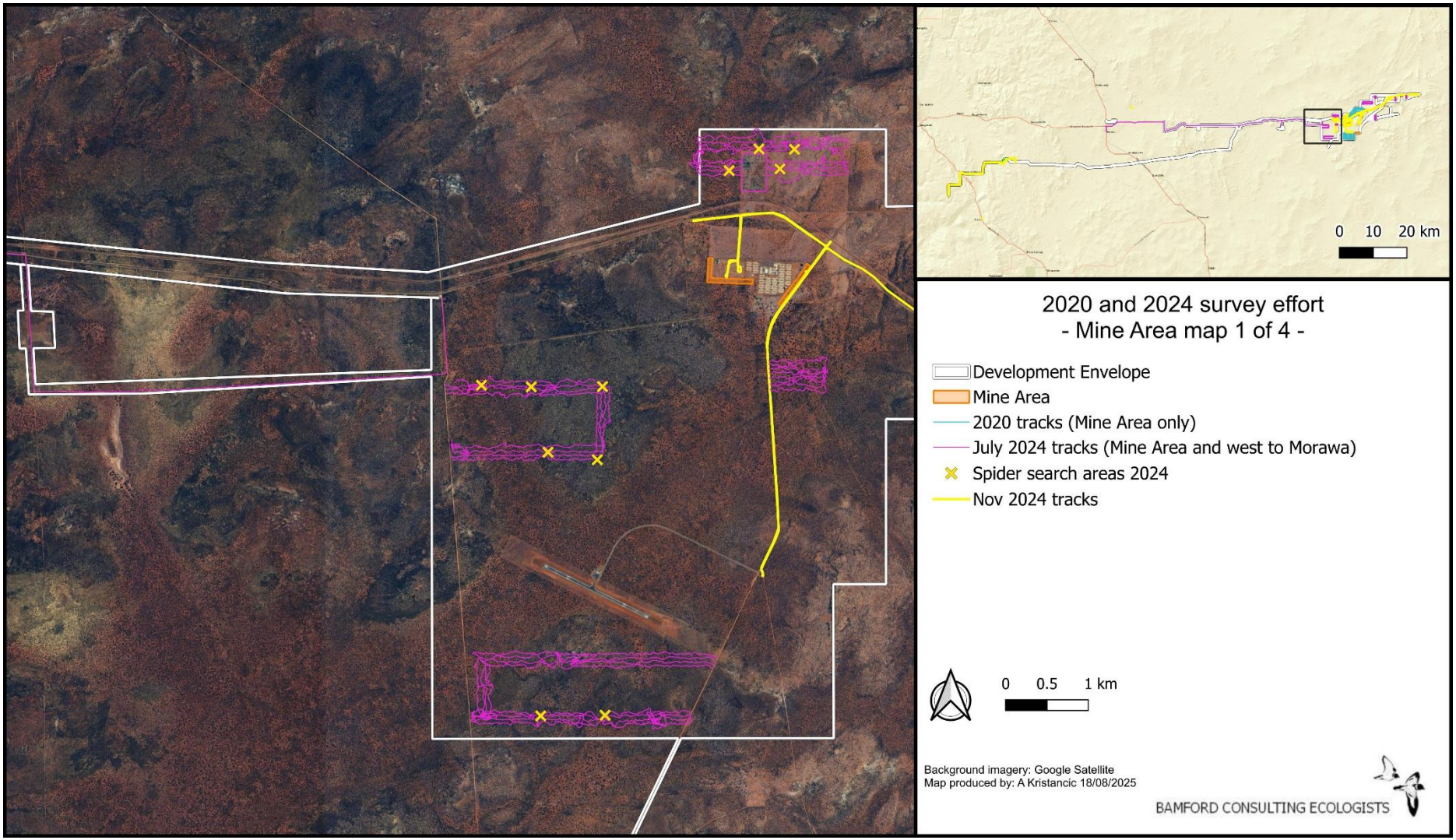

Figure 2-4. Survey effort within Mine Area in 2020 and 2024. Map 1 of 4.

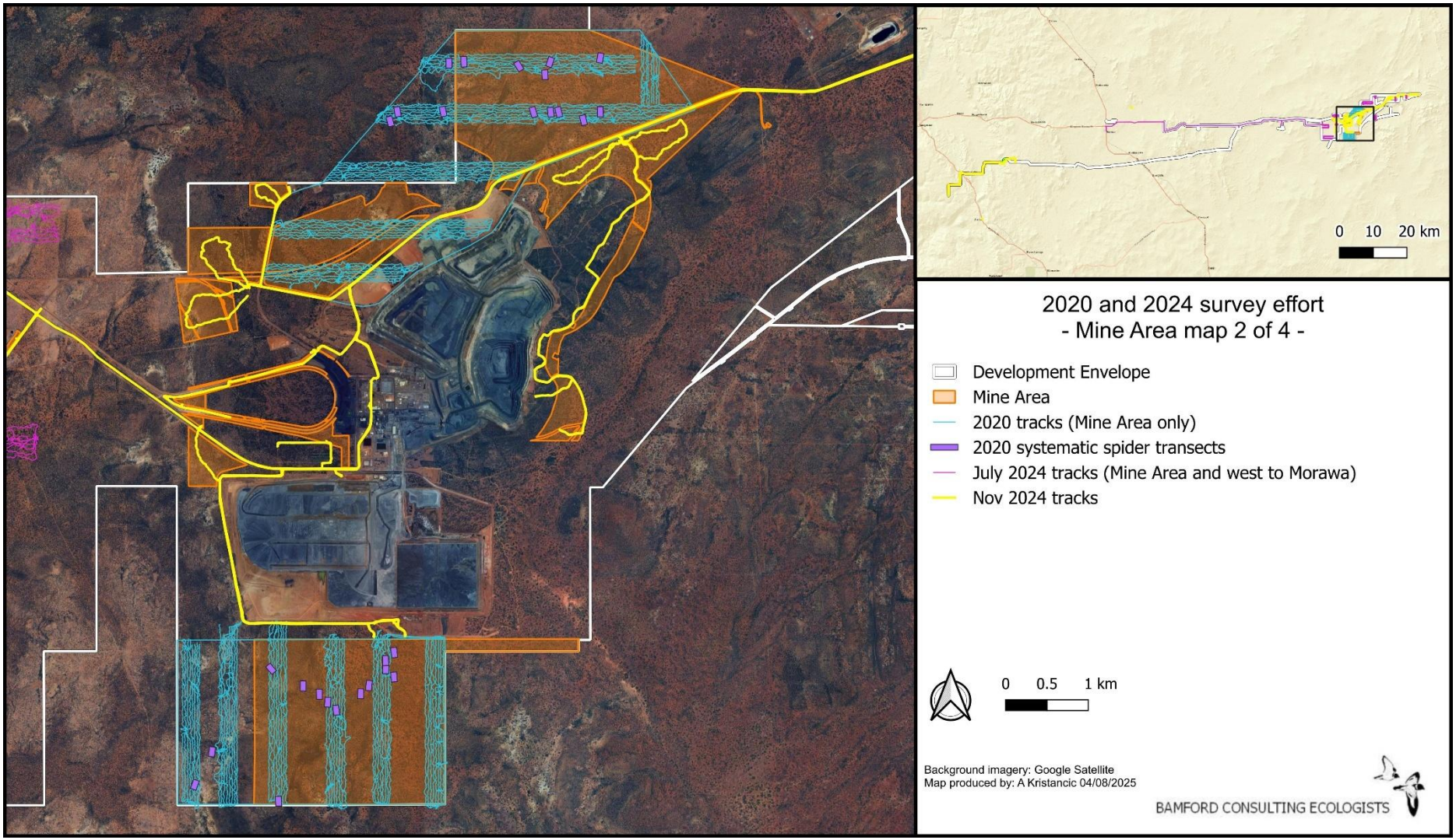

Figure 2-5. Survey effort within Mine Area in 2020 and 2024. Map 2 of 4.

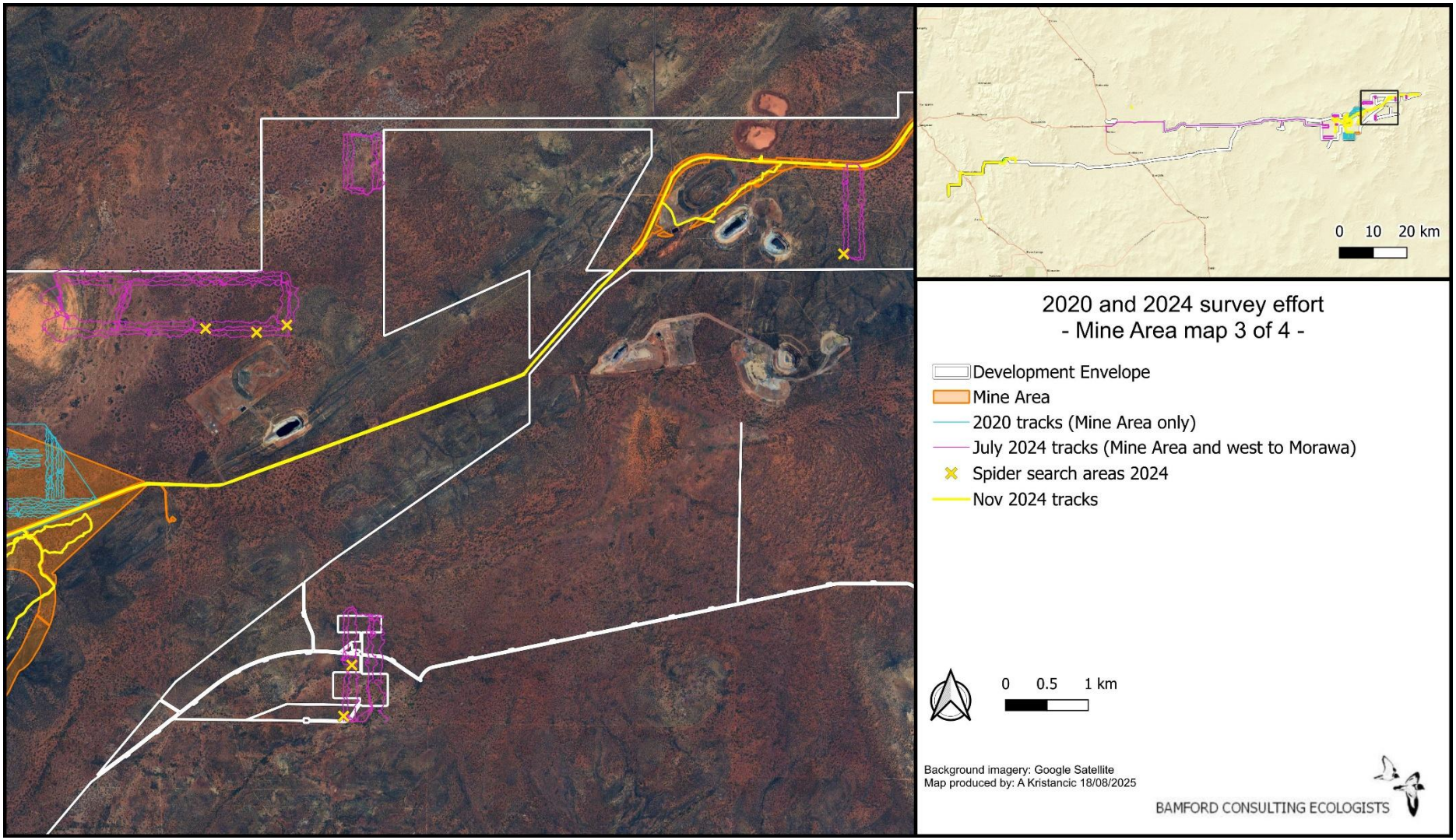

Figure 2-6. Survey effort within Mine Area in 2020 and 2024. Map 3 of 4.

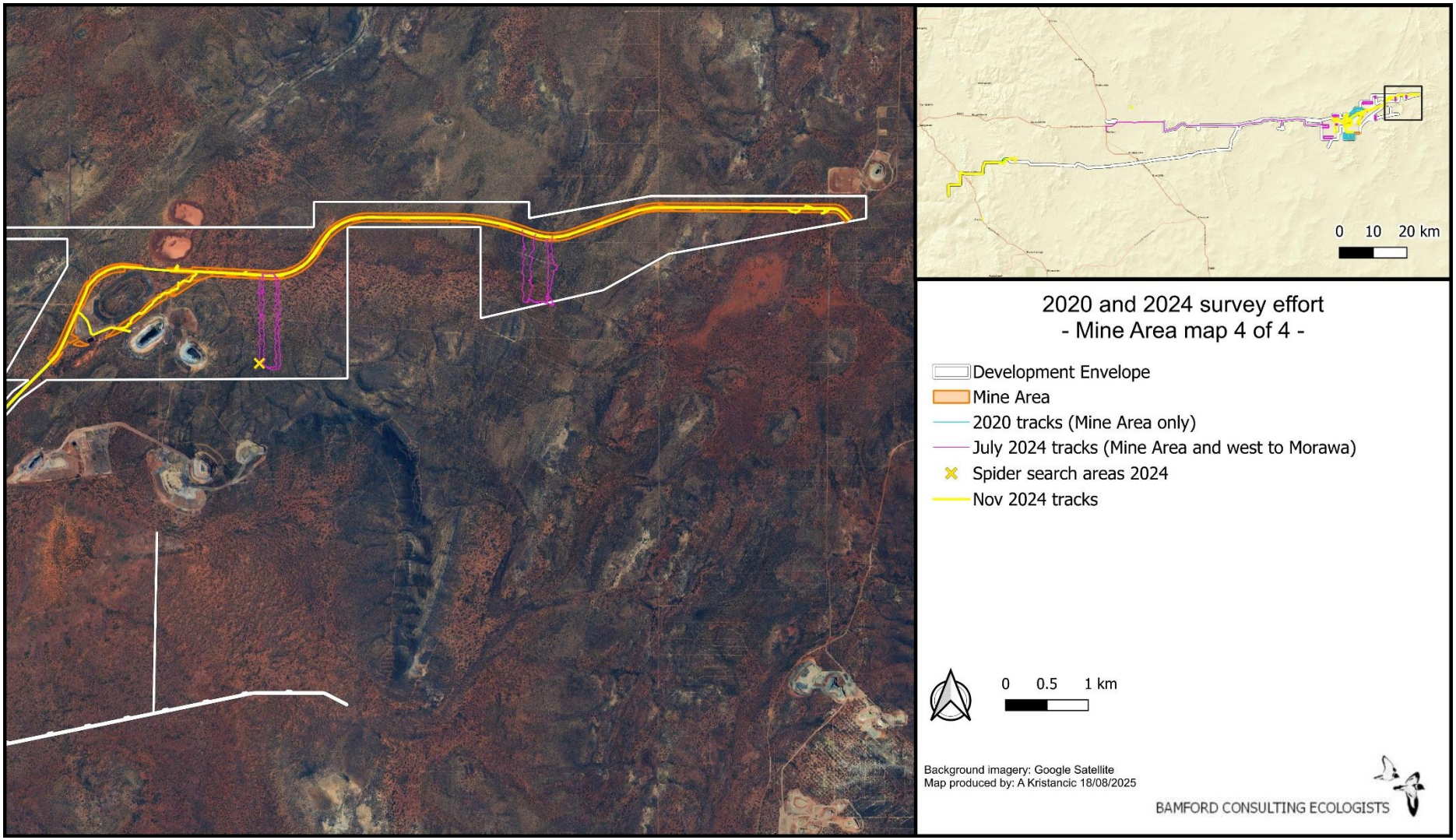

Figure 2-7. Survey effort within Mine Area in 2020 and 2024. Map 4 of 4.

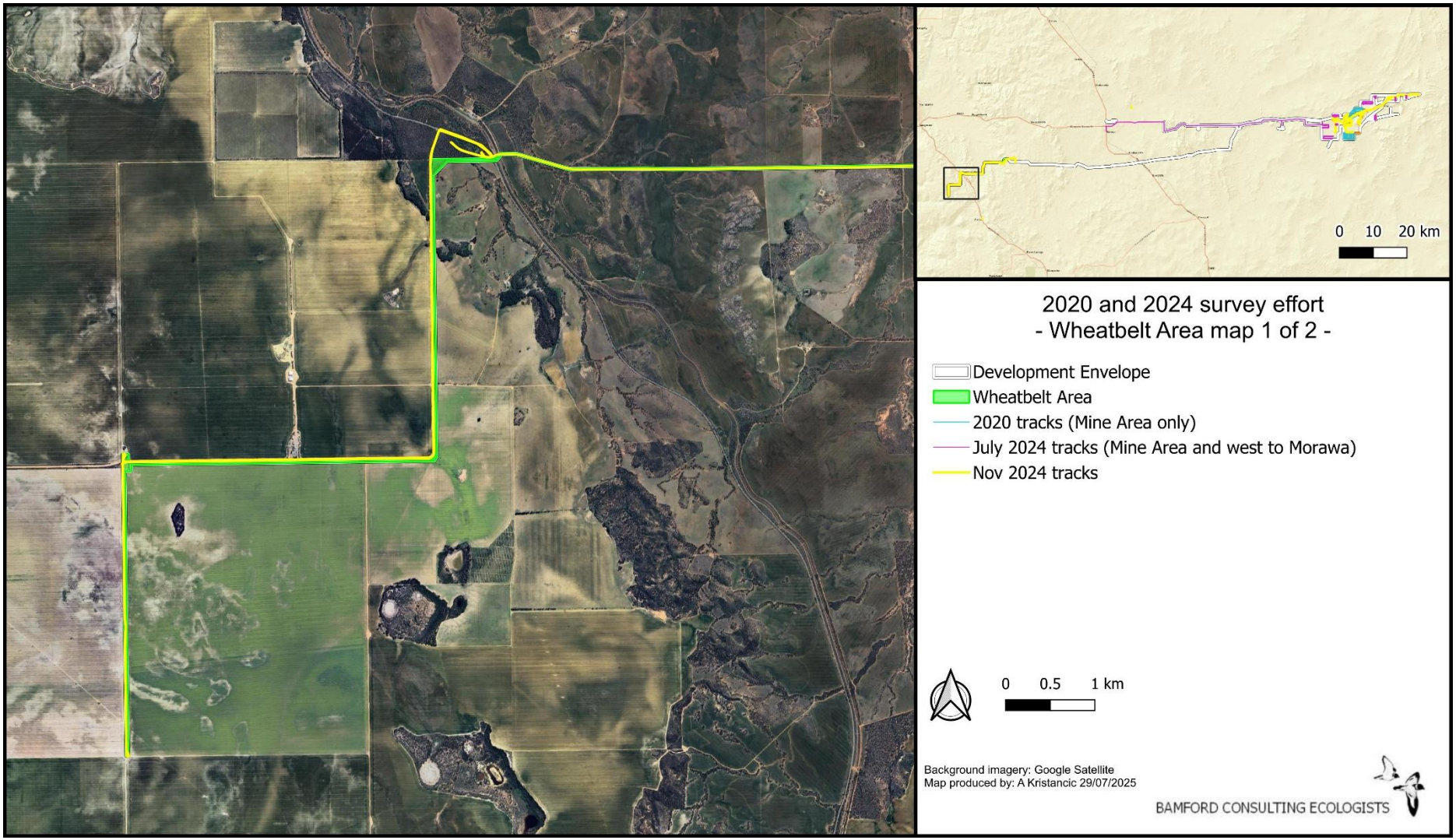

Figure 2-8. Survey effort within Wheatbelt Area in 2020 and 2024. Map 1 of 2.

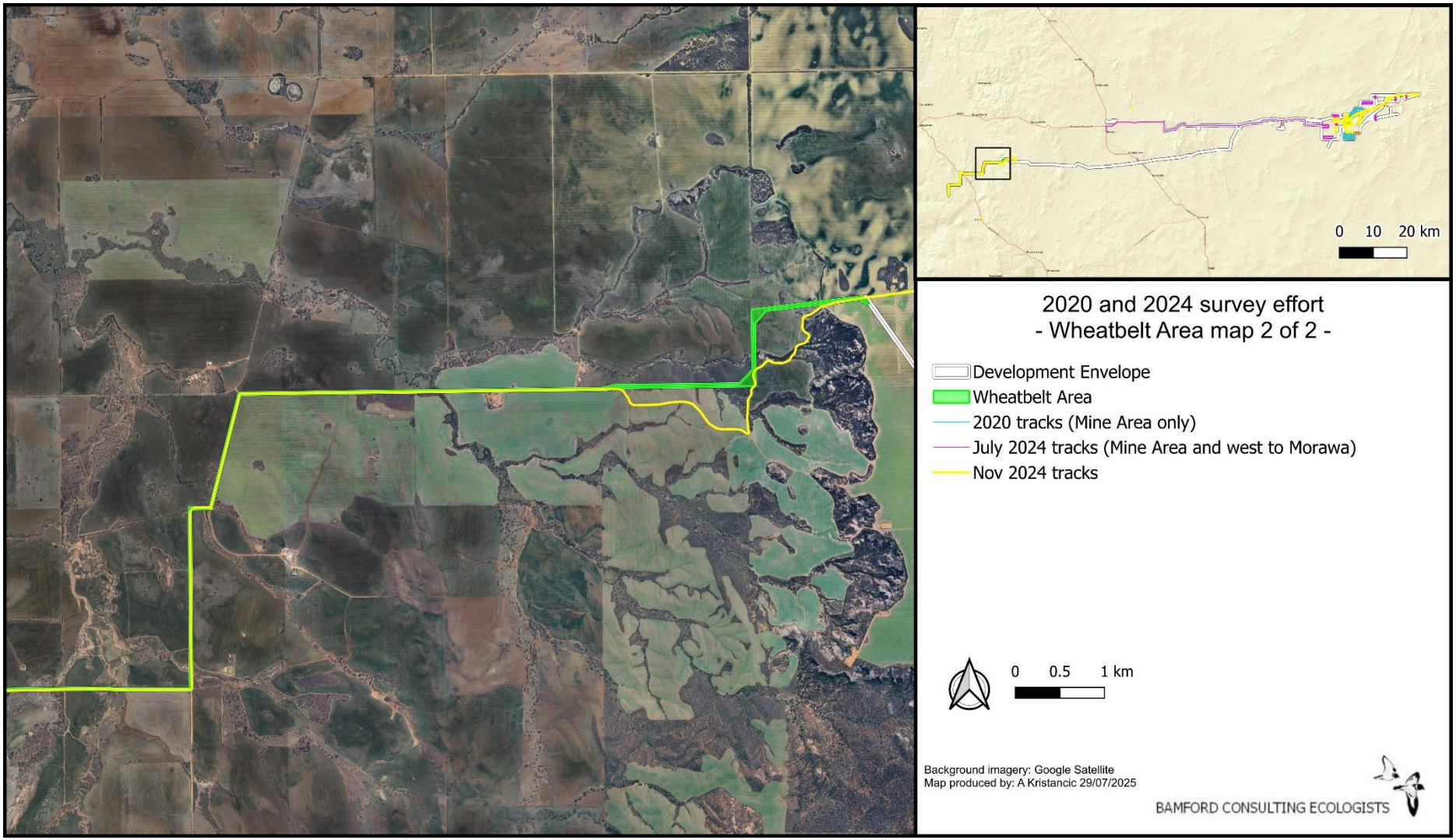

Figure 2-9. Survey effort within Wheatbelt Area in 2020 and 2024. Map 2 of 2.

Plate 2-1. Searching along a systematic spider transect; searching took place 1m either side of the tape measure. This was conducted in 2020 only and locations of spider transects are shown on Figure 2-5 and Figure 2-10.

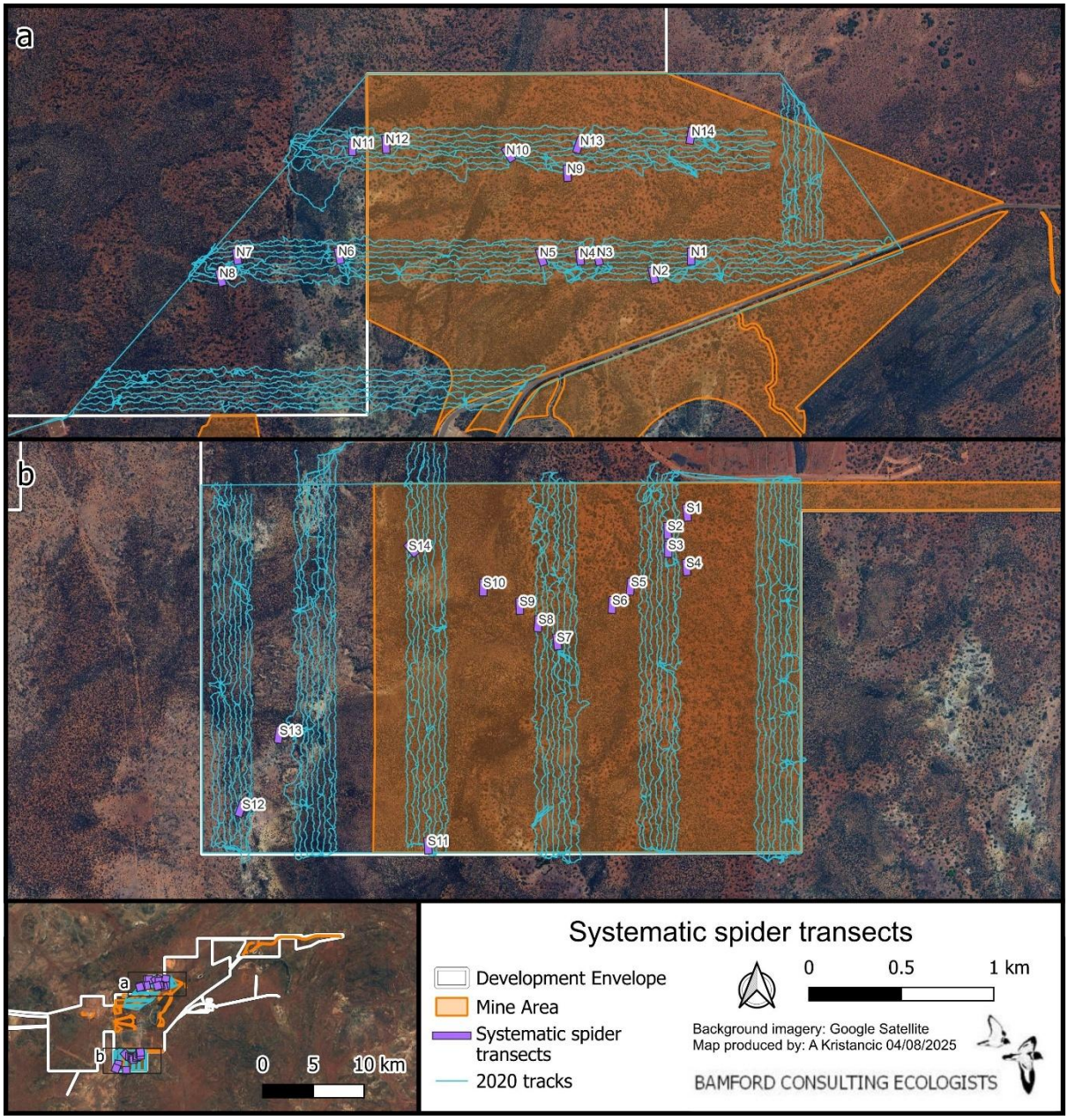

Figure 2-10. Detailed location of systematic spider transects searched in Mine Area in 2020.

2.3.2 Survey Limitations

The EPA Guidance Statement 56 (EPA 2004) outlines a number of limitations that may arise during surveying. These survey limitations are discussed in the context of the BCE investigation of the two expansion areas in Table 2.2.

Table 2.2. Survey limitations as outlined by EPA.

EPA Limitation	Comment
Level of survey.	Basic and targeted surveys - desktop study and field investigation), but supported by extensive previous surveys in immediate area and therefore abundant pre-existing data.
Competency/experience of the consultant(s) carrying out the survey.	The field team have conducted multiple surveys in the area over a period of more than a decade, and a combined total experience of >100 years in field investigations for Environmental Impact Assessment in WA.
Scope (What faunal groups were sampled and were some sampling methods not able to be employed because of constraints?)	The survey focussed on significant vertebrate and invertebrate fauna.
Proportion of fauna identified, recorded and/or collected.	Several invertebrate specimens were collected for later identification and some spiders could only be identified to genus in the field. This is not a limitation as all members of the genus present in the area are of similar conservation significance.
Sources of information e.g. previously available information (whether historic or recent) as distinct from new data.	Very extensive information from the immediate area due to multiple previous surveys.
The proportion of the task achieved and further work which might be needed.	All tasks completed.
Timing/weather/season/cycle.	Weather was mostly fine during all field investigations and very suited to the approach taken. The time of year was suited to the approaches undertaken with none of the target species being weather-dependent.
Disturbances (e.g. fire, flood, accidental human intervention etc.) that affected results of survey.	None.
Intensity (In retrospect, was the intensity adequate?)	The walking approach ensured that large parts of the expansion areas were visited.
Completeness (e.g. was relevant area fully surveyed).	Relevant areas were visited on foot almost completely and more than adequately for the purpose.
Resources (e.g. degree of expertise available in animal identification to taxon level).	Field personnel have extensive experience with fauna and habitat in the region.
Remoteness and/or access problems.	There were no remoteness/access problems encountered.
Availability of contextual (e.g. biogeographic) information on the region.	Extensive regional information was available and was consulted.

2.4 Identification of 'Vegetation and Substrate Associations' (VSAs)

Vegetation and substrate associations (VSAs) combine vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna.

BCE deliberately makes the distinction between 'habitat' (a species-specific term that may encompass the whole or part of one or more VSAs and is the physical subset of an ecosystem that a given species, or species group, utilises) and 'VSA' (a general, discrete and mutually exclusive spatial division of a target area, based on soil, vegetation and topography). It is recognised, however, that, within the broader EIA literature/guidance, the former term is used more or less synonymously to indicate the latter (e.g.' habitat assessment' used by EPA, 2020). Further discussion is provided in Appendix 1.

For the current assessment, VSAs were identified based on observations made during the field investigations combined with vegetation mapping prepared by Umwelt (2025).

2.5 Analysis of monitoring data

A component of the desktop review consisted of examining monitoring data for Malleefowl mounds and Western Spiny-tailed Skink colonies.

Western Spiny-tailed Skink colonies were found during systematic surveys undertaken by BCE (e.g. Bamford and Harris 2008), by surveys undertaken by H. Bradley (student from Curtin University), and opportunistically by KML staff. As with Malleefowl mounds, both systematic and opportunistic surveys have overlapped with the current areas of interest around the mine, but not in the Wheatbelt Area. Skink colonies have been monitored annually by KML staff with notes being made on presence and age of scats as an indication of activity. A guide to identifying scats of the Western Spiny-tailed Skink, and distinguishing them from those of the Pygmy Spiny-tailed Skink, and also to aging the scats, was prepared by M. Bamford. The vegetation where Western Spiny-tailed Skinks occur is readily identified, and therefore the review of the monitoring data focussed on examining trends in abundance. The review involved re-interpretation of some notes on colonies and particularly descriptions of scats. Colonies were identified as active (ie occupied by skinks at the time of a survey) if scats were identified as fresh or recent, which changed some of the conclusions regarding colony activity in the KML records.

The Malleefowl register was interrogated to determine how many active mounds had ever been found during the monitoring period (since 2008/09), and to summarise the number of active vs. inactive mounds each year since 2011/12. The latter was done from 2011/12 onwards as the data collection appeared inconsistent prior to this monitoring period.

For each species, the results of the analysis of monitoring records is presented within the species account (Section 3.2.4.1).

3 Results

3.1 Vegetation and Substrate Associations

The development envelope (DE) is extensive, starting in the Karara mine area and extending west. Soils and vegetation are quite variable across the development envelope in the Karara area, but it is possible to recognise a sequence of Vegetation and Substrate Associations (VSAs) that relate to changes in elevation/relief and substrate type across the landscape. VSAs often blend into each other with broad (occasionally abrupt) transitional zones. Note that the acacia shrublands and thickets occur mainly low in the landscape and are similar, but often with distinct differences in substrate type, co-dominant shrubs and understorey. Overall, 12 VSAs are recognised within the entire development envelope; these are based on observations made during field investigations in 2020 and 2024, combined with vegetation mapping provided by Umwelt (2025). VSAs within the development envelope include:

VSA 1. Breakaways and rocky ridges. These are isolated and scattered and most appear to be laterite or with some ironstone. Breakaways and rocky ridges support scattered mostly low acacias forming a moderately dense to open shrubland. This VSA occurs within the Mine Area and surrounding DE, and in small, scattered areas to the west of the Karara area. The entire DE contains 913 ha of this VSA, of which 103 ha is within the Mine Area and none is within the Wheatbelt Area. This VSA includes Umwelt VT O and F. See Plate 3-1.

VSA 2. Acacia Shrubland over granite and Granite Outcrops. Acacia open shrubland often over a herbfield of Resurrection Plant on shallow sandy loam over granite, with some granite outcropping. The outcrops have a low profile with little actual exposed rock, and are scattered throughout the large expansion area in the south investigated in 2020, and just north of the Village. Areas with Acacia shrubland occur in the west of the southern expansion area (around granite outcrops), and just to the north of the accommodation village. The entire DE contains 112 ha of this VSA, of which 4 ha is within the Mine Area and none is in the Wheatbelt Area. This VSA includes Umwelt VT B. See Plate 3-2 and Plate 3-3.

VSA 3. Acacia tall shrubland on moderately deep sandy loam, often with scattered small rocks on surface. Abundant annuals in winter and spring. Scattered York Gum and other eucalypts. Extensive and generally low in the landscape. Occurs within the Mine Area and surrounding DE, and in patches along the remainder of the DE to the west of the Karara area. In the Wheatbelt Area this VSA is confined to road verges and small remnants and is generally highly degraded due to weed invasion. The entire DE contains 2115 ha of this VSA, of which 230 ha is within the Mine Area and 2 ha is within the Wheatbelt Area. This VSA includes Umwelt VTs A, AA, C, E, H, R, T, Z, HMVT B, HMVT C and HMVT G. See Plate 3-1, Plate 3-4 and Plate 3-9.

VSA 4. Acacia shrubland with scattered Sand Pine on sandy loam flats. Occurs on broad flats mainly in the Mine Area and surrounding DE. Also occurs immediately to the west of the Karara area. The entire DE contains 2444 ha of this VSA, of which 390 ha is within the Mine Area and none is in the Wheatbelt Area. This VSA includes Umwelt VT D. See Plate 3-5.

VSA 5. Mixed shrubland and tall thicket of Acacia and Melaleuca on clay-loam flats with little understorey. This VSA is fairly extensive within the Mine Area (and surrounding DE) and is also present in the northern corridor west of the Karara area, and in the DE near Morawa. The entire DE contains 2600 ha of this VSA, of which 316 ha is within the Mine Area and none within the Wheatbelt Area. This VSA includes Umwelt VTs P and Q. See Plate 3-6.

VSA 6. Acacia low shrubland on gravelly-loam rises. Shrubs tend to be low (<1.5m) and dense. This occurs scattered within the Mine Area and surrounding DE, and along the DE to the west of the Karara area, where the northern corridor passes through the Koolanooka Hills. The entire DE contains 456 ha of this VSA, of which 110 ha is within the Mine Area and none is within the Wheatbelt Area. This VSA includes Umwelt VTs S, V, W, X and Y. See Plate 3-7.

VSA 7. York Gum open woodland on clay-loam flats with little understorey. Extensive and low in the landscape. Soils may occasionally be waterlogged. It occurs scattered within the Mine Area and surrounding DE, as patches immediately west of the Karara area, and in small and degraded (weed invaded) patches along road verges in the Wheatbelt Area. The entire DE contains 1903 ha of this VSA, of which 274 ha is within the Mine Area and 4 ha is within the Wheatbelt Area. This VSA includes Umwelt VTs G, I, K, HMVT E and HMVT F. See Plate 3-1 and Plate 3-8.

VSA 8. *Eucalyptus clelandiorum* woodland to forest on calcareous clay loam flats usually close to salt lake systems. This VSA is present only within the Karara area, c. 300 m north of the boundary of the Mine Area. The entire DE contains 64 ha of this VSA, all of which occurs outside the project area boundaries. This VSA includes Umwelt VT U. See Plate 3-9.

VSA 9. Chenopod shrublands and salt lakes, with a large system in the central north of the mine area. Also includes areas of clay pans. This VSA occurs in the DE surrounding the Mine Area, c. 800 m north of the proposed disturbance areas, but not within the proposed disturbance areas themselves. It also occurs where the DE crosses salt lakes to the west of the Karara area, such as Weelhamby Lakes and the Salt River, and in the disjunct section of DE near Morawa. The entire DE contains 186 ha of this VSA, all of which occurs outside the project area boundaries. This VSA includes Umwelt VTs J, L, M, N and HMVT A. See Plate 3-10.

VSA 10. Cleared Land. Depending upon the location within the DE, this VSA consists of either land cleared for mining infrastructure and operations, or cleared paddocks and road verge. Cleared land makes up the majority of the DE to the west of the Karara area, particularly the very narrow corridors which tend to follow existing roads through cleared farmland. Within the wheatbelt this VSA contains occasional isolated trees of York Gum or Jam. Within the Karara area (including the Mine Area) this VSA encompasses the mine itself as well as areas cleared for infrastructure such as buildings, roads/tracks and the air strip. The entire DE contains 2754 ha of this VSA, of which 17 ha is within the Mine Area and 62 ha is within the Wheatbelt Area. This VSA includes Umwelt VT CL.

VSA 11. Creeklines. Narrow and probably ephemeral drainage lines with *Eucalyptus camaldulensis* over sedge, *Hakea preissii, Acacia saligna*, annual herbs and introduced grasses on seasonally waterlogged and even wet clay- loam soils. Occurs only within the boundary of the Wheatbelt Area,

in the far west of the DE. The entire DE contains c. 5 ha of this VSA, all of which is within the Wheatbelt Area. This VSA includes Umwelt VT HMVT D. See Plate 3-14.

VSA 12. Planted Eucalypts. This occurs only in the far west of the DE, along road verges within the Wheatbelt Area. The entire DE contains c. 4 ha of this VSA, with none in the Mine Area and 3.6 ha in the Wheatbelt Area. This VSA includes Umwelt VT PL.

The development envelope also contains 1.6 ha of 'Water', none of which is within either project area.

Table 3.1. Area of each VSA present within the entire development envelope (DE), and each of the project areas.

VSA	ha in entire DE	ha in Mine Area	ha in Wheatbelt Area
1 Breakaways and Rocky Ridges	913.0	103.2	0.0
2 Acacia Shrubland over Granite	112.3	3.8	0.0
3 Acacia Tall Shrubland	2114.8	232.8	2.3
4 Acacia Shrubland with Sand Pine	2443.7	389.6	0.0
5 Mixed Acacia and Tall Thicket (Acacia and Melaleuca)	2599.7	315.6	0.0
6 Acacia Low Shrubland on Gravelly Rises	455.7	110.0	0.0
7 York Gum Open Woodland	1903.0	274.4	3.7
8 *Eucalyptus clelandiorum* Woodland/Forest	64.3	0.0	0.0
9 Chenopod Shrubland/Salt Lakes/Clay Pans	186.0	0.0	0.0
10 Cleared Land	2754.4	16.5	61.7
11 Creeklines	4.7	0.0	4.7
12 Planted Eucalypts	3.9	0.0	3.6
Water	1.6	0.0	0.0
TOTAL	**133 557 ha**	**1 446 ha**	**76 ha**

Within the proposed disturbance areas that make up the Mine Area, eight VSAs are present. VSAs 8 and 9 are present within the general Karara area (c. 300 m and 800 m north of proposed disturbance areas, respectively) but are not present within the actual proposed disturbance areas. Within the proposed disturbance areas that make up the Wheatbelt Area, five VSAs are present; c. 80% of this project area is made up of VSA 10 (Cleared Land), with other VSAs mostly confined to small patches along the roadside. Full details of VSAs within the two project areas are provided in the following subsections.

The remainder of the development envelope (in between the two project areas) contains all VSAs except VSA 11; all areas of this VSA are within the boundary of the Wheatbelt Area. The first section of the development envelope west of the Karara area passes through native vegetation of acacia shrublands (VSAs 3, 4, 5 and 6) and eucalypt woodlands (VSA 7), and crosses Weelhamby Lakes where there are chenopod shrublands (VSA 9) on saline soils around the lake. West of this lake system, the

development envelope branches into two corridors. The northern corridor continues to follow the existing Mungada Road through acacia shrublands (VSAs 3-6) and eucalypt woodlands (VSA 7), but then enters farming areas which are extensively cleared, with native vegetation largely confined to the road reserve. This corridor passes through the Koolanooka Hills, where acacia shrubland is extensive within the landscape, with VSAs 5 and 6 being found alongside cleared areas within the development envelope. In this area, some parts of the development envelope contain thin strips of VSA 7 alongside cleared areas (VSA 10). Also present within the Koolanooka Hills are distinctive granite outcrops (VSA 2); with prominent monadnocks (kopjes) standing out amongst acacia shrubland (Plate 3-11). To the west of the Koolanooka Hills, just north of Morawa, an isolated portion of the development envelope occurs in largely cleared land (VSA 10) adjacent to the Karara Mine railway line. In this portion of the development envelope, there are scattered areas of vegetation consistent with VSAs 5, 7 and 9.

The southern corridor extends south-west through mostly cleared land (VSA 10) to Lochada Rd, where it passes through remnant vegetation on the border of Bowgarder Nature Reserve (including patches of VSA 1, 3 and 7), then continues to roughly follow Lochada Rd, through mostly cleared land, before passing in between patches of remnant vegetation in the south of the Koolanooka Hills. From here the development envelope continues west, mostly following existing roads and passing through cleared farmland (VSA 10) with scattered degraded remnant vegetation (e.g. VSAs 7 and 9) or planted eucalypts (VSA 12) along the roadside. To the south-west of Morawa, the development envelope is comprised primarily of VSA 9 (but also some VSA 7 and VSA 3) where it passes through an extensive chain of salt lakes (the Salt River). Further west, VSA 3 is present along the edges of the development envelope where it passes between patches of remnant vegetation south of Mt Nunn Nature Reserve and north of Mount Campbell. The development envelope continues west through cleared farmland, until it reaches the far west, where the proposed disturbance area of the Wheatbelt Area occurs. This area is described in more detail below. The distribution of VSAs within the intervening development envelope (between the Mine Area and Wheatbelt Area) is shown in Figure 3-7 to Figure 3-13.

Plate 3-1. View from low rocky hill (VSA 1) in the north across York Gum (VSA 7) and acacia shrublands (VSA 3) towards Karara mine.

Plate 3-2. VSA 2. Open acacia shrubland on sandy loam with exposed granite in west of the southern expansion area.

Plate 3-3. VSA 2. Acacia shrubland over Resurrection Plant on sandy loam soil in the southern expansion area.

Plate 3-4. VSA 3. Acacia tall shrubland on sandy loam soil with scattered rocks in the northern expansion area.

Plate 3-5. VSA 4. Acacia shrubland with scattered Sand Pine on sandy loam flats.

Plate 3-6. VSA 5. Mixed shrubland and tall thicket of acacia and melaleuca on clay-loam flats.

Plate 3-7. VSA 6. Acacia low shrubland on gravelly rise.

Plate 3-8. Open woodland of York Gum (VSA 7) in clayey-loam soil. Note accumulation of leaf litter but sparse understorey.

Plate 3-9. *Eucalyptus clelandorium* woodland (VSA 8) on left, with apparently natural clearing on transition to acacia tall shrubland (VSA 3) on right.

Plate 3-10. VSA 9. Chenopod Shrubland and scattered *Eucalyptus clelandiorum* on margin of salt lake north of the current mine.

Plate 3-11. Koolanooka Hills with granite monadnocks (VSA 2) rising through acacia shrubland (VSA 3).

Plate 3-12. Remnant acacia shrubland (broadly VSA 3) passing through paddocks (VSA 10).

Plate 3-13. VSA 7: Degraded York Gum (*Eucalyptus loxophleba*) open woodland, with shrubs of *Acacia acuminata*, *Hakea preissii* and *Enchylaena tomentosa*, over annual herbs and introduced grasses on red-brown sandy loam.

Plate 3-14. VSA 11: Narrow band of Creekline. *E. camaldulensis* over sedge, *Hakea preissii Acacia saligna*, Annual herbs and introduced grasses on clay loam wet soil.

3.1.1 Mine Area

Within the boundaries of the proposed disturbance footprint of the Mine Area, eight VSAs are present (described above). VSA 1 (Breakaways and rocky ridges) occurs high in the landscape, and makes up c. 7 % of the proposed disturbance footprint. VSA 2 (Acacia shrubland over Granite) is limited within the disturbance footprint and makes up only 0.3 % of the Mine Area. Lower in the landscape, VSAs 3, 4, 5 and 6 (broadly Acacia shrublands but with differences such as substrate) together make up the majority (72 %) of the Mine Area. About 20 % of the Mine Area (e.g. disturbance footprint) is comprised of York Gum woodland (VSA 7), and a very small proportion (1 %) is cleared land (VSA 10). The distribution of VSAs across the Mine Area and surrounding DE is shown in Figure 3-1 to Figure 3-4.

3.1.2 Wheatbelt Area

The disturbance area in the far west (the Wheatbelt Area) is largely in farmland with little remnant vegetation. Five broad VSAs were identified in the Wheatbelt Area; these are described in detail above (Section 3.1). The majority (81 %) of the Wheatbelt Area, the boundaries of which tend to follow existing roads, is made up of VSA 10 (Cleared Land); this contains occasional isolated trees of York Gum or Jam, but is otherwise comprised of cleared roads, cleared paddocks, or roadside dominated by agricultural weeds. The remaining VSAs tend to occur as small areas along roadsides, and each make up relatively small proportions of the overall area; VSA 3 (Acacia tall shrubland) makes up 3%, VSA 7 (York Gum woodland) makes up 5%, VSA 11 (Creeklines) makes up 6% and VSA 12 (Planted Eucalypts) makes up 5%. Of note is a section in the far east of the Wheatbelt Area where it passes through remnant vegetation just east of Willis Rd (shown as an inset in Figure 3-6); in this section the majority of the disturbance footprint is made up of vegetated VSAs (VSAs 3 and 11) rather than existing clearing. The distribution of VSAs across the Wheatbelt Area is shown in Figure 3-5 and Figure 3-6. VSAs in the intervening rea (between the Min Area and Wheatbelt Area) are mapped in Figure 3-7 to Figure 3-13. Note that because much of the Wheatbelt Area is very narrow, small patches of some VSAs are not visible.

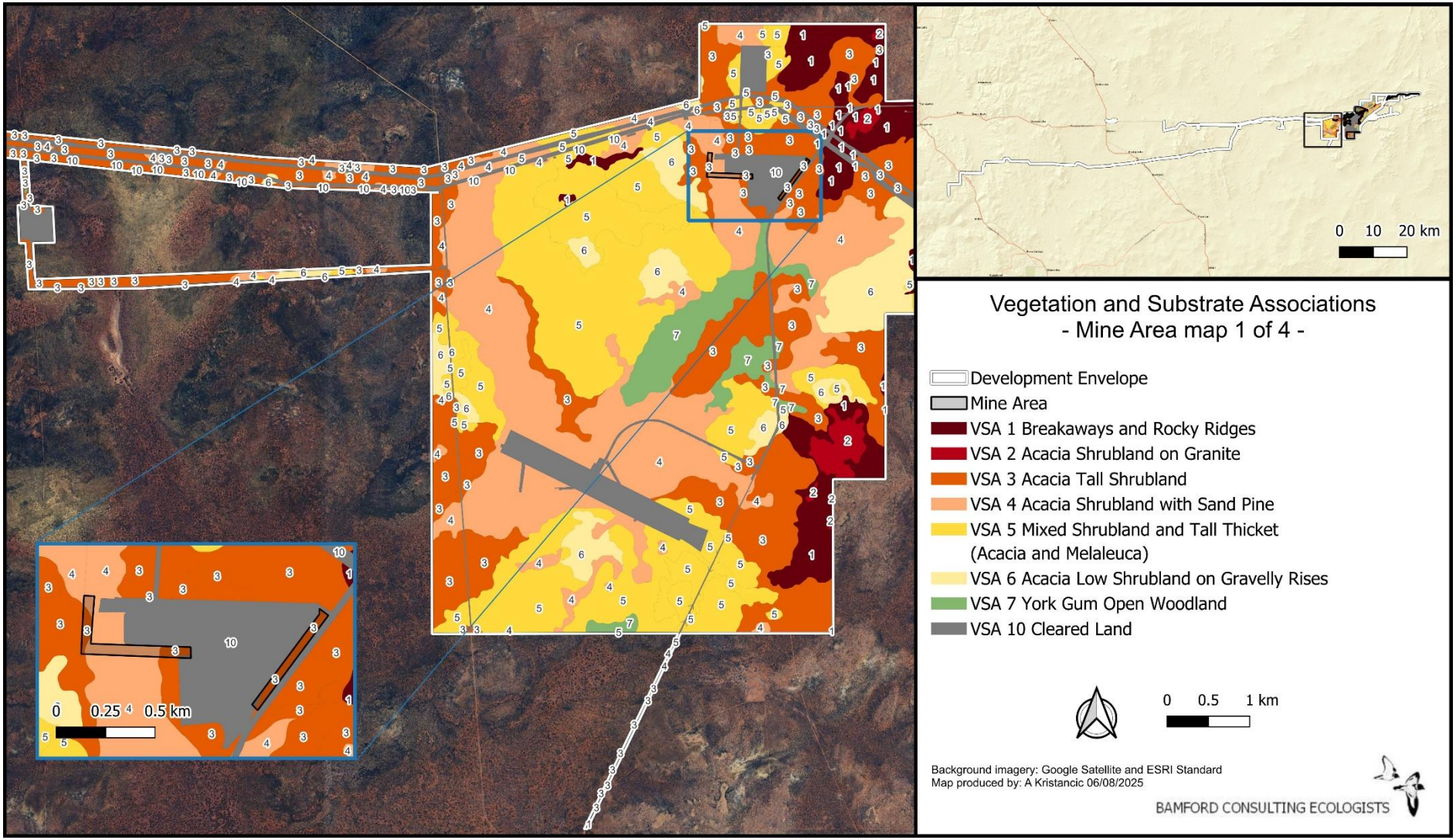

Figure 3-1. Distribution of VSAs across the development envelope surrounding the Mine Area. Map 1 of 4.

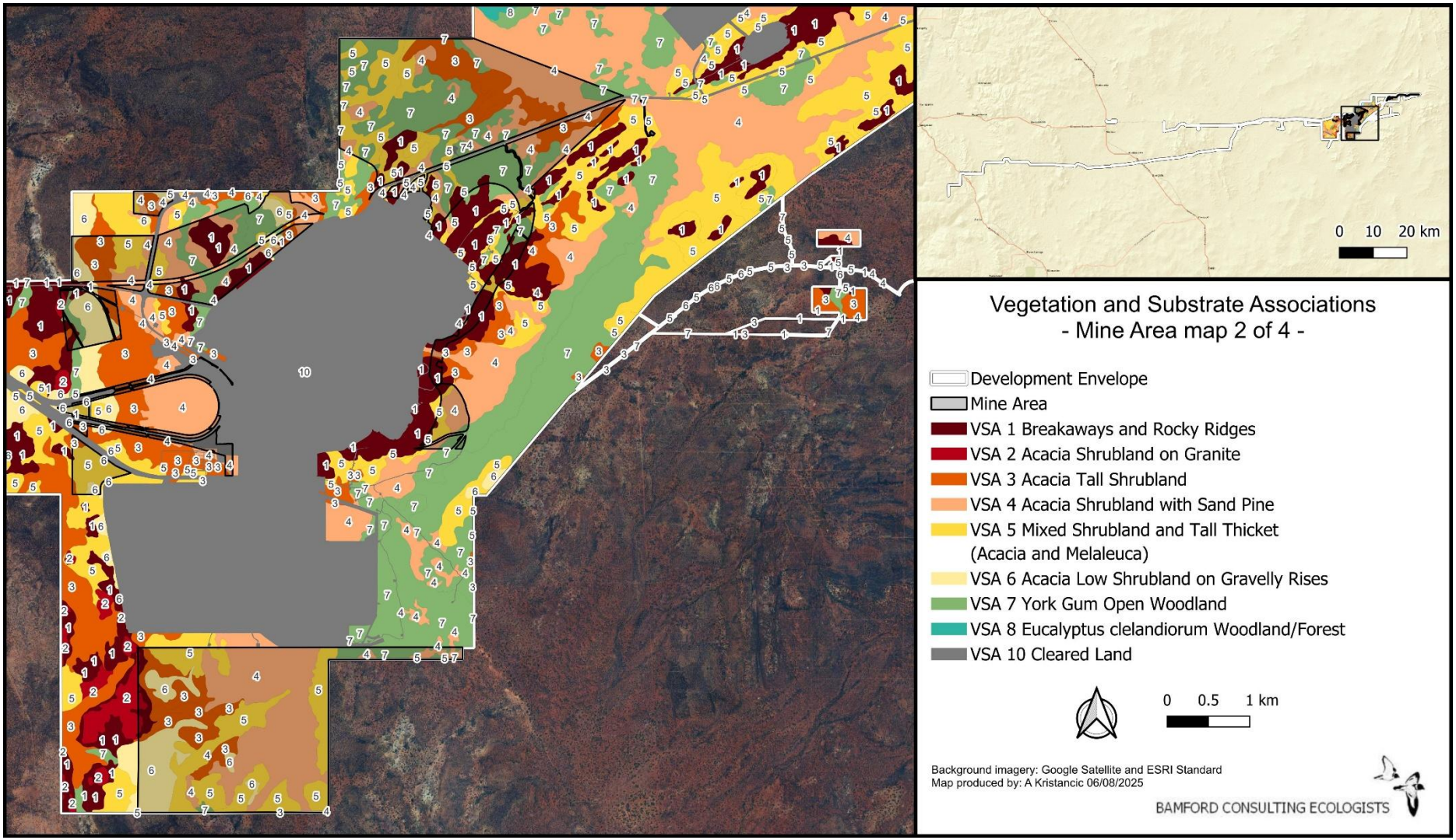

Figure 3-2. Distribution of VSAs across the development envelope surrounding the Mine Area. Map 2 of 4.

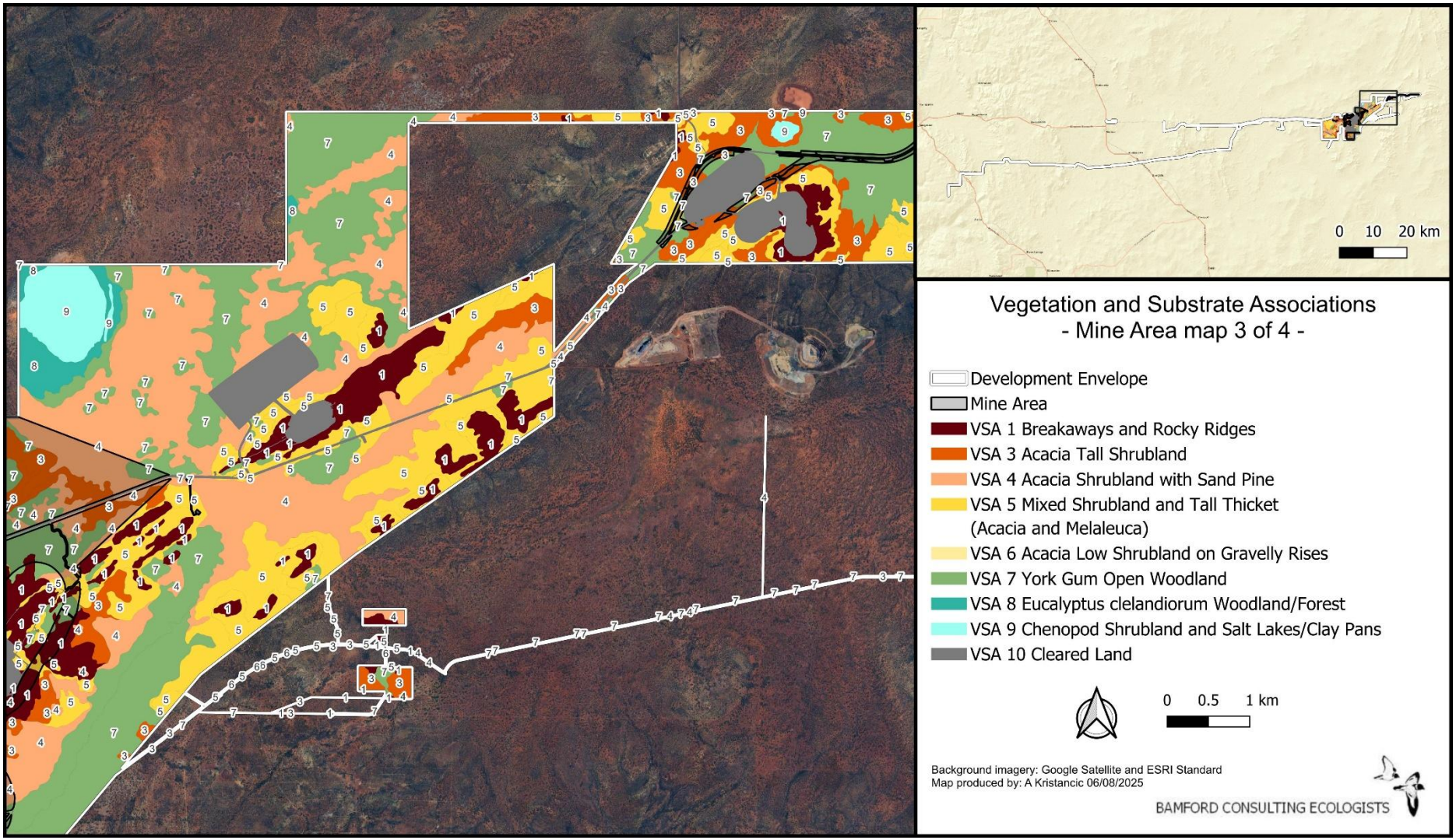

Figure 3-3. Distribution of VSAs across the development envelope surrounding the Mine Area. Map 3 of 4.

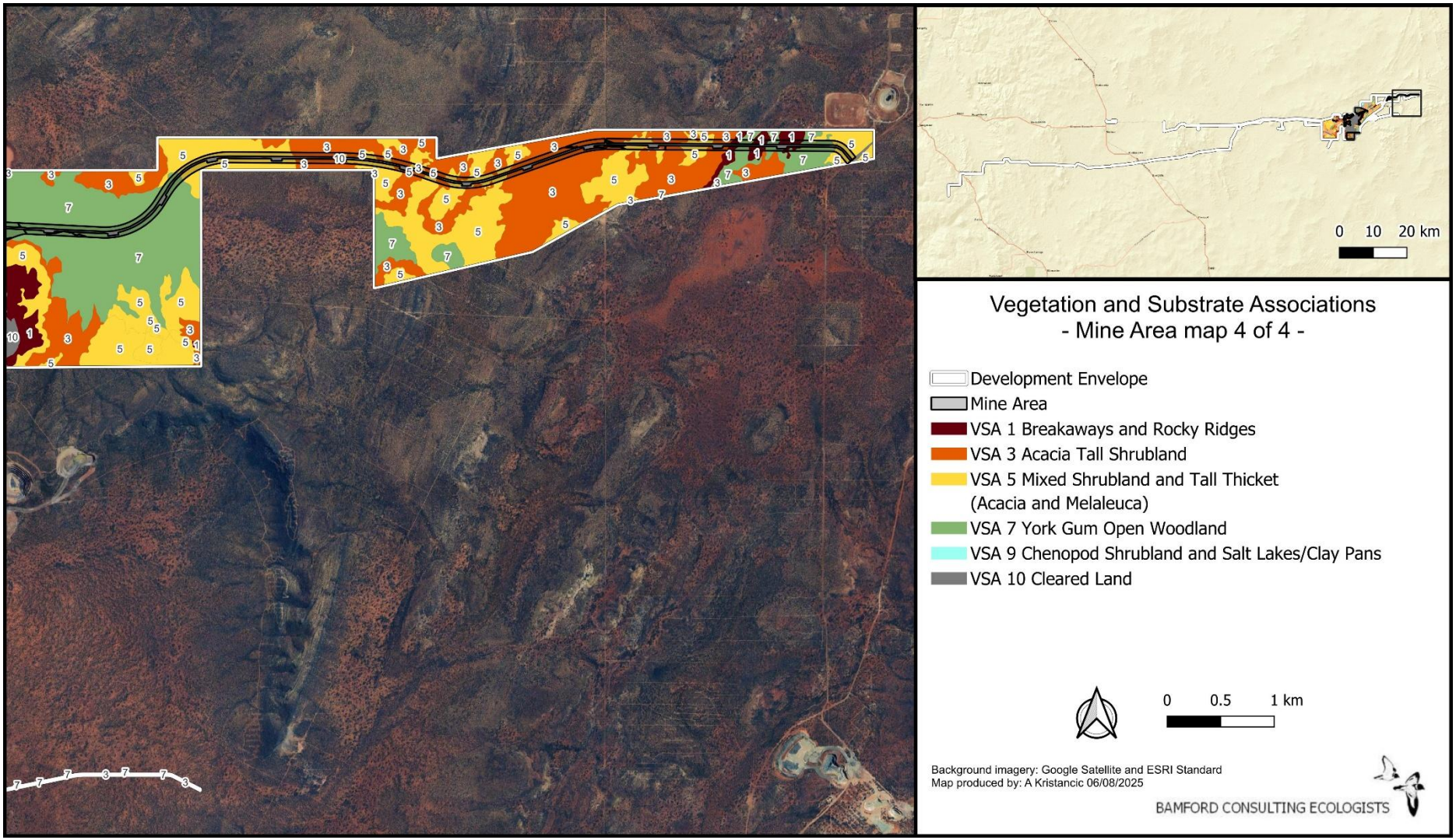

Figure 3-4. Distribution of VSAs across the development envelope surrounding the Mine Area. Map 4 of 4.

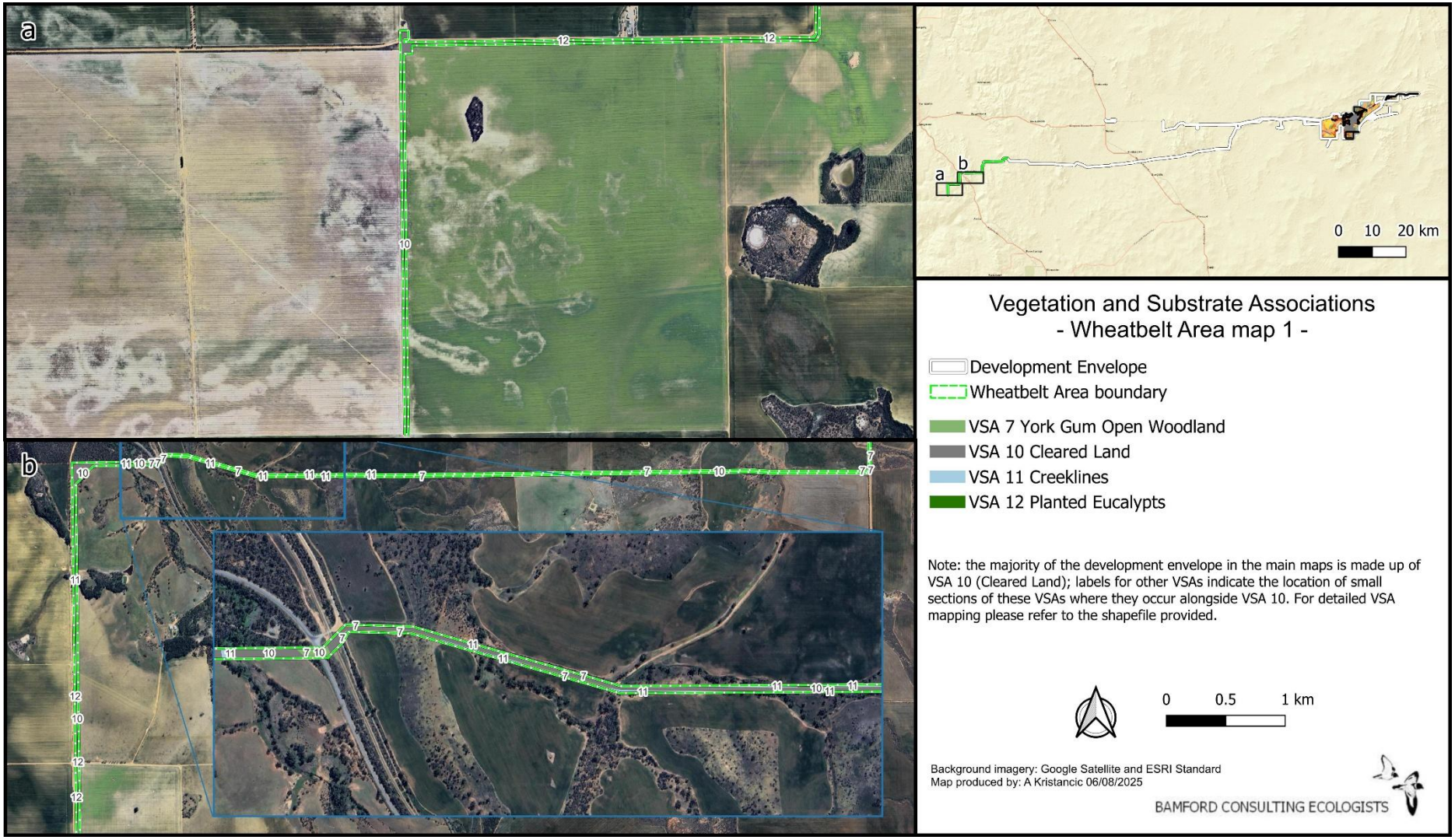

Figure 3-5. Distribution of VSAs across the Wheatbelt Area. Map 1 of 2.

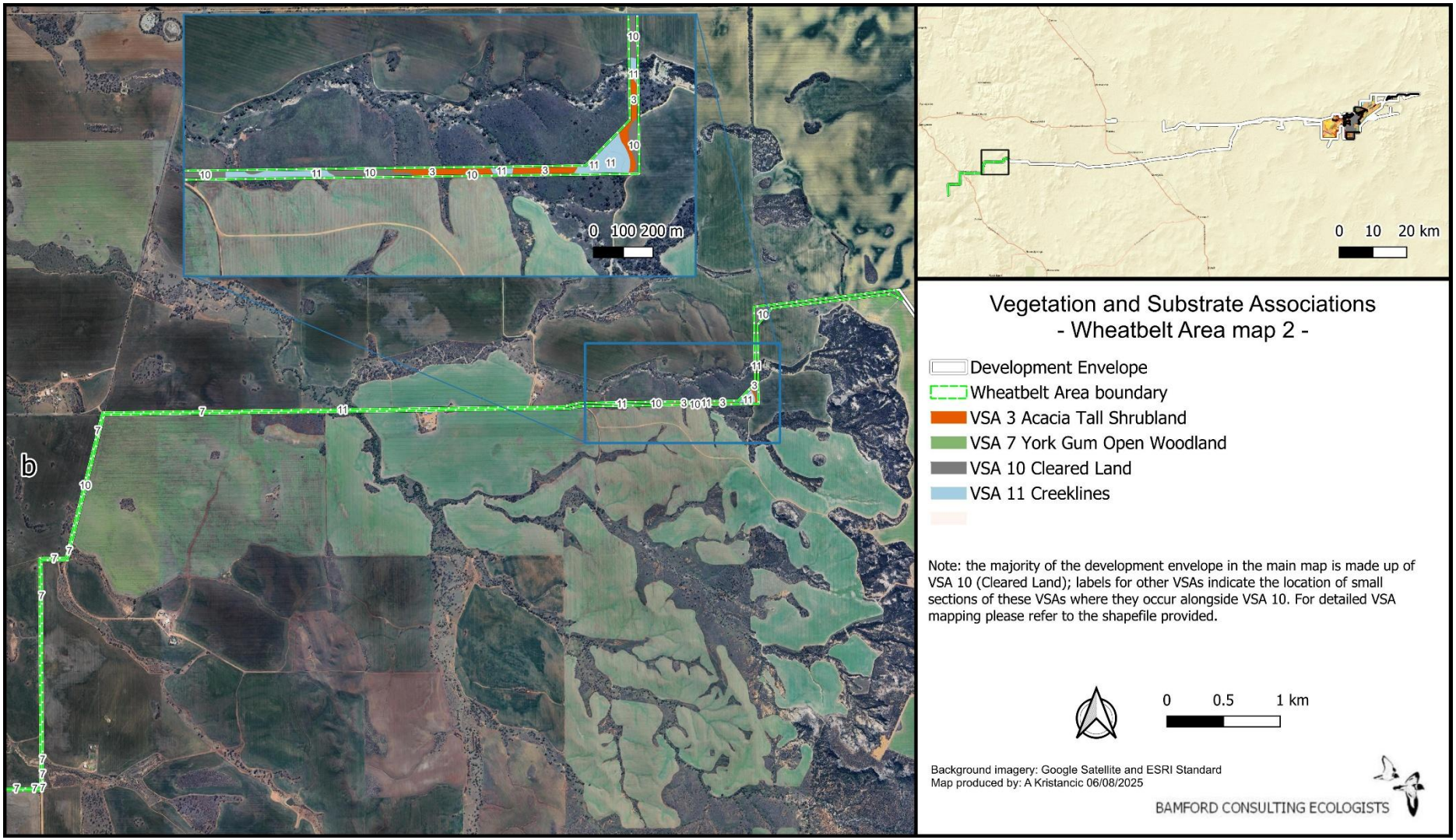

Figure 3-6. Distribution of VSAs across the Wheatbelt Area. Map 2 of 2.

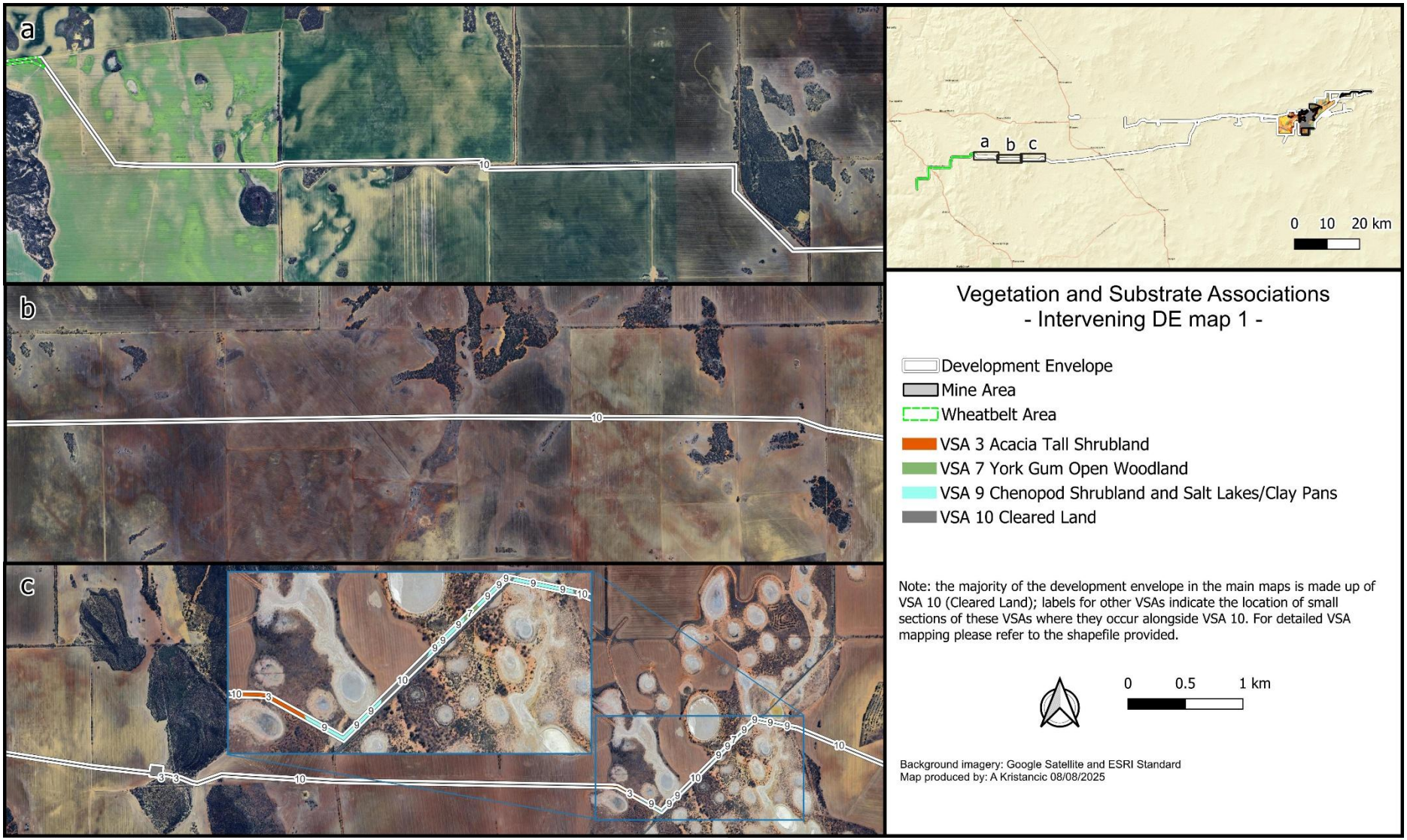

Figure 3-7. Distribution of VSAs across the intervening DE. Map 1 of 7. .

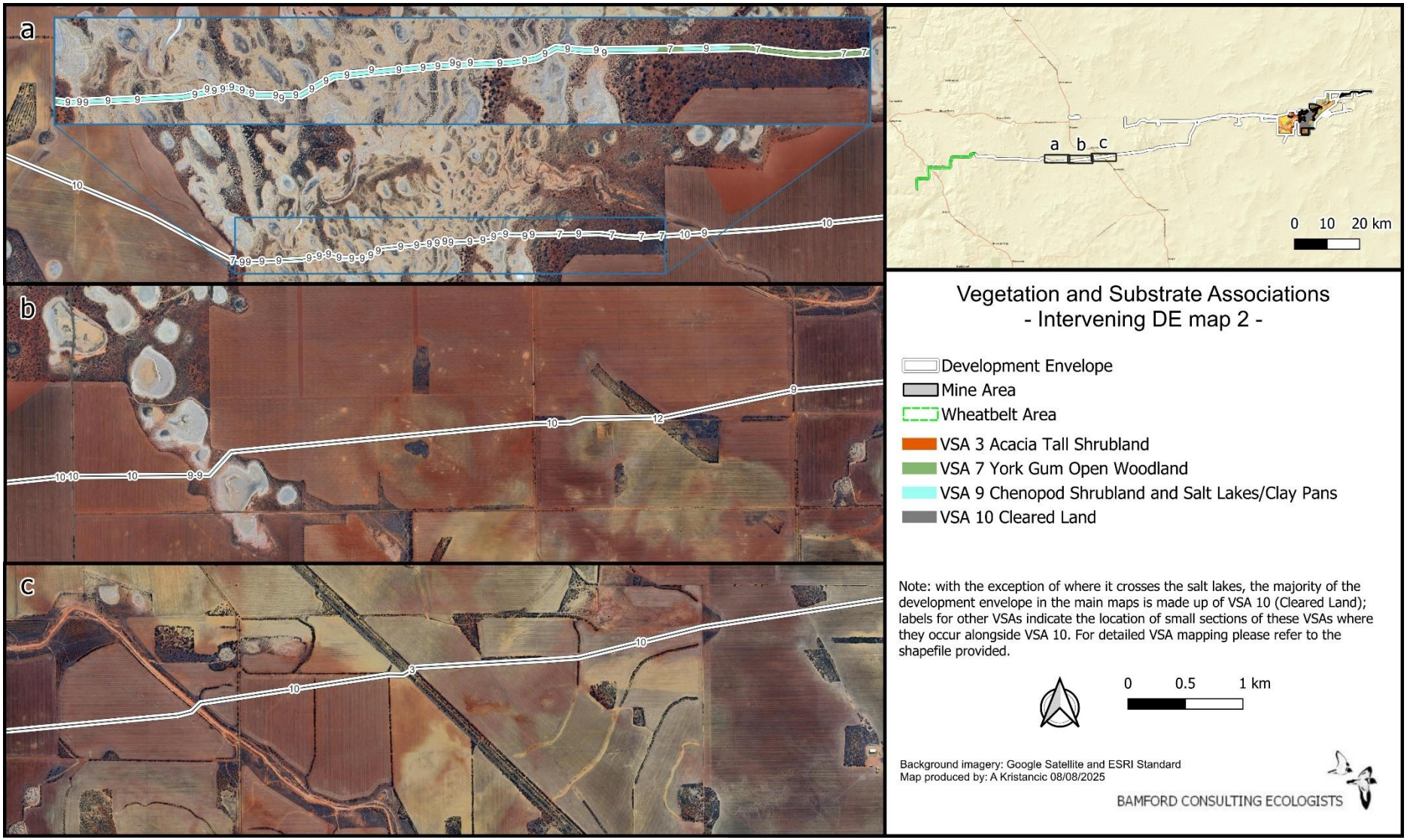

Figure 3-8. Distribution of VSAs across the intervening DE. Map 2 of 7.

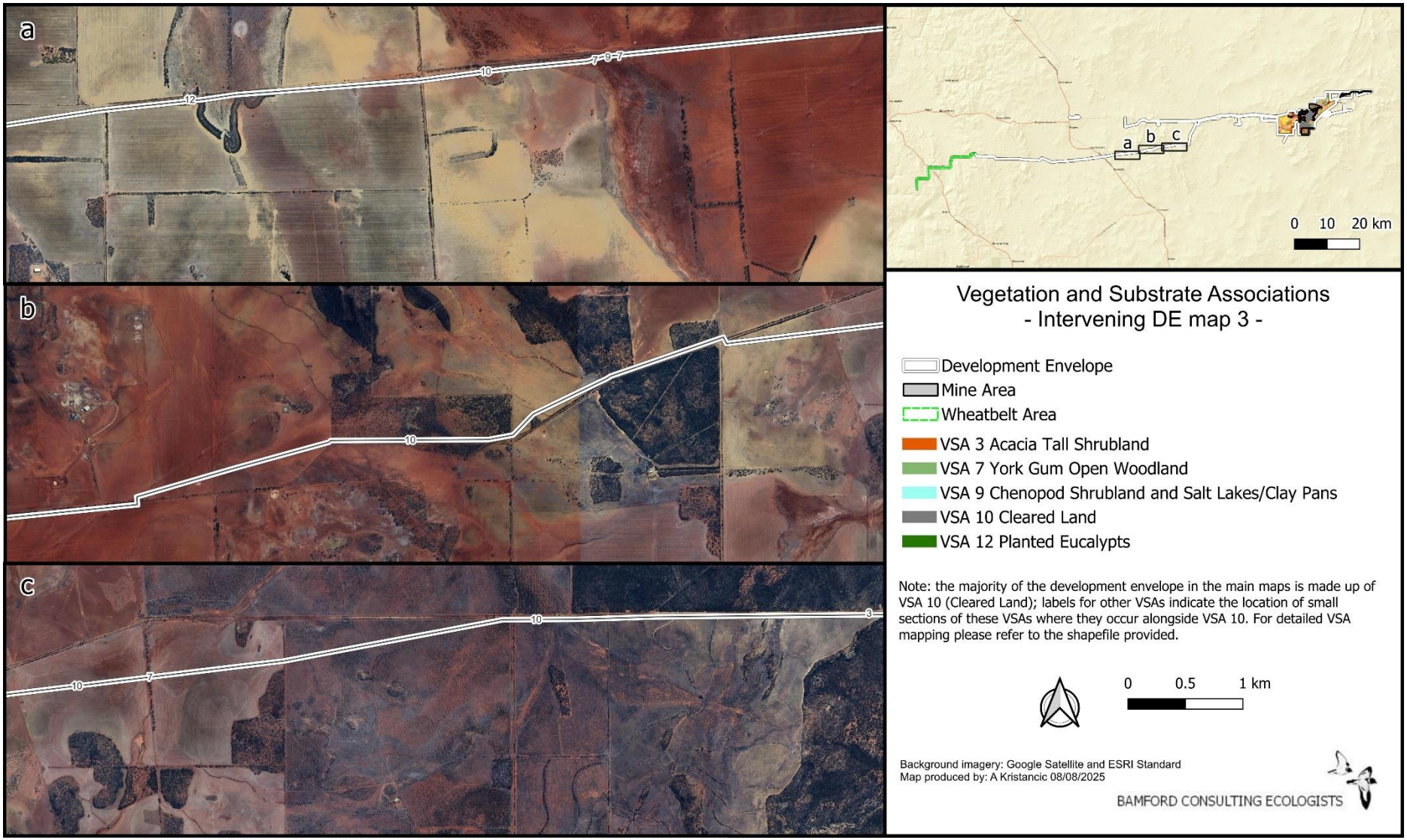

Figure 3-9. Distribution of VSAs across the intervening DE. Map 3 of 7.

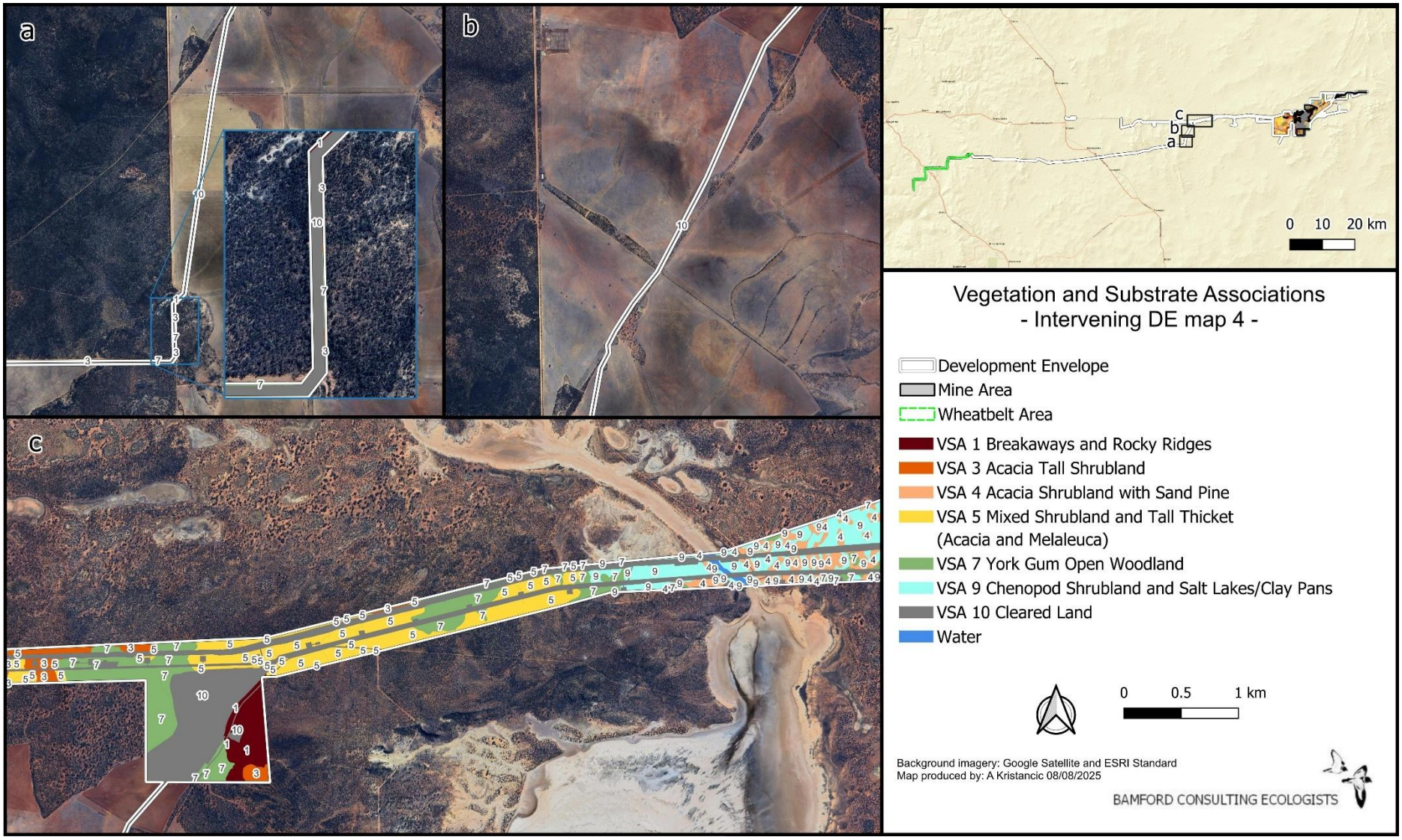

Figure 3-10. Distribution of VSAs across the intervening DE. Map 4 of 7.

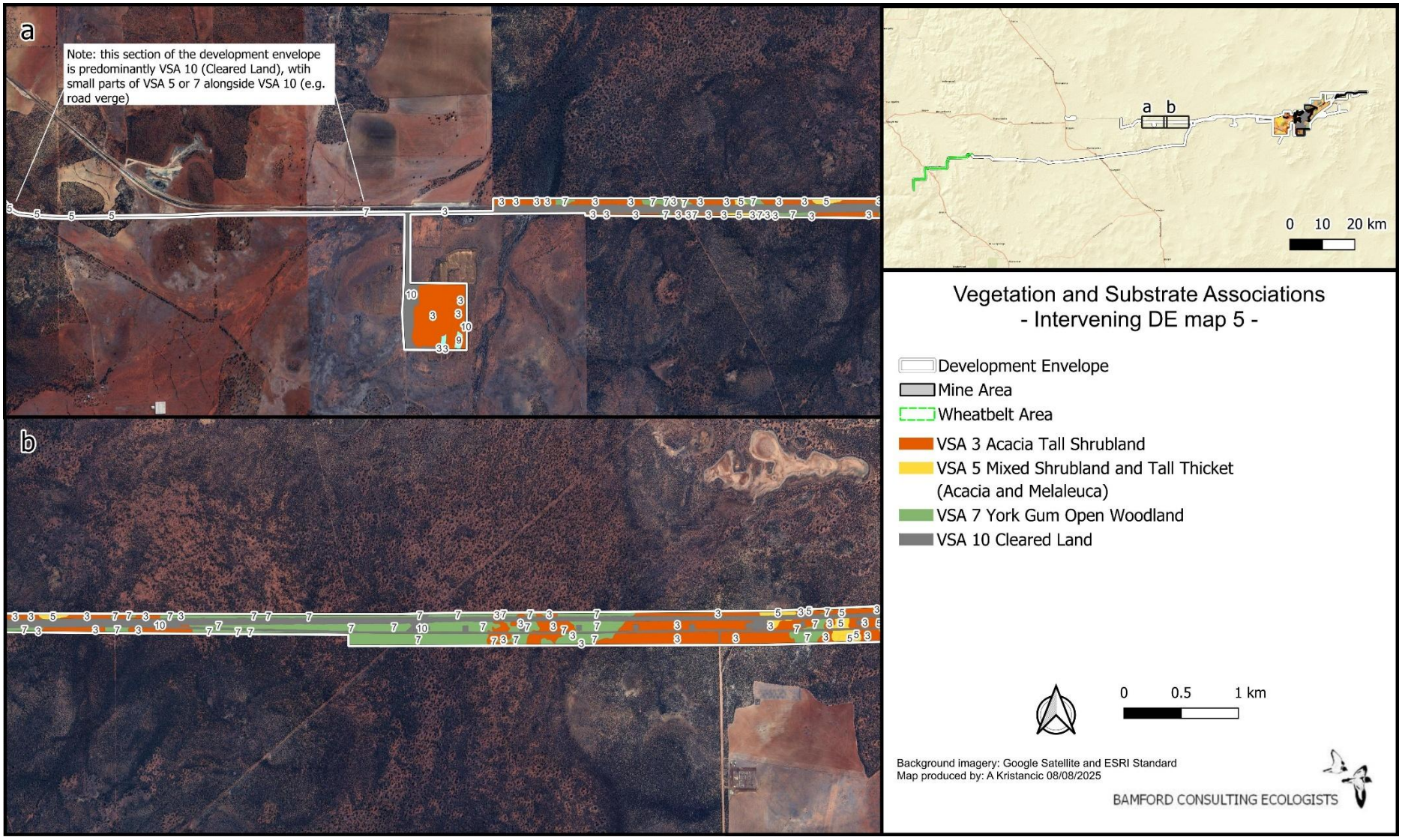

Figure 3-11. Distribution of VSAs across the intervening DE. Map 5 of 7.

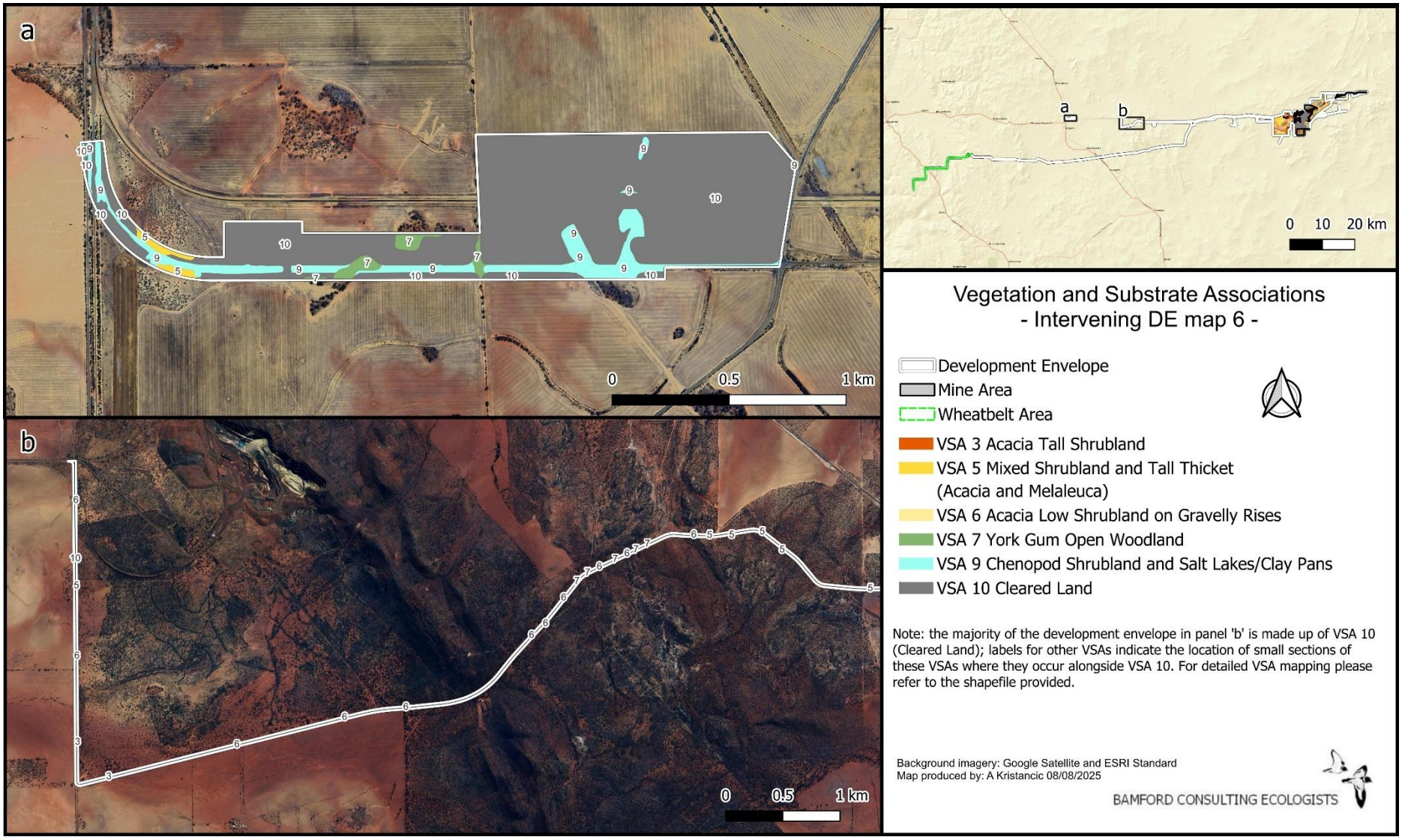

Figure 3-12. Distribution of VSAs across the intervening DE. Map 6 of 7.

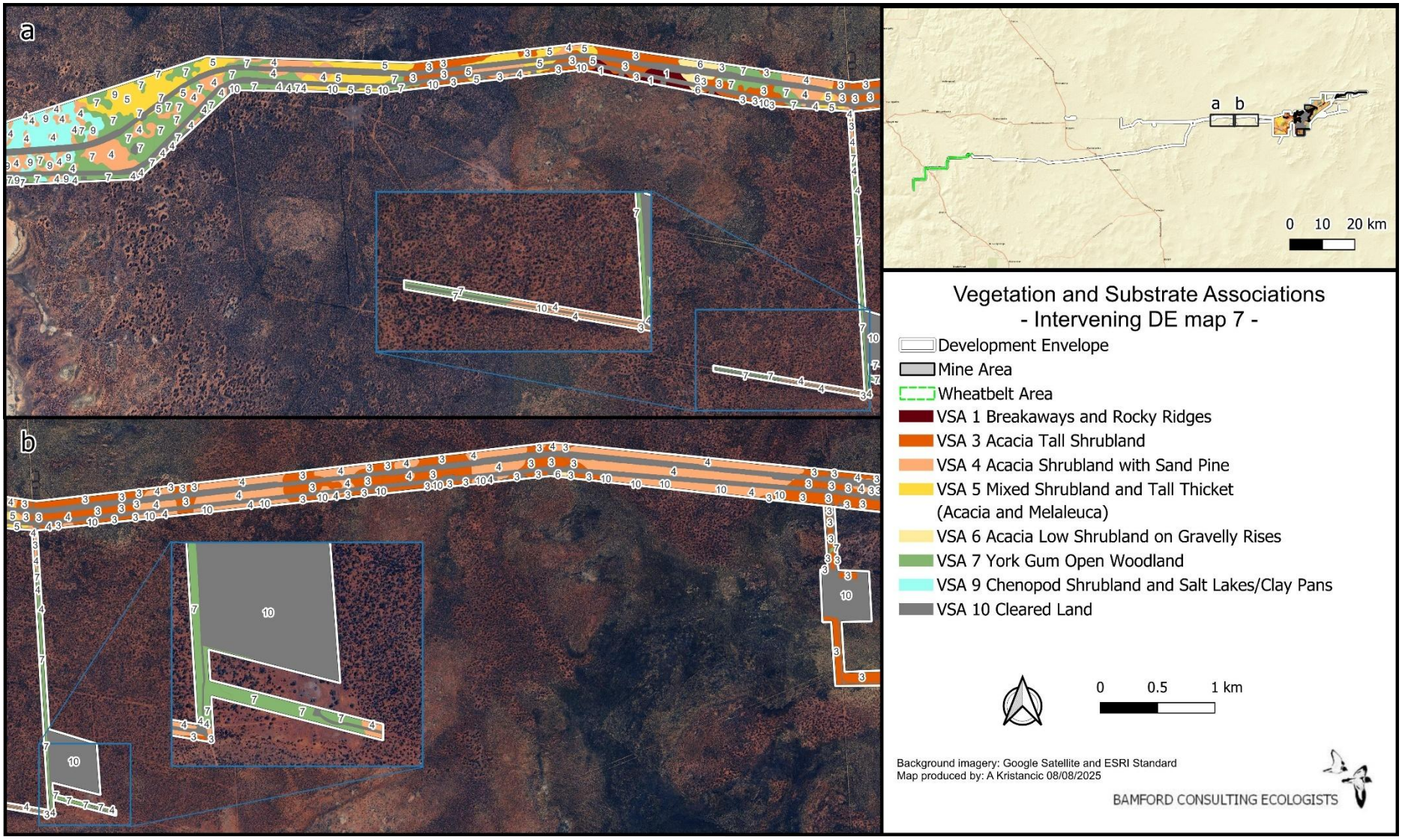

Figure 3-13. Distribution of VSAs across the intervening DE. Map 7 of 7.

3.2 Fauna

3.2.1 Overview of Vertebrate Fauna Assemblage

The expected vertebrate fauna assemblage is broadly similar in each project area, but there are some differences relating to the different environments present in each area, as well due to the large distance (c. 100 km) between each area. Although the total number of species expected in the Wheatbelt Area and Mine Area is similar, fewer species are expected as resident in the Wheatbelt Area (see Table 3.2 and **Table** 3.3). There is also less certainty regarding the expected occurrence of species in the Wheatbelt Area as some species may be locally extinct in the project area itself due to extensive loss of habitat as a result of clearing for agriculture. The overall expected vertebrate fauna assemblage of both project areas is presented in Appendix 6.

In addition to the database review, information on the fauna assemblage has been accumulated over a period of more than 20 years in the general vicinity of the mine, with the earliest BCE records near the Wheatbelt disturbance envelope from over 30 years ago, and the most recent surveys in and around the Mine and Wheatbelt Areas in July/August and November 2024. Since the earliest surveys in and around the Mine Area, BCE has recorded conservation significant invertebrates and 184 species of vertebrates: three frogs, 47 reptiles, 114 birds and 20 mammals. One bird species (Gilbert's Whistler) was recorded in the Mine Area in 2024 that had been unconfirmed from earlier surveys dating back to 2004. These confirmed species account for about 75% of the expected assemblage; the confirmation rate is not higher even after many years of study due to the dynamic and highly variable landscape. Fewer species were recorded in the Wheatbelt Area with much less survey effort and a much more degraded landscape; in the 2024 site visits, zero reptiles, 22 birds and one mammal were recorded (Appendix 10). Species confirmed to be present in each area are indicated in Appendix 6, which lists all species expected to be present in either area based upon interpretation of database results. Appendix 9 presents an annotated list of for all species recorded during studies for KML (broadly in the Karara area) since 2004.

Species considered to be locally extinct across both areas are presented in Appendix 7 and are discussed briefly below. One hundred and twenty-eight species returned during the database review were omitted for both project areas because of habitat or range limitations, or because they are domesticated species. These species are shown in Appendix 8. Note that some species are expected in one project area but not in the other; these are still presented in Appendix 6 (Fauna expected to occur in the project areas).

3.2.1.1 Mine area

The desktop study identified 257 vertebrate fauna species as potentially occurring in the Mine Area (see Table 3.2 and Appendix 9): seven frogs, 54 reptiles, 167 birds and 29 mammals (24 native and five introduced). This does not include at least 19 locally extinct species including one reptile, two birds and 16 mammals (discussed below). The assemblage includes 34 species of conservation significance, discussed in Section 3.2.4.

The assemblage discussed below is generally considered to occur within all proposed disturbance areas within the Mine Area; where relevant differences between parts of the Mine Area may exist, they are discussed. With respect to impact assessment, slight differences in the distribution and abundance of widespread species are not significant; of more concern are differences related to species of conservation significance, broader patterns of biodiversity and ecological processes that sustain biodiversity. These are discussed in more detail in Sections 3.2.40and 3.2.6.

Frogs

The seven frog species are all considered resident although their status in the project area is uncertain. One, the Desert Tree Frog, has been introduced into the region due to the movement of mining infrastructure. It naturally occurs further north, but has been recorded in mine camps such as Minjar (BCE data; presumably introduced by the operators of that camp), and may well be present around Karara. All other frogs are burrowing species that spend long periods inactive below ground during naturally extended dry periods. These species breed following rain; usually in winter but they can breed opportunistically. Suitable habitat is not present in all parts of the Mine Area. All species rely on seasonal wetlands to breed, so their distribution the mine area is likely to be affected by the presence of seasonal drainage lines such as around granite outcrops in the south and on the lower slopes of rocky hills in the north and east. Fresh water may also occur around the margins of the large salt like in the mid-north. The wastewater treatment site north of the accommodation village may provide permanent freshwater which is likely to have been colonised by at least some of the frog species.

All the frog species are characteristic of the southern interior and species more typical of the south-west are absent. Only three of the seven species have been recorded by BCE in the Karara area due to lack of sampling under suitable conditions (such as after summer or autumn rain). One frog species (Desert Trilling Frog) may be of local conservation significance but its status in the area is uncertain; it is discussed further in Section 3.2.4.

Reptiles

The 54 reptile species are all considered resident except for the Carpet Python; this large python has not been recorded but the site is within its generally recognised range, so individuals may be present at least occasionally. The reptile assemblage is particularly rich in geckoes and many of these are associated with eucalypt woodlands. It is generally an assemblage of species characteristic of the southern interior. The southern part of the mine area has sandy soils and a distinctive granite area which also overlaps with some proposed disturbance areas in the centre of the Mine Area. The northern area has distinctive rocky hills and banded ironstone formations. The linear feature in the eastern extent of the Mine Area is on loamy soils. These differences in substrate may affect the local abundance of reptile species and there could be a few species present in some parts of the Mine Area and not in others. Very intensive sampling would be required to investigate these differences and they relate mostly to otherwise widespread species.

A large proportion (47 of 54) of the species returned from the desktop review have been found during Karara surveys. It is possible that species not detected during the last 20 years of previous surveys by BCE are not present in the area, but reptiles can be cryptic and difficult to find. For example, the June 2020 site visit recorded one species in the southern expansion area, the Moon Snake, that had not

been previously recorded despite the multiple surveys over the previous 15 years. Therefore, under the precautionary principle, those reptiles not detected by surveys are still expected to be present. Two of the reptile species expected to be resident are of high conservation significance (CS1), and three additional reptiles are of local conservation significance (CS3); these five species are discussed in Section 3.2.4.

Birds

The bird assemblage of 167 species includes 65 classed as residents, 33 as regular visitors, 57 as irregular visitors and 12 as vagrants. During the 2024 field investigations, 41 (63%) of the resident species were recorded.

Nearly 70% (114 out of 167) of the bird assemblage determined from the desktop review have been recorded as part of general Karara surveys, with those species not detected mostly being expected only as irregular visitors or vagrants. The bird assemblage is likely to be very similar throughout the Mine Area, as vegetation is broadly similar in floristics and structure. While the bird assemblage is broadly typical of the southern interior, it includes a number of species that have declined in agricultural land to the west and thus are of local conservation significance where they persist. At least two bird species are considered locally extinct (Masked Owl and Barking Owl) and several others have declined in the region, including the Bush Stone-curlew and Australian Bustard.

Twenty-two of the expected bird species are of conservation significance (nine CS1, one CS2 and 12 CS3) and are discussed further in Section 3.2.4.

Mammals

The mammal assemblage is depauperate with possibly 16 locally extinct species. These extinctions are due to introduced predators and grazing impacts from domestic and feral herbivores. Twenty-four extant native mammals and five introduced mammals are expected in the Mine Area. Almost half (eleven species) of the native mammals are bats that roost in tree hollows and small caves, and some of these species may occupy old mine shafts. Hill's Sheath-tailed Bat and the Chocolate Wattled Bat could use mine shafts in large numbers and such roosts would be locally significant, but there appear to be no mine shafts in the development envelope, while caves are small and suited to roosting only by small numbers of bats. Breakaways and rocky ridges with small caves are best represented in the north while York Gum Woodland (VSA 7) which may provide tree hollows is extensive throughout. During the site inspection in 2020 and 2024, the Echidna was noticeably abundant, with one animal found in 2024 and fresh diggings and tracks throughout. Feral Cat tracks were conspicuous in the northern area, particularly close to the waste disposal area near Karara.

Five of the expected mammal species are of conservation significance (two CS2 and three CS3) and are discussed further in Section 3.2.4.

Table 3.2. Composition of expected vertebrate fauna assemblage of the Mine Area.

Taxon	Number of species*	Number of species in each status category				
		Resident	Regular visitor	Irregular visitor	Vagrant	*Locally extinct*
Frogs	7 (inc. 1 introduced)	7	0	0	0	*0*
Reptiles	54	53	0	1	0	*?1*
Birds	167	65	33	57	12	*?2*
Native Mammals	24	21	2	1	0	*?16*
Introduced Mammals	5	4	1	0	0	*0*
Total	**257**	**150**	**36**	**59**	**12**	***?19***

* Locally extinct species are not included in totals. Note the number of locally extinct species is uncertain.

3.2.1.2 Wheatbelt Area

The desktop study identified 252 vertebrate fauna species as potentially occurring in the Wheatbelt Area (see Table 3.3 and Appendix 9): six frogs, 48 reptiles, 168 birds, 25 native and five introduced mammals. This does not include at least 19 locally extinct species including one reptile, two birds and 16 mammals (discussed below). The assemblage includes 31 species of conservation significance, discussed in Section 3.2.4.

Frogs

The six frog species are all considered resident, and all are burrowing species that spend long periods inactive below ground during naturally extended dry periods. These species breed following rain; usually in winter but they can breed opportunistically. They may be present throughout the Wheatbelt Area where there is suitable breeding habitat (seasonal freshwater) and remnant of native vegetation. Read (1992) recorded five of these species at Inering, near Carnamah. A sixth frog species was recorded (the Motorbike Frog *Litoria moorei*) but it was known only from gardens and ponds in Perenjori and is suspected of not being a natural population (ie frogs transported by children). None of the frog species is of conservation significance.

Reptiles

The 48 reptile species include 34 lizards and 14 snakes, and all are considered resident except the Carpet Python and Gilled Slender Blue-tongue, both expected as irregular visitors. Very few reptiles have been recorded due to the lack of sampling, but the Inering study (Read 1992) confirmed the presence of 19 species in a highly cleared and fragmented landscape. The reptile assemblage is particularly rich in geckoes and many of these are associated with eucalypt woodlands. Although the landscape surrounding the Wheatbelt Area is heavily cleared, eucalypt woodland is presumed to have been present in the area prior to European settlement. The local distribution and abundance

of reptiles will have been greatly altered by clearing and the status of many species is uncertain due to this loss of habitat and the reliance of most species on small fragments of intact landscape. Four of the reptile species are of conservation significance (two CS1 and two CS3) and are discussed below (Section 3.2.4). In such an extensively cleared landscape, almost all reptile species could be considered of local significance with very few capable of persisting on agricultural land and even degraded fragments of native vegetation.

Birds

The bird assemblage of 168 species includes only 48 classed as residents, with a large proportion expected as visitors (42 regular and 64 irregular), or vagrants (14 species). This low proportion of residents reflects the high level of habitat loss and fragmentation in the surrounding landscape. The resultant small, isolated fragments of remnant vegetation are not able to support the same richness of resident species that would be expected in larger, less fragmented areas of vegetation in the broader region.

As well as the two species considered locally extinct in the area (Barking Owl and Masked Owl), several species have declined in the region, including the Bush Stone-curlew and Australian Bustard. Several bird species are therefore considered of local conservation significance (CS3) as their persistence in the area is dependent on the small amounts of native vegetation remaining and they are therefore sensitive to continued habitat loss and degradation.

Mammals

Twenty-five native mammals are expected in the Wheatbelt Area. The mammal assemblage in the Wheatbelt Area is likely to be highly depauperate due to clearing, degradation of the remaining fragmented habitat, and the impact of feral species. Only nine native species are expected as residents, with the remainder expected as visitors (eight regular and eight irregular). Read (1992) recorded just three small, terrestrial native mammals in an intensive sampling programme in remnant native vegetation near Perenjori. Almost half the native species are bats. There are at least 15 locally extinct species (discussed below). Five of the expected native mammals are of conservation significance (two CS2 and three CS3) and are discussed in Section 3.2.4.

Table 3.3. Composition of the expected vertebrate fauna assemblage of the Wheatbelt Area.

Taxon	Number of species*	Number of species in each status category				
		Resident	Regular visitor	Irregular visitor	Vagrant	Locally extinct
Frogs	6	6	0	0	0	0
Reptiles	48	46	0	2	0	?1
Birds	168	48	42	64	14	?2
Native Mammals	25	9	8	8	0	?16
Introduced Mammals	5	4	0	0	1	0
Total	**252**	**113**	**50**	**74**	**15**	**?19**

* Locally extinct species are not included in totals. The number of locally extinct species is uncertain.

3.2.2 Invertebrate fauna

The project areas sit within DBCA's Midwest management region (DBCA 2023a), within which DBCA (2022) has listed 22 threatened or priority invertebrate fauna. Invertebrate records were obtained from several databases, as detailed in Appendix 11. The majority of these species were excluded as they were considered unlikely to be present based on distance from known population and absence of suitable habitat (particularly for the Wheatbelt Area where remnant vegetation within the disturbance boundary is generally highly degraded). There are several records of *Idiosoma arenaceum* in the DBCA database within 15 km of the Wheatbelt Area, and this species may be present in nearby remnant vegetation that is not degraded. However, it is unlikely to occur within the Wheatbelt Area itself due to habitat degradation.

Documenting the invertebrate assemblage is beyond the scope of even major field investigations, but several invertebrate species of conservation significance have been documented across the overall KML project (mine) as a result of investigations by BCE, and through surveys for subterranean invertebrates (Biota 2007, Ecologia 2008). There are also observations on significant trapdoor spiders from studies undertaken by BCE (2013) and Spectrum Ecology (2019) in the Minjar/Mt Mulgine region about 20-30km east of Karara. These include several trapdoor spiders and are discussed below (Section 3.2.4.1.1).

The mine development envelope does lie within the presumed range of the host ant of the Arid Bronze Azure Butterfly (*Ogyris subterrestris petrina*) (DBCA, 2020), listed as Critically Endangered under both the EPBC Act 1999 and WA BC Act 2016. The butterfly has an obligate association with a host ant (a sugar ant, *Camponotus* sp. nr. *terebrans*). Larvae of the butterfly live within the ant's nest during development, therefore the butterfly can only persist in the presence of large colonies of the host ant. However, the project area is not within the known range of the species, with the closest record more than 400 km east near Coolgardie (ALA, 2024), so it is not expected to occur within the project area.

Note that the invertebrate species that have been recorded represent only a tiny proportion of the invertebrate assemblage. The ecology and distribution of invertebrates, including short-range endemic invertebrates, is often poorly understood or documented. Thus there may be undetected

SRE species present. Protecting the largely unknown (and unknowable) invertebrate assemblage requires protecting the integrity of the landscape, such as preserving representation of all land systems, ensuring broad connectivity and managing landscape scale threatening processes.

3.2.3 Locally extinct species

At least 19 vertebrate species are considered to be locally extinct, with 15 of these of conservation significance (Appendix 7). Note this is probably not a complete list due to the lack of comprehensive records prior to major impacts from gazing and introduced predators early in the 20th Century. For example, both the Banded Hare-Wallaby *Lagorchestes fascicularis* and the Woylie *Bettongia lesueur* may have been present, but their distribution at the time of European settlement is uncertain. While these locally extinct species are not expected to be present, some of them may have persisted in the area until the middle of the Twentieth Century. Old nests of one of the species of stick-nest rat (the Lesser Stick-nest Rat based on historic distribution) have been found on Mungada ridge to the east (BCE database), and some of the breakaways in the mine expansion area. The granite hills around Koolanooka may potentially have supported the species. Old Boodie warrens are common in the Karara/Mungada region in general and have been regularly found during investigations in the area. The Brush Wallaby was reported from Karara Station and Rothsay in the early 2000s but the records are uncertain (N Hamilton pers. comm.) and no further sightings have been made. It has therefore been assumed to be locally extinct.

3.2.4 Species of Conservation Significance

The suite of conservation significant species expected in each project area is very similar, but the expected occurrence differs based on the environments present, in particular the extent of clearing, and the surrounding landscape of each project area. Overall, 35 vertebrate species of conservation significance are expected across the two project areas; this list is provided in Table 3.6, along with information about the expected occurrence of each species in each project area. Locations of records from databases are given in Figure 3-14 and Figure 3-16. Although almost all species are expected in both project areas, the distribution of these species in this region will be patchy and the status of these species within the actual disturbance footprint of the Wheatbelt Area is therefore subject to considerable uncertainty. In addition, several conservation significant species that are expected as residents in the Mine Area, such as Malleefowl, Peregrine Falcon and a suite of locally significant birds, are less likely to occur in the Wheatbelt Area, mostly due to high levels of habitat loss and fragmentation in the region. The two target conservation significant reptiles (Gilled Slender Blue-tongue and Western Spiny-tailed Skink) are expected as resident in the Mine Area. In the Wheatbelt Area the Western Spiny-tailed Skink is expected as a resident (even in degraded York Gum woodland). There is evidence that reptiles are able to persist even in small remnants (Bamford & Calver, 2012), and in 2012, an adult Western Spiny-tailed Skink was found (M. Bamford) on a road about 10km east of Perenjori, where the verge vegetation consisted only of York Gums over weedy grasses (a degraded example of VSA 7). The Gilled Slender Blue-tongue will be very limited in distribution and is expected as an irregular visitor in the disturbance footprint of the Wheatbelt Area.

As outlined in Appendix 1, species classed as CS1 are those listed under WA State and/or Commonwealth legislation, while those classed as CS2 are listed as Priority by the Department of Parks

and Wildlife. The CS3 class is more subjective, but includes species that have declined extensively across the mid-west of WA, and some species that occur at the edge of their range. This makes their presence in the project areas significant as populations on the edge of a species' range are often less abundant and more vulnerable to local extinction than populations at the centre of the range (Curnutt *et al*. 1996). Several bird species listed as CS3 in Table 3.6 have declined dramatically in the Wheatbelt, making remaining populations locally significant. Species of conservation significance are summarised below for each project area, and discussed in detail in Section 3.2.2.1. Database records of CS1 and CS2 species within 40 km of the development envelope are shown in Figure 3-14 and Figure 3-15, with the exception of Southern Whiteface (database records in Figure 3-16).

Table 3.4. Composition of extant conservation significant fauna in the Mine Area.

Taxon	Conservation Significant fauna		
	CS1	CS2	CS3
Frogs	-	-	1
Reptiles	2	-	3
Birds	10	1	12
Native Mammals	-	2	3
Invertebrates	1	1	c. 5

Table 3.5. Composition of extant conservation significant fauna in the Wheatbelt Area.

Taxon	Conservation Significant fauna		
	CS1	CS2	CS3
Frogs	-	-	-
Reptiles	2	-	2
Birds	11	1	12
Native Mammals	-	2	3
Invertebrates	1	1	-

Table 3.6. Conservation significant fauna species of the Mine Area and Wheatbelt Area (not including locally extinct species presented in Appendix 7).

Species recorded in each project area are indicated in Appendix 9.

See Appendices 1 and 2 for descriptions of conservation significance levels (CS1, CS2 and CS3).

EPBC Act listed species: VU = Vulnerable, EN = Endangered, CR = Critically Endangered, MI = Migratory.

WABC Act listed species: S1 – S3 = Schedule 1 – 3, D1 – 3 = Division 1 – 3; DBCA Priority Species: P1 - P5 = Priority 1 - 5.

Latin Name	English Name	CS status	Mine Area		Wheatbelt Area	
			Status	VSA	Status	VSA
Frogs						
Neobatrachus centralis	Desert Trilling Frog	CS3	Resident	Throughout except 9	Out of range	NA
Reptiles						
Caimanops (Diporiphora) amphiboluroides	Mulga Dragon	CS3	Resident	3, 4, 5, 6	Out of range	NA
Morelia spilota	Carpet Python	CS3	Irregular visitor	Mainly 1, 2	Irregular visitor	3, 7, 11
Hesperoedura reticulata	Reticulated Velvet Gecko	CS3	Resident	7	Resident	7
Cyclodomorphus branchialis	Gilled Slender Blue-tongue	CS1: S2D3	Resident	1,2	Irregular visitor	3, 7, 11
Egernia stokesii badia	Western Spiny-tailed Skink	CS1: EN S2D3	Resident	Mostly 7	Resident	Mostly 7
Birds						
Apus pacificus	Fork-tailed Swift	CS1: MI S1D2	Irregular Visitor	Throughout	Irregular visitor	Throughout
Burhinus grallarius	Bush Stone-curlew	CS3	Regular visitor	3, 4, 5, 6	Irregular visitor	Restricted to any remnant vegetation
Cacatua leadbeateri	Major Mitchell's Cockatoo	CS3	Resident	Forage throughout except bare salt lakes; nesting 7	Irregular visitor	Forage throughout except bare salt lakes; nesting 7
Zanda latirostris	Carnaby's Black-Cockatoo	CS1: EN S2D2	Out of range	NA	Irregular visitor	Throughout
Thinornis cucullatus	Hooded Plover	CS2: P4	Irregular Visitor	9	Irregular visitor	9
Climacteris affinis	White-browed Treecreeper	CS3	Resident	6, 7	Vagrant	NA
Climacteris rufus	Rufous Treecreeper	CS3	Resident	7, 8	Irregular visitor	7
Falco peregrinus	Peregrine Falcon	CS1: S1D3	Resident	Forage throughout; nest cliff ledges 1	Regular visitor	Forage throughout
Leipoa ocellata	Malleefowl	CS1: VU S2D3	Resident	Forage throughout; mounds mainly 3, 4, 6	Regular visitor	3, 7, 11
Ardeotis australis	Australian Bustard	CS3	Irregular Visitor	Throughout	Irregular visitor	Throughout, including paddocks
Oreoica gutturalis	Crested Bellbird	CS3	Resident	3, 4, 5, 6	Resident	Any remnant vegetation

Latin Name	English Name	CS status	Mine Area		Wheatbelt Area	
			Status	VSA	Status	VSA
Calamanthus montanellus	Western Fieldwren	CS3	Irregular Visitor	3, 6, 9	Irregular visitor	3, 9
Pyrrholaemus brunneus	Redthroat	CS3	Resident	3, 4, 5, 6	Resident	3
Aphelocephala leucopsis	Southern Whiteface	CS1: VU	Resident	Parts of 3, 4, 5, 6, 9	Resident	Parts of 3, 9
Eopsaltria griseogularis	Western Yellow Robin	CS3	Resident	3, 4, 5, 6	Regular visitor	3
Pomatostomus superciliosus	White-browed Babbler	CS3	Resident	3, 4, 5, 6	Resident	3
Polytelis anthopeplus	Regent Parrot	CS3	Regular visitor	Forage throughout; nesting 7	Regular visitor	Forage throughout; nesting 7
Neophema splendida	Scarlet-chested Parrot	CS3	Vagrant	Throughout	Vagrant	Throughout
Actitis hypoleucos	Common Sandpiper	CS1: MI S1D2	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Calidris acuminata	Sharp-tailed Sandpiper	CS1: VU & MI S1D2	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Calidris ferruginea	Curlew Sandpiper	CS1: CR & MI S2D1	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Calidris ruficollis	Red-necked Stint	CS1: MI S1D2	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Calidris subminuta	Long-toed Stint	CS1: MI S1D2	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Tringa nebularia	Common Greenshank	CS1: EN & MI S1D2	Irregular Visitor	Salt lakes and margins; 9	Irregular visitor	Salt lakes and margins; 9
Mammals						
Antechinomys (Sminthopsis) longicaudata	Long-tailed Dunnart	CS2: P4	Resident	1, 2	Irregular visitor	3, 7, 11
Pseudantechinus woolleyae	Woolley's Pseudantechinus	CS3	Resident	1, 2	Irregular visitor	3, 7, 11
Antechinomys laniger	Kultarr	CS3	Resident	3, 4, 5, 6	Irregular visitor	3
Trichosurus vulpecula	Brush-tailed Possum	CS3	Irregular visitor	1, 7	Irregular visitor	7
Nyctophilus major tor	Inland Long-eared Bat	CS2: P3	Resident	Forage throughout; shelter 7, 8	Irregular visitor	Any with occasional large eucalypt
Invertebrates						
Idiosoma clypeatum	Northern Shield-backed Trapdoor Spider	CS2: P3	Resident	1, 3, 5, 6	Out of range/ locally extinct	N/A
Idiosoma formosum	Ornate Trapdoor Spider	CS1: S2D2	Resident	4 and 6; also possibly 5 and 7	Out of range/ locally extinct	N/A
Aganippe (Idiosoma) sp.	Unidentified trapdoor spider	CS3	Resident	2	Out of range	N/A

Latin Name	English Name	CS status	Mine Area		Wheatbelt Area	
			Status	VSA	Status	VSA
Antichiropus sp. nov. 'Karara'	Karara Millipede	CS3	Resident	1 and 3	Absent	N/A
Antichiropus sp. nov. 'PM1'	Millipede PM1	CS3	Resident	1 and 3	Absent	N/A
Urodacus sp. nov. 'Mt Gairdner'	Mt Gairdner Scorpion	CS3	Resident	1 and 3	Absent	N/A

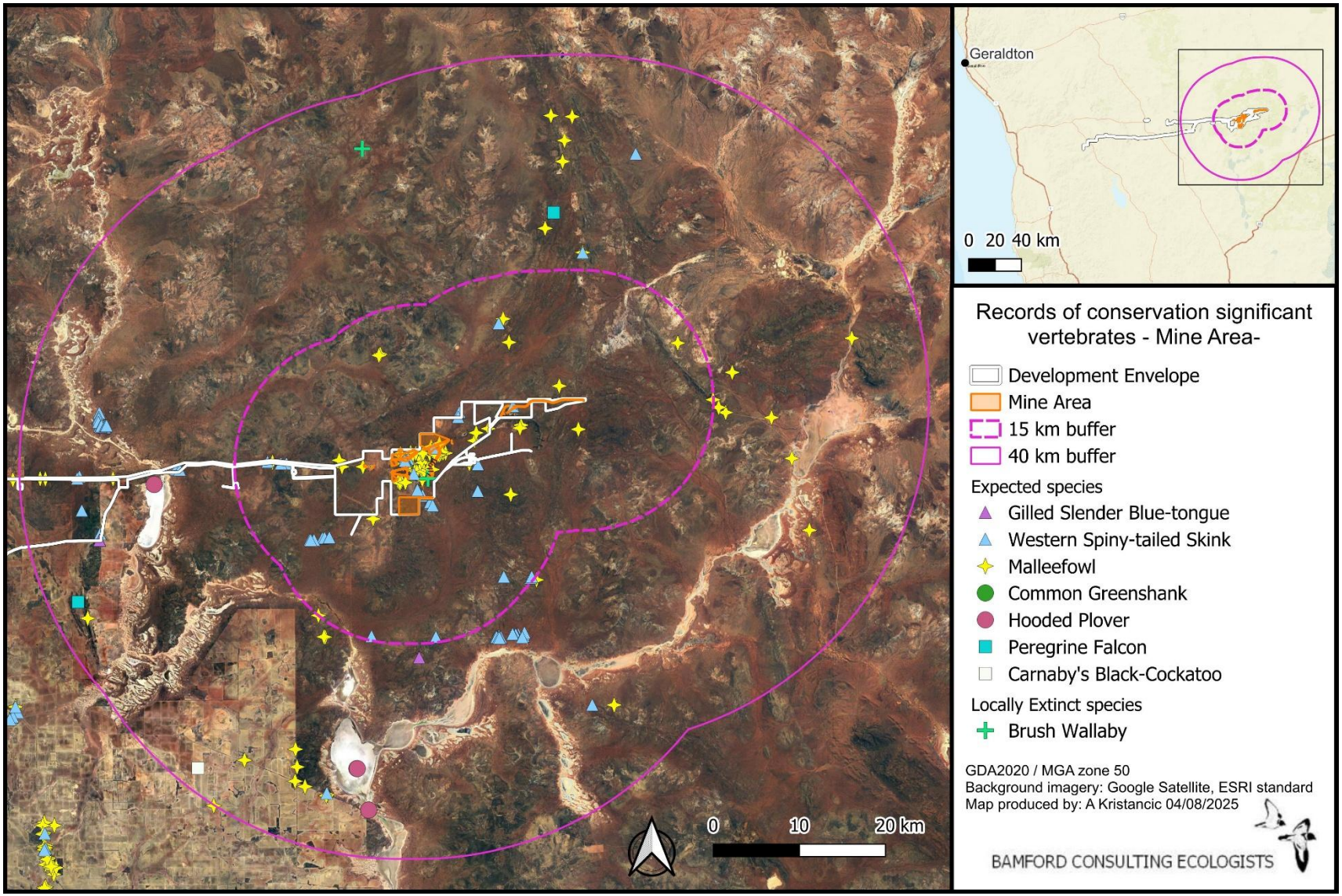

Figure 3-14. Records of expected (and locally extinct) conservation significant (CS1 and CS2) species within 40 km of the Mine Area. Data from DBCA (2024b).

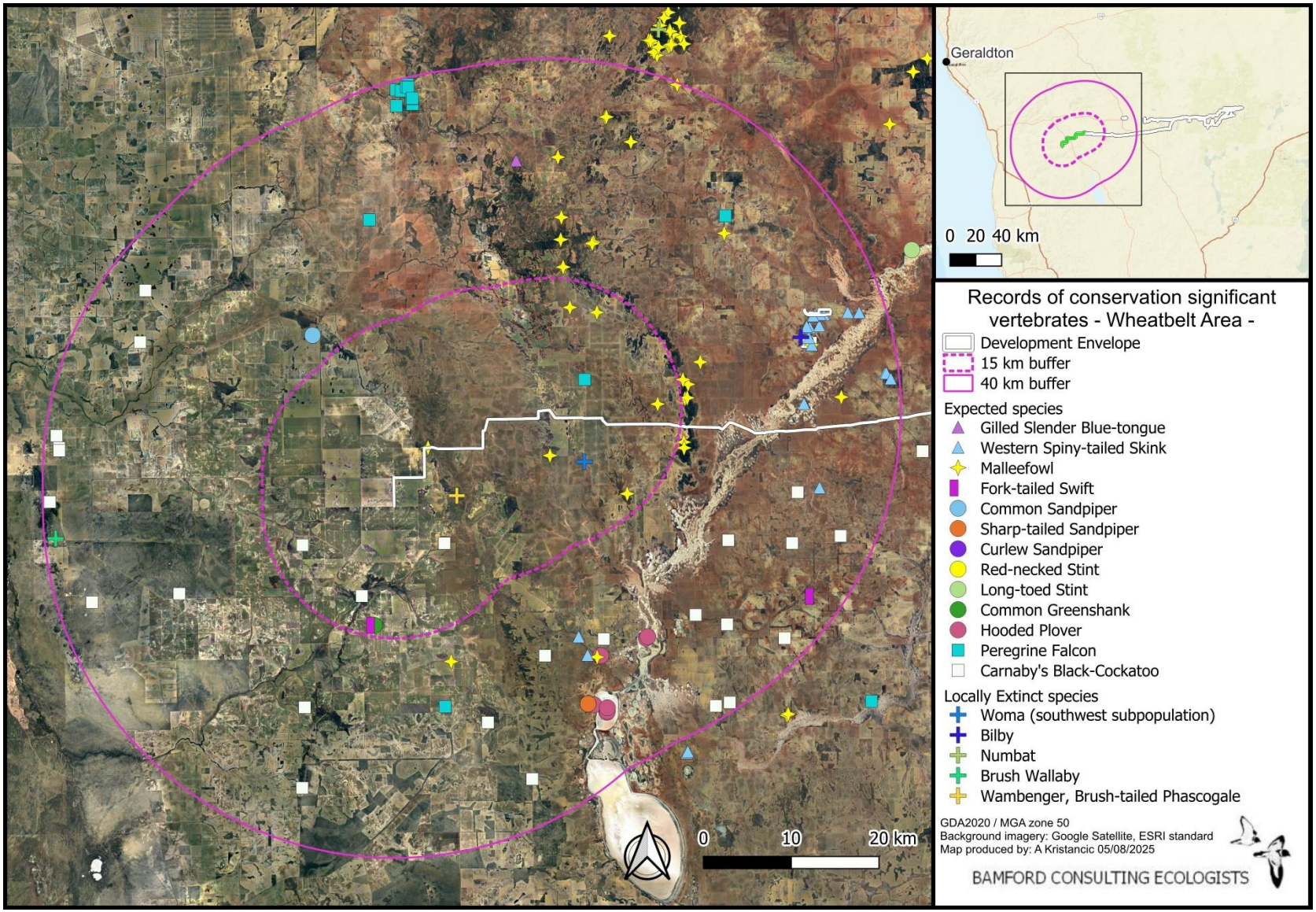

Figure 3-15. Records of expected (and locally extinct) conservation significant (CS1 and CS2) species within 40 km of the Wheatbelt Area. Data from DBCA (2024b).

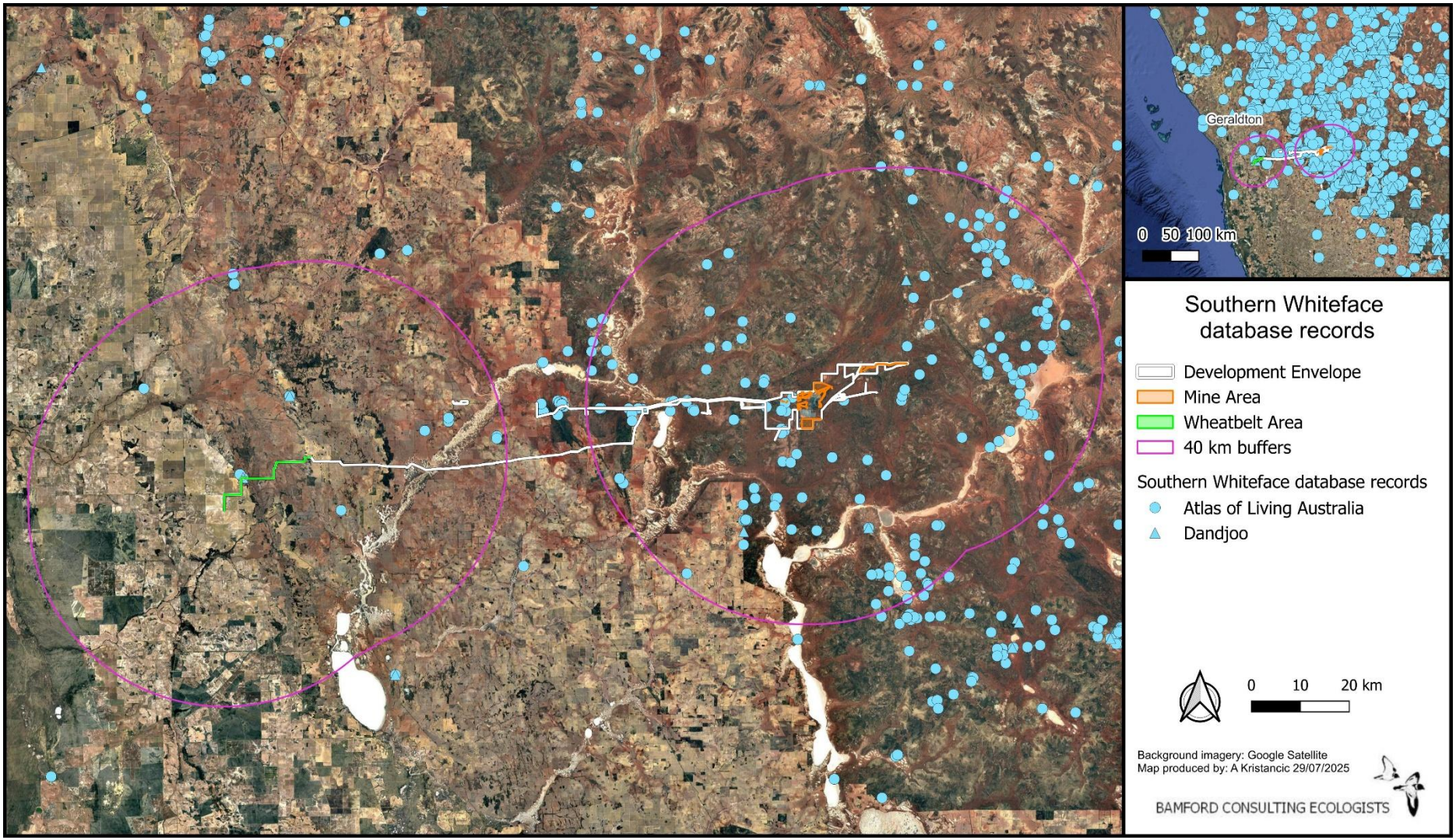

Figure 3-16. Southern Whiteface database records (from Atlas of Living Australia and Dandjoo) within 40 km of the development envelope.

3.2.4.1 Conservation significant species accounts

3.2.4.1.1 Conservation significance level 1

Gilled Slender Blue-tongue (*Cyclodomorphus branchialis*)

CS1 (S2D3): Schedule 2 Division 3 (Vulnerable) under WA BC Act.

The Gilled Slender Blue-tongue has a restricted distribution, being confined to the Midwest coast from the Murchison River to the Irwin River and inland to Mt Magnet (Bush *et al.* 2007). Within this region it is known from only a few locations, and is variously described as occurring on loamy soils in wattle woodlands and rocky areas (Bush *et al*. 2007), or on heavy red soil (Wilson and Swan 2013). BCE, however, has three records of the species, all from rocky environments, including a specimen from Karara ridge and one from Mungada ridge. The location of the Karara record has since been mined. The DBCA threatened fauna database has four additional records in the area and these also appear to fall on rocky hills (Figure 3-14). Two of these records appear to be from ATA Environmental (2004b, 2004a) who found the species at rocky sites in the Koolanooka Hills, so it has been recorded in the development envelope (but not the disturbance footprint) in the wheatbelt.

BCE undertook intensive searching for the species in the period 2010-2012, including searching under dead brush alongside minor tracks which is typical habitat for other members of the genus, but no further specimens were located. Searching was also undertaken in 2020 and 2024, often targeting low rocky hills, but no lizards were found. If the species does favour rocky landscapes, there are rocky hills scattered throughout the Mine Area but very limited such habitat in the Wheatbelt Area; the Koolanooka Hills do provide such habitat and the species has been recorded there (ATA Environmental, 2004b, 2004a).

Despite the lack of recent records, the Gilled Slender-Bluetongue is very likely to be resident along rocky hills and ridges in the Mine Area. This species is likely a resident in the Koolanooka Hills but unlikely elsewhere, perhaps occurring as an irregular visitor (dispersing individuals) within the Wheatbelt Area.

Western Spiny-tailed Skink (*Egernia stokesii badia*)

CS1 (EN, S2D3): Endangered under EPBC Act and Schedule 2 Division 3 (Vulnerable) under WA BC Act.

This has been found to be locally abundant in York Gum woodlands on loam and clay flats in the Karara area, and has been the subject of species-specific studies, including monitoring (Bamford Consulting Ecologists 2017 and ongoing by KML staff) and a Ph.D. study and associated publications (Bradley, 1992; Bradley et al., 2022). There are multiple records in the DBCA threatened fauna database (Figure 3-14), some of which probably come from studies undertaken for KML Most of these records come from pastoral landscapes which are largely uncleared with few records from agricultural areas, but there are records from around towns such as Perenjori and Morawa. Within this region, it appears to be largely restricted to York Gum woodland in good condition, particularly where the understorey is intact and forms patches of dense thickets close to large trees that provide a range of hollow sizes in which the lizards shelter (Plate 3-15). However, they have been found in degraded York Gum woodland along road verges just east of Perenjori (M. Bamford pers. obs.) Colonies have also been

found in very large melaleucas on rocky ridges (BCE records). Suitable habitat corresponds largely to VSA 7 in the Mine Area; however, in the Wheatbelt Area VSA 7 is degraded and may be less suitable, although some animals do persist. The extent of possible suitable habitat within the Mine Area and surrounding DE has been mapped (Figure 3-17) with a total of 1,903 ha of predicted habitat in the Karara area DE, of which 12.5% (238 ha) is within the proposed disturbance areas (almost all in the Mine area). Potentially suitable habitat is widespread in the region and across the Karara area. This aligns with VSA 7, which includes vegetation types D, E, G, I, Z and HMVT-F (Umwelt, 2025), although suitable habitat would not be continuous across these areas.

Plate 3-15. Dead York Gum with known Western Spiny-tailed Skink colony. Note shrubs around log.

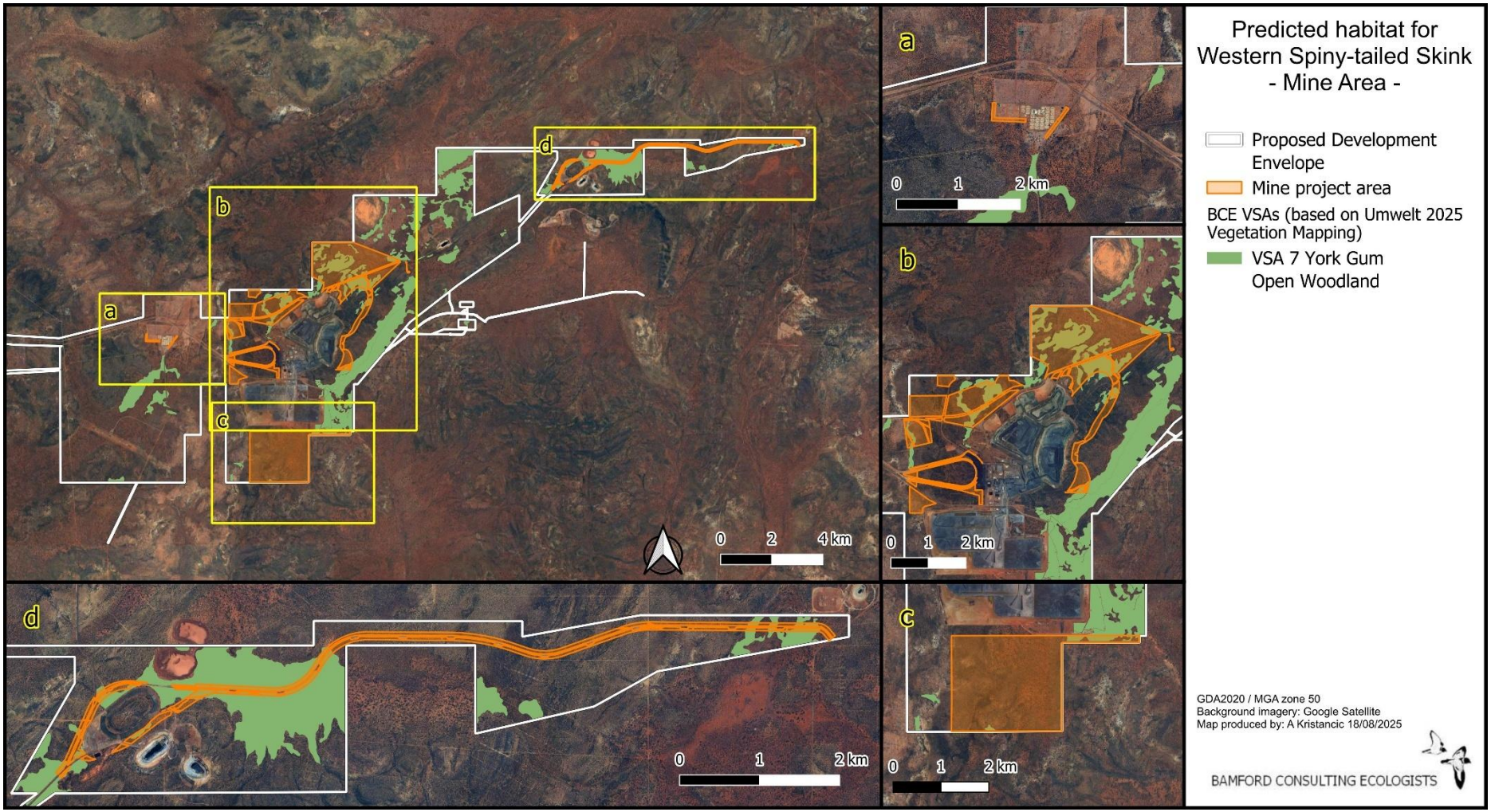

Figure 3-17. Predicted extent of habitat of the Western Spiny-tailed Skink in the Karara area (mapping limited to available vegetation mapping for which the boundary is the development envelope).

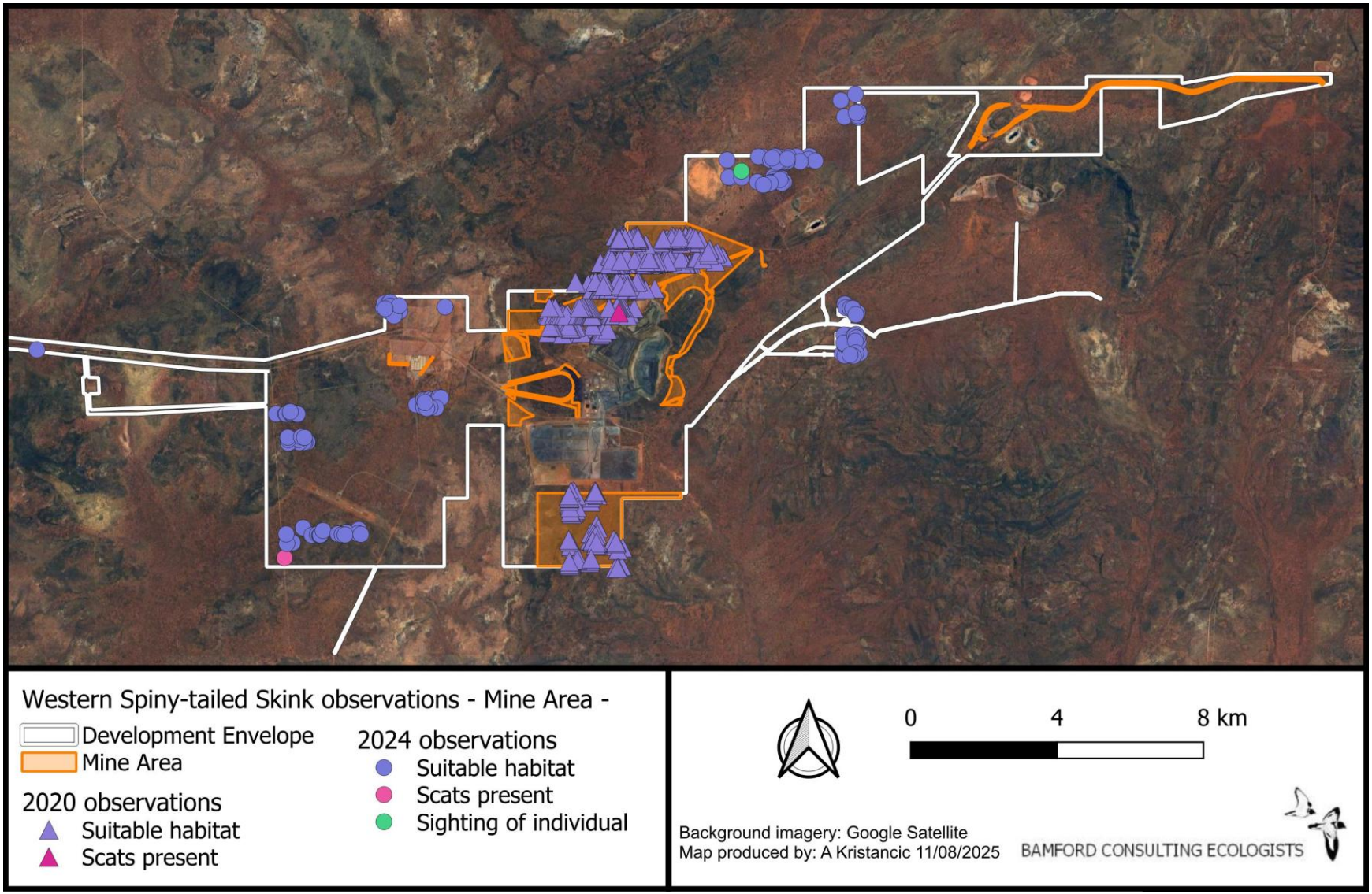

Figure 3-18. Locations of potential colony sites (suitable habitat) for Western Spiny-tailed Skink observed by BCE in 2020 and 2024. Also shown are locations where scats were observed in 2020 and 2024 and where an individual was seen in 2024.

BCE Western Spiny-tailed Skink records

Locations of potential colony sites recorded during 2020 and 2024 are given in Appendix 12 and illustrated in Figure 3-18. The two expansion areas inspected in 2020 were searched more thoroughly than the much larger and dispersed areas of 2024, and there were many more potential colony sites in the northern compared with the southern expansion area (459 compared with 100). Based upon the proportion of each of these two areas surveyed and allowing for the extent of suitable habitat indicated by the 2020 surveys, there could be 1,000 to 1,500 potential colony sites in the north and about 200 in the south. Note that these are only potential sites and even under ideal conditions all would not be expected to be occupied.

Far fewer potential colony sites were found in 2024 than in 2020 because the areas surveyed in 2024 contained little York Gum Woodland. No potential colony sites were found in the Wheatbelt Area with very little suitable habitat, and there are few records in the wheatbelt from the DBCA threatened fauna database (Figure 3-15). No active colonies were found in either survey in 2024; even when known colony sites were encountered they were found to be inactive.

The low number of active colonies is likely to be due to a combination of impacts from grazing by feral herbivores and impacts from predators. Most potential colony sites provided little cover and food in the form of shrubs around the log pile, probably as a consequence of grazing by livestock, while especially in the northern expansion area there was abundant evidence of likely predators. This includes tracks of feral Cats and flocks of up to 20 Little Crows more or less constantly moving through the area. The Little Crows were not recorded in early surveys at Karara, but moved in when the rubbish tip was established close to the exploration camp and just to the east of the northern expansion area.

Western Spiny-tailed Skink KML monitoring data 2018-2023

KML keeps a register of skink colony sites (usually log piles) and these are monitored yearly to determine whether or not the site is occupied (based on direct observation of skinks, or more commonly on presence of at least moderately fresh scats). The occupancy status of each site was interpreted by BCE based on notes in the register regarding age of scats; sites with only old or very old scats were categorised as unoccupied and sites with any fresh or recent scats were categorised as occupied. Note that this interpretation (based on scat age), resulted in some sites being classified differently compared with what had been recorded as inhabited versus uninhabited in the register. The number of occupied sites provides a proxy for skink abundance. Sites within close proximity (ca. 50m) to each other have been grouped into clusters, which represent skink colonies. The location of monitoring sites within clusters is shown in Figure 3-21. The number of occupied sites overall, and within each cluster, was examined over time (from 2018-2023 inclusive). Overall, there is evidence of a decline in occupied sites over time since 2018 (Figure 3-19). Based on examination of occupancy data within clusters his appears to be a widespread trend. With the exception of SKM12, at which there was only one occupied site, all skink colonies (clusters) show some evidence of a decline in abundance over time (Figure 3-20). The extent of the decline varies between clusters and occurred in clusters close to the mine (SKM4, SKM5), and clusters along the transport corridor (SKM7, SKM8, SKM9 and SKM10). Although all of the colonies (clusters) were still occupied to some extent as of 2023, the overall number of occupied sites (log piles) declined from 63 in 2018 to 49 in 2023.

Studies in the Karara area have found that predation by corvids is likely to be negatively impacting populations of Western Spiny-tailed Skink, and that infrastructure associated with mining operations (specifically landfill areas) may exacerbate this impact (Bradley in press). The observed reduction in the number of sites occupied by Western Spiny-tailed Skinks suggests that the abundance of skinks in the area has decreased, possibly due to predation such as corvids and cats.

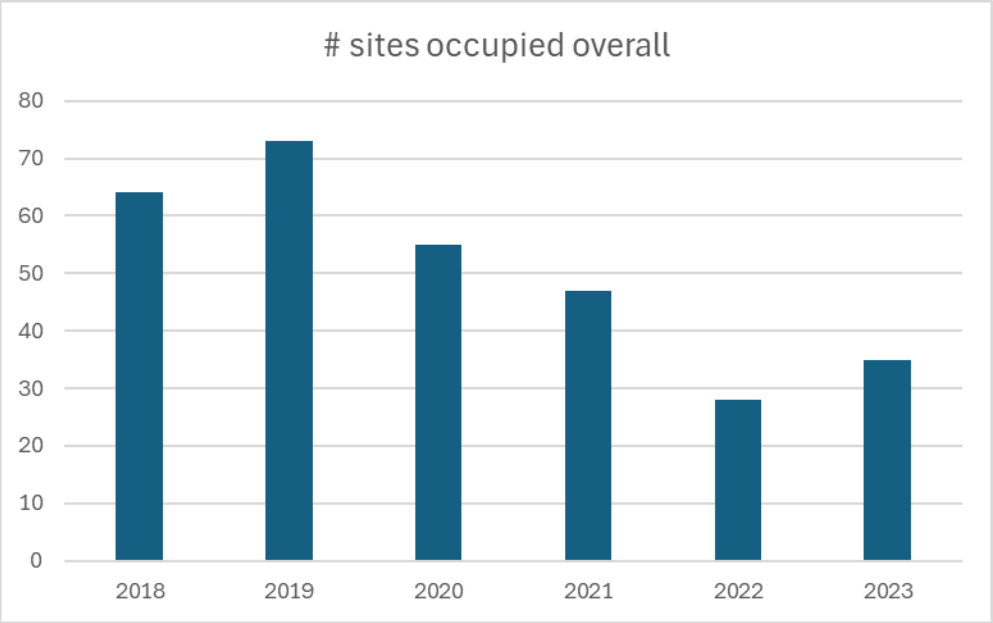

Figure 3-19. Total number of occupied skink monitoring sites.

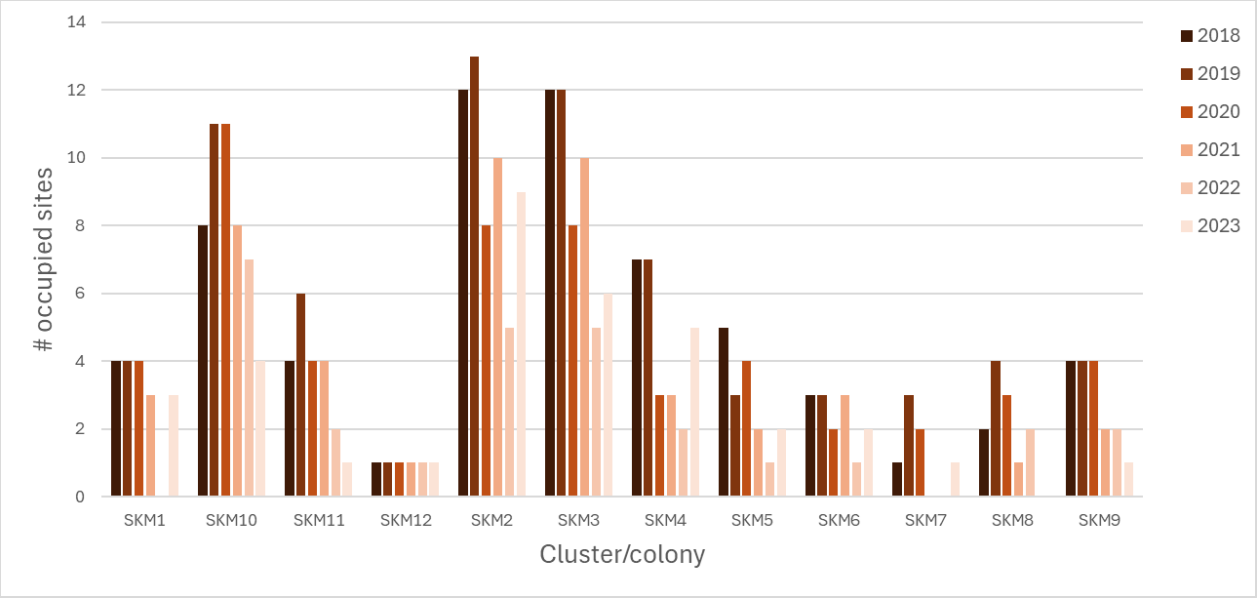

Figure 3-20. Number of occupied sites over time within each cluster. All clusters except SKM12 show evidence of a decline in occupied sites over time since 2018.

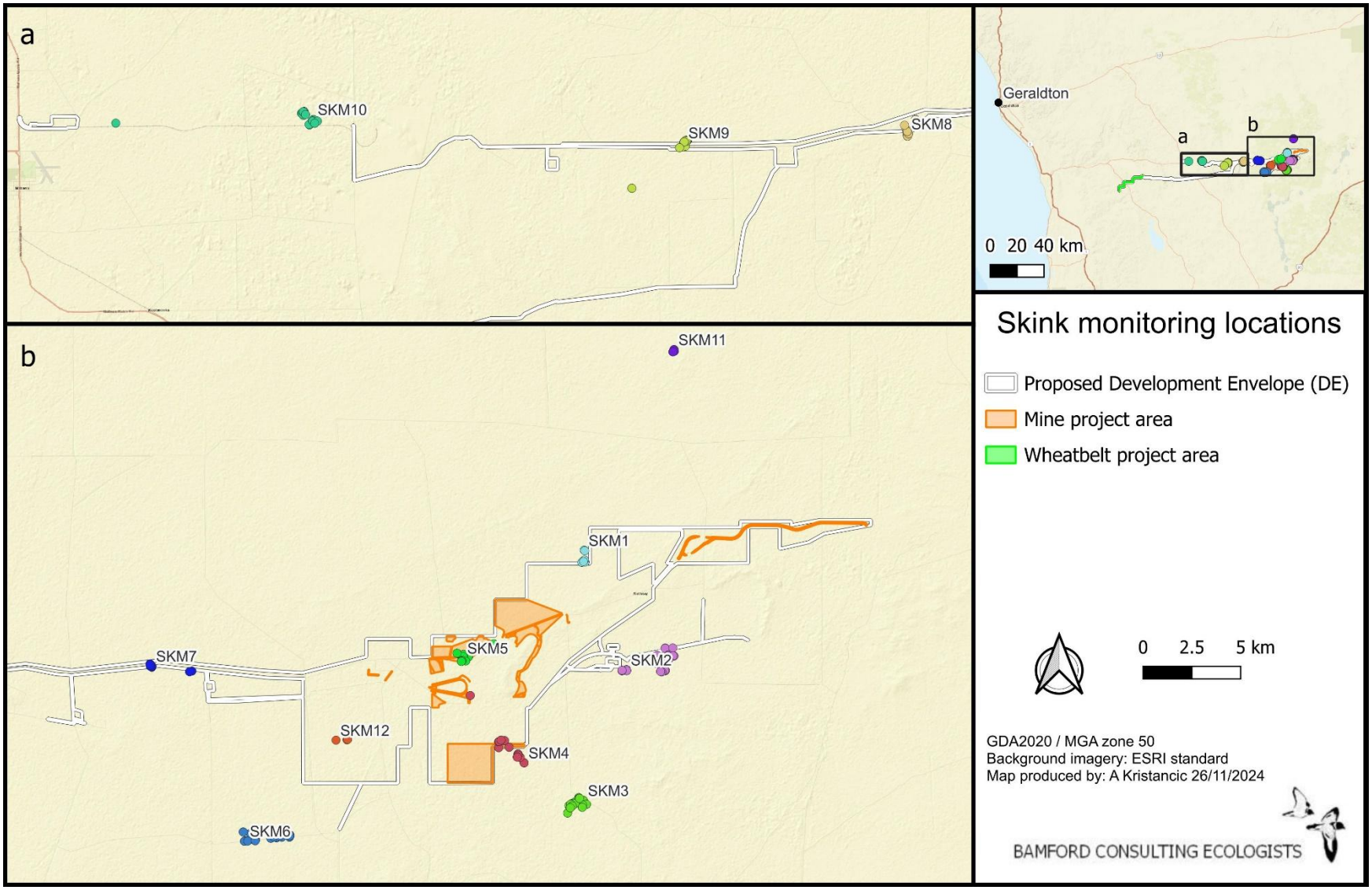

Figure 3-21. Location of Western Spiny-tailed Skink monitoring sites, consisting of 169 sites within 12 clusters (SKM1 – SKM12).

Malleefowl (*Leipoa ocellata*)

CS1 (VU, S2D3): Vulnerable under EPBC Act and Schedule 2 Division 3 (Vulnerable) under WA BC Act.

The Malleefowl is widespread in the general region, with multiple records in the DBCA threatened fauna database (Figure 3-14 and Figure 3-15). Most records are in the pastoral region where little clearing has occurred, with many records in the vicinity of the mine; many of these are based on KML data. There are few Malleefowl records in the nearby wheatbelt, with such records largely restricted to reserves such as at Koolanooka where breeding activity has been documented (Biologic, 2014). The species has been extensively studied in the Karara area, with large numbers of mounds located and monitored since 2008. The level of breeding activity varies annually in response to conditions, in particular the amount of rainfall, with breeding dependent on winter rains to ensure moisture levels in the mounds are sufficient for incubation to occur. The mounds tend to be associated with the lower slopes of hills as the heavy soils of the surrounding plains appear unsuitable for mound construction (Bamford, 2008). Extent of suitable habitat is discussed below.

Malleefowl mounds (Plate 3-16 and Plate 3-17) and evidence of the birds such as tracks (Plate 3-18) were found during investigations carried out in 2020 and 2024. Active and recently active mounds were found only in areas to the south of the current mine (2020) and to the south of the airport (2024), with only scattered old and long-unused mounds elsewhere (see Figure 3-23 for distribution of mounds found in 2020 and 2024). The southern area surveyed in 2020 contained two active mounds (Plate 3-16 and Plate 3-17), and as about a third of this area was searched this suggests a minimum of six pairs breeding in that area in that year. Two active mounds were also found along transects walked south of the airport in 2024, again suggesting about five or six pairs in that area in that year. It is worth noting that both these southerly areas are adjacent to vegetation that had been progressively cleared for infrastructure, and Malleefowl were known to nest in those now-cleared areas. Birds were displaced by clearing following KML procedures, and therefore the number present in the southern expansion area may be artificially increased and an artefact of this displacement. Consistent with this, both the mounds found in 2024 were not only active but were newly constructed (e.g. not constructed at the site of an historic mound, see Plate 3-17). Typically, Malleefowl will construct a mound at the site of an historic mound, rather than constructing a completely new mound. The southerly area searched in 2024 had only one old mound, indicating that it was not historically a prime breeding area for the species, suggesting that displacement has led to the birds constructing new mounds and breeding in what may be sub-optimal breeding habitat. This has implications for the long-term viability of displaced Malleefowl populations.

Analysis of monitoring data

Since monitoring began in 2008/09, 64 mounds have been classified as Active during at least one monitoring period. Some of these mounds were active across multiple survey years while others were only active during one monitoring year. The locations of mounds that have ever been classified as active (since 2008/09) are shown on Figure 3-24.

Since 2011/12 the survey effort has varied from a minimum of 71 mounds surveyed in 2022/23 to a maximum of 190 mounds surveyed in 2016/17. A summary of the number of mounds surveyed and a breakdown of the classifications assigned during each monitoring period is provided in Table 3.7, while Figure 3-22 illustrates the percent active annually. This percent has fluctuated between about 5% to 10% except in the last two years of monitoring (2021/22 and 2022/23), where the percentage

of surveyed mounds classified as active was 18% and 27% respectively. There were more active mounds found in those years than in any other year.

According to comments in the monitoring register, 41 mounds have been destroyed/removed as part of clearing or constructions works within the Karara area. Of these, at least 5 were classified as active during at least one monitoring period since 2008/9. Therefore, 7.8% of mounds that have been active at least once have been destroyed.

Table 3.7. Summary of Malleefowl mound monitoring results from 2011/12 to 2022/23.

Year	# mounds surveyed	# mounds active	% active	# mounds inactive	Inactive classification (see Appendix 5)			
					B	C	D	E
2011/12	87	4	4.6	83	6	13	49	15
2012/13	124	4	3.2	120	16	8	45	51
2013/14	148	10	6.8	138	1	16	31	90
2014/15	111	12	10.8	99	2	11	25	61
2015/16	104	8	7.7	96	2	6	14	74
2016/17	190	9	4.7	181	4	1	18	158
2017/18	112	7	6.3	105	1	7	12	85
2018/19	91	10	11.0	81	0	8	2	71
2019/20	83	9	10.8	74	0	4	6	64
2020/21	149	9	6.0	140	1	11	24	104
2021/22	83	15	18.1	68	1	5	6	56
2022/23	71	19	26.8	52	1	7	4	40

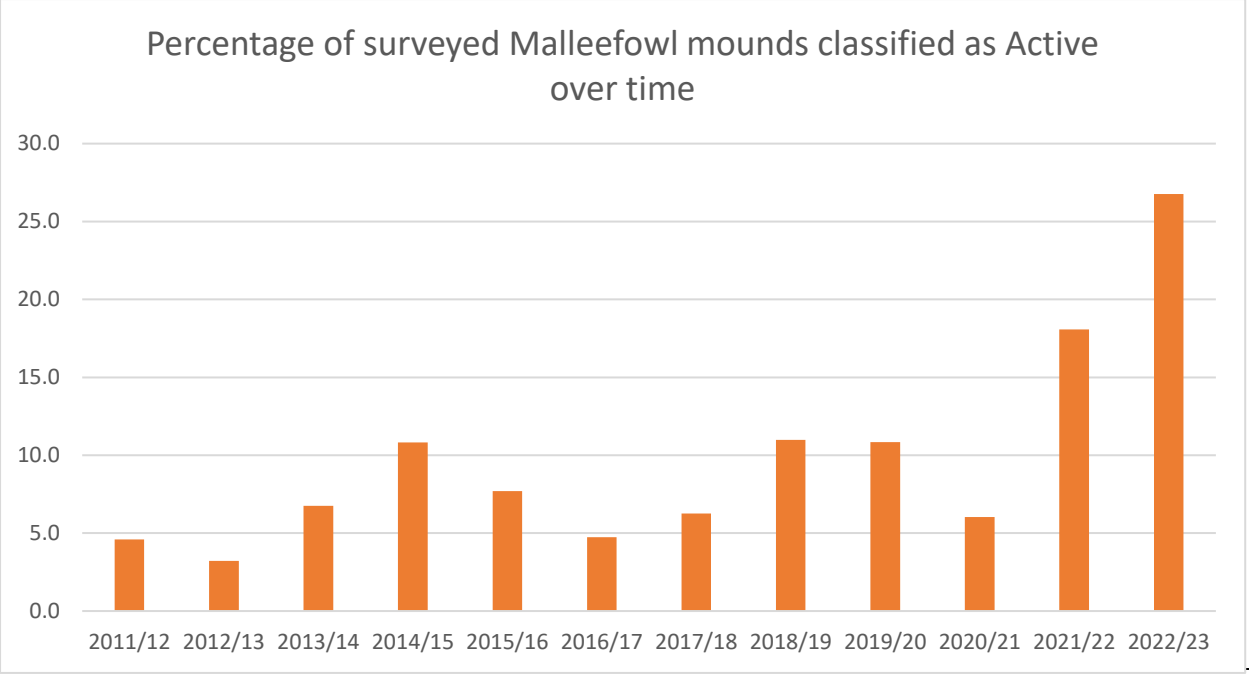

Figure 3-22. Graphical representation of percentage of surveyed Malleefowl mounds that were classified as Active during each monitoring period since 2011/12.

Predicted extent of habitat

The extent of suitable habitat for Malleefowl was estimated based on land systems that support Malleefowl breeding based on known locations of Malleefowl mounds and the known environmental preference for mound construction (based largely on observations by M. Bamford in this region, where birds avoid heavy soils where mounds may get waterlogged). The locations of known mounds overlaid over suitable land systems are shown in Figure 3-25; this creates a map of predicted Malleefowl breeding habitat within 15 km of the development envelope. Land systems mapped in this figure are limited to those found to support Malleefowl mounds in the Karara area (based on monitoring data and BCE records from 2020 and 2024 field investigations). Not all land systems are of equal value, with a strong bias towards systems close to ridges where the soil is a gravel loam rather than heavier soils of the plains. While to some extent the distribution reflects survey effort, with most searching carried out along and close to ridges, searching has been deliberately carried out away from ridges, such as when looking for other significant species. Such searching has found few mounds. This was the case in 2024 when some walked transects passed through York Gum Woodland on heavy soils, with no mounds, and was also found in early Malleefowl mound surveys undertaken in 2010.

The predicted extent of suitable habitat was not mapped for the Wheatbelt Area as land systems do not reflect suitable habitat in this region due to widespread clearing. Malleefowl may persist in large remnants of native vegetation (with suitable substrate) in the wheatbelt in general. It is unlikely that Malleefowl will utilise vegetation within the Wheatbelt Area disturbance footprint for breeding due to the degraded nature of vegetation. However, the native vegetation in the Wheatbelt Area itself may provide an important ecological function by providing connectivity in a heavily cleared landscape where habitat is highly fragmented.

Plate 3-16. Active Malleefowl mound in southern expansion area at 474791mE, 6766267mN, August 2020.

Plate 3-17. Active Malleefowl mound in area south of the airport, June 2024. This mound appears to be new and not built upon an historic mound as is usually the case.

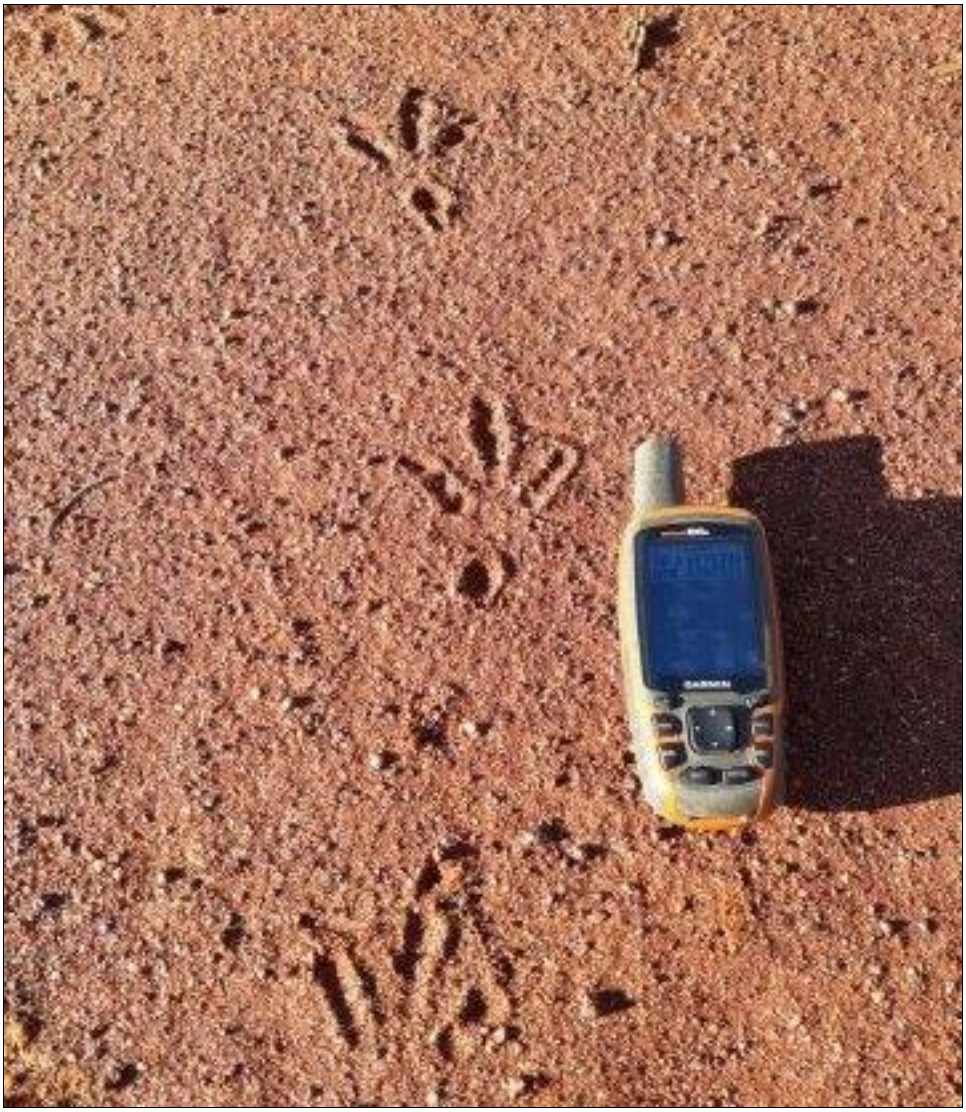

Plate 3-18. Fresh tracks of a Malleefowl (August 2020).

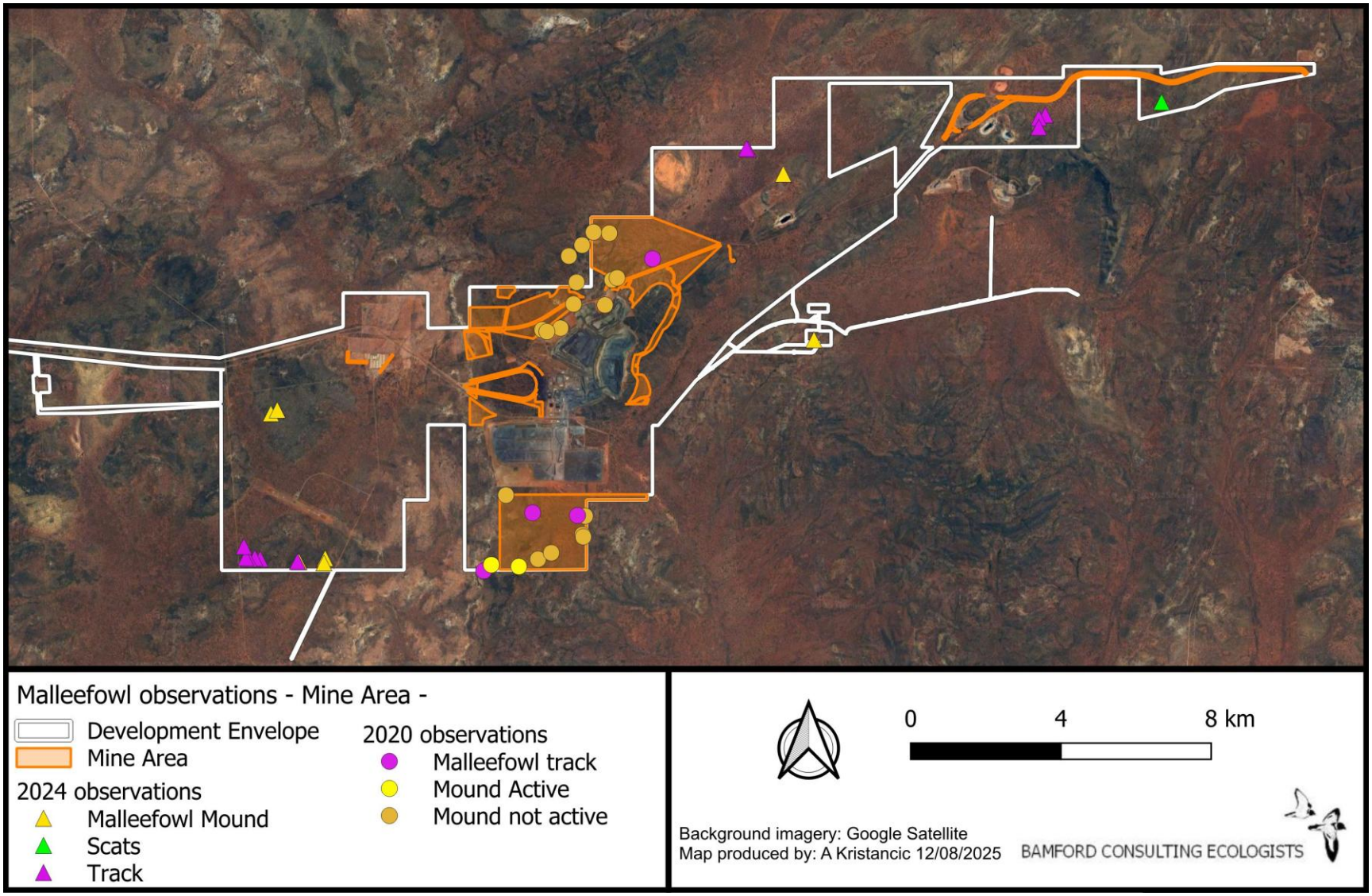

Figure 3-23. Locations of Malleefowl mounds recorded in Mine Area by BCE in 2020 and 2024.

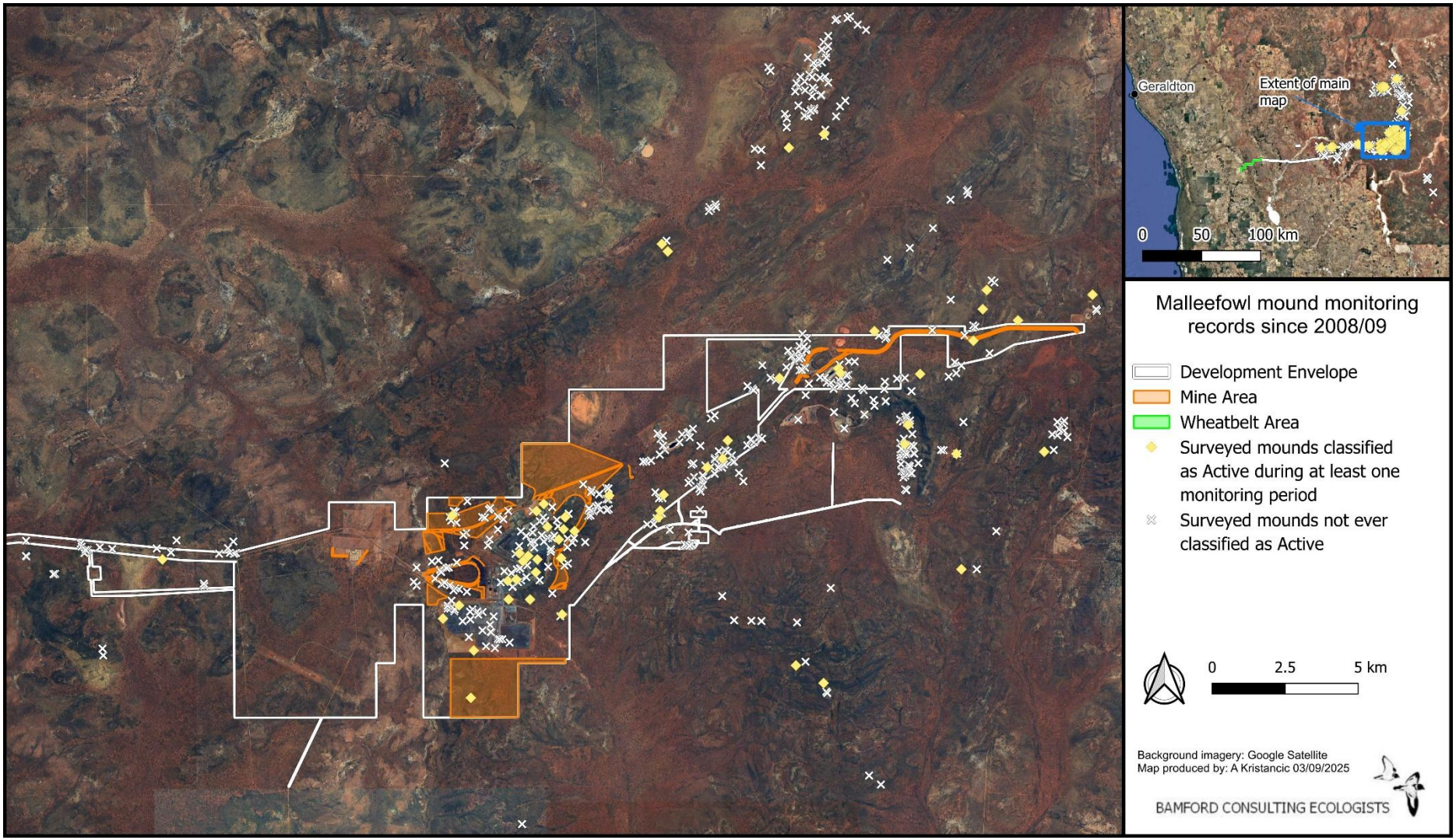

Figure 3-24. Locations of Malleefowl mounds monitored since 2008/09.

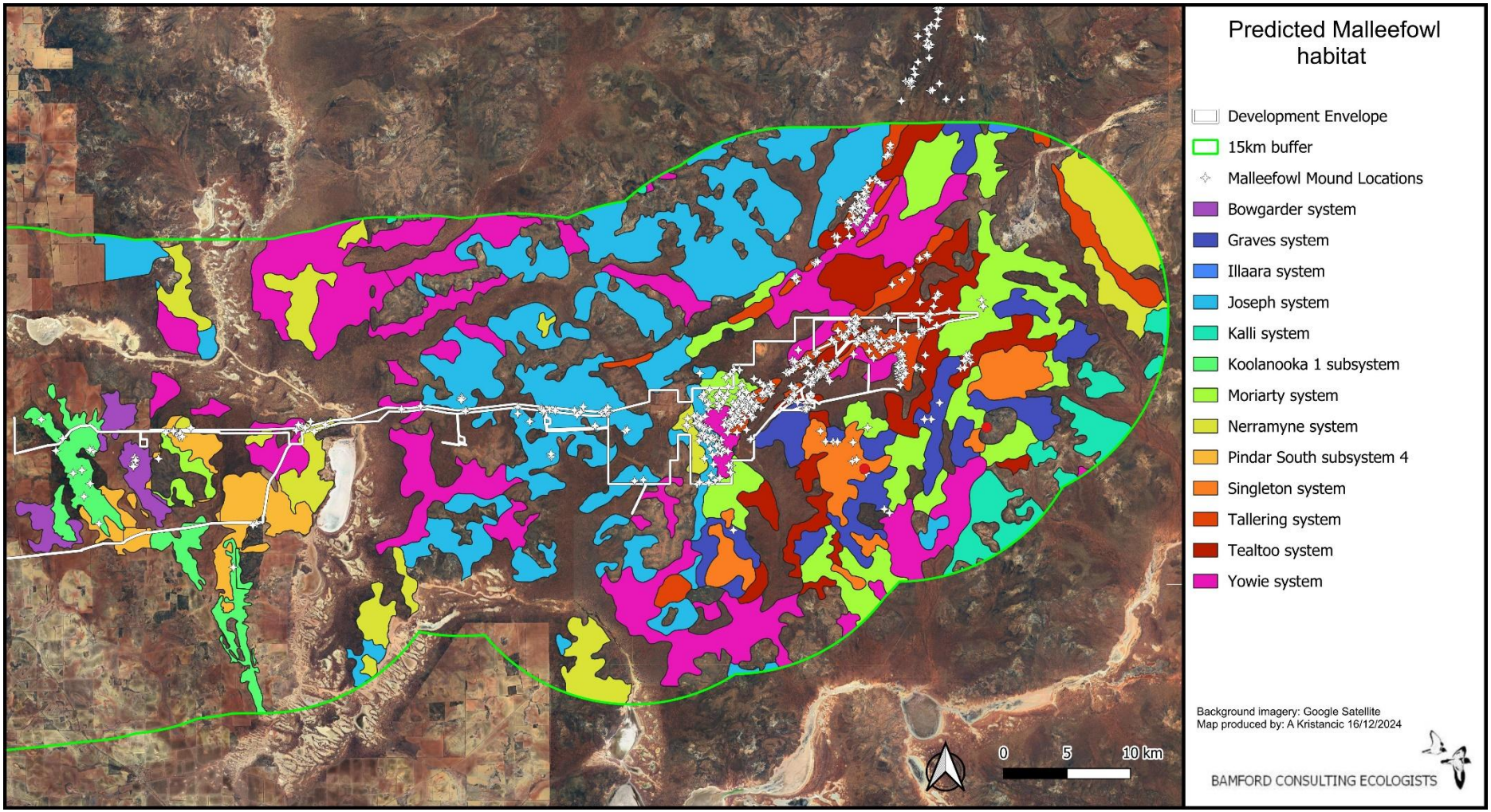

Figure 3-25. Overview of predicted Malleefowl habitat within 15 km of the KML development envelope.

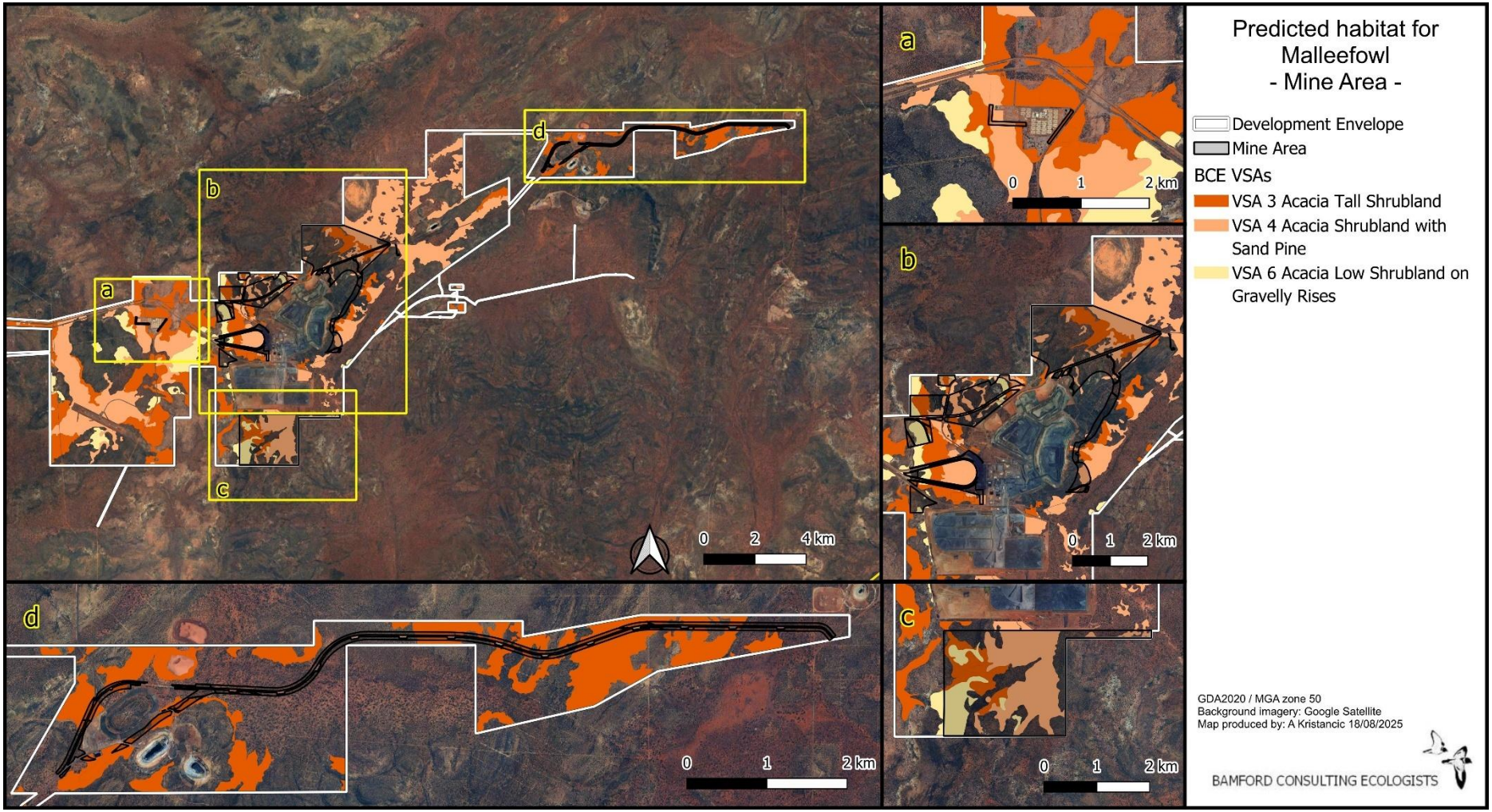

Figure 3-26. Predicted habitat for Malleefowl within Mine Area and surrounding DE.

Fork-tailed Swift (*Apus pacificus*)

CS1 (MI, S1D2): Migratory under EPBC Act and Schedule 1 Division 2 (Migratory) under WA BC Act.

The Fork-tailed Swift is a non-breeding summer migrant in northern Australia, and occasionally occurs in the south. It could be an irregular visitor to the general area but is primarily aerial and more or less independent of terrestrial environments. There are two records in the DBCA threatened fauna database, both in the wheatbelt region (Figure 3-15), and the species has not been recorded in any of the BCE work undertaken around Karara and the broader region.

Peregrine Falcon (*Falco peregrinus*)

CS1 (S1D3): Schedule 1 Division 3 (Species otherwise in need of special protection) under WA BC Act.

This species is known to occur over a wide range of environments across Australia. Preferred nesting locations include a range of elevated locations with steep bisected topography such as rocky hills, breakaways, cliffs and high artificial structures. It will also nest in very large, horizontally-aligned tree hollows, and in old Raven nests in tall trees (M. Bamford pers. obs.). There are several records in the DBCA threatened fauna database (Figure 3-14) in the vicinity of the Mine Area, and there is a nest on the eastern side of Mungada Ridge. The pair breeding at this site was seen regularly around 2010 when BCE carried out work along that ridge. The proposed disturbance areas within the Mine Area are therefore within the foraging range of what is probably a resident pair. The proposed disturbance areas lack elevated landscapes/cliffs and tall trees, so are unlikely to support nesting.

Migratory shorebirds (Common Sandpiper, Common Greenshank, Curlew Sandpiper, Sharp-tailed Sandpiper, Red-necked Stint, Long-toed Stint)

CS1 (Mig., S1D2). All are listed as Migratory under the EPBC and the WA BC Acts. Curlew Sandpiper also listed as Critically Endangered (under both the EPBC Act and WA BC Act), Sharp-tailed Sandpiper also listed as Vulnerable under EBPC Act, Common Greenshank also listed as Endangered under the EPBC Act.

These migratory shorebirds have been recorded in the broader region in the DBCA threatened fauna database and may occur occasionally and in small numbers (irregular visitors) in suitable habitat (seasonal salt lakes) throughout. There are suitable lakes in both the mine and the wheatbelt development envelopes. None of these species has been recorded in surveys by BCE despite regular checks of locations such as the salt lakes just north of Terapod.

Carnaby's Black-Cockatoo (*Zada latirostris*)

CS1 (VU). Vulnerable under the EPBC Act and Schedule 2 Division 2 (Endangered) under the WA BC Act.

The Mine Area is out of range but the species would formerly have occurred at least in the west of the Wheatbelt Area, with several records in the DBCA threatened fauna database west and south of the wheatbelt development envelope (Figure 3-15). Due to the massive extent of habitat loss it is probably now locally extinct even in the Wheatbelt Area, but individuals may occur as irregular visitors. There is almost no breeding habitat remaining and very little foraging habitat; elsewhere in

the wheatbelt some Carnaby's Black-Cockatoos persist where there is a mixture of natural foraging habitat and where they can also feed on crops such as Canola.

Southern Whiteface (*Aphelocephala leucopsis*)

CS1 (VU): Vulnerable under the EPBC Act; not listed under the WA BC Act.

The Southern Whiteface was listed as Vulnerable under the EPBC Act as of March 2023, based on evidence of a >50% decline in abundance since 2000 (Garnett & Baker, 2021). This decline occurred mainly in the eastern sub-species, with a lesser decline in the west. The decline was considered possibly due to habitat fragmentation and degradation, with degradation due to feral and domestic herbivore. Garnett and Baker (2021) also cited reports that found no evidence of a decline, and based on personal experience (M. Bamford), the species is widespread and common in the Murchison and Goldfields regions of WA. The conservation listing was therefore unexpected but the species was targeted in the 2024 investigations. It was not listed in 2020.

Southern Whiteface habitat is broadly described as semi-arid woodlands particularly of Mulga (e.g. Garnett and Baker 2021), while Johnstone and Storr (2005) describe habitat (of the western sub-species) as 'Open or sparsely wooded plains with scattered low shrubs, especially blue-bush (*Maireana sedifolia*); Myall (Acacia *papyrocarpa)*, mallee, Mulga with bushy understorey.' In the listing of the species, DCCEEW (2023b) stated that the Southern Whiteface inhabits "*… a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains*." In addition, DCCEEW (2023b) defines 'habitat critical to the survival of the Southern Whiteface' as:

- relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both;
- habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat;
- living and dead trees with hollows and crevices which are essential for roosting and nesting.

These descriptions are fairly general in nature, probably due to the wide geographic range of this species. Most of these 'habitat' descriptions are vegetation descriptions and make little if any reference to structure. In June 2024, BCE targeted the Southern Whiteface during walked transects, and while the vegetation was consistent with the broad description of Southern Whiteface habitat, the distribution of the species was very patchy (Figure 3-27). The species was found at multiple locations across the Mine Area and on the edge of cleared land west of Weelhamby Lake, but not in the Wheatbelt Area. This aligns with database record, which are extensive in the pastoral zone but scattered (and often old) in cleared areas of the wheatbelt (Figure 3-16).

The distribution of records in 2024 aligned with a particular vegetation structure, with the species occurring where dense acacia thickets were juxtaposed with open, low shrubland (often sparse bluebush) and bare ground. Suitable habitat was therefore very patchy and the habitat suitable for Southern Whiteface would normally be included in a broad VSA or vegetation type description. For example, observations of Southern Whiteface parties were typically made in the following environments:

- Where Acacia thickets occurred alongside clearings/bare ground that supported annuals and cryptograms (Plate 3-19 and Plate 3-20).
- In a rehabilitated gravel pit, where Acacias formed clumps between extensive bare areas (Plate 3-21).
- Open shrubland of bluebush and solanum, with clumps of Acacia, and about 50-60% open ground (Plate 3-22).
- Where Acacia tall shrubland met a claypan; the shrubland broke up into smaller thickets and there was extensive open ground.

This sort of vegetation structure does not align with any vegetation type but is more like a patchily distributed ecotone between vegetation types, which makes it virtually impossible to map. Menkhorst *et al.* (2017) note that the Southern Whiteface tends to forage on the ground, amongst leaf litter and debris, and retreats into low foliage or shrubs when disturbed. The habitat association and apparent importance of bare ground may reflect this species' foraging preferences. The distribution of VSAs likely to contain this preferred habitat for Southern Whiteface is shown in Figure 3-28. Note that the entire area of each VSA is not necessarily suitable, but that preferred habitat (see Plate 3-19 to Plate 3-22) is expected to occur within these VSAs.

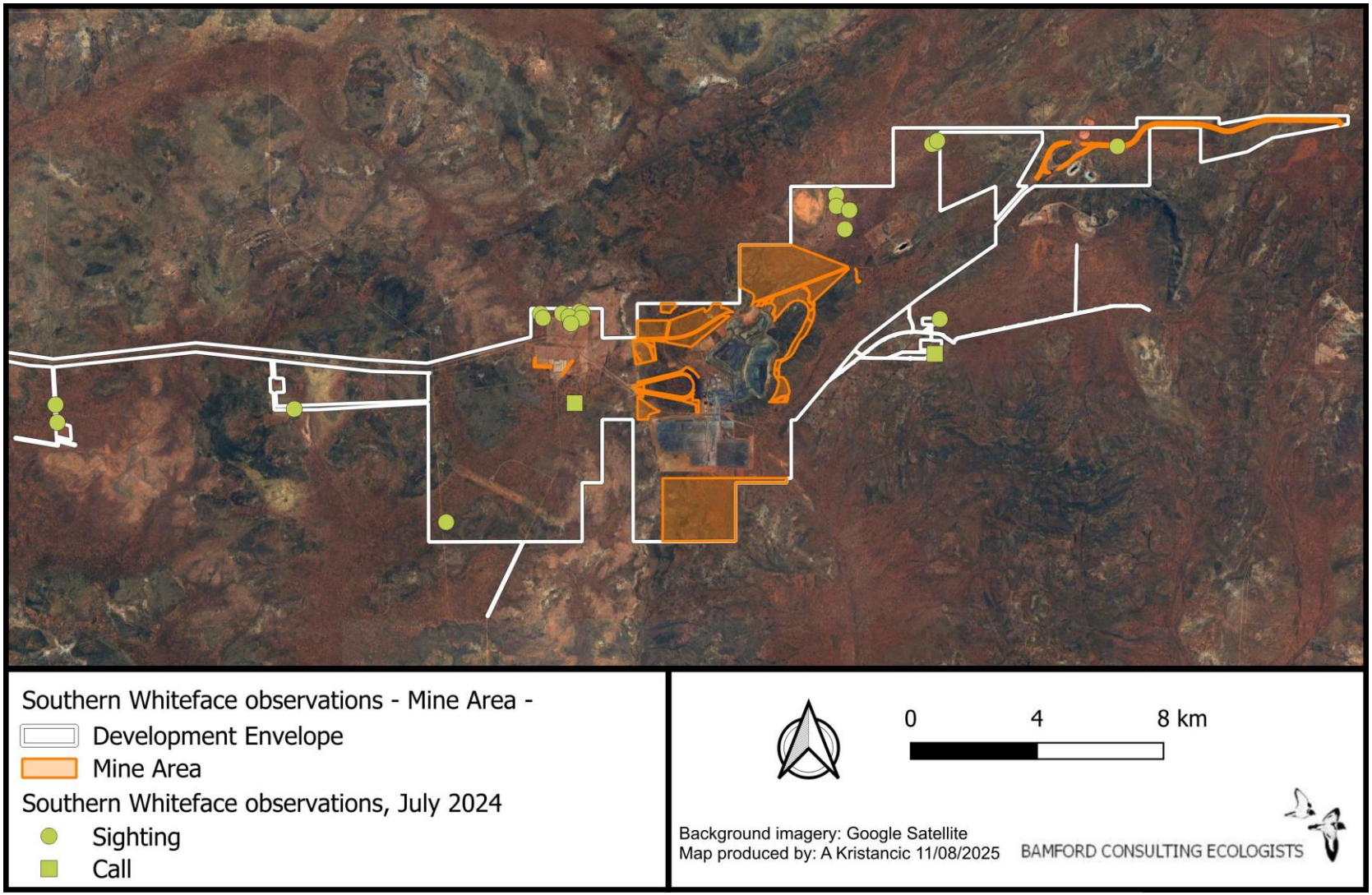

Figure 3-27. Distribution of records of the Southern Whiteface in 2024.

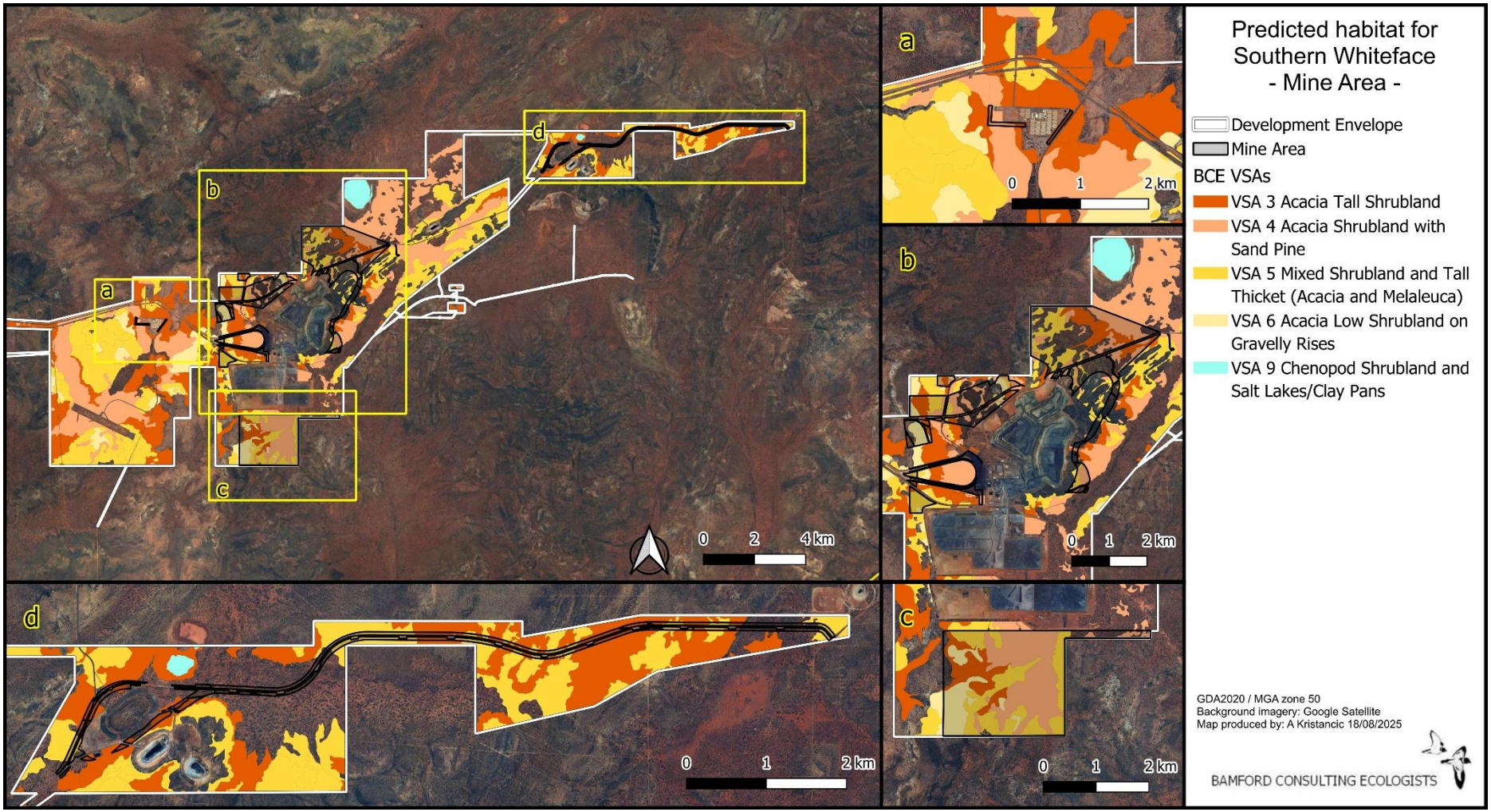

Figure 3-28. Predicted extent of VSAs that may contain suitable habitat for Southern Whiteface within the Mine Area and surrounding DE.

Plate 3-19. Southern Whiteface site. Acacia tall shrubland and thicket with about 50% open ground.

Plate 3-20. Southern Whiteface site. Acacia shrubland with ca. 50% open ground.

Plate 3-21. Southern Whiteface site. Restored borrow pit along Mungada Road, July 2024.

Plate 3-22. Southern Whiteface site. Very sparse, low shrubland with scattered Acacia on shallow soil over granite.

Trapdoor Spiders

Prior to the June 2020 surveys, two spider species of conservation significance were known in the greater Karara area: the Northern Shield-backed Trapdoor Spider (*Idiosoma clypeatum*) and the Ornate Trapdoor Spider (*Idiosoma formosum*), the latter with just one record near Karara Homestead (about 10km south of the Karara mine). The Northern Shield-backed Trapdoor Spider was initially identified as *Idiosoma nigrum*, listed as Vulnerable under the EPBC Act and Schedule 2 of the WA Biodiversity Conservation Act 2018 (WABC). Following a taxonomic review, (Rix *et al.* 2018), the spider in the Karara area was re-named to *I. clypeatum* and assigned a lower level of conservation significance (Priority 3), mainly because studies carried out by BCE for KML had found it to be widespread in the region, and with records as far north as near Wiluna. In 2014, BCE created a predicted distribution map for the species in the broader Karara area which is based on confirmed records (Figure 3-30). The species was also found to be very abundant in suitable areas (generally gravelly loam soils along ironstone ridges) with robust density calculations in the range of 140 to 623 spiders/ha, although Bancroft and Bamford (2019) did suggest that populations may be in decline, possibly due to long term declines in rainfall. This was based upon a monitoring program supported by KML but discontinued in 2019 with approval from the EPA.

The Ornate Trapdoor Spider was named as part of that taxonomic review as it had previously been known only by a code number. It is listed as Schedule 2 Division 2 (Endangered) under the WA BC Act but is not listed under the EPBC Act. Both species were found in the Mine Area in 2020 and 2024, along with an unidentified and possibly significant third species (*Idiosoma (Aganippe)* sp.), and all are discussed below.

Two additional members of the genus, *I. gutharuka* (Priority 1) and *I. intermedium*, were recognised as part of the taxonomic revision, while a third species, the priority 3 Tree-stem Trapdoor Spider *Aganippe castellum*, was recently re-classified as *Idiosoma castellum*. All three are known broadly from the area but none has been found in the Karara area despite intensive searching over many years. The nearest confirmed records of *I. castellum* come from 20-30km east of Karara, in the Minjar/Mt Mulgine area, and come from Everard and Bamford (2014) and Spectrum Ecology (2019). The geology in this area is different from around Karara, so this may affect the spiders, while Everard and Bamford (2014) noted that *I. clypeatum* and *I. castellum* were more or less mutually exclusive, suggesting a fundamental difference in substrate driving their distribution. These three species (*I. gutharuka, I. intermedium* and *I. castellum*) are therefore placed in Appendix 11 as invertebrate species excluded on the basis of Karara being out of range and not providing suitable habitat. This is not to say, however, that they are absolutely certain to be absent particularly in the east of the Mine Area which is close to Minjar. Similarly, surveys for potentially significant invertebrates and especially undescribed species are certain to be incomplete.

In the current studies no trapdoor spiders were found in the Wheatbelt Area and much of the landscape was too degraded, but they may persist on road verges and in reserves. In contrast, many records of trapdoor spiders were made in the Mine Area to supplement existing extensive records.

Both the Northern Shield-backed Trapdoor Spider and Ornate Trapdoor Spider were found to be widespread in areas visited in 2020 and in 2024, and a third (and currently undescribed) species was collected in 2020. The Northern Shield-backed Trapdoor Spider was found even in areas of loam soil outside its range predicted on past experience, suggesting it is even more widespread and abundant than previously concluded. The Ornate Trapdoor Spider was also widespread but tended to occur in

areas of sandy loam soils well away from the rocky ridges. The Northern Shield-backed Trapdoor Spider is most closely aligned with VSAs 1, 3, 5 and 6, while the Ornate Trapdoor Spider appeared to occur mainly in VSAs 4 and 6, but with records also in VSAs 5 and 7. The unidentified trapdoor spider was found in VSA 2, but with only one record it is uncertain to what extent it may be restricted to this environment. Raw data on spider locations are provided in Appendix 14.

Initially during the June 2020 field trip, field identification of the Ornate Trapdoor Spider was uncertain even when a spider could be viewed down a burrow, but it was later found that there are more or less consistent differences in the lid architecture allowing the two species to be distinguished without disturbing the spider (Plate 3-23 and Plate 3-24). These records of the Ornate Trapdoor Spider greatly increase the number of records known of the species in the region (Figure 3-33). It would appear to be abundant on moderately heavy soils on plains around Karara. Densities calculated on spider transects in the two areas surveyed in 2020 were 364/ha in the north and 221/ha in the south (raw data in Appendix *15*), although there was a great deal of variation between transects and more extensive sampling would be required to provide robust estimates. There appears to be extensive suitable habitat for the species in the region beyond the limits of the development envelope.

The third trapdoor spider collected was represented by a single animal collected in the north-west corner of the southern area in 2020. It was collected because the lid and fan architecture appeared to be more complex than that of either of the other species (Plate 3-25). The WA Museum was not able to identify it to species as it was a juvenile female, but were able to assign it to a group of spiders referred to as *Idiosoma (Aganippe)* sp.. These are trapdoor spiders formerly classed in the genus *Aganippe* but now reassigned to the genus *Idiosoma*. Because this specimen couldn't be identified to a species, it is treated here as possibly locally significant (CS3) that could favour sandy soils near granite outcrops (VSA 2).

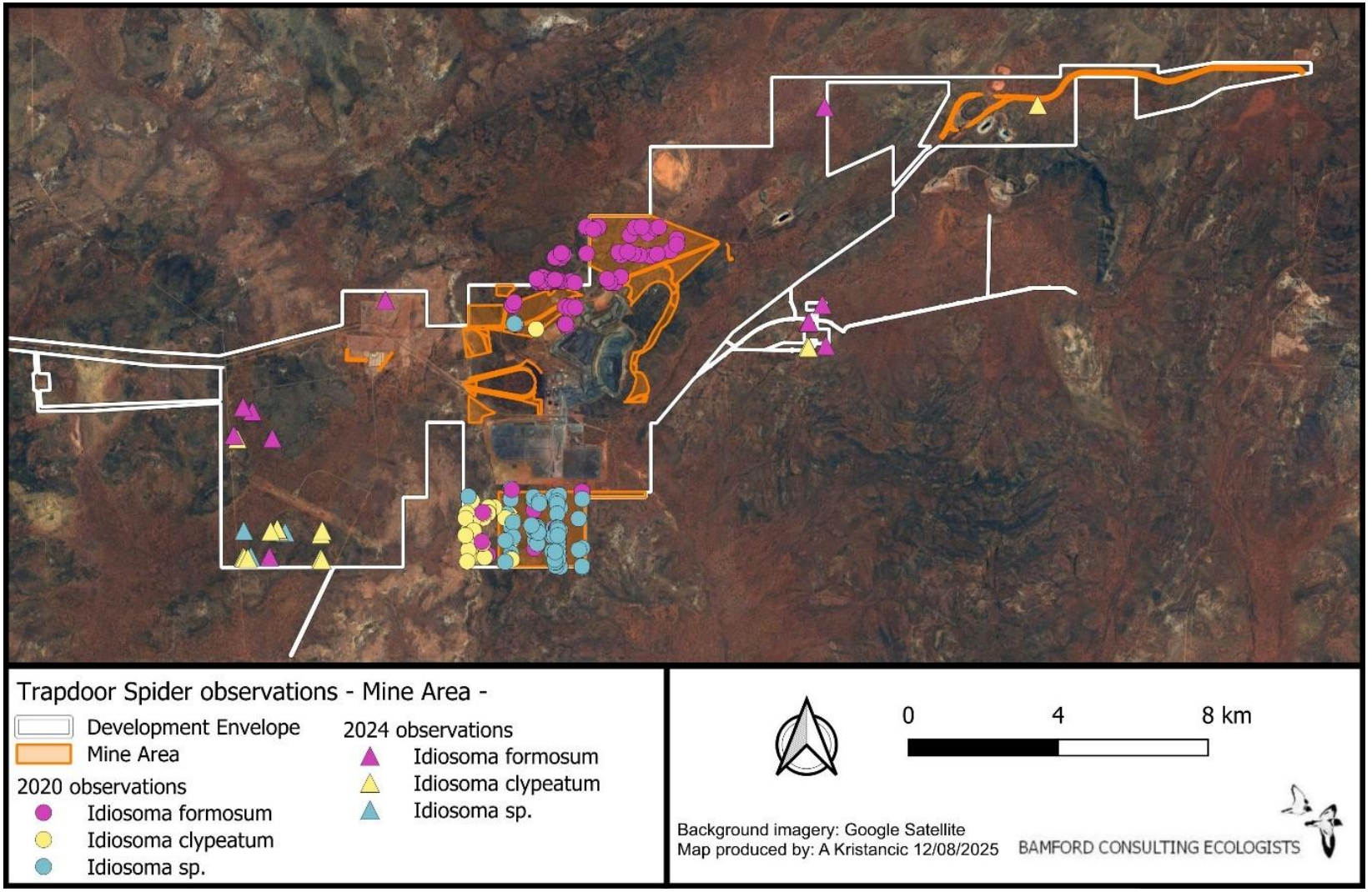

Figure 3-29. BCE observations of trapdoor spiders in the Karara area in 2020 and 2024.

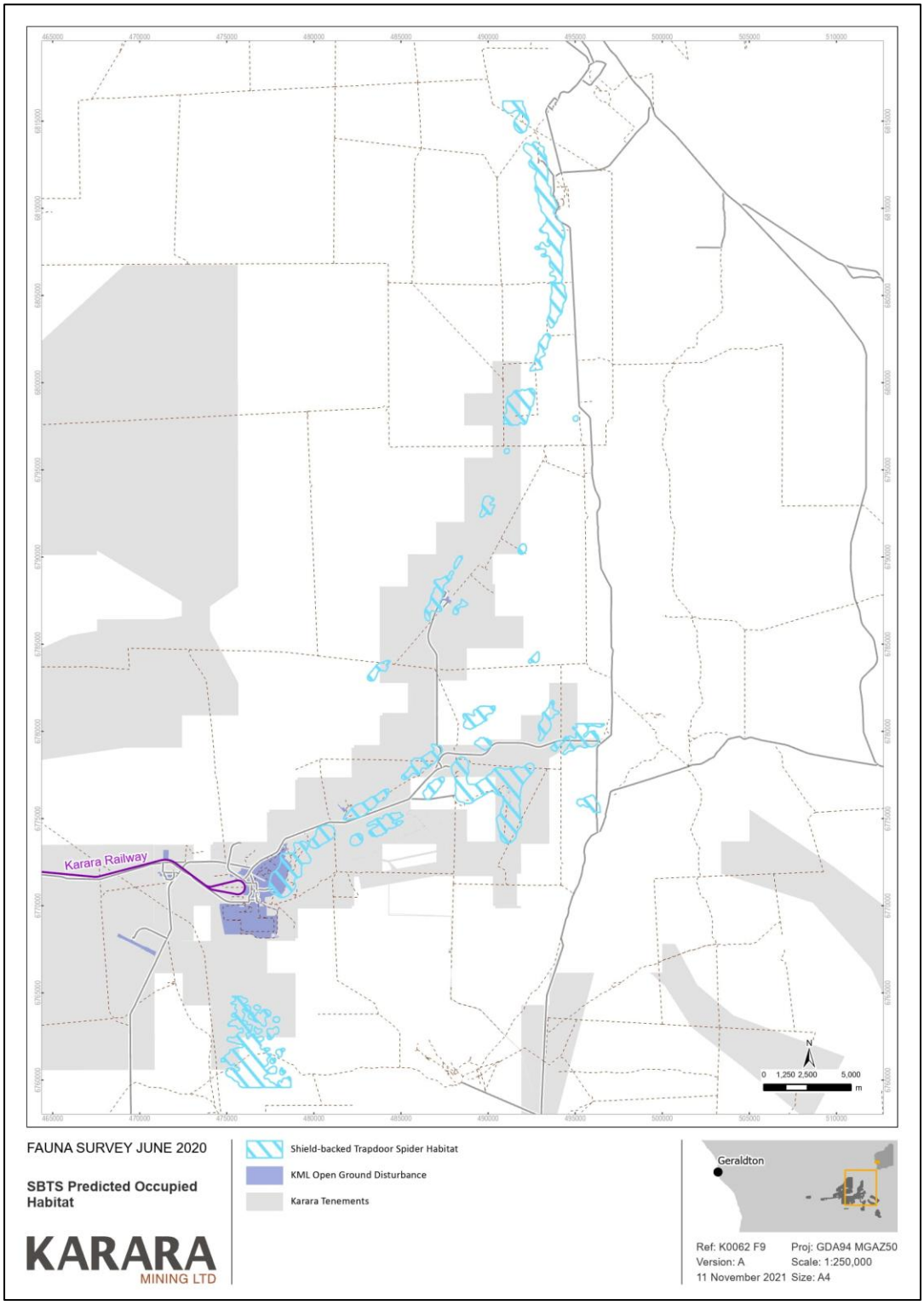

Figure 3-30. Distribution of the Northern Shield-backed Trapdoor Spider as estimated in 2014

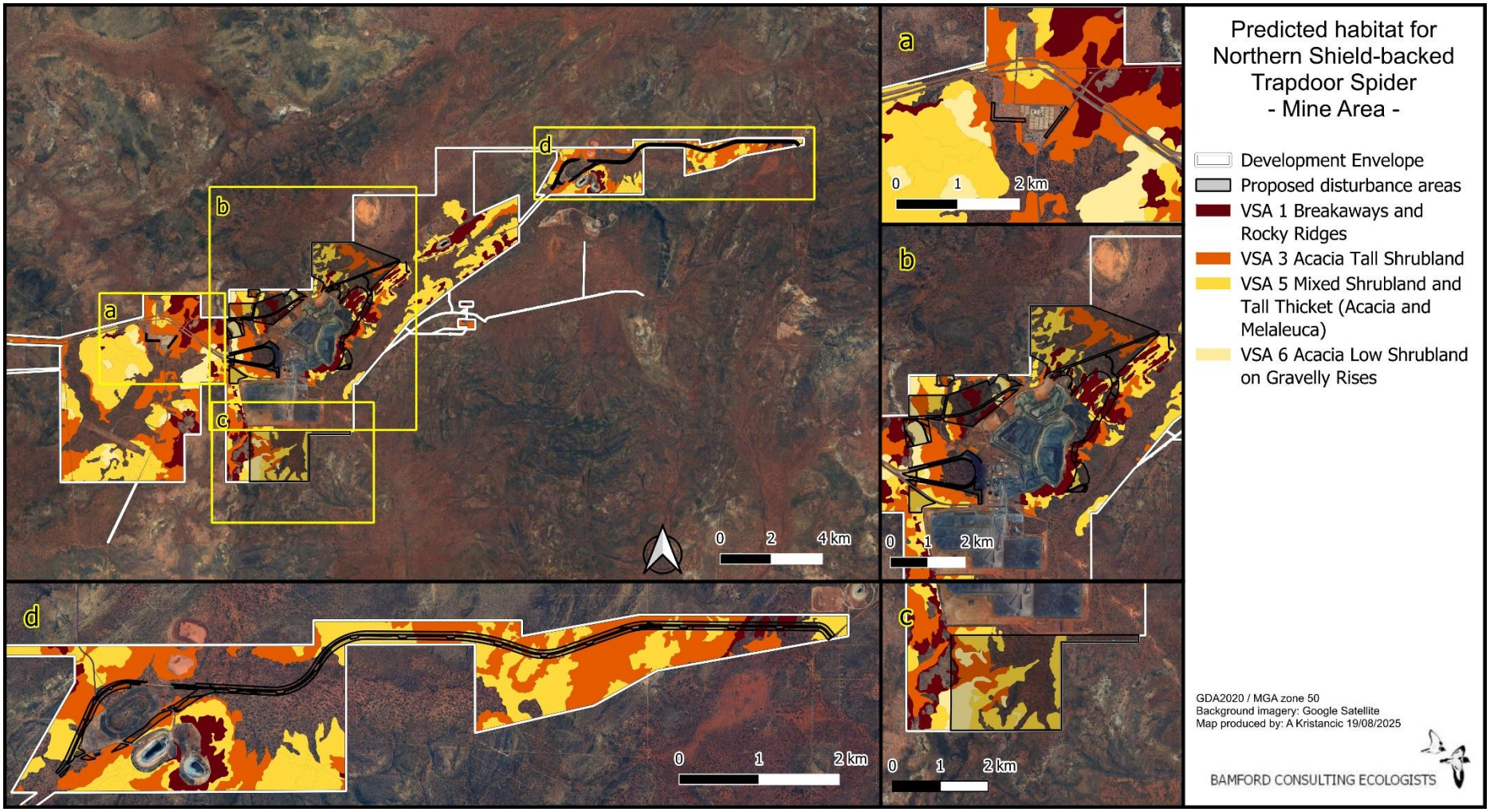

Figure 3-31. Distribution of predicted habitat for *Idiosoma clypeatum* within the Mine Area and surrounding DE.

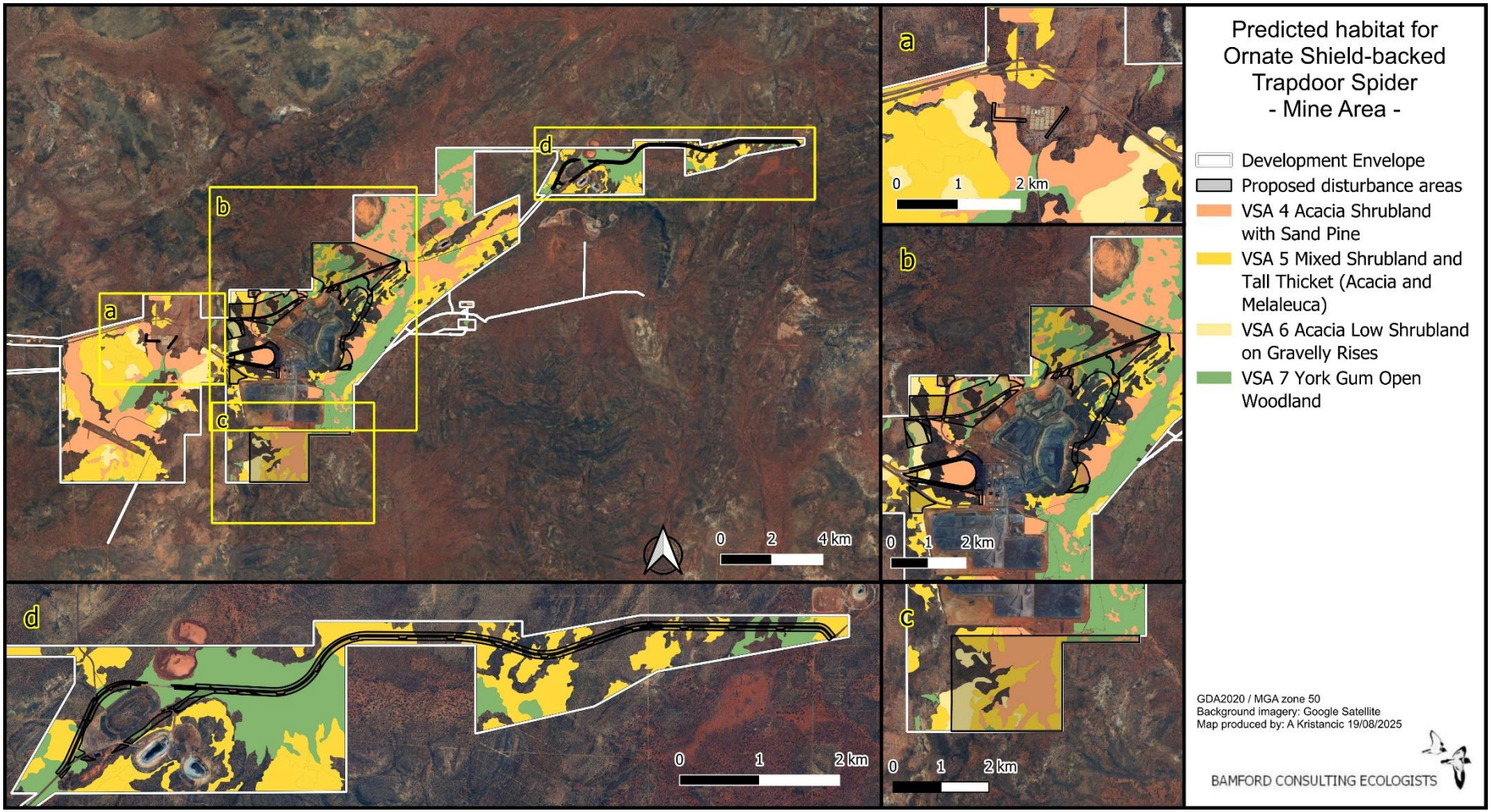

Figure 3-32. Distribution of predicted habitat for *Idiosoma formosum* within the Mine Area and surrounding DE.

Plate 3-23. Burrow lid and fan of Ornate Trapdoor Spider. Note upright material on leading edge of door.

Plate 3-24. Burrow lid and fan of Northern Shield-backed Trapdoor Spider. Note untidy material on leading edge of door with no consistent upright twigs.

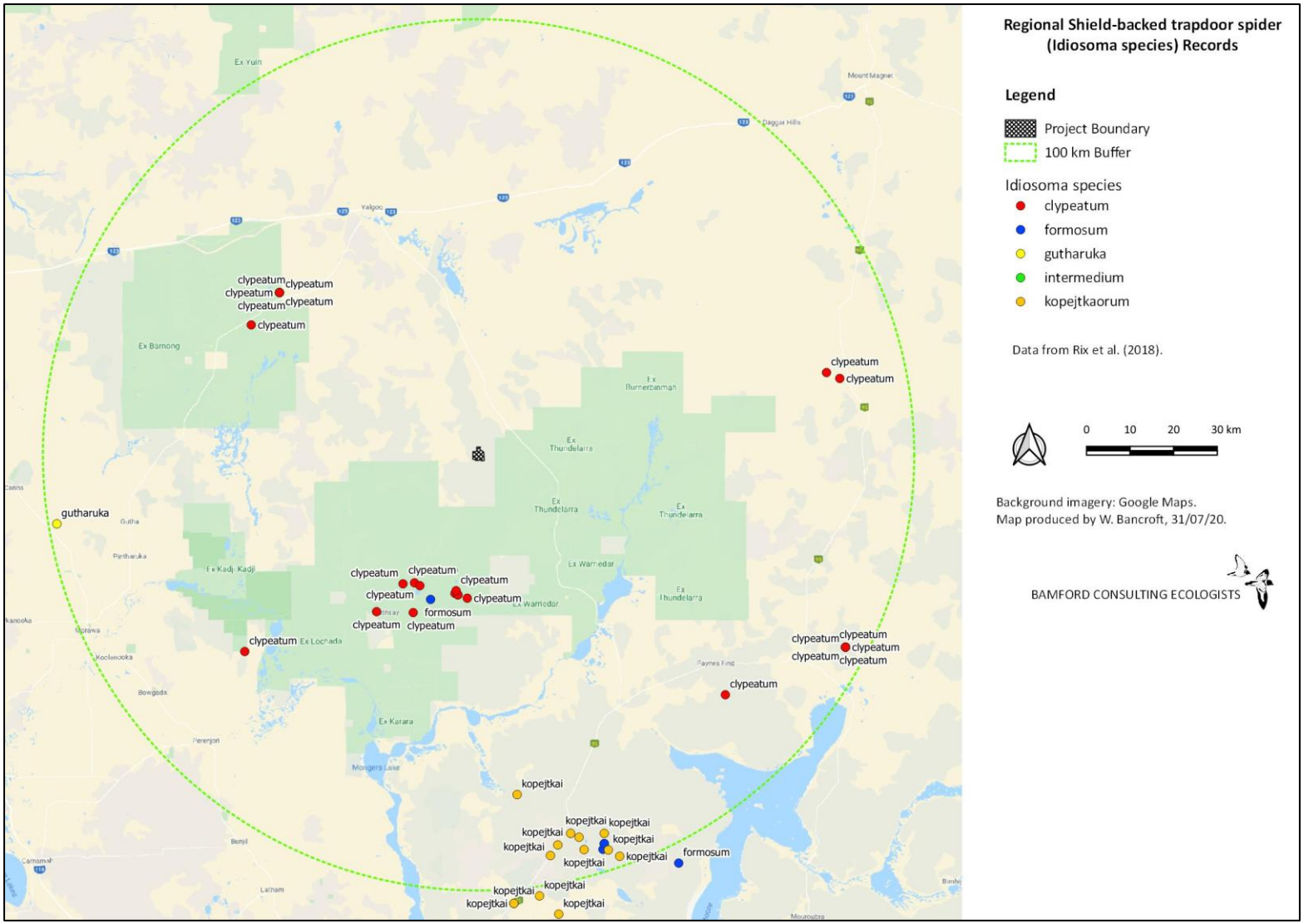

Figure 3-33. Specimen location records of *Idiosoma* spiders from Rix et al. (2018) in a 100km radius from a site about 30km north of Karara. The cluster of *I. clypeatum* represents specimens collected from Karara and Mungada.

Plate 3-25. Burrow lid and fan of *Idiosoma (Aganippe)* sp. with milliscope inserted. Note thick cluster of upright material at leading edge of door. This may be a feature that can be used for future field identification of the species.

3.2.4.1.2 Conservation significance level 2

Hooded Plover *Thinornis cucullatus*
CS2 (P4): Listed as Priority 4 by DBCA.
A species of coastal and near-coastal areas of the southern states of Australia, although extends well inland in Western Australia to salt lakes through the Wheatbelt and southern Goldfields (Johnstone & Storr, 1998; Menkhorst et al., 2017; Singor, 2009). In south-west of Western Australian, the Hooded Plover inhabits beaches and the margins of estuaries and salt lakes from Kalbarri to Eyre, and inland to the vicinity of Paynes Find, Kambalda and Norseman (Johnstone & Storr, 1998; TSSC, 2014). It is therefore a possibility as an irregular visitor in small numbers to salt lakes in both project areas, but has not been observed.

Long-tailed Dunnart (*Antechinomys (Sminthopsis) longicaudata*)
CS2 (P4): Listed as Priority 4 by DBCA.
An insectivore that is probably largely nocturnal and forages within and close to rocky areas. It is therefore closely-associated with rocky landscapes (Menkhorst & Knight, 2011) across much of inland Australia, but the distribution is poorly-documented as the species is hard to detect. There are no database records of this species within 40 km of the development envelope; this most likely reflects that this species is difficult to detect when present. It was detected in rocky hills in Koolanooka (c. 60 km east of the Mine Area and c. 35 km west of the Wheatbelt Area) in early 2024 (N. Dunlop pers.

comm.). Given this recent record in the wheatbelt, it is expected as resident in rocky environments in the Mine Area and as an irregular visitor (dispersing individuals) in the Wheatbelt Area.

Inland Long-eared Bat (*Nyctophilus major tor*)
CS2 (P3): Listed as Priority 3 by DBCA.
This species is a nocturnal, aerial insectivore (Churchill, 2009; Parnaby, 2009) that shelters during the day in tree cavities, under bark and within foliage (Churchill, 2009). It occurs in 'desert habitats' (Churchill, 2009), including shrublands, grassland and eucalypt woodlands. It is found throughout southern Western Australia, east to the Eyre Peninsula in South Australia, with the exception of the south-western corner of Western Australia, where this subspecies is replaced by *N. m. major* (Parnaby, 2009). It possibly occurs as far north as the Hammersley Ranges but does not extend onto the Nullarbor Plain (Churchill, 2009). The project areas are therefore within the general range of this species, and recent records from Mt Gibson Nature Reserve (Biota, 2022) (c. 80 km east of the Mine Area) suggest that this species may be present in both project areas. It is therefore expected as a resident in both project areas, and is expected to utilise trees with hollows and loose bark for shelter and shrubby areas for foraging (Menkhorst & Knight, 2011). It will therefore rely on VSAs where large trees are present, such as VSA 7.

3.2.4.1.3 Conservation significance level 3

Desert Trilling Frog (*Neobatrachus centralis*)
Considered of local significance because the species has a restricted distribution in WA (mostly around Mt Magnet; Tyler et al., 2000). The Wheatbelt Area is out of range, but in 2004 BCE collected a specimen just south of the Blue Hills, between Mungada and Karara, and confirmed by the WA Museum. The species is therefore present in the Mine Area.

Reticulated Velvet Gecko (*Hesperoedura reticulata*)
Largely confined to smooth-barked eucalypts in the Wheatbelt and Goldfields, this species is at the northern limit of its range in the project areas and has been recorded on York Gums (VSA 7) just south of Mungada (BCE database). This VSA is widespread in the Mine Area but very limited in the wheatbelt, so the species potentially occurs where suitable habitat exists throughout.

Mulga Dragon (*Caimanops (Diporiphora) amphiboluroides*)
This is a species with a limited and very patchy distribution in the southern interior of WA but has been found to be locally common in acacia shrublands around Karara, Blue Hills and Mungada (BCE database). It thus is probably present in the Mine Area in acacia shrublands (VSAs 3 to 6). The Wheatbelt Area is out of range for this species.

South-West Carpet Python (*Morelia spilota imbricata*)
This sub-species was previously listed under Western Australian conservation Legislation and as a DBCA Priority species. Although it has been de-listed, it has declined across much of its distribution due to clearing and feral predators; remaining populations are therefore of conservation interest. In addition, it is on the edge of its range in the Mine Area, another factor which means populations in this area are of local conservation significance. It has been recorded from the region at the

Koolanooka Range (I. Harris, pers. comm.) that is traversed by the wheatbelt development envelope. It has not been recorded in the Karara area by BCE. If present in the Mine Area, it would be most likely be as an irregular visitor around low rocky hills that provide extra shelter.

CS3 birds (See Table 3.6)

Across both project areas, twelve bird species are considered to be locally significant; this includes seven species expected to be resident in the mine project are and three species expected to be resident (albeit with some uncertainty and very restricted distributions) in the Wheatbelt Area. All species listed as CS3 have declined in the Wheatbelt due to extensive clearing, and this makes populations persisting in the Wheatbelt and in nearby uncleared, pastoral areas significant. All of the CS3 birds expected to be resident in the Mine Area have been observed by BCE during previous site inspections; six of these were observed during the site inspections of the Mine Area in 2024 (July/August and November). None of the CS3 birds expected as resident in the Wheatbelt Area was observed and it is possible they no longer persist as residents buy may still occur as regular or irregular visitors.

The Australian Bustard and Bush Stone-curlew are also considered to be locally significant and both were until recently classed as Priority species by DBCA. Although only expected as regular or irregular visitors in the Mine Area, both species have been observed in the Karara area by BCE, including a record of tracks in the Mine Area in June 2024. This was the first record of the stone-curlew within the KML area, with previous records from Badja Station to the north. The bustard occasionally appears in areas of open ground around Karara (BCE database) but the stone-curlew favours tall shrublands that provide cover.

Kultarr (*Antechinomys laniger*)

This small mammal is possibly widespread across inland Australia but is poorly-known, and as such any records are of interest. It has been reported from Badja Station to the north of Karara (R. Pitman pers. comm.) in the mid 2000s, so it may be present and resident in the Mine Area. It may be extinct in the Wheatbelt Area but is listed as 'vagrant' in Table 3.6 to allow for the possibility of individuals occasionally dispersing into that area.

Woolley's Pseudantechinus (*Pseudantechinus woolleyae*)

This species is at the southern limit of its range in the region and appears to be common on the ironstone ridges throughout the KIOP area and nearby (based on surveys by BCE). Thus it is highly likely to be resident on low rocky hills in the mine development envelope (VSA 1 and possible VSA 2), and may also be resident in the wheatbelt in locations such as the Koolanooka Hills, but will only occur as an irregular visitor (dispersing individuals) where there is some vegetation cover in the Wheatbelt Area.

Common Brushtail Possum (*Trichosurus vulpecula*)

This species has undergone a significant reduction in distribution in Western Australia, and the Midwest in particular (How & Hilcox 2000), and remaining populations are therefore of local conservation significance. Its status in both project areas is uncertain but the species was observed 50km to the southwest of Karara in April 2006 (G. Woodman, pers. comm.). There are no DBCA database records within 40 km of the development envelope. As this is a species often attracted to

farmhouses, it may be locally extinct. As a precaution, however, it is listed as an irregular visitor in both areas in Table 3.6.

CS3 invertebrates

Several invertebrate species have been collected which may have restricted distributions; these have no formal conservation listing and are therefore considered locally significant (CS3). Bancroft and Bamford (2007) noted that the ironstone ridges of the region are ideal environments for the evolution of SRE invertebrates. The surrounding plains provide more continuous habitat that may be less suited to short range endemism, although granite outcrops may be an exception. Ironstone ridges are a feature of the landscape across the broader region and are present in the development envelope surrounding the Mine Area, while granite outcrops occur at a few locations in the Mine Area, such as in the southern area inspected in 2020 and just north of the village (inspected in 2024). There are also granite outcrops in the Koolanooka Hills in the wheatbelt. Species recorded are:

- The millipede *Antichiropus* sp. nov. 'Karara'. This has been found (BCE records) only on ironstone ridges from Karara, Blue Hills and Mungada, and is therefore classed as a short-range endemic (Harvey 2002). It appears to be abundant in rocky areas of the ironstone hills in the region (VSA 1), so is likely to be present in such landscapes within the Mine Area and surrounding development envelope.
- The millipede sp. nov. 'PM1'. A single specimen was collected from Karara ridge in August 2006 (BCE records) and Harvey (2006) noted that '*This species is relatively widespread in the northern wheatbelt region of Western Australia, ranging from East Yuna Nature Reserve in the north to Lake Ninnan Shire Reserve in the south, a linear distance of some 310 km*'. Harvey (2006) also noted that '*it is clearly a short-range endemic species*'. As with *Antichiropus* sp. nov. 'Karara', this species may be present but not widespread, likely being most abundant in the ironstone ridge environments (VSA 1) of the Mine Area and development envelope.
- The scorpion *Urodacus* sp. nov. 'Mt Gairdner'. When collected in 2006 (BCE records), the specimen from Karara was only the second seen by the WA museum, with the other specimen from the Gairdner Range, some 200km to the southeast. Harvey (2006) concluded that it was therefore an SRE species. The 2006 specimen came from a rocky landscape so presumably the species is more or less restricted to rocky areas in the Mine Area and surrounding development envelope.
- The troglobitic pseudoscorpion *Tyrannochthonius* sp. was collected by Biota (2007) from drillhole MGD198 on the northern edge of the Terapod area. The species was undescribed and no further specimens have been collected. Ecologia (2008) concluded that suitable habitat for troglofauna along the ironstone ridges was restricted to this area at Terapod. This is outside the Mine Area.
- Presumed troglofauna collected by Ecologia (2008) from pastoral bores on Karara station but outside the areas affected by the Karara Iron Ore Project and outside the Mine Area. These consisted of assumed single and probably undescribed species of worms and small crustacea: ostracods, syncarids, oligochaetes, copepods (Harpacticoida and Calanoida) and isopods.

3.2.5 Patterns of Biodiversity

Investigating patterns of biodiversity can be complex and are often beyond the scope even of comprehensive field sampling. However, patterns can be interpreted from the nature of environments present and the environmental requirements of the fauna assemblage in each project area.

3.2.5.1 Mine Area

The extensive acacia tall shrublands (VSAs 3, 4, 5 and 6) are likely to be fairly uniform in the fauna assemblage present, with slight differences in presence and abundance of some reptile species in relation to soil type, while areas where York Gum are present within acacia shrublands may be particularly rich in birds. Areas of granite and ironstone may be rich in SRE invertebrates. 'Run-on' sites where water is concentrated, including around the base or rocky landscapes, may be richer in species overall.

For species of conservation significance, patterns that are apparent include the concentration of breeding by the Malleefowl in gravelly and sandy loam soils, the abundance of potential colony sites for the Western Spiny-tailed Skink in York Gum Woodlands (VSA 7), and the partial separation of the two significant trapdoor spiders by soil type, with the Northern Shield-backed Trapdoor Spider tending to favour gravel to sandy loam soils high in the landscape, and the Ornate Trapdoor Spider tending to favour slightly heavier sandy loam to loam soils low in the landscape. Ironstone hills and possibly granites may support the Gilled Slender Blue-tongue. The pattern of distribution of the Southern Whiteface is complex as it is linked to very localised structural features in the vegetation, with areas of open ground and dense thickets of acacia occurring both around granite outcross and towards the margins of drainage lines. Such structure was usually absent from the broad and fairly uniform plains of acacia shrublands.

3.2.5.2 Wheatbelt Area

The wheatbelt development envelope supports highly variable environments with extensive cleared (agricultural) areas, degraded and narrow vegetation along road verges, and some blocks of more or less intact native vegetation such as at the Koolanooka Hills. The fauna assemblage will be very depauperate on cleared land, and somewhat depauperate on road verges due to the narrowness of the environment and its degraded condition. Remnants of native vegetation will support the richest fauna assemblage. Even where degraded, large tracts of native vegetation can be valuable for fauna. In the study at Inering, near Carnamah, it was found that degraded shrublands close to salt lakes supported some mammal species not present in large but isolated reserves. It appeared to be that the size and connectivity of vegetation along salt lakes systems was important.

3.2.6 Ecological Processes

The nature of the landscape and the fauna assemblage indicate some of the ecological processes that may be important for ecosystem function in each project area (see Appendix 1 for descriptions and other ecological processes). These are discussed below for each project area.

3.2.6.1 Mine Area

Local hydrology. The landscape includes short drainage systems off granite areas and ironstone hills, broad and low-lying flats sometimes prone to water-logging, and several salt lakes systems (north of

the Karara mine and north of Terapod). Drainage from the hills tends to disperse across the flats, probably on the surface and with sub-surface movement. The extent of groundwater systems in the two areas is uncertain.

Fire. As is the case throughout most of Western Australia, the vegetation of the region is fire-adapted to some degree, but the flora and fauna assemblages can be altered by too-frequent fires; and even by fire exclusion. Some species are particularly sensitive to wildfires and altered fire regimes. Fire season may also be important in seed germination. There was evidence of past fires in mine development envelope, particularly in the dense acacia shrublands (VSAs 3 to 6), with fire probably very uncommon in open vegetation such as York Gum Woodland (VSA 8) and in the chenopod shrublands around salt lakes systems.

Feral species and interactions with over-abundant native species. Feral species occur throughout Western Australia, with several feral species recorded during the site visit. There was also evidence of an over-abundant native species, the Little Crow. Impacts of these species on the fauna assemblage are uncertain, but it is possible that feral Cats and Little Crows around the Karara landfill sites are adversely affecting the Western Spiny-tailed Skink. Feral species contributed to the local extinction of a suite of mammal species, and may continue to suppress ground-nesting birds such as the Bush Stone-curlew.

Connectivity and landscape permeability. The mine development envelope lies within a substantially intact landscape except for the current mine and associated infrastructure, including rail and roads. It is therefore a broadly permeable landscape in terms of fauna movements, with the disruption caused by the current mine and infrastructure largely concentrated in one area. There are few major linear features that might channel fauna movements, but the ironstone hills tend to be linear so at least in theory there is a long-term risk of loss of gene flow of species with poor powers of dispersal that are also closely associated with the ironstone hills. To some extent this could apply to the Northern Shield-backed Trapdoor Spider, but observations made in 2024 suggested it was less confined to the ironstone ridge than had previously been believed.

3.2.6.2 Wheatbelt Area

Local hydrology. The wheatbelt development envelope spans several major paleo-drainage systems represented by chains of sat lakes. These may contain some water annually but with only occasional major flow events. These chains of salt lakes have been retained even in cleared areas and thus provide some habitat and connectivity for wildlife, and occasional habitat for waterbirds. There are also some minor drainage lines but across much of the landscape water infiltrates rather than flows. There is likely to be complex sub-surface water movement and the extent of groundwater systems is uncertain.

Fire. The fire regime in remnant native vegetation in the wheatbelt disturbance envelope is uncertain; fires are probably very infrequent because of the risk to infrastructure. Occasional fires in fragments of native vegetation may be more destructive of biodiversity than in continuous landscapes as entire areas can be burnt at once, resulting in loss of populations with little or no possibility of recolonisation.

Chenopod shrublands around salt lake systems may be resistant to fire and may therefore protect other areas of vegetation from fire.

Feral species and interactions with over-abundant native species. Feral and over-abundant native species are likely to be widespread in the wheatbelt development envelope and may contribute to the decline and even extinction of native species. The persistence of CS3 birds in remnant patches of native vegetation may fail due to feral predators and habitat degradation due to grazing by introduced herbivores. Likewise, over-abundant native species such as the Galah and Little Corella may displace other native parrots such as Major Mitchell's Cockatoo and Carnaby's Black-Cockatoo.

Connectivity and landscape permeability. The Wheatbelt Area lies within a highly cleared and fragmented landscape which means that permeability for many fauna species is limited. As a result, liner environments such as road verges and chains of salt lakes are highly important for many fauna species to be able to move across the landscape and utilize habitat patches. Poor connectivity increases the risk of species disappearing from fragments of native vegetation, resulting in a gradual process of species loss. This is likely to have contributed to species decline across the wheatbelt.

3.2.7 Summary of Fauna Values

3.2.7.1 Mine Area

The desktop study identified 257 vertebrate fauna species as potentially occurring across the mine development envelope: 7 frogs, 54 reptiles, 167 birds, and 24 native and 5 introduced mammals. Of these, 3 frogs, 47 reptiles, 102 birds and 20 native and 5 introduced mammals have been confirmed in the greater Karara area. Fauna values within the survey area can be summarised as follows:

Fauna assemblage. Moderately intact (but lacking several mammal species) and rich. The confirmed reptile and bird assemblages are particularly species-rich, which is a reflection of the long period of time over which investigations have been carried out. While this confirmed assemblage comes from surveys over a large area, the mine development envelope is also extensive and covers a wide range of environments. The assemblage is broadly typical of the southern interior of Western Australia and is notable for the presence of species that have declined in the wheatbelt.

Species of conservation significance. Across the KIOP area, 34 conservation significant vertebrates are expected to be present, and a number of conservation significant invertebrates have been confirmed. More conservation significant invertebrates (SREs) are predicted to be associated with granite and rocky hill areas. Significant species of greatest interest, because they are present and occur as residents in the overall project area, and are resident or likely to be resident in the development envelope, are:

- Malleefowl. Listed under state (Schedule 2 Division 3; Vulnerable) and federal legislation (Vulnerable). Present throughout but breeding habitat limited as much of the development envelope lies low in the landscape rather than close to ridges where sandy loam to gravelly soils are favoured for nest-mound construction. Despite this, some evidence of birds displaced by past clearing now breeding in areas of what might be sub-optimal breeding habitat within the development envelope.

- Western Spiny-tailed Skink. Listed under state (Schedule 2 Division 3; Vulnerable) and federal legislation (Endangered). Greatest availability of colony sites in York Gum Woodlands (VSA 7) which are patchily distributed within and outside the mine area development envelope. The population may be undergoing a decline, perhaps due to predation from feral Cats and Little Crows attracted to the Karara waste disposal facility which is close to the northern area.
- Gilled Slender Blue-tongue. Listed under state (Schedule 2 Division 3; Vulnerable) legislation. Apparently restricted to rocky landscapes across the KIOP area, which will include parts of the mine area development envelope.
- Northern Shield-backed Trapdoor Spider. Listed as Priority 3 by DBCA (thus not under legislation). Very extensive distribution across the broader KIOP area and usually associated with gravelly loam soils of the ironstone ridges and associated slopes, but surveys in 2020 and 2024 found it to also be more widespread low in the landscape on sandy loam to loam soils.
- Ornate Trapdoor Spider. Listed under state legislation (Schedule 2 Division 2; Endangered). Abundant in heavy loam/sand soils low in the landscape. Previously known from very few records but may be widespread and abundant in suitable soils.

Vegetation and Substrate Associations (VSAs). The mine development envelope is a largely intact landscape ranging from low ironstone hills, slight granite, extensive plains and salt lake systems subject to seasonal inundation. Eight major VSAs were identified within the boundary of the Mine Area with the majority of the area supporting variations of acacia shrublands on lower slopes and flats (VSAs 3 to 6). The most distinctive and restricted VSAs within the Mine Area itself were breakaways and rocky ridges (VSA1), granite outcrops and associated shrublands (VSA 2) and York Gum woodland (VSA 7). Of note within the surrounding DE (but not within the boundary of the Mine area) are *Eucalyptus clelandiorum* woodland (VSA 8) and chenopod shrublands associated with salt lakes (VSA 9).

Patterns of biodiversity. The extensive nature of acacia shrublands (elements of VSAs 3 to 6) means that patterns of biodiversity may be moderately uniform within the Mine Area and surrounding DE, but distinctive patterns can be expected around rocky hills and the granite outcrop. SRE invertebrates may be associated with these features. Patterns of distribution of significant species are important as noted above: Malleefowl tending to nest in well-drained soils high in the landscape, Western Spiny-tailed Skink potential colony sites in generally in York Gum woodland (VSA 7), and differences in distribution and abundance of the two listed trapdoor spiders in relation to soil type.

Key ecological processes. Surface and sub-surface drainage may have local effects on vegetation, notably close to granites and ironstone ridges where runoff occurs, but also low in the landscape where water accumulates on flats and in salt lakes. Feral Cats and over-abundant Little Crows may be affecting native fauna, in particular close to the Karara waste disposal facility.

3.2.7.2 Wheatbelt Area

The desktop study identified 252 vertebrate fauna species as potentially occurring across the Wheatbelt Area: 6 frogs, 48 reptiles, 168 birds, and 25 native and 5 introduced mammals. Many of these species would occur infrequently and in low numbers and therefore the number of confirmed species is low. The vertebrate assemblage includes 33 species of conservation significance. Fauna values within the survey area can be summarised as follows:

Fauna assemblage. Depauperate with a large number of species likely to occur only intermittently and in small numbers. Many of the species expected as residents or to occur regularly are tolerant of or even dependent upon disturbed landscapes; some may occur only in fields and in degraded native vegetation. It is thus an assemblage with a high proportion of 'disturbance' species, but particularly where there is intact native vegetation there will be species that have generally declined across the wheatbelt.

Species of conservation significance. While many species of conservation significant vertebrates may occur in the Wheatbelt Area, most will do so only very intermittently and in small numbers. Of most interest is where species occur as residents or may rely on remnant native vegetation for dispersal. Significant species of greatest interest are:

- Malleefowl. Listed under state (Schedule 2 Division 3; Vulnerable) and federal legislation (Vulnerable). May be resident only in Koolanooka hills but may use corridors of remnant native vegetation (including those in the Wheatbelt Area) to move through the landscape.
- Western Spiny-tailed Skink. Listed under state (Schedule 2 Division 3; Vulnerable) and federal legislation (Endangered). Likely to be confined to small patches of suitable habitat along road verges, with remnant vegetation along verges possibly allowing for some dispersal.
- Gilled Slender Blue-tongue. Listed under state (Schedule 2 Division 3; Vulnerable) legislation. Recorded in Koolanooka Hills and probably still resident. Unlikely elsewhere but may rely on remnant vegetation for dispersal.
- Trapdoor spiders. The Northern Shield-backed Trapdoor Spider (P3, DBCA) and Ornate Trapdoor Spider (Schedule 2 Division 2, WA BC Act) may both be present in large areas of remnant vegetation and/or along road verges, but they may also have disappeared due to habitat degradation and fragmentation. Other significant trapdoor spider species are known from the broader region and if they were present, they would occur in areas of remnant native vegetation.
- Long-tailed Dunnart and Woolley's Pseudantechinus. May be resident in locations such as Koolanooka Hills where there is suitable habitat, but may rely on remnant vegetation for dispersal.
- CS3 birds. A suite of birds that has declined dramatically in the general wheatbelt may persist in the larger areas of remnant vegetation and may utilise road verge vegetation.

Vegetation and Substrate Associations (VSAs). The wheatbelt development envelope is a largely cleared landscape of extensive cropping and grazing land, with remnant vegetation largely confined to road verges, rocky hills and salt lake systems. Remnant vegetation is often degraded by grazing and weed invasion, but is intact in the larger patches. There is a notable remnant of VSAs 3 and 11 just east of Willis Road, while the Koolanooka Hills along the pipeline alignment are a prominent feature in the region. Within the disturbance footprint (the Wheatbelt Area) five VSAs are present; the majority of the Wheatbelt Area is VSA 10 (Cleared Land, with occasional isolated trees of York Gum or Jam), and the remaining VSAs (VSA 3: Acacia tall shrubland, VSA 7: York Gum woodland, VSA 11: Creeklines and VSA 12: Planted Eucalypts) tend to occur as small areas along roadsides.

Patterns of biodiversity. Patterns of biodiversity are strongly associated with the distribution of remnant native vegetation. Large patches of remnant vegetation with a range of landscapes, such as low rocky hills and slopes, likely to support more species than small remnants, road reserves and

around salt lakes where the environment is less variable. The large and more complex remnants likely to be key for conservation significant species.

Key ecological processes. Habitat fragmentation and the presence/absence of connectivity are likely to be the key ecological processes affecting the fauna assemblage in the Wheatbelt Area and surrounding development envelope. Native vegetation in the Wheatbelt Area is expected to provide an important ecological function by providing connectivity and allowing fauna to move through an otherwise cleared landscape. Feral and over-abundant native species are also likely to be important.

4 References

ALA. (2024). *Atlas of Living Australia*. http://www.ala.org.au

ATA Environmental. (2004a). *Fauna Assessment Koolanooka. Report prepared for Midwest Corporation Limited. Perth: ATA Environmental.*

ATA Environmental. (2004b). *Fauna Assessment Koolanooka South. Report prepared for Mount Gibson Mining Limited.*

Bamford, M. J. (2008). *Surveys for mounds of the Malleefowl Leipoa ocellata in the Karara area, July 2008. Unpublished report to Karara Mining Limited by Bamford Consulting Ecologists*.

Bamford, M. J. (2014). *Review of the monitoring programme for the Western Spiny-tailed Skink at Karara. Unpubl. Report prepared for Karara Mining Limited by Bamford Consulting Ecologist, Kingsley.*

Bamford, M. J. (2017). *Review of the monitoring program for the Western Spiny-tailed Skink at Karara. Unpubl. Report to KML.*

Bamford, M. J., Browne-Cooper, R., & Huang, N. (2009). *Survey and Habitat Assessment of the Western Spiny-tailed Skink, Egernia stokesii badia, in the Karara Infrastructure area, August 2009. Unpubl. Report prepared by Bamford Consulting Ecologists for Karara Mining Limited: Karara Iron Ore Project.*

Bamford, M. J., & Calver, M. C. (2012). Cat predation and suburban lizards; a 22 year study at a suburban Australian property. *The Open Conservation Biology Journal*, *6*, 1–11.

Bamford, M. J., Dunlop, J. N., Gamblin, T., & Bamford, A. R. (2013). *Fauna Sampling Manual: Guide to sampling techniques for wildlife research in Western Australia*. Conservation Council of WA.

Bamford, M. J., & Harris, I. (2008). *Surveys for Western Spiny-tailed Skinks Egernia stokesii badia. Unpubl. Report prepared by Bamford Consulting Ecologists for Karara Mining Limited: Karara Iron Ore Project.*

Bamford, M. J., & Huang, N. (2009). *Karara Mining Limited. Assessment of fauna values of alternative airstrip, accommodation camp site and communications tower. Unpubl. Report prepared for Karara Mining Limited by Bamford Consulting Ecologist, Kingsley.*

Bamford, M. J., & Metcalf, B. M. (2008). *Report into investigations into the status of Woolley's Pseudantechinus and the Shield-backed Trapdoor Spider; June 2008.* Unpublished report to Karara Mining Limited: Karara Iron Ore Project by M. J. and A. R. Bamford Consulting Ecologists.

Bamford, M. J., & Smith, P. (2007). *Gindalbie Metals NL. Investigations into the distribution of the Shield-backed Trapdoor Spider and Woolley's Pseudantechinus in the Karara/Mungada area, July 2007*. Unpublished report to Coffey Natural Systems, on behalf of Gindalbie Metals NL, by M. J. and A. R. Bamford Consulting Ecologists.

Bamford, M. J., & Wilcox, J. (2004). *Blue Hills fauna assessment. Unpubl, report by Bamford Consulting Ecologists to ATA Environmental, Perth.*

Bancroft, W., & Bamford, M. (2007). *Fauna values of Gindalbie Metal's Karara and Mungada haematite/magnetite projects. Unpubl. Report to Woodman Environmental by Bamford Consulting Ecologists, Kingsley.*

Bancroft, W., & Bamford, M. J. (2019). *Karara Iron Ore Project: Annual Monitoring Survey of the Shield-backed Trapdoor Spider 2010 to 2019. Unpublished report to Karara Mining Limited by M. J. and A. R. Bamford Consulting Ecologists, Kingsley, Western Australia.*

Bancroft, W. J., & Bamford, M. J. (2018). *Karara Iron Ore Project: Annual Monitoring Survey of the Shield-backed Trapdoor Spider 2010 to 2018*. Unpublished report to Karara Mining Limited by M. J. and A. R. Bamford Consulting Ecologists.

Basnett, G., & Bamford, M. J. (2013). *Hinge Project Area Fauna Assessment. Unpubl. Report prepared by Bamford Consulting Ecologists for Karara Mining Limited: Karara Iron Ore Project.*

Beard, J. S., Beeston, G. R., Harvey, J. M., Hopkins, A. J. M., & Shepherd, D. P. (2013). The vegetation of Western Australia at the 1:3,000,000 scale. Explanatory memoir. Second edition. *Conservation Science Western Australia*, *9*, 1–152.

Beecham, B. (2001). Avon Wheatbelt 1 (AW1—Ancient Drainage subregion). In CALM (Ed.), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (pp. 7–35). Department of Conservation and Land Management.

Biologic. (2014). *Targeted Level 2 Survey for Vertebrate Fauna at Koolanooka South. Report prepared for Westralian Iron Pty Ltd. Perth: Biologic Environmental Survey Pty Ltd.*

Biota. (2007). *Gindalbie Metals Haematite Project Troglofauna Survey. Unpubl. Report prepared for Enesar Consulting.*

Biota. (2022). *Mount Gibson Gold Project: Basic and Targeted Fauna Survey. Prepared for Tetris Environmental Pty Ltd on behalf of Crimson Metals Pty Ltd (a subsidiary of Capricorn Metals Ltd) by Biota Environmental Sciences, Leederville Western Australia.*

BOM. (2025). *Climate Data Online*. Commonwealth of Australia, Bureau of Meteorology. http://www.bom.gov.au/climate/data/index.shtml?bookmark=200&view=map

Bradley, H. S. (1992). *Improving translocation management for restricted range reptiles. Case Study: The Western Spiny-tailed Skink Egernia stokesi badia. Unpubl. Ph.D. thesis, Curtin University.*

Bradley, H. S., Craig, M. D., Tomlinson, S., Cross, A. T., Bamford, M. J., & Bateman, P. W. (2022). Predators in a mining landscape; threat to a behaviourally unique, endangered lizard. *Austral Ecology*. https://doi.org/10.1111/aec.13195

Burbidge, A. A., & McKenzie, N. L. (1989). Patterns in the modern decline of Western Australia's vertebrate fauna: Causes and conservation implications. *Biological Conservation*, *50*, 143–198.

Calver, M. C., Lymbery, A. J., McComb, J., & Bamford, M. J. (2009). *Environmental Biology*. Cambridge University Press.

Churchill, S. (2009). *Australian Bats* (Second edition). Allen & Unwin.

Clevenger, A. P., & Waltho, N. (2000). Factors influencing the effectiveness of wildlife underpasses in Banff National Park, Alberta, Canada. *Conservation Biology*, *14*, 1–11.

DBCA. (2020). *Guideline for the survey of arid bronze azure butterfly (ABAB) in Western Australia.* Department of Biodiversity, Conservation, and Attractions. https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-

species/Guideline%20for%20the%20survey%20of%20arid%20bronze%20azure%20butterfly.pdf

DBCA. (2023a). *Directory of Important Wetlands in Australia—Western Australia (DBCA-045)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/directory-of-important-wetlands-in-western-australia

DBCA. (2023b). *Priority Ecological Communities for Western Australia Version 35*. Species and Communities Program, Department of Biodiversity, Conservation, and Attractions. www.dbca.wa.gov.au/media/1730/download

DBCA. (2023c). *Ramsar Sites (DBCA-010)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/ramsar-sites

DBCA. (2023d). *Threatened Ecological Communities (DBCA-038)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/tr/dataset/threatened-ecological-communities

DBCA. (2024a). *Black Cockatoo Roosting Sites—Buffered (DBCA-064)*. Department of Biodiversity, Conservation and Attractions. https://catalogue.data.wa.gov.au/dataset/black-cockatoo-roosting-sites-buffered

DBCA. (2024b). *Threatened and Priority Fauna Database*. Department of Biodiversity, Conservation and Attractions.

DBCA. (2025). *DBCA Statewide Vegetation Statistics* [Dataset]. https://catalogue.data.wa.gov.au/dataset/dbca-statewide-vegetation-statistics

DCCEEW. (2022). *Collaborative Australian Protected Areas Database (CAPAD) 2022*. https://www.dcceew.gov.au/environment/land/nrs/science/capad

DCCEEW. (2023a). *Australia's bioregions (IBRA)*. Department of Climate Change, Energy, the Environment and Water. https://www.dcceew.gov.au/environment/land/nrs/science/ibra#ibra

DCCEEW. (2023b). *Conservation Advice for Aphelocephala leucopsis (southern whiteface)*.

DCCEEW. (2023c). *Listed Key Threatening Processes*. http://www.environment.gov.au/cgi-bin/sprat/public/publicgetkeythreats.pl

DCCEEW. (2024). *Protected Matters Search Tool*. Department of Climate Change, Energy, the Environment and Water. https://www.environment.gov.au/epbc/protected-matters-search-tool

DEH. (2000). *List of marine species—Declaration under s248 of the EPBC Act*. Department of the Environment and Heritage. https://www.legislation.gov.au/Details/F2008B00465

DEH. (2006). *Protected marine species—Identification guide.* Department for Environment and Heritage. https://www.environment.gov.au/marine/publications/protected-marine-species-identification-guide

Dell, J., & Banyard, J. (Eds.). (2000). *Bush Forever*. Department of Environmental Protection.

Desmond, A., & Chant, A. (2003a). Geraldton Sandplains 3 (GS3—Lesueur Sandplain subregion). In CALM (Ed.), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (pp. 293–313). Department of Conservation and Land Management.

Desmond, A., & Chant, A. (2003b). Yalgoo (Yal). In CALM (Ed.), *A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002* (pp. 656–667). Department of Conservation and Land Management.

DotE. (2013). *Matters of National Environmental Significance. Significant impact guidelines 1.1. Environment Protection and Biodiversity Conservation Act 1999*. Department of the Environment.

DPIRD. (2024a). *Native Vegetation Extent (DPIRD-005)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/native-vegetation-extent

DPIRD. (2024b). *Pre-European Vegetation (DPIRD-006)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/pre-european-dpird-006

DPIRD. (2024c). *Soil Landscape Mapping—Best Available (DPIRD-027)*. Department of Primary Industries and Regional Development. https://catalogue.data.wa.gov.au/dataset/soil-landscape-mapping-best-available

DPIRD. (2024d). *Soil landscape mapping—Zones (DPIRD-017)* [Dataset]. https://catalogue.data.wa.gov.au/dataset/soil-landscape-land-quality-zones

DSEWPaC. (2013). *Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies. Significant impact guidelines 1.2. Environment Protection and*

Biodiversity Conservation Act 1999. Department of Sustainability, Environment, Water, Population and Communities.

Dufty, A. C. (1989). Some population characteristics of Perameles gunnii in Victoria. *Wildlife Research*, *18*, 355–365.

DWER. (2023a). *Clearing Regulations—Environmentally Sensitive Areas (DWER-046)*. Department of Water and Environmental Regulation. https://catalogue.data.wa.gov.au/tr/dataset/clearing-regulations-environmentally-sensitive-areas-dwer-046

DWER. (2023b). *Environmentally Sensitive Areas*. Department of Water and Environmental Regulation. https://www.der.wa.gov.au/your-environment/environmentally-sensitive-areas

ecologia. (2008). *Greater Karara Iron Ore Project subterranean fauna biological report. Unpubl. Report prepared for Coffey Natural Systems.*

EPA. (2002). *Terrestrial Biological Surveys as an Element of Biodiversity Protection. Position Statement No. 3.* Environmental Protection Authority.

EPA. (2016a). *Environmental Factor Guideline—Terrestrial Fauna*. Environmental Protection Authority. https://www.epa.wa.gov.au/sites/default/files/Policies_and_Guidance/Guideline-Terrestrial-Fauna-131216_3.pdf

EPA. (2016b). *Technical Guidance: Sampling of short range endemic invertebrate fauna.* Environmental Protection Authority.

EPA. (2016c). *Technical Guidance: Terrestrial Fauna Surveys.* Environmental Protection Authority.

EPA. (2020). *Technical Guidance—Terrestrial vertebrate fauna surveys for environmental impact assessment*. Environmental Protection Authority. https://www.epa.wa.gov.au/policies-guidance/technical-guidance-terrestrial-vertebrate-fauna-surveys-environmental-impact

Everard, C., & Bamford, M. (2014). *Minjar Gold Project Fauna Assessment. Unpubl. Report for Minjar Gold by Bamford Consulting Ecologists, Kingsley.*

Everard, C., & Bamford, M. J. (2012). *Karara Iron Ore Project. Fauna assessment of the plant expansion area, August 2012. Unpubl. Report prepared for Karara Mining Limited by Bamford Consulting Ecologist, Kingsley.*

Fox, B. J. (1982). Fire and mammalian secondary succession in an Australian coastal heath. *Ecology*, *63*, 1332–1341.

Garnett, S., & Baker, G. B. (2021). *The Action Plan For Australian Birds 2020*. CSIRO Publishing.

Gill, A. M., Groves, R. H., & Noble, I. R. (1981). *Fire and the Australian Biota.* Australian Academy of Science.

Gleeson, J., & Gleeson, D. (2012). *Reducing the Impacts of Development on Wildlife.* CSIRO Publishing.

Harrington, R. (2002). *The effects of artificial watering points on the distribution and abundance of avifauna in an arid and semi-arid mallee environment.* [PhD thesis]. Department of Zoology, University of Melbourne.

Harvey, M. S. (2002). Short-range endemism among the Australian fauna: Some examples from non-marine environments. *Invertebrate Systematics*, *16*, 555–570.

Harvey, M. S. (2006). *The Short-Range Endemic Invertebrate Fauna from Karara Station, Western Australia*. Unpubl. report to M. J. and A. R. Bamford Consulting Ecologists by the Department of Terrestrial Invertebrates, Western Australian Museum.

How, R. A., & Hilcox, S. J. (2000). Brushtail possum, Trichosurus vulpecula, populations in south-western Australia: Demography, diet and conservation status. *Wildlife Research*, *27*, 81–89.

IUCN. (2012). *IUCN Red List Categories and Criteria, Version 3.1. Second edition.* International Union for the Conservation of Nature.

Jackson, S. D., & Griffin, C. R. (2000). A Strategy for Mitigating Highway Impacts on Wildlife. In *In Messmer, T.A. and B. West, (eds) Wildlife and Highways: Seeking Solutions to an Ecological and Socio-economic Dilemma.* (pp. 143–159). The Wildlife Society.

Johnstone, R. E., & Storr, G. M. (1998). *Handbook of Western Australian birds. Volume 1: Non-passerines (Emu to Dollarbird)* (Vol. 1). Western Australian Museum.

Johnstone, R. E., & Storr, G. M. (2005). *Handbook of Western Australian birds. Volume 2: Passerines (Blue-winged Pitta to Goldfinch)* (Vol. 2). Western Australian Museum.

Jones, M. E. (2000). Road upgrade, road mortality and remedial measures: Impacts on a population of Eastern Quolls and Tasmanian Devils. *Wildlife Research*, *27*, 289–296.

KBA. (2025). *Key Biodiversity Areas – map search*. https://www.keybiodiversityareas.org/sites/search

Kofoed, P. (1998). A wizard with wavelengths. *Ecos*, *96*, 32–35.

Kristancic, A., Bleby, K., Huang, N., & Bamford, M. J. (2023). *Perenjori Fauna Assessment. Unpublished report prepared for CBH Group.*

Kristancic, A., Huang, N., & Bamford, M. J. (2024). *CBH Coorow Black-Cockatoo Assessment. Unpublished report prepared for CBH Group.*

Kristancic, A., Wadey, J., Huang, N., & Bamford, M. J. (2023). *CBH Mingenew Level 1 Fauna Assessment and Black-Cockatoo Assessment. Unpublished report prepared for CBH Group.*

Letnic, M., Dickman, C. R., Tischler, M. K., Tamayo, B., & Beh, C. L. (2004). The responses of small mammals and lizards to post-fire succession and rainfall in arid Australia. *Journal of Arid Environments*, *59*, 85–114.

Menkhorst, P., & Knight, F. (2011). *A Field Guide to the Mammals of Australia*. Oxford University Press.

Menkhorst, P., Rogers, D., Clarke, R., Davies, J., Marsack, P., & Franklin, K. (2017). *The Australian Bird Guide*. CSIRO Publishing.

NHT. (2007). *National Manual for The Malleefowl Monitoring System: Standards, Protocols and Monitoring Procedures.* National Heritage Trust, Commonwealth of Australia.

Parnaby, H. E. (2009). A taxonomic review of Australian Greater Long-eared Bats previously known as Nyctophilus timoriensis (Chiroptera: Vespertilionidae) and some associated taxa. *Australian Zoologist*, *35*(1), 39–81.

Read, J. J., Parkhurst, B., & Delean, S. (2015). Can Australian bush birds be used as canaries? Detection of pervasive environmental impacts at an arid Australian mine site. *Emu - Austral Ornithology*, *115*, 117–125.

Read, V. (1992). *Inering 'Save the Bush' project. Bush Management Strategy. Unpubl. Report prepared for the Inering Landcare Group of the Carnamah Land Conservation District.*

Rich, C., & Longcore, T. (2006). *Ecological Consequences of Artificial Night Lighting.* Island Press.

Scheick, B. K., & Jones, M. D. (1999). Locating wildlife underpasses prior to expansion on Highway 64 in North Carolina. *Proceedings of the Third International Conference on Wildlife Ecology*

and *Transportation*, 247–252.

Evink, G. L., Garrett, P. and Ziegler, D. (Eds)

Singor, M. J. C. (2009). Inland movements of the Hooded Plover Thinornis rubricollis in Western Australia. *The Stilt*, *55*, 25–26.

Soule, M. E., Mackey, B. G., Recher, H. F., Williams, J. E., Woinarski, J. C. Z., Driscoll, D., Dennison, W. C., & Jones, M. E. (2004). The role of connectivity in Australian conservation. *Pacific Conservation Biology*, *10*, 266–279.

Spectrum Ecology. (2019). *Mt Mulgine fauna survey*.

Thackway, R., & Cresswell, I. D. (1995). *An Interim Biogeographic Regionalisation for Australia: A framework for establishing the national system of reserves, Version 4.0*. Australian Nature Conservation Agency.

TSSC. (2014). *Conservation Advice Thinornis rubricollis tregellasi, hooded plover (western)*. Threatened Species Scientific Committee, Department of the Environment and Energy. https://www.dcceew.gov.au/sites/default/files/documents/66726-conservation-advice.pdf

Tyler, M. J., Smith, L. A., & Johnstone, R. E. (2000). *Tyler, M.J., Smith, L.A. and Johnstone, R.E. (2000). Frogs of Western Australia. W.A. Museum, Perth.* WA Museum.

Umwelt. (2025). *2023 AND 2024 DETAILED AND TARGETED FLORA AND VEGETATION ASSESSMENT, Karara Iron Ore Project Mine Life Extension, DRAFT July 2025. Reported prepared for Karara Mining Limited.*

5 Appendices

Appendix 1. Explanation of fauna values.

Fauna values are the features of a site and its fauna that contribute to biodiversity, and it is these values that are potentially at threat from a development proposal. Fauna values can be examined under the five headings outlined below. It must be stressed that these values are interdependent and should not be considered equal, but contribute to an understanding of the biodiversity of a site. Understanding fauna values provides opportunities to predict and therefore mitigate impacts.

Assemblage characteristics

Uniqueness. This refers to the combination of species present at a site. For example, a site may support an unusual assemblage that has elements from adjacent biogeographic zones, it may have species present or absent that might be otherwise expected, or it may have an assemblage that is typical of a very large region. For the purposes of impact assessment, an unusual assemblage has greater value for biodiversity than a typical assemblage.

Completeness. An assemblage may be complete (i.e. has all the species that would have been present at the time of European settlement), or it may have lost species due to a variety of factors. Note that a complete assemblage, such as on an island, may have fewer species than an incomplete assemblage (such as in a species-rich but degraded site on the mainland).

Richness. This is a measure of the number of species at a site. At a simple level, a species rich site is more valuable than a species poor site, but value is also determined, for example, by the sorts of species present.

Vegetation and substrate associations (VSAs)

VSAs combine broad vegetation types, the soils or other substrate with which they are associated, and the landform. In the context of fauna assessment, VSAs are the environments that provide habitats for fauna. The term habitat is widely used in this context, but by definition an animal's habitat is the environment that it utilises (Calver et al., 2009), not the environment as a whole. Habitat is a function of the animal and its ecology, rather than being a function of the environment. For example, a species may occur in eucalypt canopy or in leaf-litter on sand, and that habitat may be found in only one or in several VSAs. VSAs are not the same as vegetation types since these may not incorporate soil and landform, and recognise floristics to a degree that VSAs do not. Vegetation types may also not recognise minor but often significant (for fauna) structural differences in the environment. VSAs also do not necessarily correspond with soil types, but may reflect some of these elements.

Because VSAs provide the habitat for fauna, they are important in determining assemblage characteristics. For the purposes of impact assessment, VSAs can also provide a surrogate for detailed information on the fauna assemblage. For example, rare, relictual or restricted VSAs should automatically be considered a significant fauna value. Impacts may be significant if the VSA is rare, a large proportion of the VSA is affected and/or the VSA supports significant fauna. The disturbance of

even small amounts of habitat in a localised area can have significant impacts to fauna if rare or unusual habitats are disturbed.

VSA assessment was made with reference to the key attributes provided by (EPA, 2020):

- soil type and characteristics
- extent and type of ground surfaces and landforms
- height, cover and dominant flora within each vegetation stratum
- presence of specific flora or vegetation of known importance to fauna
- evidence of fire history including, where possible, estimates of time since fire
- evidence and degree of other disturbance or threats, e.g. feral species
- presence of microhabitats and significant habitat features, such as coarse woody debris, rocky
- outcrops, tree hollows, water sources and caves
- evidence of potential to support significant fauna
- function of the habitat as a fauna refuge or part of an ecological linkage.

Patterns of biodiversity across the landscape

This fauna value relates to how the assemblage is organised across the landscape. Generally, the fauna assemblage is not distributed evenly across the landscape or even within one VSA. There may be zones of high biodiversity such as particular environments or ecotones (transitions between VSAs). There may also be zones of low biodiversity. Impacts may be significant if a wide range of species is affected even if most of those species are not significant per se.

Species of conservation significance

Species of conservation significance are of special importance in impact assessment. The conservation status of fauna species in Australia is assessed under Commonwealth and State Acts such as the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Western Australian *Biodiversity Conservation Act 2016* (BC Act). In addition, the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) recognises priority levels, while local populations of some species may be significant even if the species as a whole has no formal recognition. Therefore, three broad levels of conservation significance can be recognised and are used for the purposes of this report, and are outlined below. A full description of the conservation significance categories, schedules and priority levels mentioned below is provided in Appendix 3.

<u>Conservation Significance (CS) 1: Species listed under State or Commonwealth Acts</u>.

Species listed under the EPBC Act are assigned to categories recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN, 2012), or are listed as migratory. Migratory species are recognised under international treaties such as the China Australia Migratory Bird Agreement (CAMBA), the Japan Australia Migratory Bird Agreement (JAMBA), the Republic of South Korea Australia Migratory Bird Agreement (ROKAMBA), and/or the Convention on the Conservation of Migratory Species of Wild Animals (CMS; also referred to as the Bonn Convention). The *Biodiversity Conservation Act 2016* uses a series of divisions within three Schedules to classify conservation status that largely reflect the IUCN categories (IUCN, 2012).

Conservation Significance (CS) 2: Species listed as Priority by DBCA but not listed under State or Commonwealth Acts.

In Western Australia, DBCA has produced a supplementary list of Priority Fauna, being species that are not considered threatened under the *Biodiversity Conservation Act 2016* but for which DBCA feels there is cause for concern.

Conservation Significance (CS) 3: Species not listed under Acts or in publications, but considered of at least local significance because of their pattern of distribution.

This level of significance has no legislative or published recognition and is based on interpretation of distribution information, but is used here as it may have links to preserving biodiversity at the genetic level (EPA, 2002). If a population is isolated but a subset of a widespread (common) species, then it may not be recognised as threatened, but may have unique genetic characteristics. Conservation significance is applied to allow for the preservation of genetic richness at a population level, and not just at a species level. Species on the edge of their range, or that are sensitive to impacts such as habitat fragmentation, may also be classed as CS3, as may colonies of waterbirds. The Western Australian Department of Environmental Protection, now DBCA, used this sort of interpretation to identify significant bird species in the Perth metropolitan area as part of the Perth Bushplan (Dell & Banyard, 2000).

Marine-listed species

Some conservation significant species may also be listed as 'Marine' under the EPBC Act. This listing protects these species in 'Commonwealth areas' which include "marine areas beyond the coastal waters of each State and the Northern Territory, and includes all of Australia's Exclusive Economic Zone (EEZ)" (DEH, 2000). The EEZ extends to 200 nautical miles (approximately 350 kilometres) from the coast (DEH, 2006). This may mean that the 'Marine' listing does not apply to the project/project area (depending on its location). Therefore, when a species is otherwise protected (under the EPBC Act or BC Act) or priority-listed (by the DBCA) then the Marine listing is also noted but it does not have site-specific relevance. In cases where a species is solely Marine-listed (for a list see DEH, 2000) and a project/project area is not within a Commonwealth area then it is treated like all other fauna.

Invertebrates

Invertebrate species considered to be short range endemics (SREs) also fall within the CS3 category, as they have no legislative or published recognition and their significance is based on interpretation of distribution information. Harvey (2002) notes that the majority of species that have been classified as short-range endemics have common life history characteristics such as poor powers of dispersal or confinement to discontinuous habitats. Several groups, therefore, have particularly high instances of short-range endemic species: Gastropoda (snails and slugs), Oligochaeta (earthworms), Onychophora (velvet worms), Araneae (mygalomorph spiders), Pseudoscorpionida (pseudoscorpions), Schizomida (schizomids), Diplopoda (millipedes), Phreatoicidea (phreatoicidean crustaceans), and Decapoda (freshwater crayfish). The poor understanding of the taxonomy of many of the short-range endemic species hinders their conservation (Harvey, 2002).

Introduced species

In addition to these conservation levels, species that have been introduced (INT) are indicated throughout the report. Introduced species may be important to the native fauna assemblage through effects by predation and/or competition.

Ecological processes upon which the fauna depend

These are the processes and conditions that apply to the existing environment and that affect and maintain fauna populations in an area. As such they are very complex; for example, populations are maintained through the dynamic of mortality, survival and recruitment being more or less in balance, and these are affected by a myriad of factors. The dynamics of fauna populations in a project area may be affected and effectively determined by processes such as:

- fire regime.
- landscape patterns (such as extent of existing habitat, fragmentation and/or linkage).
- the presence of feral species.
- hydrology.

Appendix 2. Explanation of threatening processes.

Potential impacts of proposed developments upon fauna values can be related to threatening processes. This is recognised in the literature and under the EPBC Act, in which threatening processes are listed (see Appendix 4). Processes that may impact fauna values are discussed below. Rather than being independent of one another, processes are complex and often interrelated. They are the mechanisms by which fauna can be affected by development. Impacts may be significant if large numbers of species or large proportions of populations are affected.

Note that the terms direct and indirect impacts are used by the DotE (2013), DSEWPaC (2013) and EPA (2016a), but there is some inconsistency in how these are defined. The federal guidance does not define direct impact but has a very broad definition of indirect, and makes the statement (DotE, 2013) '*Consideration should be given to all adverse impacts that could reasonably be predicted to follow from the action, whether these impacts are within the control of the person proposing to take the action or not. Indirect impacts will be relevant where they are sufficiently close to the proposed action to be said to be a consequence of the action, and they can reasonably be imputed to be within the contemplation of the person proposing to take the action*.' Indirect impacts therefore can even include what the DotE (2013) calls facilitated impacts, which are the result of third party actions triggered by the primary action. In contrast, the EPA (2016a) defines direct impacts to '*include the removal, fragmentation or modification of habitat, and mortality or displacement of individuals or populations*.' This document then lists as indirect impacts what in many cases are the consequences of the removal, fragmentation or modification of habitat. For example, '*disruption of the dispersal of individuals required to colonise new areas inhibiting maintenance of genetic diversity between populations'* is a consequence of habitat fragmentation. Impacts of light, noise and even roadkill are defined as indirect but they are clearly the result of the action and in control of the person taking the action. Roadkill is as direct a form of mortality as can be observed, but it is considered as an indirect impact in the context of a development presumably because it is not directly linked to land clearing. The EPA (2016a) makes a strong distinction between removal of vegetation (direct impact) and the consequences of such clearing and other aspects of a development (indirect impacts). It is not obvious how this distinction between direct and indirect impacts is helpful in the EIA process, as the key aim is to ensure that all impacts that result from a project are addressed in this assessment process. Interestingly, Gleeson and Gleeson (2012), in a major review of impacts of development on wildlife, do not use the terms direct or indirect. In the following outlines of threatening processes that can cause impacts, the emphasis is upon interpreting how a threatening process will cause an impact. For example, loss of habitat (threatening process) can lead to population decline and to population fragmentation, which are two distinct impacts, with population decline considered a direct impact and fragmentation an indirect impact by the EPA (2016a).

Loss of habitat affecting population survival

Clearing for a development can lead to habitat loss for a species with a consequent decline in population size. This may be significant if the smaller population has reduced viability. Conservation significant species or species that already occur at low densities may be particularly sensitive to habitat loss affecting population survival.

Loss of habitat leading to population fragmentation

Loss of habitat can affect population movements by limiting movement of individuals throughout the landscape as a result of fragmentation (Gleeson & Gleeson, 2012; Soule et al., 2004). Obstructions associated with the development, such as roads, pipes and drainage channels, may also affect movement of small, terrestrial species. Fragmented populations may not be sustainable and may be sensitive to effects such as reduced gene flow.

Degradation of habitat due to weed invasion leading to population decline

Weed invasion, such as through introduction by human boots or vehicle tyres, can occur as a result of development and if this alters habitat quality, can lead to effects similar to habitat loss.

Increased mortality

Increased mortality can occur during project operations; for example from roadkill, animals striking infrastructure and entrapment in trenches. Roadkill as a cause of population decline has been documented for several medium-sized mammals in eastern Australia (Dufty, 1989; Jones, 2000). Increased mortality due to roadkill is often more prevalent in habitats that have been fragmented (Clevenger & Waltho, 2000; Jackson & Griffin, 2000; Scheick & Jones, 1999).

Increased mortality of common species during development is unavoidable and may not be significant for a population. However, the cumulative impacts of increased mortality of conservation significant species or species that already occur at low densities may have a significant impact on the population.

Species interactions, including predation and competition

Changes in species interactions often occur with development. Introduced species, including the feral Cat, Red Fox and Rabbit may have adverse impacts upon native species and development can alter their abundance. In particular, some mammal species are very sensitive to introduced predators and the decline of many mammals in Australia has been linked to predation by the Red Fox, and to a lesser extent the feral Cat (Burbidge & McKenzie, 1989). Introduced grazing species, such as the Rabbit, Goat, Camel and domestic livestock, can also degrade habitats and deplete vegetation that may be a food source for other species.

Changes in the abundance of some native species at the expense of others, due to the provision of fresh watering points, can also be a concern. Harrington (2002) found the presence of artificial fresh waterpoints in the semi-arid mallee rangelands to influence the abundance and distribution of certain bird species. Common, water-dependent birds were found to out-compete some less common, water-independent species. Similarly, Read *et al.* (2015) found a decline in some bird species but an increase in others in the vicinity of active mines and concluded this was due to the mine attracting large and aggressive species that displaced other species. Over-abundant native herbivores, such as kangaroos, can also adversely affect less abundant native species through competition and displacement.

Hydroecology

Interruptions of hydroecological processes can have major effects because they underpin primary production in ecosystems and there are specific, generally rare habitats that are hydrology-dependent. Fauna may be impacted by potential changes to groundwater level and chemistry and

altered flow regime. These changes may alter vegetation across large areas and may lead to habitat degradation or loss. Impacts upon fauna can be widespread and major.

Changes to flow regime across the landscape may alter vegetation and may lead to habitat degradation or loss, affecting fauna. For example, Mulga has a shallow root system and relies on surface sheet flow during flood events. If surface sheet flow is impeded, Mulga can die (Kofoed, 1998), which may impact on a range of fauna associated with this vegetation type.

Fire

The role of fire in the Australian environment and its importance to vertebrate fauna has been widely acknowledged (Fox, 1982; Gill et al., 1981; Letnic et al., 2004). It is also one of the factors that has contributed to the decline and local extinction of some mammal and bird species (Burbidge & McKenzie, 1989). Fire is a natural feature of the environment but frequent, extensive fires may adversely impact some fauna, particularly mammals and short-range endemic species. Changes in fire regime, whether to more frequent or less frequent fires, may be significant to some fauna. Impacts of severe fire may be devastating to species already occurring at low densities or to species requiring long unburnt habitats to survive. In terms of conservation management, it is not fire *per se* but the fire regime that is important, with evidence that infrequent, extensive and intense fires adversely affect biodiversity, whereas frequent fires that cover small areas and are variable in both season and intensity can enhance biodiversity. Fire management may be considered the responsibility of managers of large tracts of land, including managers of mining tenements.

Dust, light, noise and vibration

Impacts of dust, light, noise and vibration upon fauna are difficult to predict. Some studies have demonstrated the impact of artificial night lighting on fauna, with lighting affecting fauna behaviour more than noise (Rich & Longcore, 2006). Effects can include impacts on predator-prey interactions, changes to mating and nesting behaviour, and increased competition and predation within and between invertebrates, frogs, birds and mammals.

The death of very large numbers of insects has been observed around some remote mine sites and attracts other fauna, notably native and introduced predators (M. Bamford pers. obs). The abundance of some insects can decline due to mortality around lights, although this has previously been recorded in fragmented landscapes where populations are already under stress (Rich & Longcore, 2006). Artificial night lighting may also lead to disorientation of migratory birds. Aquatic habitats and open habitats such as grasslands and dunes may be vulnerable to light spill.

Appendix 3. Categories used in the assessment of conservation status.

IUCN (International Union for the Conservation of Nature) categories, as outlined by IUCN (2012), and as used for the *Environment Protection and Biodiversity Conservation Act 1999* and the Western Australian *Biodiversity Conservation Act 2016*.

Extinct	Taxa not definitely located in the wild during the past 50 years.
Extinct in the Wild (Ex)	Taxa known to survive only in captivity.
Critically Endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future.
Endangered (E)	Taxa facing a very high risk of extinction in the wild in the near future.
Vulnerable (V)	Taxa facing a high risk of extinction in the wild in the medium-term future.
Near Threatened	Taxa that risk becoming Vulnerable in the wild.
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classed as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern.	Taxa that are not Threatened.

Schedules used in the WA *Biodiversity Conservation Act 2016, updated 2023*

Schedule 1	Specially protected fauna Division 1 – Species of special conservation interest (S1D1) Division 2 – Migratory species (S1D2) Division 3 – Species otherwise in need of special protection (S1D3)
Schedule 2	Threatened species Division 1 – Critically endangered species (S2D1) Division 2 – Endangered species (S2D2) Division 3 – Vulnerable species (S2D3)
Schedule 3	Extinct species (S3)

WA DBCA Priority species (species not listed under the *WA Biodiversity Conservation Act 2016*, but for which there is some concern).

Priority 1 (P1)	Taxa with few, poorly known populations on threatened lands.
Priority 2 (P2)	Taxa with few, poorly known populations on conservation lands; or taxa with several, poorly known populations not on conservation lands.
Priority 3 (P3)	Taxa with several, poorly known populations, some on conservation lands.
Priority 4. (P4)	Taxa in need of monitoring. Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change.
Priority 5 (P5)	Taxa in need of monitoring. Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years (IUCN Conservation Dependent).

Appendix 4. Ecological and threatening processes identified under legislation and in the literature.

Ecological processes are processes that maintain ecosystems and biodiversity. They are important for the assessment of impacts of development proposals, because ecological processes make ecosystems sensitive to change. The issue of ecological processes, impacts and conservation of biodiversity has an extensive literature. Following are examples of the sorts of ecological processes that need to be considered.

Ecological processes relevant to the conservation of biodiversity in Australia (Soule et al., 2004) :

- Critical species interactions (highly interactive species);
- Long distance biological movement;
- Disturbance at local and regional scales;
- Global climate change;
- Hydroecology;
- Coastal zone fluxes;
- Spatially-dependent evolutionary processes (range expansion and gene flow); and
- Geographic and temporal variation of plant productivity across Australia.

Threatening processes (EPBC Act)

Under the EPBC Act, a key threatening process is an ecological interaction that threatens or may threaten the survival, abundance or evolutionary development of a threatened species or ecological community. There are currently 22 key threatening processes listed by the federal Department of Climate Change, Energy, the Environment, and Water (DCCEEW, 2023c) :

- Aggressive exclusion of birds from potential woodland and forest habitat by over-abundant noisy miners (*Manorina melanocephala*).
- Competition and land degradation by rabbits.
- Competition and land degradation by unmanaged goats.
- Dieback caused by the root-rot fungus (*Phytophthora cinnamomi*).
- Fire regimes that cause declines in biodiversity.
- Incidental catch (bycatch) of Sea Turtle during coastal otter-trawling operations within Australian waters north of 28 degrees South.
- Incidental catch (or bycatch) of seabirds during oceanic longline fishing operations.
- Infection of amphibians with chytrid fungus resulting in chytridiomycosis.
- Injury and fatality to vertebrate marine life caused by ingestion of, or entanglement in, harmful marine debris.
- Invasion of northern Australia by Gamba Grass and other introduced grasses.
- Land clearance.
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Loss of biodiversity and ecosystem integrity following invasion by the Yellow Crazy Ant (*Anoplolepis gracilipes*) on Christmas Island, Indian Ocean.
- Loss of climatic habitat caused by anthropogenic emissions of greenhouse gases.
- Novel biota and their impact on biodiversity.
- Predation by European red fox.
- Predation by exotic rats on Australian offshore islands of less than 1000 km^2 (100,000 ha).
- Predation by feral cats.
- Predation, Habitat Degradation, Competition and Disease Transmission by Feral Pigs.

- Psittacine Circoviral (beak and feather) Disease affecting endangered psittacine species.
- The biological effects, including lethal toxic ingestion, caused by Cane Toads (*Bufo marinus*).
- The reduction in the biodiversity of Australian native fauna and flora due to the red imported fire ant, *Solenopsis invicta* (fire ant).

General processes that threaten biodiversity across Australia (The National Land and Water Resources Audit):

- Vegetation clearing;
- Increasing fragmentation, loss of remnants and lack of recruitment;
- Firewood collection;
- Grazing pressure;
- Feral animals;
- Exotic weeds;
- Changed fire regimes;
- Pathogens;
- Changed hydrology—dryland salinity and salt water intrusion;
- Changed hydrology— such as altered flow regimes affecting riparian vegetation; and
- Pollution.

In addition to the above processes, the federal Department of Agriculture, Water and the Environment (DAWE) produced Significant Impact Guidelines that provide criteria for the assessment of the significance of impacts. These criteria provide a framework for the assessment of significant impacts. The criteria are listed below.

- Will the proposed action lead to a long-term decrease in the size of a population?
- Will the proposed action reduce the area of occupancy of the species?
- Will the proposed action fragment an existing population?
- Will the proposed action adversely affect habitat critical to the survival of a species?
- Will the proposed action disrupt the breeding cycle of a population?
- Will the proposed action modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline?
- Will the proposed action result in introducing invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat?
- Will the proposed action introduce disease that may cause the species to decline?
- Will the proposed action interfere with the recovery of the species?

Appendix 5. Malleefowl mound classification for determining annual activity

The profile of a Malleefowl Mound changes with breeding activity and age (erosion and vegetation growth). Malleefowl mounds should be defined using the following system, obtained from the National Manual for the Malleefowl Monitoring System (NHT, 2007):

Profile 1. Typical crater with raised rims. This is the typical shape of an inactive mound. However the mound can also be active and open.

Profile 2. Mound fully dug out. The characteristic of this profile is that the crater slopes down steeply, and at the base the sides drop vertically to form a box- like structure with side usually 20 to 30 cm deep. Often, litter will have been raked into windrows, and may have started to enter the mound.

Profile 3. Mound with litter. This is the next stage after profile 2. Litter will have been raked into the mound by Malleefowl, and thick layers of litter are evident on the surface. There may or may not be sand mixed with the litter at this stage.

Profile 4. Mound mounded up (no crater). This is the typical profile of an active but unopened Malleefowl mound. The active mound is closed and dome shaped.

Profile 5. Mound has a sandy crater with a peak in centre. This is a typical profile of an active mound which is in the process of being closed by Malleefowl.

Profile 6. Mound low and flat without peak or crater. This mound has not been used for some time and weathering and erosion have 'flattened" the original mound.

The mound profiles describe the appearance of the mound and while this is related to activity status, there can be some ambiguity, particularly in the harsh, rocky environments. Furthermore, the most important piece of information to come from monitoring of the mounds during the breeding season is to determine which mounds are actually used for breeding in that year. Profiles 1 to 5 may all be mounds that are active in some sense, but only some mounds of profile 4 are active in the sense of containing eggs that are being incubated. For example, it is possible to have a Profile 4 mound that has been abandoned and does not contain eggs, while it is also possible to have a mound that has been dug out (Profile 2) or with some litter in it (Profile 3) but that is not used for breeding. Therefore, in addition to the above mound profiles, it is recommended that the following statuses be recorded. These may only be useful during breeding season monitoring. Descriptions may not apply at other times and annual monitoring is necessary to draw conclusions as to the status of the mound. Statuses A to D all apply to mounds that may have been technically active in the current breeding season, but only mounds of status A are active in that they are being used for breeding, with mounds of Status C active in that they are being worked, but thy may still not be used for breeding in that year.

Status A. Active; breeding. (profile 4). Mound almost certainly contains eggs. Mound is covered over, dome-shaped and surface is freshly disturbed (that day), often with small excavations around the lower perimeter where the male has scratched material onto the centre of the mound. There will be no ant-lion traps and very few tracks of small animals present, as the surface of the mound is being worked constantly.

Status B. Inactive. (profile 4). Mound is covered over and dome-shaped, but surface is not disturbed, having assorted animal tracks and ant-lion traps on it. This is either a) a mound that has been fully-prepared for incubation in that year(or earlier), but has been abandoned or b) a mound that was not dug out at the completion of its last breeding season.

Status C. Active; preparation. (profile 2, 3 or 5). Mound has been excavated and may be filled with leaf-litter, but not yet covered over. Being worked on a regular basis but does not contain eggs.

Status D. Inactive. (profile 1 or 2). Mound has been excavated but no further progress has been made and not being worked regularly.

Status E. Inactive. (profile 1 or 6). No recent activity. Profile 1 and 6 grade into each other, but mounds can be roughly aged (ie time since last used) by their appearance. Eg:

- Recently used. Eggshell and plant material in centre still present. It is not known how long it takes for such material to degenerate in the Karara region, but such a mound could be >5 years old. If very young, the plant material in the centre is like compost, may contain beetle larvae and termites, and may be excavated by foraging goannas and Echidnas.
- Not recently used. No eggshell or plant material in centre, but central depression still well-formed, crater still distinct, with central depression often lower than the surrounding soil surface. Such mounds may be decades old. One that has been observed annually for five years has not changed in appearance at all. Weathering of such mounds and colonisation by plants may be very slow except after rare heavy rainfall events.
- Old. Clearly weathered by still distinctly profile 1. Often with small plants in centre. Probably several decades old or older.
- Very old. Profile 6 or still with a hint of profile 1. The age of such mounds may be in the order of 50 to 500 years. Shrubs and even trees may be present.

Appendix 6. Fauna expected to occur in at least one of the project areas

Status codes:

CS1, CS2, CS3 = (summary) levels of conservation significance. See Appendix 1 for full explanation.

EPBC Act listings: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, MI = Migratory (see Appendix 3).

Biodiversity Conservation Act 2016 listings: S1 to S3 = Schedules 1 to 3, D1 to D3 = Divisions 1 to 3 (see Appendix 3).

DBCA Priority species: P1 to P4 = Priority 1 to 4 (see Appendix 3).

CS3 = considered to be of local significance by Bamford Consulting Ecologists (see Appendix 3).

Int = introduced species.

See Section 2.2.3for explanation of expected occurrence categories.

Species with expected occurrence in **bold** were observed during field investigations.

Source: 1 = Atlas of Living Australia, 2 = Birdata, 3 = Protected Matters Search, Tool 4 = Naturemap, 5 = DBCA threatened and priority fauna search, 6 = BCE surveys 2004-2020, 7 = previous surveys (inc. IBSA), 8 = general literature.

Frogs

						Expected occurrence		
Latin Name	**English Name**	**CS1**	**CS2**	**CS3**	**Int**	**Mine area**	**Wheatbelt**	**Source**
Hylidae (Tree frogs)								
Cyclorana occidentalis	Western Water-holding Frog					Resident	Out of range	1
Litoria rubella	Desert Tree Frog				X	**Resident**	Out of range	6
Myobatrachidae (Ground frogs)								
Heleioporus albopunctatus	Western Spotted Frog					Out of range	Resident	1 4
Limnodynastes dorsalis	Banjo Frog, Pobblebonk					Out of range	Resident	1 4
Neobatrachus centralis	Desert Trilling Frog			CS3		**Resident**	Out of range	6
Neobatrachus kunapalari	Kunapalari Frog					Resident	Resident	1 4
Neobatrachus pelobatoides	Humming Frog					Resident	Resident	1 4
Neobatrachus sutor	Shoemaker Frog					Resident	Resident	1 4
Pseudophryne guentheri	Guenther's Toadlet					Out of range	Resident	1 4
Pseudophryne occidentalis	Western Toadlet					**Resident**	Out of range	1 4 6
TOTAL expected				**1**		**7**	**6**	

Reptiles

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence		Source
						Mine area	Wheatbelt	
Gekkonidae (geckoes)								
Diplodactylus granariensis	Western Stone Gecko					**Resident**	Resident	1 4 6
Diplodactylus pulcher	Fine-faced Gecko					**Resident**	Resident	1 4 6
Lucasium maini						Resident	Out of range	1 4
Hesperoedura reticulata	Reticulated Velvet Gecko			CS3		**Resident**	Resident	6
Rhynchoedura ornata	Beaked Gecko					**Resident**	Resident	1 4 6
Underwoodisaurus milii	Barking Gecko					**Resident**	Resident	1 4 6
Gehyra variegata	Variegated Dtella					**Resident**	Resident	1 4 6
Heteronotia binoei	Bynoe's Gecko					**Resident**	Resident	1 4 6
Pygopodidae (legless lizards)								
Delma australis						**Resident**	Resident	1 4 6
Lialis burtonis	Burton's Legless Lizard					**Resident**	Resident	1 4 6
Pygopus lepidopodus	Common Scaly-foot					Resident	Resident	1 4
Agamidae (dragon lizards)								
Caimanops (Diporiphora) amphiboluroides	Mulga Dragon			CS3		**Resident**	Out of range	1 4 6
Ctenophorus nuchalis	Central Netted Dragon					**Resident**	Out of range	1 4 6
Ctenophorus reticulatus	Western Netted Dragon					**Resident**	Resident	1 4 6
Ctenophorus scutulatus	Lozenge-marked Dragon					**Resident**	Resident	1 4 6
Moloch horridus	Thorny Devil					**Resident**	Resident	1 4 6
Pogona minor	Western Bearded Dragon					**Resident**	Resident	1 4 6
Varanidae (monitors or goannas)								
Varanus caudolineatus	Stripe-tailed Monitor					**Resident**	Resident	1 4 6
Varanus giganteus	Perentie					**Resident**	Out of range	1 4 6
Varanus gouldii	Sand Goanna					**Resident**	Resident	1 4 6
Varanus tristis	Black-headed Monitor					**Resident**	Resident	1 4 6
Varanus panoptes	Yellow-spotted Monitor					**Resident**	Out of range	1 4 6

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Scincidae (skink lizards)								
Cryptoblepharus buchananii	Buchanan's snake-eyed Skink					**Resident**	Resident	4 6
Ctenotus mimetes						**Resident**	Resident	1 4 6
Ctenotus schomburgkii						**Resident**	Resident	1 4 6
Ctenotus uber						**Resident**	Resident	1 4 6
Cyclodomorphus branchialis	Gilled Slender Blue-tongue	S2D3				**Resident**	Irregular visitor	1 4 5 6 7
Egernia depressa						**Resident**	Resident	1 4 6
Egernia stokesii badia	Western Spiny-tailed Skink	EN S2D3				**Resident**	Resident	1 3 4 5 6 7
Eremiascincus richardsonii	Broad-banded Sand-swimmer					**Resident**	Resident	1 4 6
Liopholis inornata	Desert Skink					**Resident**	Resident	1 4 6
Lerista gerrardii						**Resident**	Out of range	1 4 6
Lerista kingi						**Resident**	Resident	1 4 6
Lerista timida						**Resident**	Resident	6
Menetia greyii	Common Dwarf Skink					**Resident**	Resident	1 4 6
Morethia butleri						**Resident**	Resident	1 4 6
Morethia obscura	Dusky Morethia					Resident	Resident	1 4
Tiliqua rugosa	Bobtail					Out of range	Resident	1 4
Tiliqua occipitalis	Western Blue-tongue					**Resident**	Resident	1 4 6
Typhlopidae (blind snakes)								
Anilios australis	Southern Blind Snake					Resident	Resident	1 4
Anilios hamatus						**Resident**	Resident	1 4 6
Anilios waitii	Beaked Blind Snake					**Resident**	Resident	1 4 6
Boidae (pythons)								
Antaresia childreni	Children’s Python					**Resident**	Resident	1 4 6
Morelia spilota	Carpet Python			CS3		Irregular Visitor	Resident	8

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Elapidae (front-fanged snakes)								
Brachyurophis semifasciata	Shovel-nosed Snake					Resident	Resident	1 4
Demansia reticulata	Yellow-faced Whipsnake					**Resident**	Resident	1 4 6
Furina ornata	Moon Snake					**Resident**	Resident	1 6
Suta monachus	Monk Snake					**Resident**	Resident	1 4 6
Pseudechis australis	Mulga Snake					**Resident**	Resident	1 4 6
Pseudechis butleri	Yellow-spotted Mulga Snake					**Resident**	Out of range	1 4 6
Pseudonaja mengdeni	Gwarder					**Resident**	Resident	1 4 6
Pseudonaja modesta	Ringed Brown Snake					**Resident**	Resident	1 4 6
Simoselaps bertholdi	Jan's Banded Snake					**Resident**	Resident	1 4 6
Suta fasciata	Rosen's Snake					**Resident**	Resident	1 4 6
TOTAL expected		**2**	**-**	**3**		**54**	**48**	

Birds

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
CASUARIIDAE (Cassowaries and emus)								
Dromaius novaehollandiae	Emu					**Resident**	Regular visitor	1 2 4 6 7
MEGAPODIIDAE (Megapodes)								
Leipoa ocellata	Malleefowl	VU S2D3				**Resident**	Regular visitor	1 2 3 4 5 6 7
ANATIDAE (Ducks and swans)								
Anas gracilis	Grey Teal					**Irregular Visitor**	Irregular visitor	1 2 4 6
Anas superciliosa	Pacific Black Duck					Irregular Visitor	Irregular visitor	1 2 4
Aythya australis	Hardhead					Irregular Visitor	Irregular visitor	1 2 4
Chenonetta jubata	Australian Wood Duck					**Irregular Visitor**	Irregular visitor	1 2 4 6
Cygnus atratus	Black Swan					Irregular Visitor	Irregular visitor	1 2 4
Malacorhynchus membranaceus	Pink-eared Duck					Irregular Visitor	Irregular visitor	1 2 4
Spatula rhynchotis	Australasian Shoveler					Irregular Visitor	Irregular visitor	1 2 4

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Tadorna tadornoides	Australasian Shelduck					**Irregular Visitor**	Irregular visitor	1 2 4 6
Poliocephalus poliocephalus	Hoary-headed Grebe					**Irregular Visitor**	Irregular visitor	1 2 4 6
Tachybaptus novaehollandiae	Australasian Grebe					**Irregular Visitor**	Irregular visitor	1 2 4 6
COLUMBIDAE (Pigeons and doves)								
Columba livia	Rock Dove					Irregular Visitor	Regular visitor	1 2 4
Phaps chalcoptera	Common Bronzewing					**Resident**	Resident	1 2 4 6 7
Ocyphaps lophotes	Crested Pigeon					**Resident**	Resident	1 2 4 6
Geopelia cuneata	Diamond Dove					**Resident**	Regular visitor	1 2 4 6
Spilopelia senegalensis	Laughing Dove				X	Out of range	Regular visitor	1 2 4
PODARGIDAE (Australian frogmouths)								
Podargus strigoides	Tawny Frogmouth					**Resident**	Resident	1 2 4 6 7
CAPRIMULGIDAE (Nightjars and allies)								
Eurostopodus argus	Spotted Nightjar					**Resident**	Regular visitor	1 2 4 6
AEGOTHELIDAE (Owlet-nightjars)								
Aegotheles cristatus	Australian Owlet-nightjar					**Resident**	Regular visitor	1 2 4 6
APODIDAE (Typical swifts)								
Apus pacificus	Fork-tailed Swift	MI, S1D2				Irregular Visitor	Irregular visitor	1 2 4 5
THRESKIORNITHIDAE								
Platalea flavipes	Yellow-billed Spoonbill					Irregular Visitor	Irregular visitor	1 2 4
Threskiornis moluccus	Australian White Ibis					Irregular Visitor	Irregular visitor	1 2 4
Threskiornis spinicollis	Straw-necked Ibis					**Irregular Visitor**	Irregular visitor	1 2 4 6
ARDEIDAE (herons and egrets)								
Ardea alba	Eastern Great Egret					Irregular Visitor	Irregular visitor	1 2
Egretta novaehollandiae	White-faced Heron					**Irregular Visitor**	Irregular visitor	1 2 4 6
Nycticorax caledonicus	Nankeen Night-Heron					Irregular Visitor	Irregular visitor	1 2 4
Ardea pacifica	White-necked Heron					Irregular Visitor	Irregular visitor	1 2 4
PELECANIDAE (pelicans)								
Pelecanus conspicillatus	Australian Pelican					Vagrant	Vagrant	1 4

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
PHALACROCORACIDAE (cormorants)								
Microcarbo melanoleucos	Little Pied Cormorant					Vagrant	Vagrant	1 2 4
Phalacrocorax sulcirostris	Litte Black Cormorant					Vagrant	Vagrant	1 2 4
ANHINGIDAE (Darters)								
Anhinga novaehollandiae	Australian Darter					**Vagrant**	Vagrant	1 2 4 6
ACCIPITRIDAE (Osprey, hawks and eagles)								
Elanus axillaris	Black-shouldered Kite					Regular visitor	Regular visitor	1 2 4
Elanus scriptus	Letter-winged Kite					Vagrant	Vagrant	1
Lophoictinia isura	Square-tailed Kite					**Irregular Visitor**	Irregular visitor	1 2 4 6
Hamirostra melanosternon	Black-breasted Buzzard					**Irregular Visitor**	Irregular visitor	1 6
Milvus migrans	Black Kite					**Vagrant**	Vagrant	1 6
Haliastur sphenurus	Whistling Kite					**Irregular Visitor**	Regular visitor	1 2 4 6
Circus assimilis	Spotted Harrier					Regular visitor	Regular visitor	1 2 4
Circus approximans	Swamp Harrier					Vagrant	Irregular visitor	1 2 4
Accipiter fasciatus	Brown Goshawk					**Resident**	Resident	1 2 4 6
Accipiter cirrocephalus	Collared Sparrowhawk					**Resident**	Resident	1 2 4 6
Aquila audax	Wedge-tailed Eagle					**Resident**	**Resident**	1 2 4 6
Hieraaetus morphnoides	Little Eagle					**Resident**	Resident	1 2 4 6
FALCONIDAE (Falcons)								
Falco berigora	Brown Falcon					**Resident**	Resident	1 2 4 6 7
Falco longipennis	Australian Hobby					**Resident**	Resident	1 2 4 6
Falco peregrinus	Peregrine Falcon	S1D3				**Resident**	Regular visitor	1 2 4 5 6 7
Falco cenchroides	Nankeen Kestrel					**Regular visitor**	**Resident**	1 2 4 6
RALLIDAE (Rails, gallinules and coots)								
Fulica atra	Eurasian Coot					Irregular Visitor	Irregular visitor	1 2 4
Hypotaenidia philippensis	Buff-banded Rail					Vagrant	Vagrant	2
Tribonyx ventralis	Black-tailed Native-hen					**Irregular Visitor**	Irregular visitor	1 2 4 6
OTIDIDAE (Bustards)								
Ardeotis australis	Australian Bustard			CS3		**Irregular Visitor**	Irregular visitor	1 2 4 6

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
BURHINIDAE (Stone-curlews)								
Burhinus grallarius	Bush Stone-curlew			CS3		**Regular visitor**	Irregular visitor	1 4 6
CHARADRIIDAE (Plovers and lapwings)								
Vanellus tricolor	Banded Lapwing					**Regular visitor**	Regular visitor	1 2 4 6
Thinornis cucullatus	Hooded Plover		P4			Irregular Visitor	Irregular visitor	1 2 4 5
Elseyornis melanops	Black-fronted Dotterel					Irregular Visitor	Irregular visitor	1 2 4
Erythrogonys cinctus	Red-kneed Dotterel					Irregular Visitor	Irregular visitor	1 2 4
Peltohyas australis	Inland Dotterel					Vagrant	Vagrant	1 2 4
Charadrius ruficapillus	Red-capped Plover					**Regular visitor**	Regular visitor	1 2 4 6
SCOLOPACIDAE (Sandpipers and allies)								
Actitis hypoleucos	Common Sandpiper	MI, S1D2				Irregular Visitor	Irregular visitor	1 4 5
Tringa nebularia	Common Greenshank	EN & MI, S1D2				Irregular Visitor	Irregular visitor	1 2 3 4 5
Calidris ruficollis	Red-necked Stint	MI, S1D2				Irregular Visitor	Irregular visitor	1 4 5
Calidris subminuta	Long-toed Stint	MI, S1D2				Irregular Visitor	Irregular visitor	1 2 4 5
Calidris acuminata	Sharp-tailed Sandpiper	VU & MI, S1D2				Irregular Visitor	Irregular visitor	1 3 4 5
Calidris ferruginea	Curlew Sandpiper	MI & CR, S2D1				Irregular Visitor	Irregular visitor	1 3 4 5
RECURVIROSTRIDAE (Avocets and stilts)								
Cladorhynchus leucocephalus	Banded Stilt					Irregular Visitor	Irregular visitor	1 2 4
Recurvirostra novaehollandiae	Red-necked Avocet					Irregular Visitor	Irregular visitor	1 2 4
Himantopus leucocephalus	Pied Stilt					Irregular Visitor	Irregular visitor	1 2 4
TURNICIDAE (Button-quails)								
Turnix velox	Little Button-quail					**Regular visitor**	Regular visitor	1 2 4 6
Turnix varius	Painted Button-quail					**Resident**	Regular visitor	6
LARIDAE (gulls and terns)								
Chlidonias hybrida	Whiskered Tern					Irregular Visitor	Irregular visitor	1 2

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Gelochelidon macrotarsa	Australian Gull-billed Tern					Irregular Visitor	Irregular visitor	1
Larus novaehollandiae	Silver Gull					Irregular Visitor	Irregular visitor	1 2 4
CACATUIDAE (Cockatoos)								
Calyptorhynchus banksii escondidus	Inland Red-tailed Black-Cockatoo					**Resident**	Resident	1 2 4 6 7
Zanda latirostris	Carnaby's Black-Cockatoo					Out of range	Irregular visitor	1 2 3 4 5
Eolophus roseicapilla	Galah					**Resident**	**Resident**	1 2 4 6 7
Cacatua sanguinea	Little Corella					Vagrant	Resident	1 2 4
Cacatua leadbeateri	Major Mitchell's Cockatoo			CS3		**Resident**	Irregular visitor	1 2 4 6
Nymphicus hollandicus	Cockatiel					**Irregular Visitor**	Irregular visitor	1 2 4 6
PSITTACULIDAE (Parrots)								
Glossopsitta porphyrocephala	Purple-crowned Lorikeet					**Irregular Visitor**	Irregular visitor	1 2 4 6
Polytelis anthopeplus	Regent Parrot			CS3		**Regular visitor**	Regular visitor	1 2 4 6
Barnardius zonarius	Australian Ringneck					**Resident**	**Resident**	1 2 4 6 7
Psephotellus varius	Mulga Parrot					**Resident**	Regular visitor	1 2 4 6
Melopsittacus undulatus	Budgerigar					**Irregular Visitor**	Irregular visitor	1 2 4 6
Neopsephotus bourkii	Bourke's Parrot					**Regular visitor**	Vagrant	1 2 4 6
Neophema splendida	Scarlet-chested Parrot			CS3		Vagrant	Vagrant	1
CUCULIDAE (Old world cuckoos)								
Heteroscenes pallidus	Pallid Cuckoo					**Regular visitor**	Regular visitor	1 2 4 6
Cacomantis flabelliformis	Fan-tailed Cuckoo					**Regular visitor**	Regular visitor	1 2 4 6
Chalcites osculans	Black-eared Cuckoo					**Irregular Visitor**	Irregular visitor	1 2 4 6
Chalcites basalis	Horsfield's Bronze-Cuckoo					**Regular visitor**	Regular visitor	1 2 4 6
Chalcites lucidus	Shining Bronze-Cuckoo					**Regular visitor**	Regular visitor	1 2 6
STRIGIDAE (Hawk owls)								
Ninox boobook	Southern Boobook					**Resident**	Resident	1 2 4 6
TYTONIDAE (Barn owls)								
Tyto javanica	Eastern Barn Owl					**Regular visitor**	Regular visitor	1 2 4 6
HALCYONIDAE (Kingfishers)								

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence		Source
						Mine area	Wheatbelt	
Todiramphus pyrrhopygius	Red-backed Kingfisher					**Regular visitor**	Irregular visitor	1 2 4 6 7
Todiramphus sanctus	Sacred Kingfisher					**Regular visitor**	Regular visitor	1 2 4 6
MEROPIDAE (Bee-eaters)								
Merops ornatus	Rainbow Bee-eater					**Regular visitor**	Regular visitor	1 2 4 6 7
CLIMACTERIDAE (Australian treecreepers)								
Climacteris affinis	White-browed Treecreeper			CS3		**Resident**	Vagrant	1 2 4 6
CLIMACTERIDAE (Australian treecreepers)								
Climacteris rufus	Rufous Treecreeper			CS3		**Resident**	Irregular visitor	1 2 4 6
MALURIDAE (Fairy-wrens and allies)								
Malurus splendens	Splendid Fairy-wren					**Resident**	Resident	1 2 4 6 7
Malurus assimilis	Purple-backed Fairy-wren					**Resident**	Resident	1 2 4 6
Malurus leucopterus	White-winged Fairy-wren					**Resident**	Resident	1 2 4 6
Malurus pulcherrimus	Blue-breasted Fairy-wren					Out of range	Resident	1 2 4
PARDALOTIDAE (Pardalotes, scrubwrens, thornbills)								
Pardalotus punctatus	Spotted Pardalote					Irregular Visitor	Vagrant	1 2
Pardalotus striatus	Striated Pardalote					**Resident**	Resident	1 2 4 6 7
Calamanthus montanellus	Western Fieldwren			CS3		Irregular Visitor	Irregular visitor	1 4
Calamanthus cautus	Shy Heathwren					Irregular Visitor	Irregular visitor	1 2 4
Pyrrholaemus brunneus	Redthroat			CS3		**Resident**	Resident	1 2 4 6
Smicrornis brevirostris	Weebill					**Resident**	Resident	1 2 4 6 7
Sericornis maculatus	Spotted Scrubwren					Out of range	Irregular visitor	1 2 4
Gerygone fusca	Western Gerygone					**Resident**	Resident	1 2 4 6
Acanthiza apicalis	Inland Thornbill					**Resident**	Resident	1 2 4 6 7
Acanthiza iredalei	Slender-billed Thornbill					Irregular Visitor	Out of range	1 2 4
Acanthiza uropygialis	Chestnut-rumped Thornbill					**Resident**	Resident	1 2 4 6 7
Acanthiza robustirostris	Slaty-backed Thornbill					**Resident**	Out of range	1 2 4 6
Acanthiza chrysorrhoa	Yellow-rumped Thornbill					**Resident**	Resident	1 2 4 6 7
Aphelocephala leucopsis	Southern Whiteface					**Resident**	Resident	1 2 3 4 6 7
MELIPHAGIDAE (Honeyeaters)								

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Anthochaera carunculata	Red Wattlebird					**Regular visitor**	Regular visitor	1 2 4 6
Acanthagenys rufogularis	Spiny-cheeked Honeyeater					**Resident**	Resident	1 2 4 6 7
Manorina flavigula	Yellow-throated Miner					**Resident**	**Resident**	1 2 4 6 7
Gavicalis virescens	Singing Honeyeater					**Resident**	Resident	1 2 4 6
Nesoptilotis leucotis	White-eared Honeyeater					**Resident**	Irregular visitor	1 2 4 6
Melithreptus brevirostris	Brown-headed Honeyeater					**Resident**	Regular visitor	1 2 4 6
Lichmera indistincta	Brown Honeyeater					**Resident**	Resident	1 2 4 6
Gliciphila melanops	Tawny-crowned Honeyeater					Out of range	Vagrant	1 2 4
Purnella albifrons	White-fronted Honeyeater					Regular visitor	Regular visitor	1 2 4 6
Ptilotula plumula	Grey-fronted Honeyeater					Vagrant	Out of range	1 4
Sugomel nigrum	Black Honeyeater					**Regular visitor**	Irregular visitor	1 2 4 6
Certhionyx variegatus	Pied Honeyeater					**Regular visitor**	Irregular visitor	1 2 4 6
Epthianura aurifrons	Orange Chat					Irregular Visitor	Irregular visitor	1 4
Epthianura tricolor	Crimson Chat					Regular visitor	Regular visitor	1 2 4 7
Epthianura albifrons	White-fronted Chat					Regular visitor	Regular visitor	1 2 4
POMATOSTOMIDAE (Babblers)								
Pomatostomus superciliosus	White-browed Babbler			CS3		**Resident**	Resident	1 2 4 6
CINCLOSOMATIDAE (Quail-thrushes and allies)								
Cinclosoma clarum	Copper-backed Quail-thrush					**Resident**	Irregular visitor	1 2 4 6 7
NEOSITTIDAE (Sitellas)								
Daphoenositta chrysoptera	Varied Sittella					**Resident**	Regular visitor	1 2 4 6
CAMPEPHAGIDAE (Cuckoo-shrikes and trillers)								
Coracina novaehollandiae	Black-faced Cuckoo-shrike					**Resident**	Regular visitor	1 2 4 6
Coracina maxima	Ground Cuckoo-shrike					Irregular Visitor	Vagrant	1 2 4
Lalage tricolor	White-winged Triller					**Regular visitor**	Regular visitor	1 2 4 6
PACHYCEPHALIDAE (Whistlers, shrike-thrushes)								
Oreoica gutturalis	Crested Bellbird			CS3		**Resident**	Resident	1 2 4 6 7
Pachycephala occidentalis	Western Whistler					**Regular visitor**	Irregular visitor	1 2 4 6
Pachycephala rufiventris	Rufous Whistler					**Resident**	Resident	1 2 4 6 7

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
Pachycephala inornata	Gilbert's Whistler					**Irregular Visitor**	Out of range	1 2 6
Colluricincla harmonica	Grey Shrike-thrush					**Resident**	Resident	1 2 4 6 7
ARTAMIDAE (Woodswallows, butcherbirds, currawongs)								
Artamus cyanopterus	Dusky Woodswallow					**Regular visitor**	Regular visitor	1 2 4 6
Artamus personatus	Masked Woodswallow					**Irregular Visitor**	Irregular visitor	1 2 4 6 7
Artamus cinereus	Black-faced Woodswallow					**Resident**	**Resident**	1 2 4 6
Artamus minor	Little Woodswallow					**Resident**	Regular visitor	1 2 4 6 7
Cracticus torquatus	Grey Butcherbird					**Resident**	Resident	1 2 4 6 7
Cracticus nigrogularis	Pied Butcherbird					**Resident**	Resident	1 2 4 6
Gymnorhina tibicen	Australian Magpie					**Resident**	**Resident**	1 2 4 6
Strepera versicolor	Grey Currawong					**Resident**	Regular visitor	1 2 4 6 7
DICRURIDAE (Monarchs, fantails and drongoes)								
Grallina cyanoleuca	Magpie-lark					**Resident**	Resident	1 2 4 6
Rhipidura albiscapa	Grey Fantail					**Regular visitor**	Regular visitor	1 2 4 6
Rhipidura leucophrys	Willie Wagtail					**Resident**	**Resident**	1 2 4 6 7
CORVIDAE (Crows and allies)								
Corvus coronoides	Australian Raven					**Resident**	**Resident**	1 2 4 6
Corvus bennetti	Little Crow					**Resident**	Regular visitor	1 2 4 6 7
Corvus orru	Torresian Crow					**Regular visitor**	Regular visitor	1 2 4 6
PETROICIDAE (Robins)								
Drymodes brunneopygia	Southern Scrub-robin					Irregular Visitor	Out of range	1 2 4
Microeca fascinans	Jacky Winter					**Irregular Visitor**	Irregular visitor	1 2 4 6
Petroica goodenovii	Red-capped Robin					**Resident**	Resident	1 2 4 6 7
Melanodryas cucullata	Hooded Robin					**Irregular Visitor**	Irregular visitor	1 2 4 6
Eopsaltria griseogularis	Western Yellow Robin			CS3		**Resident**	Regular visitor	1 2 4 6 7
LOCUSTELLIDAE (Songlarks and allies)								
Cincloramphus mathewsi	Rufous Songlark					**Regular visitor**	Resident	1 2 4 6
Cincloramphus cruralis	Brown Songlark					Regular visitor	Resident	1 2 4
Poodytes gramineus	Little Grassbird					Irregular Visitor	Irregular visitor	1 2 4

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
ACROCEPHALIDAE (reed-warblers)								
Acrocephalus australis	Australian Reed-Warbler					Irregular Visitor	Irregular visitor	1 2
ZOSTEROPIDAE (White-eyes)								
Zosterops lateralis	Silvereye					Out of range	Irregular visitor	1 2 4
HIRUNDINIDAE (Swallows and martins)								
Cheramoeca leucosterna	White-backed Swallow					**Regular visitor**	Regular visitor	1 2 4 6
Hirundo neoxena	Welcome Swallow					**Resident**	Resident	1 2 4 6 7
Petrochelidon nigricans	Tree Martin					**Resident**	Resident	1 2 4 6
Petrochelidon ariel	Fairy Martin					**Regular visitor**	Regular visitor	1 2 4 6
DICAEIDAE (Flowerpeckers)								
Dicaeum hirundinaceum	Mistletoebird					**Resident**	Regular visitor	1 2 4 6 7
PASSERIDAE (Finches)								
Taeniopygia castanotis	Zebra Finch					**Regular visitor**	Irregular visitor	1 2 4 6 7
MOTACILLIDAE (Pipits, Old world wagtails)								
Anthus novaeseelandiae	Australasian Pipit					**Resident**	**Resident**	1 2 4 6 7
TOTAL expected		**9**	**1**	**12**		**167**	**168**	

Mammals

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence Mine area	Wheatbelt	Source
TACHYGLOSSIDAE (Echidnas)								
Tachyglossus aculeatus	Echidna					**Resident**	Resident	1 4 6
DASYURIDAE (Dasyurids)								
Antechinomys laniger	Kultarr			CS3		**Resident**	Irregular visitor	1 6
Antechinomys (Sminthopsis) longicaudata	Long-tailed Dunnart		P4			Resident	Irregular visitor	8
Pseudantechinus woolleyae	Woolley's Pseudantechinus			CS3		**Resident**	Irregular visitor	4 6
Sminthopsis crassicaudata	Fat-tailed Dunnart					Regular visitor	Resident	1 4
Sminthopsis dolichura	Little Long-tailed Dunnart					**Resident**	Resident	1 4 6

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence		Source
						Mine area	Wheatbelt	
MACROPODIDAE (Kangaroos, wallabies)								
Macropus fuliginosus	Western Grey Kangaroo					**Resident**	Resident	1 4 6
Osphranter robustus	Euro, Biggada					**Resident**	**Resident**	1 4 6
Osphranter rufus	Red Kangaroo, Marlu					**Resident**	Regular visitor	1 4 6
PHALANGERIDAE (brush-tailed possums)								
Trichosurus vulpecula	Brush-tailed Possum			CS3		Irregular Visitor	Irregular visitor	6?
EMBALLONURIDAE (Sheathtail bats)								
Taphozous hilli	Hill's Sheathtail-Bat					Resident	Regular visitor	8
VESPERTILIONIDAE (Vesper bats)								
Chalinolobus gouldii	Gould's Wattled Bat					**Resident**	Resident	1 4 6
Chalinolobus morio	Chocolate Wattled Bat					Resident	Resident	1 4 7
Nyctophilus geoffroyi	Lesser Long-eared Bat					**Resident**	Resident	1 4 6
Nyctophilus major tor	Central Long-eared Bat		P3			Resident	Irregular visitor	8
Scotorepens balstoni	Inland Broad-nosed Bat					Resident	Regular visitor	7
Scotorepens greyii	Little Broad-nosed Bat					**Resident**	Regular visitor	6
Vespadelus baverstocki	Inland Forest Bat					**Resident**	Regular visitor	1 4 6
Vespadelus finlaysoni	Finlayson's Cave Bat					Resident	Regular visitor	1 4
MOLOSSIDAE (Freetail bats)								
Ozimops petersi (Listed as Species 3 by Adams et al. (1988))	Inland Freetail-Bat					Resident	Regular visitor	4 7
Austronomus australis	White-striped Freetail-bat					**Regular visitor**	Regular visitor	1 4 6
MURIDAE (Rats and mice)								
Mus musculus	House Mouse				Int	**Resident**	Resident	1 4 6
Notomys mitchellii	Mitchell's Hopping-Mouse					**Resident**	Irregular visitor	1 4 6
Pseudomys hermannsburgensis	Sandy Inland Mouse					**Resident**	Irregular visitor	1 4 6
Rattus rattus	Black Rat				Int	Out of range	Resident	1 4
LEPORIDAE (Rabbits and hares)								
Oryctolagus cuniculus	Rabbit				Int	**Resident**	Resident	1 4 6
CANIDAE (Dogs and foxes)								

Latin Name	English Name	CS1	CS2	CS3	Int	Expected occurrence		Source
						Mine area	Wheatbelt	
Canis lupus dingo	Dingo				Nat	**Resident**	Irregular visitor	6
Vulpes vulpes	Red Fox				Int	**Resident**	Resident	1 4 6
FELIDAE (Cats)								
Felis catus	Cat				Int	**Resident**	Resident	1 4 6
BOVIDAE (Horned ruminants)								
Capra hircus	Goat				Int	**Regular visitor**	Vagrant	1 4 6
TOTAL expected		**-**	**2**	**3**		**29**	**30**	

Appendix 7. Vertebrate species returned from the literature review and database search that have been omitted from the expected species list because they are extinct or considered locally extinct in both project areas.

Status codes: CS1, CS2, CS3 = (summary) levels of conservation significance. See **Error! Reference source not found.** for full explanation.

EPBC Act listings: CR = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory, Mar = Marine (see **Error! Reference source not found.**).

Biodiversity Conservation Act 2016 listings: S1 to S7 = Schedules 1 to 7 (see **Error! Reference source not found.**).

DBCA Priority species: P1 to P4 = Priority 1 to 4 (see **Error! Reference source not found.**).

Int = introduced species.

See Section **Error! Reference source not found.** for explanation of expected occurrence categories.

Sources: 1 = Atlas of Living Australia, 2 = Birdata, 3 = Protected Matters Search Tool, 4 = Naturemap, 5 = DBCA threatened and priority fauna search, 6 = BCE surveys Karara (2004-2020), 7 = previous surveys (IBSA), 8 = general literature

Family	Species Name	Common Name	Status	Expected occurrence	Source
Reptiles					
Pythonidae	*Aspidites ramsayi*	Woma (southwest)	CS2 (P1)	Locally extinct	1 4 5
Birds					
Tytonidae	*Tyto novaehollandiae novaehollandiae*	Masked Owl (southwest)	CS2 (P3)	Locally extinct	1
Strigidae	*Ninox connivens*	Barking Owl (southwest)	CS2 (P3)	Locally extinct	1
Mammals					
Dasyuridae	*Dasyurus geoffroii*	Chuditch	CS1 (V, S3)	Locally extinct	3
	Phascogale tapoatafa wambenger	South-Western Brush-tailed Phascogale	CS1 (S6)	Locally extinct	4 5
Myrmecobiidae	*Myrmecobius fasciatus*	Numbat	CS1 (E, S2)	Locally extinct	4 5
Potoroidae	*Bettongia Lesueur* (mainland sub-species)	Boodie (old warrens)	extinct	Extinct	6
Peramelidae	*Isoodon fusciventer*	Quenda	CS2 (P4)	Locally extinct	8
Thylacomyidae	*Macrotis lagotis*	Bilby	CS1 (V, S3)	Locally extinct	4 5
Tarsipedidae	*Tarsipes rostratus*	Honey Possum		Locally extinct	4
Macropodidae	*Notamacropus irma*	Brush Wallaby	CS2 (P4)	Locally extinct	4 5 6
	Petrogale lateralis	Black-footed Rock-Wallaby	CS1 (E, S2)	Locally extinct	1

Family	Species Name	Common Name	Status	Expected occurrence	Source
Muridae	*Leporillus apicalis*	Lesser Stick-nest Rat (old nests observed)	extinct	Extinct	6
	Notomys longicaudatus		extinct	Extinct	8
	Notomys macrotis		extinct	Extinct	8
	Pseudomys albocinereus	Ash-grey Mouse		Locally extinct	1 4
	Pseudomys bolami	Bolam's Mouse		Locally extinct	1 4
	Rattus fuscipes	Bush Rat		Locally extinct	1 4
Megadermatidae	*Macroderma gigas*	Ghost Bat	CS1 (V, S3)	Locally extinct	5

Appendix 8. Vertebrate species returned from the literature review that have been omitted from the expected species list for both project areas because of habitat or range limitations, possible erroneous records or because they are domesticated species.

Note that some birds could still occur as extremely rare vagrants. Some species listed as 'out of range' are a reflection of taxonomic change.
Status codes: CS1, CS2, CS3 = (summary) levels of conservation significance. See **Error! Reference source not found.** for full explanation.
EPBC Act listings: CR = Critically Endangered, E = Endangered, V = Vulnerable, M = Migratory, Mar = Marine (see **Error! Reference source not found.**).
Biodiversity Conservation Act 2016 listings: S1 to S7 = Schedules 1 to 7 (see **Error! Reference source not found.**).
DBCA Priority species: P1 to P4 = Priority 1 to 4 (see **Error! Reference source not found.**).
Int = introduced species.

Species Name	Common Name	Status	Reason for omitting
FROGS			
Heleioporus eyrie	Moaning Frog		out of range
Heleioporus psammophilus			out of range
Limnodynastes tasmaniensis	Spotted Grass Frog		out of range
Myobatrachu gouldii	Turtle Frog		Out of range
Neobatrachus albipes			out of range
Neobatrachus wilsmorei	Goldfields Bullfrog		out of range
Opisthodon spenceri	Spencer's Frog		out of range
Crinia georgiana	Tschudi's Froglet		out of range
Crinia glauerti	Glauert's Froglet		out of range
Crinia insignfera	Granite Froglet		Out of range
Cyclorana platycephala	Water-holding Frog		out of range
Litoria adelaidensis	Slender Tree Frog		out of range
Litoria caerulea	Green Tree Frog		out of range
Litoria cyclorhyncha	Spotted-thighed Frog		out of range
Litoria moorei	Motorbike Frog		out of range
REPTILES			
Chelodina oblonga	South-West Long-necked Tortoise		No habitat
Chelodina steindachneri	Steindachner's Long-necked Tortoise		No habitat

Species Name	Common Name	Status	Reason for omitting
Diplodactylus mainii			Old taxonomy/out of range
Nephrurus levis			out of range
Diplodactylus nebulosus	Cloudy Stone Gecko		out of range
Diplodactylus ornatus	Ornate Stone Gecko		out of range
Lucasium alboguttatum	White-spotted Ground Gecko		out of range
Lucasium squarrosum			Out of range
Strophurus ciliaris	Northern Spiny-tailed Gecko		out of range
Strophurus strophurus			out of range
Christinus marmoratus	Marbled Gecko		out of range
Hemidactylus frenatus	House Gecko		out of range
Delma grayii	Side-barred Delma		out of range
Delma tincta	Excitable Delma		out of range
Pletholax gracilis	Keeled Legless Lizard		out of range
Pygopus nigriceps	Western Hooded Scaly-foot		out of range
Ctenophorus adelaidensis	Western Heath Dragon		out of range
Ctenophorus maculatus	Spotted Military Dragon		Out of range
Ctenophorus salinarum	Claypan Dragon		No habitat/out of range
Gowidon longirostris	Long-nosed Dragon		out of range
Cryptoblepharus plagiocephalus			out of range
Ctenotus fallens			out of range
Ctenotus leonhardii			out of range
Ctenotus pantherinus			no habitat
Ctnotus severus			Out of range
Cyclodomorphus celatus	Western Slender Blue-tongue		out of range
Egernia inornatta			Old taxonomy
Lerista bipes	North-western Sandslider		out of range
Lerista connivens			out of range

Species Name	Common Name	Status	Reason for omitting
Lerista lineopunctulata	Dotted-line Robust Slider		out of range
Lerista muelleri			out of range
Lerista nichollsi			out of range
Lerista planiventralis	Keeled Slider		out of range
Varanus pilbarensis			out of range
Anilios affinis	Small-headed Blind Snake		out of range
Echiopsis curta			out of range
Neelaps calonotos	black-striped snake, black-striped burrowing snake	CS2 (P3)	out of range
Pseudonaja affinis	Dugite		out of range
Pseudonaja nuchalis	Northern Brown Snake		Out of range
Simoselaps littoralis	West-coast Banded Snake		Out of range
Suta gouldii	Gould's Snake		Out of range
BIRDS			
Anas castanea	Chestnut Teal		no habitat
Anas platyrhynchos	Northern Mallard		Out of range
Biziura lobata	Musk Duck		no habitat
Dendrocygna eytoni	Plumed Whistling-Duck		Out of range
Oxyura australis	Blue-billed Duck	CS2 (P4)	no habitat
Stictonetta naevosa	Freckled Duck		no habitat/out of range
Podiceps cristatus	Great Crested Grebe		Waterbird; no habitat
Geopelia placida (striata)	Peaceful Dove		out of range
Phaps elegans	Brush Bronzewing		out of range
Streptopelia chinensis	Spotted Dove		Out of range
Porphyrio porphyrio	Purple Swamphen		Out of range
Bubulcus ibis	Cattle Egret		Out of range
Egretta garzetta	Little Egret		Out of range
Egretta sacra	Eastern Reef Egret		Out of range

Species Name	Common Name	Status	Reason for omitting
Ixobrychus dubius	Australian Little Bittern	CS2 (P4)	Out of range
Charadrius bicinctus	Double-banded Plover	CS1 (M, S1D2)	out of range
Charadrius veredus	Oriental Plover	CS1 (M, S1D2)	out of range
Rostratula australis	Australian Painted-snipe	CS1 (E, S2)	No habitat
Numenius madagascariensis	Eastern Curlew	CS1 (CR, M, S1)	No habitat
Gelochelidon nilotica	Gull-billed Tern	CS1 (M, S1D2)	Out of range
Larus pacificus	Pacific Gull		No habitat
Thalasseus bergii	Crested Tern	CS1 (M, S1D2)	No habitat
Eurystomus orientalis	Dollarbird		out of range
Todiramphus chloris	Collared Kingfisher		out of range
Pandion haliaetus	Osprey	CS1	No habitat
Falco hypoleucos	Grey Falcon	CS1 (V, S3)	out of range
Falco subniger	Black Falcon		Out of range
Calyptorhynchus banksii naso	Forest Red-tailed Black Cockatoo	CS1 (V, S3)	out of range
Zanda baudinii	Baudin's Black-Cockatoo	CS1 (E, S2)	out of range
Neophema petrophila	Rock Parrot		out of range
Pezoporus occidentalis	Night Parrot	CS1 (E, S1)	out of range/no habitat
Platycercus icterotis	Western Rosella		Out of range
Psephotellus haematonotus	Red-rumped Parrot		out of range
Chlamydera guttata	Western Bowerbird		Out of range
Malurus lamberti	Variegated Fairy-wren		Out of range, old taxonomy
Malurus pulcherrinus	Blue-breasted Fairy-wren		Out of range
Acanthorhynchus superciliosus	Western Spinebill		out of range
Anthochaera chrysoptera	Little Wattlebird		out of range, old taxonomy
Anthochaera lunullata	Western Wattlebird		Out of range
Cwergionyx variegatus	Grey Honeyeater		Out of range
Manorina melanotis	Black-eared Miner	CS1 (E)	out of range

Species Name	Common Name	Status	Reason for omitting
Ptilotula penicillata	White-plumed Honeyeater		out of range
Ptilotula ornata	Yellow-plumed Honeyeater		out of range
Acanthiza inornate	Western Thornbill		out of range
Gerygone olivacea	White-throated Gerygone		out of range
Calamanthus campestris	Rufous Fieldwren		Out of range/old taxonomy
Pomatostomus temporalis	Grey-crowned Babbler		out of range
Cinclosoma castaneothorax	Chestnut-breasted Quail-thrush		out of range
Cinclosoma marginatum	Western Quail-thrush		out of range
Psophodes cristatus	Chirruping Wedgebill		Out of range
Psophodes occidentalis	Chiming Wedgebill		Out of range
Artamus superciolsus	White-browed Woodswallow		Out of range
Rhipidura fuliginosa	New Zealand Fantail		out of range
Petroica boodang	Scarlet Robin		out of range
Quoyornis georgianus	White-breasted Robin		out of range
Acrocephalus stentoreus	Clamorous Reed-Warbler		Out of range
MAMMALS			
Parantechinus apicalis	Dibbler	CS1 (En)	Out of range
Sminthopsis fuliginosus	Grey-bellied Dunnart		out of range
Sminthopsis gilberti	Gilbert's Dunnart		Out of range
Sminthopsis granulipes	White-tailed Dunnart		Out of range
Sminthopsis griseoventer	Grey-bellied Dunnart		Old taxonomy
Pseudocheirus occidentalis	Western Ringtail Possum	CS1 (CrEn; S2D1)	Out of range
Hydromys chrysogaster	Rakali	CS2 (P4)	No suitable habitat
Notomys alexis	Spinifex Hopping-Mouse		out of range
Ozimops kitcheneri	South-western Free-tailed Bat		out of range
Ozimops planiceps			out of range
Vespadelus regulus	Southern Forest Bat		out of range

Species Name	Common Name	Status	Reason for omitting
Equus caballus	Horse	Int	Domestic
Sus scrofa	Pig	Int	Domestic
Bos taurus	Cattle	Int	Domestic
Ovis aries	Sheep	Int	Domestic
Dama dama	Fallow Deer	Int	Domestic

Appendix 9. Annotated species list for Karara mine area.

A. July 2024

1. Emu. Skeleton near vermin fence just south on Mungada Road. Lots of scats around claypans in east of K line (30/06).
2. Grey Teal. Flock of 100 loafing on terapod claypan (2/07).
3. Australian Shelduck. Two on flooded roadside in farmland along Mungada road (3/07).
4. Malleefowl. Recent tracks and active mounds in south-west area and along M line (tracks only) in north-east. Bird crossing Mungarda Road near Blue Hills turnoff (2/07).
5. Wedge-tailed Eagle. One along Mungada Road east of Koolanooka, and one juvenile bird over Koolanooka (3/07).
6. Whistling Kite. One over gatehouse 1 and two seen later in the day over the old shearing shed (8/06). One over north of north-west area (29/06).
7. Brown Falcon. Pair very noisy and aerial in eucalypt woodlands west of wastewater disposal area (29/06). Single bird along Syncline track and M line (2/07).
8. Australian Hobby. Pair near old shearing sheds (27/06).
9. Banded Lapwing. Two at Weelhamby Lake crossing (3/07).
10. Bush Stone-curlew. Tracks in acacia shrubland along K line (30/06).
11. Australian Ringneck. Pairs and small parties throughout. Pairs inspecting hollows in York Gum woodland (29/06) and in YG woodland on 30/06 (K line). Few pairs in O line area (1/07, and both east and west of M line (2/07). Pair in Village (30/06).
12. Mulga Parrot. Group of 4 in south-west (27/06). At least one pair in north-west woodland (29/06). At least two pairs foraging in O line area (1/07).
13. Inland Red-tailed Black-Cockatoo. Flock of about 30 just south of Village and few heard later further south (27/06). On 29/06 in woodland west and north of waste water disposal area, a flock of 49 birds forging in tall shrubs and roosting in tall trees in late morning (Mandy has location). On 30/06, flock of 15 flew over central K line around 1pm; at low rotor-swept height!
14. Major Mitchell's Cockatoo. Two heard over south-west transects (27/06). Seen regularly on 29/06 in woodland and shrubland north of rail line. Maximum count of six. Appeared to be active and noisy amongst tall York Gum with multiple likely breeding hollows to west of aster water disposal area. On 30/06 along central K line, pair apparently nest-searching in York Gum woodland. Pair in O line area on 1/07, and noted as flying at 30-50m.
15. Galah. Pair in grove of large York Gum along transect off vermin fence (28/06). Pair flew across O line area (1/07). Flock of about 10 along Mungarda Road near Blue Hill pit (2/07).
16. Tawny Frogmouth. Two flushed from roosting on a log on the ground in area just east of Karara Road (29/06).
17. Rufous Treecreeper. One heard just east of Karara Road (29/06) in York Gum woodland. Single bird seen and heard in woollybutt woodland just east of the claypan along K line (30/06), and one heard in similar woodland at western end of M line (2/07).
18. Splendid Fairy-wren. Parties occasionally throughout. Conspicuous in shrublands west and north of waste water disposal area, including coloured males (29/06). Also noted, with some coloured males, in K line area (30/06) and O line area (1/07).
19. White-winged Fairy-wren. Party in chenopod shrubland on claypan (30/06).
20. Chestnut-rumped Thornbill. Small parties in acacia tall shrublands throughout. Seemed to favour areas of thickets and less common where tall shrubland rather open, such as amongst York Gum.
21. Inland Thornbill. Seen occasionally in acacia tall shrublands; less common than CrTb.

22. Slaty-backed Thornbill. In acacia tall shrubland west of wastewater disposal area (29/06) and along O line (1/07). Seen close to CrTb and ITb.
23. Yellow-rumped Thornbill. Party in O line area (1/07).
24. Southern Whiteface. Party in far west of south-west transect (27/06). In mixed group of passerines (CrTb and Gy Ftl) in complex landscape of open herbfield, low shrubs, some tall shrubs, acacia and few eucalypts, on loam soil flat. On 29/06, common in open shrublands and some adjacent denser shrublands north of rail line (around waste water disposal area). One party in York Gum woodland, but in an area of scattered shrubs and open ground between York Gums and acacia tall shrubland, and notably where abundant annual herbs germinating. Often in company of other species (thornbills, Redthroat, Splendid Fairy-wren…and three of eight parties had a pair of Red-capped Robins present). Detailed notes and locations of each party below. On 29/06, two parties in acacia open woodland to east of claypan along K line. As elsewhere, acacia thickets and open ground, with low vegetation close to the ground integrated with taller acacias, and birds often foraging on open ground along edge of taller vegetation. On 1/07 (O line area) two parties in Acacia tall shrubland, in area with wide clearings between tall and low shrubs, with extensive herbs and cryptograms over the clearings. On 2/07 (M line and L line area), one party in east (along Syncline Track) and a large party (7 birds?) or possibly two parties neat western end of M line. In 'typical' Whiteface habitat in both areas. On 3/07, party in first borrow pit off Mungada road, and party right on edge of paddocks along Mungada Road. Suitable habitat scattered right along Mungada road until paddocks.
25. Weebill. Few heard in eucalypts in east of M line (2/07).
26. Redthroat. Many calling throughout. Typically in dense thickets of acacia and in shrublands with scattered by dense bushes.
27. Spiny-cheeked Honeyeater. Few calling throughout.
28. Singing Honeyeater. One or two calling in south-west transects (27/06). One heard in Village evening of 27/06. Several heard along transect off vermin fence (28/06). Few heard in north-west area north of the rail line (29/06). Few also in K line (30/06), O line (1/07) and M/L lines (2/07) areas.
29. Brown Honeyeater. One heard in Village evening of 27/06.
30. Yellow-throated Miner. Few calling throughout, including around Village.
31. Grey Shrike-thrush. One calling along south-west transect (27/06) and several along transects visited on 28/06 just to the north. One heard in woodland just west of wastewater disposal area (29/06). Also few heard in K line and O line areas.
32. Western (Golden) Whistler. One heard on margin of claypan in west of K line (30/06), and one heard in east of M line (2/07).
33. Rufous Whistler. One calling in east of M line (2/07).
34. Gilbert's Whistler. One clearly and repeatedly heard, and briefly seen, in acacia thicket in south of O line area (1/07).
35. Crested Bellbird. Few seen and heard throughout.
36. White-browed Babbler. Group heard in shrublands around wastewater disposal area (29/06), and along O line (1/07). Also group in east of M line (2/07).
37. Copper-backed Quail-thrush. Heard (and briefly seen) along K line (30/06) and O line (1/07).
38. Red-capped Robin. Few seen and heard along south-west transect (27/06). Several pairs in open shrubland around wastewater disposal area (29/06). Several pairs also along K line (30/06) and O line (1/07). Also along east and west of M line (2/07). Very little calling heard.

39. Grey Fantail. Several of southern form along south-west transect (27/06) and several in shrublands around wastewater disposal area (29/06). Also in K line (30/06) and O line (1/07) areas.
40. Willie Wagtail. One in chenopod shrubland at western end of K line (30/06).
41. Magpie-lark. One in Village (27/06), 28/06).
42. Tree Martin. Several over Village most of the time. Few also seen near wastewater disposal area (29/06). Loose flock of Gimlet in O line area (1/07). About 10 foraging over terapod claypan (2/07).
43. Welcome Swallow. Several amongst Tree Martins foraging over terapod claypan (2/07).
44. Little Woodswallow. Two in east of M line (2/07).
45. Black-faced Woodswallow. Several over Mungada road in farmland.
46. Australasian Pipit. One along Mungada Road in farmland (3/07).
47. Grey Butcherbird. Several seen and heard throughout.
48. Pied Butcherbird. Heard along K line (30/06) and in O line area (1/07). Also western end of M line (2/07).
49. Australian Magpie. Party in shrublands around wastewater disposal area (29/06), and one seen on claypan along K line (30/06).
50. Grey Currawong. One heard along south-west transect (27/06) and one heard along transects just to the north on 28/06. Heard near the first borrow pit off Mungada Road (3/07).
51. Australian Raven. Few seen and heard throughout.
52. Torresian Crow. Two over transects off vermin fence (28/06).

Echidna. Old and recent foraging holes throughout. Scats in many hollow logs. One found out and foraging in late afternoon just east of Karara Road (29/06). Lots of fresh tracks and foraging holes along K line (30/06) and west of M line (2/07). Tracks along minor drainage line near first borrow pit along Mungada Road (3/07).
Euro. Tracks throughout.
Notomys mitchelli. Burrow systems in areas of loam to sandy loam flats.
Austronomus australis. Detected on UBD outside Barry's room (27/06).
Feral Cat. Fresh tracks along transects off vermin fence (28/06). Fresh and recent tracks along minor drainage line near first borrow pit along Mungada Road (3/07).
Dingo. Fresh tracks along central K line (30/06), along O line (1/07) and both east and west of M line (2/07).

B. Annotated species list greater Karara area, all surveys from 2004 to 2024. Updated July 2024.

February 2004. Detailed survey of locations from Mungada ridge to about 5km west of Karara ridge.

April and October 2006. Detailed survey at Mungada, Blue Hill and Karara.

19-20/08/09. Most time in footprint just west of Karara Ridge; also just north of Mungada Road in this area. Visited skink site along Pine Track.

3-5/09/'09. Searching for *Egernia stokesii badia* and doing general habitat comparison of new runway and camp areas.

2-5/08/11. Checking spider monitoring sites; Karara, Mungada, Blue Hills and Terapod.

17-20 December 2011. Spider surveys at Hinge, Jasper and Spyder; staying at Karara Camp.

10-13 January 2012. Spider and Malleefowl surveys at Shine, staying at Minjar Camp.

19-22 June 2012. Spider monitoring sites at Karara. Mungada, Terapod and Blue Hills North, and checking Johnny's. Staying at Minjar Camp.

19-26 July 2012. Checking exploration areas: Hinge A, Jasper Hill Extension, Brak G, Onga Extended, Minjar Camp, Greater Gap (the southern extension of Shine) and Windanning 1 (A). Also visited Karara Expansion area.

27 September to 3 October 2012. Hinge project area and some offset areas. Staying at Minjar.

7-10 May 2013. Checking spider monitoring sites: Karara, Blue Hills North, Terrapod and Mungada.

17-21/06/13. Spider surveys at Hinge and Gap.

15-19/08/13. Bonneydoon inspection, few hours along Kerrane track and a day at Gap.

28/09 -3/10/13. Visited 28 sites for Minjar Gold from near Gnow's Nest Range in North to Mt Mulgine area in south. This includes Shine, Tom's Kitchen and many other KML sites.

6-11/07/'14. Spider monitoring sites at Karara, Mungada, Terapod and Blue Hills North, Then checked several exploration sites north and south of hinge.

31/08 – 3/09/14. Spiny-tailed Skink monitoring and skink searching around Hinge.

15-17 June 2015. Spider monitoring sites at Karara, Mungada, Terapod and Blue Hills North.

18-20 July 2016. Spider monitoring sites at Karara, Mungada, Terapod and Blue Hills North.

1-3 March 2017. Significant species surveys of exploration areas at Widdin, Jasper Phase 3, Hinge extension and Hippo South.

22-25 July 2018. Spider monitoring: Karara, Blue Hills, Terapod and Mungada. Also brief visit to Hinge.

22-25 July 2019. Spider monitoring: Karara, Blue Hills, Terapod and Mungada.

19-28/06/2020. Two new exploration areas; general fauna and targeted Malleefowl, skinks and spiders.

26/06 to 3/07/24. Inspection of proposed expansion areas that encompass much of the exiting project area from the airport to east of Terapod; also along a section of pipeline in the wheatbelt. Brief return in November 2024.

Litoria rubella
10-13 January 2012. Found around Minjar Camp; calling from drains. Reported from Badga Station (Roger Pitman) and to have arrived in last few years. Note two other frog species, *Neobatrachus ?centralis* and *Pseudophryne occidentlalis* recorded prior to 2009 but not subsequently.

Neobatrachus centralis
2006. One collected and taken to the WA Museum. Taxonomic review makes identity uncertain but initial museum identification was *N. centralis*.

Pseudophryne occidentalis
2006. Adults and tadpoles around pool in gravel pit near Blue Hills.

Diplodactylus granariensis
2006. Several caught and seen while spotlighting.

Diplodactylus pulcher
2006. Caught at several sites.
10-13 January 2012. Found around Minjar Camp.
June 2020. Few under granite in southern exploration area.

Gehyra variegata
2004. Several caught and seen.
17-20 December 2011. Few under corrugated iron at Hinge.
10-13 January 2012. Found around Minjar Camp.

Heteronotia binoei.
2006. Sen and caught.
25-30/06/08. Several under corrugated iron at old mill north of Blue Hills North (26/06).
19-20/08/09. One under long along Mungada Road 2km west of Camp.
17-20 December 2011. Few under corrugated iron at Hinge.
10-13 January 2012. Found around Minjar Camp.
19-26/07/12. Hatchling under rock in Greater Gap.
June 2020. One under granite in southern exploration area.

Hesperoedura reticulata
2006. Found spotlighting on York Gums just to east of Mungada.

Lucasium squarrosum
2006. One caught.
10-13 January 2012. One caught at night at Minjar Camp (12/01).

Rhynchoedura ornata
2006. Several caught and found headtorching.

Underwoodisaurus milii
2006. Several caught and seen while spotlighting.

Delma australis
2004. One caught.

Lialis burtonis
2006. One caught.

Caimanops (Diporiphora) amphiboluroides
2006. Several caught in Acacia shrublands. Seen occasionally on subsequent trips but a very cryptic species.

Ctenophorus reticulatus
14-19/07/08. One active near burrow entrance on a sunny morning and excavated (Along Karara West Track; 17/07). A very plump female.

Ctenophorus nuchalis
10-13/01/12. One seen in Shine area.

Ctenophorus scutulatus.
2006. Caught at several site and seen regularly.
19-20/08/09. Hatchling active south of Karara Ridge.
17-20 December 2011. Adult near Terrapod.
10-13 January 2012. Found around Minjar Camp and Shine. Several hatchlings present.
27/09 – 3/10/12. Many active in Hinge.
31/08 – 3/09/14. Several adults active in Hinge.
1-303/17. Few active in Widdin, Hinge north and Hippos south.

Moloch horridus.
27/09 – 3/10/12. Fresh tracks in sand areas north of main ridge in Hinge.
17-21/06/13. Dead specimen found on the northern slope of Hinge.

Pogona minor.
25-30/06/08. An active adult in the wintry sunshine on Karara ridge (29/06).
10-13 January 2012. One adult in Shine.
19-26/07/12. Year 2 specimen inactive under brush on side of old track in Greater Gap.
16/08/13. One adult (SVL estimated 135) at Bonneydoon in acacia shrubland.

Varanus caudolineatus
2004. Several found in dead trees.

2009. Juvenile found in spider burrow.

Varanus giganteus
10-13/01/12. One on road near Shine.

Varanus panoptes
10-13 January 2012. One adult in Shine. Also around Minjar Camp.
28/08 -3/10/13. One adult roadkill on Warriedar Coppermine road 28/09. Male. Stomach contents: 2 Ctenotus mimetes, 10 bardee grubs, 1 grasshopper and 1 moth.

Varanus gouldii
2004. Juvenile caught.
27/09 – 3/10/12. Few active in sandy areas of Hinge.

Varanus tristis
2006. One seen.

Cryptoblepharus buchananii.
19/20/08/09. One active just west of Karara Ridge.
17-20 December 2011. Few active at Hinge.
27/09 – 3/10/12. Few active in Hinge.
31/08 – 3/09/14. Few active.

Ctenotus mimetes.
10-13 January 2012. Several hatchlings in Shine area.

Ctenotus schomburgkii

2006. Several caught.
10-13 January 2012. Several in Shine area.
16/08/13. Several active at Bonneydoon.

Ctenotus uber
2006. Several caught.

Cyclodomorphus branchialis
2004. One caught in funnel trap on Mungada ridge.
2007. One found under rock on Karara ridge. Note intensive hand-searching in 'typical' *Cyclodomorphus* habitat under brush and in loose soil failed to find the species.

Egernia depressa
2004. Several caught and colony sites found.
19-20/08/09. Scat sites widespread in Acacia, melaleuca and occasionally eucalypts.
17-20 December 2011. Scat sites at Hinge, Jasper and Spyder. Some animals seen.
10-13 January 2012. In dead trees in Shine area.

19-26 July 2012. Colonies in big Melaleuca at Jasper Hills Extension. Colonies in big acacias and eucalypts at Onga Extension.
27/09 – 3/10/12. Colonies in big melaleucas in Hinge.
16/08/13. Bonneydoon.
June 2020. Colonies common in even small acacia logs in southern and northern exploration area. One colony with an E. stokesii colony!

Egernia stokesii badia
14-19/07/08. A desiccated corpse found beneath a large, dead eucalypt at 477 672E, 6 768 511N (18/07/08). Many large eucalypts in this area so presumably a population of this species is present.
19-20/08/09. Colonies found and visited mostly just north of Mungada Road and west of camp.
2-5/08/11. On 4/08, checked four relocation sites along Pine Track. No fresh evidence of skinks at any relocation site, but old scats (several years) found at a location nearly 1km from the nearest relocation site: 50S 465371mE, 6763461mN.
27/09 – 3/10/12. At least one colony in area of large eucalypts on Hinge.
15/08/13. One colony at Bonneydoon but most York Gum woodland badly degraded.
28/09-3/10/13. Several colonies in Target 15 area.
1/08 – 3/09/14. Checked monitoring sites. Animals are active with some recent tracks going from logs to bushes, and one animal caught that had just produced a fresh scat.

Eremiascincus richardsonii
10-13/01/12. One in evening at Minjar Camp.

Lerista gerrardi
2004. One caught.

Lerista timida
2006. Several caught (recorded as L. muelleri).
19-20/08/09. One dug up from loose soil under a log.
10-13 January 2012. One active in Shine area.
19-26/07/12. One in dead leaves around an abandoned Mulga Ant nest in Minjar (Tom's Kitchen).

Liopholis (Fgernia) inornata.
June 2020. One under rock in southern exploration area.

Menetia greyii
2006. Several caught.
2009. One in leaf-litter at Blue Hills.

Morethia butleri
2006. Several caught.

Tiliqua occipitalis
2012. Reported by KML environmental staff north of Blue Hills.

Anilios (Ramphotyphlops) hamatus
2004. One caught.

Anilios (Ramphotyphlops) waitei
10-13 January 2012. Hatchling active at night at Minjar (12/01).

Antaresia childrenii.
25-30/06/08. Old scat in small cave on Blue Hills North (27/06).

Furina ornata.
June 2020. One under rock in southern exploration area.

Parasuta monachus
2006. One caught.
14-19/07/08. Dead but fresh specimen below branch in woodland north-east of Karara (476 417E, 6 773 320N, 16/07).

Pseudechis australis
2006. One caught.
31/08 – 3/09/14. Adult of about 1.5m dead on Mungada Road 15km west of Gate 1 (1/09).

Pseudechis butleri
14-19/07/08. Young specimen seen active west of Karara (14/08).

Pseudonaja mengdeni.
10-13/01/12. Hatchling seen in Shine area.

Pseudonaja modesta.
10-13 January 2012. Hatchling in Shine area.

Rosen's Snake. Reported (and photographed) by staff at Karara Village.

1. **Emu.**
   - 25-30/06/08. Fresh tracks along fenceline from Terapod to north of Blue Hills North (26/06). One heard at Woolley's Hills (29/06).
   - 14-19/07/08. Nest with hatching chicks on Mt Mulgine (18/07).
   - 19-20/08/09. Fresh tracks and tracks of small chicks seen. One adult seen near Old Karara.
   - 1-5/08/'11. One along road near Karara Camp (2/08), two along vermin fence just west of Karara Camp and one near old Karara Homestead (4/08).
   - 17-20/12/11. Several adults and 6 half-grown chicks near goat trap well north of Terrapod.
   - 10-13/01/12. Two at Minjar Camp (12/01).
   - 19-26/07/12. Fresh tracks and scats throughout. Male and 5 near-adult chicks just south of Jasper Hill, and a second male with two half-grown chicks in same area.
   - 27/09 – 3/10/12. Fresh tracks and scats throughout. Male with two small chicks along Rothsay Road.

- 7-10/05/13. Recent scats throughout; full of assorted seeds.
- 17-21/06/13. Two hanging around Karara Village and two seen along Warriedar Copper Mine Road most days.
- 15-19/08/13. Present at Bonneydoon and around Karara Village.
- 28/09-3/10/13. Adult with chicks at Paradise. Tracks elsewhere.
- 6-11/07/14. Fairly recent scats at Brick (10/07).
- 31/08 – 3/09/14. Recent tracks in skink monitoring area 6 and in Hinge.
- 19-28/06/20. Fresh tracks in exploration areas.

2. Malleefowl.

- 25-30/06/08. Not observed.
- 14-19/07/08. One bird flushed on western side of Karara (477065E, 6 771 020N, 17/07). Mounds found during survey included three active with lots of fresh litter.
- 19-20/08/09. Fresh tracks in several locations. Active mound near track heaped in middle but still with raised rim. A long unused, small mound at 476 728E, 6 770 760N. <3m across with a slight depression and rim <0.25m high.
- 17-20/12/11. Very large mound found at Spyder; active in previous 5 years as shell fragments present.
- 10-13/01/12. Several mounds found; one active (still being worked, fresh eggshell and bird attending) and one with grub-scats and litter in it from recent breeding. Adult bird seen several times around active mound on ridge.
- 19-26/07/12. Fresh tracks of male and female in Hinge A and fresh tracks in Windanning A; bird seen in Windanning A. Fresh feathers in Jasper Hill Extension and Greater Gap, single bird also seen at Greater Gap. Bird crossed Minjar haul road (24/07).
- 27/09 – 3/10/12. Active mound in south-west of Hinge and birds reported seen in Hinge. One running along Goongutha Track (28/09).
- 15-19/08/13. Active mound in Mummaloo and fresh tracks and diggings in Bonneydoon. Diggings looked like very large Echidna diggings and scattered over an area of several square metres of bare ground. Possibly targeting termite alates.
- 28/09-3/10/13. A worked but not used mound (Goatsville) and scattered feathers found at some other sites.
- 31/08 – 5/09/14. Recently active mound in Hinge. Had litter piled into it and a weathered litter trail, but perhaps these dated from 2013. Litter layers in side of mound suggest it had been used in 2012 and possibly previously.
- 19-28/06/20. Recent tracks in exploration area south. Two mounds used in recent years, one with a lot of beetle larvae faeces from larvae feeding on plants material in mound. One currently active mound found.

3. Australian Shelduck.

- 25-30/06/08. Two heard over camp (night of 28/06).
- 19-20/08/09. Pair with two half-grown ducklings on lake at Karara/Rothsay road turnoff.
- 3-5/09/09. Pair with 6 newly-hatched chicks on lake at Karara/Rothsay turnoff.
- 19-22/06/12. Two on lakes north of Terapod.
- 19-26/07/12. Two on Minjar Sewage ponds and two on salt lake at intersection of Karara road and Rothsay Road (25/07).
- 15/08/13. Adult with two small chicks on small salt lake about 40km north of Wubin on Great Northern Hwy.
- 22-26 July 2018. Pair roosting beside drain along processing plant access road near big waste dump.
- July 2019. Pair on lakes north of Terapod and pair on pond at Karara mine (both on 24/07).

4. Grey Teal.

- 25-30/06/08.

- 19-20/08/09.
- 3-5/09/09.
- 19-22/06/12. 317 on lakes north of Terapod.
- 19-26/07/12. Two on Minjar Sewage ponds.

5. Australian Wood Duck.

- 25-30/06/08.
- 19-20/08/09.
- 3-5/09/09.
- 19-22/06/12. Twelve on lakes north of Terapod.
- 19-26/07/12. Two on Minjar Sewage ponds.

6. Australasian Little Grebe.

- 28/09 – 3/10/13. Two in Highland Chief pit.
- 15-17/06/15. One in pond at Karara Mine.

7. Hoary-headed Grebe.

- 17-21/06/13. Three in tailings dam at Karara mine.
- 31/08 – 3/09/14. One in tailings dam at Karara Mine.

8. White-faced Heron.

- 19-20/08/09. Two on lake at Karara/Rothsay road turnoff.

9. Straw-necked Ibis.

- 17-21/12/11. Three on ponds near Karara camp.

10. Australian Darter.

- 18-20/07/16. One on tailings dam in processing plant (18/07 and 19/07).

11. Wedge-tailed Eagle.

- 25-30/06/08. Single bird over Skyhook (28/06).
- 14-19/07/08. Single bird over Karara (16/07).
- 19-26/07/12. Pair to west of Greater Gap (21/07) and one over Minjar Camp (23/07).
- Young bird over Minjar pits checking goats (28/09).
- 28/09 – 3/10/13. Several seen.
- 6-11/07/14. One over Karara (7/07).
- 31/08 – 3/09/14. One on dead Euro along Mungada Road just west of Gate 1 (1/09).

12. Little Eagle.

- 25-30/06/08.
- 14-19/07/08.
- 19-26/07/12. Pair over Karara ridge (25/07).

13. Black-breasted Buzzard.

- 2-5/08/11. One over Pine Track skink relocation sites (4/08).
- June 2014. One rescued by enviro staff; weak and in poor condition; sent to rehab.

14. Whistling Kite.

- 28/09 – 3/10/13. One over road near Golden Grove (2/10).

15. Black Kite.

- 16/08/13. One over Bonneydoon.

16. Brown Goshawk.

- 17-20/12/11. Several seen, including one at Exploration Camp.
- 27/09 – 3/10/12. One along Minjar Road (27/09).
- 31/08 – 3/09/14. One over skink monitoring area 6 (1/09).

17. Collared Sparrowhawk.

- 28/09 – 3/102013. Dead male found near Target 15.

18. Brown Falcon.

- 25-30/06/08. Probably seen but not confirmed.
- 14-19/07/08. Group of three doing courtship flights, north-west of Karara (16/07).
- 19-20/08/09. One just south of Karara Ridge.

- 17-21/12/11. Seen around Karara Camp, Exploration Camp and Jasper.
- 10-13 January 2012. One over Shine (11/01).
- 19-26/07/12. Two near turnoff from Rothsay Road to Karara, and one just south of Jasper Hill Extension.
- 27/09 – 3/10/12. One along Minjar Road (27/09) and one along Mulga Track (28/09). Also one over hinge (30/09).
- 7-10/05/13. One over Terrapod mine (9/05).
- 15-19/08/13. Pair at Bonneydoon and pair at Kerrane.
- 28/09 – 3/10/13. Few around Mt Mulgine.
- 6-11/07/14. One near exploration camp (7/07), one near Karara Homestead and one near Karara Village.
- 15-17/06/15. One near Euro Bore.
- 19-28/06/20. One over exploration south area. Pair in north exploration area on 25.06. One caught and killed a Tawny Frogmouth; actual kill not seen but a loud and guttural distress call heard over 100m away, and when I went over to investigate found a Brown Falcon perched a metre above the ground, and a dying frogmouth on the ground below. The falcon flew 20m away and was joined by a second bird, and both watched us intently until we moved away. Within 10 minutes of us leaving, two Little Crows were circling the site and interacting with the falcons.

19. Peregrine Falcon.

- 2008. Pair probably nesting on cliff on east side of Mungada Ridge.
- 2-5/08/11. One bird seen on east side of Mungada Ridge (4/08).
- 7-10/05/13. One foraging over west side of Mungada (8/05).
- July 2019. One seen on east side of Mungada (24/07).

20. Australian Hobby.

- 2-5/08/11. Nest with pair in attendance in large eucalypt retained at Karara Camp near end of E Block.
- 10-13/01/12. One near mine workings near Shine.
- 6-11/07/14. One over Blue Hills North (7/07).

21. Painted Button-quail.

- 25-30/06/08. Foraging platelets on plain to east of Karara Ridge and birds heard in this area (28/06).

22. Little Button-quail.

- 17-20/12/11. Seen regularly around Hinge, Jasper and Spyder.
- 10-13 January 2012. Few seen and many foraging platelets in Shine area.

23. Australian Bustard.

- 27/09 – 3/10/12. One at eastern end of Mulga track near Warriedar Copper Mime road (27/09) and one reported near Karara Camp.

24. Black-tailed Native-hen.

- 19-25/07/12. Group of about 15 along Rothsay Road about 10km west of Karara Road on side of paddock.

25. Banded Lapwing.

- 25-30/06/08. Three on Terapod claypan (28/06).
- 1-6/08/11. Few on plains around Karara Camp.
- 7-10/05/13. Several around Karara Village.
- 6-11/07/14. Heard over Karara Village (10/07).
- 31/08 – 3/09/14. Several around Karara Village and chicks reported.
- 18-20/07/16. Heard near Karara Village (18/07).
- 22-25/07/18. Pair breeding near Karara Village.

26. Red-capped Plover.

- 3-5/09/09. Flock of 50 foraging around shallow pools on claypan at Karara/Rothsay Road intersection on 3/09/09.

27. Bush Stone-curlew.

- 10-13/01/12. Reported (Roger Pitman) to call regularly around Badga Station.

28. Red-tailed Black-Cockatoo.

- 25-30/06/08. Two over Exploration camp on morning of 30/06.
- 14-19/07/08. Two over Exploration camp morning of 16/07.
- 19-20/08/09. Heard just north of Mungada Road.
- 3-5/09/09. Several flocks of 3-4 birds along Karara Road from Rothsay Road on 3/09/09.
- 2-6/08/11. Two over Karara infrastructure area (2/08).
- 17-20/12/11. Two seen daily over Karara Camp and up to 20 at Goat Trap Bore.
- 27/09 – 3/10/12. About 10 near Karara Camp (27/09).
- 7-10/05/13. Small flock near Karara Village (9/05).
- 17-21/06/13. Two over Hinge (19/06) and two near Bugeye Mine (2/06).
- 15-19/08/13. Single bird over Gate 1 (17/08) and group of about 4 near Karara Village (17/08).
- 28/09 – 3/10/13. Small flocks seen occasionally along Minjar haul road.
- 6-11/07/14. Group of about 12 roosting along Mungada Road about 15km west of gate 1 (6/07).
- 31/08-3/09/14. About 10 drinking from a roadside puddle on Mungada Road 20km west of gate 1 (31/08). About 20 birds flew over Karara camp around sunset, going south (31/08). Up to 30 feeding on roadside near Gate 1 daily and pairs and small flocks seen regularly throughout.
- 22-25/07/18. Pairs and small flocks near the village.
- July 2019. Few heard near village most days; eight flew over Village on 24/07.
- June 2020. Pair over exploration area south (27/06).

29. Major Mitchell's Cockatoo.

- 25-30/06/08. Flock in distance south of Mt Karara (26/06) and pairs seen at Mungada and Karara (28/06). Three pairs apparently gathering to roost in groves of large eucalypts at north end of Karara. Potential nesting area ? (29/06).
- 14-19/07/08. Four near Karara shearing sheds (18/07) and pair amongst large eucalypts south of Karara (19/07).
- 19-20/08/09. Nil.
- 3-5/09/09. Several seen along Rothsay Road and at Rothsay/Karara Road on 3/09/09.
- 17-20/12/11. Two seen over Karara Camp and two at Goat Trap Bore. One bird with possible beak and feather disease caught at Jasper. Taken to carer and recovered; thought to have been mauled by a raven!
- 10-13/01/12. Nil.
- 19-22/06/12. Two along Syncline Track (20/06).
- 27/09 – 3/10/12. One near Mungada along Mulga Track and several near Rothsay. One bird in SW of Hinge (28/09). One bird on northern section of Mulga track near Hinge (29/09).
- 7-10/05/13. Three flying across Mungada Road near Blue Hills North (7/05); heard at Mungada (8/05) and at least one feeding on ground in weedy area beside Karara Village (9/05).
- 15-19/08/13. Pair at Bonneydoon (16/09) and pair along Mulga Track near Euro Bore (17/09).
- 28/09 – 3/10/13. Single bird feeding in Desert poplar on side of Minjar Haul Road near Warriedar Airstrip (29/09).
- 6-11/07/14. Pair along Mungada Road west of gate 1 (6/07), and pair in south of Village tenement (9/07).

- 31/08 – 3/09/14. About 6 birds foraging close to Mungada Road just west of Gate 1 (1/09). Pairs seen and/or heard elsewhere, including Hinge and Skink Monitoring Cell 6.
- 19-28/06/20. Pair in exploration area south (20/06). Pair in exploration area north (25/06) seen twice in old tree with many hollows. Single bird seen in north rea on 26/06. Flock of about 15 in roadside trees in paddocks c. 10km west of Kadji Kadji Reserve (27/06).

30. Galah.

- 25-30/06/08. Two pairs flying along Karara Ridge (29/08).
- 14-19/07/08. Few around Karara shearing shed and mills most days. Pair amongst large eucalypts south of Karara (19/07).
- 19-20/08/09. Several in woodland.
- 3-5/09/09. Few seen in woodland areas.
- 2-5/08/11. About 100 feeding in open ground near Karara Camp (4/08).
- 17-20/12/11. About 100, including dependent young, around Karara Camp.
- 10-13/01/12. Seven over Shine area (13/01).
- 19-27/07/12. About 15 feeding quietly on ground in Great Gap (21/07).
- 27/09 – 3/10/12. Small flocks throughout.
- 15-19/08/13. Small flocks around Bonneydoon.
- 28/09 – 3/10/13. Small flocks throughout.
- 6-11/07/14. Pair in south of Village tenement (9/07).
- 31/08 – 3/09/14. Pairs occasionally throughout and about 30 foraging in Skink Monitoring Area 6 (1/09).
- 17-20/07/16. Heard around Village, Karara Ridge and Mungada.
- 1-3/03/17. Few in Widdin area.
- July 2019. Few pairs in woodland.
- June 2020. Few pairs in southern exploration area.

31. Cocketiel.

- 17-20/12/11. One flew over airport (20/12).
- 26/09 – 3/10/12. Few heard over Hinge (29/09).
- 17-21/06/13. Flock of five over Rothsay Road about 5km east of Perenjori (17/06).

32. Australian Ringneck.

- 25-30/06/08. Two south-west of Mt Karara (26/06) and two at Woolley's Hills (28/06). One at Terapod (29/06).
- 14-19/07/08. Seen regularly around Karara and mills in area of Karara shearing shed.
- 19-20/08/09. Occasionally in woodland; mostly pairs.
- 2-6/08/11. Few flocks in woodland.
- 17-20/12/11. Pairs and slightly larger groups seen regularly, including Karara Camp and Goat Trap Bore.
- 10-13/01/12. Few in Shine area.
- 19-22/06/12. Pairs occasionally throughout.
- 19-26/07/12. Pairs in Hinge A, Jasper Hill Extension and occasionally elsewhere.
- 27/09 – 3/10/12. Small numbers especially along Minjar road. Also in Hinge.
- 7-10/05/13. Pairs occasionally throughout.
- 17-21/06/13. Pairs occasionally throughout.
- 15-19/08/13. Pairs around Bonneydoon and throughout Karara area.
- 28/09 – 3/10/13. Pairs and small flocks occasionally throughout.
- 6-11/07/14. Pairs and small flocks occasionally throughout.
- 31/08 – 3/09/14. Pairs and small flocks occasionally throughout. Partly feathered and recently-deceased chick at Skink Monitoring Cell 5 (2/09).
- 15-17/06/15. Few calling around all sites.
- 18-20/07/16. Few around Karara Ridge and pair at Karara Village (18/07).
- 1-3/03/17. Small group in Karara Village feeding around grevilleas.

- July 2019. Few pairs in woodland; courting in some eucalypts. Several in Village on tables in Wet Mess!
- June 2020. Few pairs throughout including at village.

33. Mulga Parrot.

- 25-30/06/08. Flock of 11 feeding on bare ground around large pools that have formed on the Terapod Claypan after rain (28/06).
- 14-19/07/08. Two at site proposed for new accommodation camp (19/07).
- 17-20/12/11. Up to 100 each morning at Goat Trap Bore.
- 10-13 January 2012. Flocks coming to drink near tanks at Minjar Camp and pairs and small groups in Shine area.
- 19-22/06/12. Not observed.
- 19-26/07/12. Pairs and small flocks in Hinge A, Jasper Hill Extension and occasionally elsewhere.
- 27/09 – 3/10/12. Small numbers mostly around Minjar but also few in Hinge.
- 17-21/06/13. Pair along track just east of Terapod (19/06) and several in Gap project area.
- 15-19/08/13. Small numbers around Bonneydoon.
- 28/09 – 3/10/13. Few pairs in north around Gnow's Nest and Monte Christo (2/10).
- 31/08 – 3/09/14. Few heard in Skink Monitoring Cell 5 and at Hinge.
- 15-17/06/15. Pair near Euro Bore.
- 18-20/07/16. Some heard on east side of Mungada.
- 22-25/07/18. Pairs occasionally throughout.
- July 2019. One pair on east side on Mungada.
- June 2020. Pair heard in southern exploration area.

34. Bourke's Parrot.

- 17-20/12/11. Four amongst Mulga Parrots at Goat Trap Bore.
- 27/09 – 3/10/12. Few flew across haul road just south of Minjar (28/09).

35. Budgerigar.

- 17-20/12/11. Several over Hinge on 19/12.
- 10-13 January 2012. Flying over Shine (11/01).

36. Regent Parrot

- 14-19/07/08. Flock of 7 on eastern side of Karara (17/07).
- 19-20/08/09. Flocks of up to 5 birds feeding in flowering eremophila; probably several such flocks in area.
- 19-25/07/12. One over Windanning A (24/07).
- 15-19/08/13. Flocks of up to 10 birds regularly over and in Bonneydoon.
- 31/08 – 3/09/14. Few pairs over Skink Monitoring Area 6 (1/09).
- 15-17/06/15. Pair near southern end of Karara ridge.

37. Common Bronzewing.

- 19-20/08/09. Two seen along Mungada Road near camp.
- 2-5/08/11. One at Pine Track skink relocation area (4/08).
- 17-20/12/11. Single birds seen regularly throughout.
- 10-13 January 2012. One on track driving back from Shine (11/01) ad seen regularly in Shine area during Malleefowl searches.
- 19-22 June 2012. Seen occasionally on road between Shine and Syncline Track in evenings.
- 19-26/07/12. Seen occasionally on road south of Minjar and in most exploration areas.
- 27/09 – 3/10/12. Few on road south of Minjar daily.
- 7-10/05/13. One near Terrapod (9/05).
- 15-19/08/13. One in Bonneydoon (16/08).
- 28/09 – 3/10/13. Few birds in evening crossing haul road and one dead under a fence near mill on way to Paradise (1/10).
- 6-11/07/14. One heard at Blue Hills North (8/07).

- 31/08 – 3/09/14. Few occasionally along Mungada road. One in Skink Monitoring Cell 2 (3/09).
- 15-17/06/15. One along Mulga Track.
- 18-20/07/16. Heard and seen occasionally throughout.
- 1-3/03/17. Several seen in Widdin and one nest with two fresh eggs.
- 22-25/07/18. Heard on east side of Karara ridge.
- July 2019. Several heard on east side of Karara ridge.
- 19-28/06/20. Few in exploration areas.

38. Diamond Dove.

- 17-20/12/11. Up to 10 birds at Goat Trap Bore each morning.
- 10-13/01/12. Few near Minjar Camp (12/01).

39. Crested Pigeon.

- 19-20/08/09. Two near intersection of Karara and Rothsay Roads.
- 2-5/08/11. Two near Pine Track skink relocation area (4/08).
- 27/09 – 3/10/12. Few along Minjar Haul Road daily.
- 15-19/08/13. Two in Bonneydoon.
- 28/09 – 3/10/13. Few along road near Gnow's Nest.
- 1-3/03/17. One near Sinsosteel mine.

40. Pallid Cuckoo.

- 19-20/08/09. Several calling in woodland.
- 2-6/08/11. Calling in woodland at Karara and Mungada.
- 6-11/07/14. Calling throughout; Karara, Blue Hills North and Mungada.

41. Fan-tailed Cuckoo.

- 6-11/07/14. Few calling throughout.

42. Black-eared Cuckoo.

- 2006. Several recorded.
- 25-30/06/08. One calling at Woolley's Hills (27/06, 28/06), and one calling at Karara (28/06).
- 14-19/07/08. Heard most days around Karara.
- 19-20/08/09. Several calling in woodland.
- 2-5/08/11. One calling on east side of Mungada Ridge (4/08).
- 19-26/07/12. One seen in Greater Gap (22/07); not heard. One seen and heard in Windanning 1 (23/07).
- 7-10/05/13. One heard Blue Hills North (8/05).
- 15-19/08/13. Several calling in Bonneydoon and at Gap.
- 28/09 – 3/10/13. Heard occasionally in Mt Mulgine area.
- 6-11/07/14. Calling regularly Karara, Blue Hills North and Mungada.
- 31/08 – 3/09/14. One seen in Skink Monitoring Cell 5 (2/09).
- 1-3/03/17. Heard in Hinge North.
- 22-25/07/18. Calling at Blue Hills and Mungada. Appeared to be a duet of one very low and one slightly higher pitched bird on both occasions.

43. Horsfield's Bronze-Cuckoo.

- 25-30/06/08. One calling at Blue Hills North (27/06) and one at Woolley's Hills (28/06).
- 19-20/08/09. Several calling in woodland.
- 2-6/08/11. Calling in woodland at Karara and Mungada.
- 19-26/07/12. Heard in Onga Extension and Greater Gap.
- 15-19/08/13. Several calling in Bonneydoon.
- 6-11/07/14. Few calling Karara, Blue Hills North and Mungada. One calling in south of Village tenement.
- 31/08 – 3/09/14. One heard briefly in Hinge (2/09).
- 18-20/07/16. One calling at Mungada.

44. Red-backed Kingfisher.

- 17-20/12/11. Two (one immature) amongst large York Gums at Jasper.

45. Sacred Kingfisher.

- 28/09 – 3/10/13. One in open eucalypt woodland at Target 26 (1/10).

46. Eastern Barn Owl.

- 31/08 – 3/09/14. Remains in Karara Village carpark.

47. Tawny Frogmouth.

- 14-19/07/08. Two flushed from eucalypt on eastern side of Karara (16/07).
- 19-26/07/12. Two flushed in Brak G, one flushed in Greater Gap and one flushed in Windanning A.
- 28/09 – 3/10/13. Feather found in Goatsville (29/09).
- 19-28/06/20. Three flushed in exploration area south (a pair and separately a single bird) on 20/06, and presumably a separate pair on 24/06. A pair also flushed in northern exploration area. One killed by Brown Falcon in north (see Brown Falcon text).

48. Owlet Nightjar.

- 19-20/08/09. One in hollow branch of fallen eucalypt; about 1.5m above the ground, just west of Karara Ridge.
- 17-20/12/11. One heard at Hinge.
- 18-7/16. One heard at Mungada and one flushed from tree hollow at Blue Hills (19/07).
- 1-3/03/17. One heard in Widdin area.
- 22-25/07/18. One heard at Blue Hills.

49. Spotted Nightjar.

- 10-13/01/12. Two roosting in heath on lower slope on Shine (11/01).
- 19-26/07/12. One roosting in Onga Extension.
- 15-19/08/13. One roosting in Bonneydoon (16/08).
- 28/09 – 3/10/13. Birds feeding around Minjar offices and camp most evenings, and bird on nest (one egg) at Goblin (2/10).
- June 2020. One flushed in northern exploration area (23/06).

50. Rufous Treecreeper.

- 14-19/07/08. One at proposed accommodation site between Karara and Mungada (19/07).
- 19-20/08/09. Several at Pine Track site.
- 15-19/08/13. Several in York Gum woodland at Bonneydoon.
- 31/08 – 3/09/14. Several in Skink Monitoring area 6 (which is down Pine Track), and in Cell 2.
- 1-3/03/17. Several heard in Widdin area.

51. White-browed Treecreeper.

- 27/09 – 3/10/12. Small group in Mulga-like acacias in Hinge (29/09).
- June 2020. Two birds in north exploration area feeding quietly amongst Mulga (25/06).

52. Splendid Fairy-wren.

- 25-30/06/08. Woolley's Hills and Blue Hills North, with coloured male at Blue Hills (27/06). Female seen at Gully (28/06).
- 14-19/07/08. Occasional groups encountered around Karara. Group present around camp.
- 19-20/08/09. Several groups in shrublands.
- 2-6/08/11. Several groups around Karara and Mungada.
- 17-20/12/11. Groups at Hinge, Jasper and Spyder.
- 10-13/01/12. Several parties at Shine.
- 19-22 June 2012. Heard along eastern side of Karara.
- 19-26/07/12. Several parties in Jasper Hill Extension; male in courtship pursuit of female. Also parties in Brak G, Onga Extension, Greater Gap, Minjar (Tom's Kitchen), Windanning 1 and Karara expansion. Coloured males seen.
- 27/09 – 3/10/12. Parties in Hinge area.
- 7-10/05/13. Few parties along lower slopes of Karara (east).
- 15-19/08/13. Several parties in Bonneydoon, along Kerrane track and at Gap.

- 28/09 – 3/10/13. Parties with coloured males throughout Minjar site.
- 6-11/07/14. Parties at Karara, Blue Hills North and Terapod. Also at Blue Hills North Extension, Tile, Brick and Spyder Stage 2. Coloured male in Terapod.
- 31/08 – 5/09/14. Several parties in Hinge.
- 15-17/06/15. Party with coloured males along Mulga track.
- 18-20/07/16. Parties around Mungada.
- 1-3/03/17. Heard in Hippo South.
- 23-27/07/18. Heard in Hinge. Nest with chicks in low bush at Blue Hills.
- July 2019. Heard along Karara east.
- 19-28/06/20. Parties in exploration areas south and north; no full colour males observed.

53. Variegated Fairy-wren.

- 14-19/07/08. Group, including coloured male, at Karara (17/07).
- 18-20/07/16. Group, including coloured male, in eastern flank of Karara (18/07).

54. White-winged Fairy-wren.

- 2-5/08/11. Several groups calling from low shrubland around Karara Camp.
- 17-20/12/11. Present in low shrubland around Karara Camp.
- 15-19/08/13. Present in low shrubland around Karara Camp.
- 1-3/03/17. Present in low shrubland around Karara Camp.

55. Striated Pardalote.

- 14-19/07/08. Few heard along Karara in eucalypt areas.
- 19-20/08/09. Few calling amongst eucalypts.
- 2-5/08/11. Heard amongst eucalypts at Pine Track skink relocation site (4/08).
- 17-20/12/11. Heard amongst eucalypts at Jasper.
- 19-26/07/12. Heard amongst eucalypts throughout.
- 28/09 – 3/10/13. Few heard amongst eucalypts in Mt Mulgine area.
- 6-11/07/14. One calling in eucalypt woodland in south of Village tenement.
- 31/08 – 3/09/14. Heard amongst eucalypts throughout.
- 1-3/03/17. Heard in Widdin area.
- 22-26/07/18. Heard at Mungada.
- July 2019. Heard at Blue Hills.
- June 2020. Heard in northern exploration area.

56. Spotted Pardalote.

- 19-26/07/12. Heard but not seen at Windanning A; has to be assumed unconfirmed.

57. Redthroat.

- 25-30/06/08. Heard all sites.
- 14-19/07/08. Heard throughout lower slopes of Karara.
- 19-20/08/09. Calling from shrublands regularly.
- 2-6/08/11. Heard throughout. Very vocal!
- 17-20/12/11. Heard throughout. Very vocal.
- 10-13/01/12. Heard throughout Shine.
- 19-22 June 2012. Heard all sites; very vocal!
- 19-26/07/12. Heard all sites; very vocal at Jasper Hill Extension and in parts of Greater Gap.
- 2709 – 3/10/12. Few calling in Hinge area.
- 7-10/05/13. Heard throughout; very vocal following rain.
- 17-21/06/13. Few calling around Hinge and Gap.
- 15-19/08/13. Heard Bonneydoon, Kerrane and Gap.
- 28/09 – 3/10/13. Heard at most sites.
- 6-11/07/14. Calling throughout.
- 31/08 – 3/09/14. Few calling in Hinge.
- 15-17/06/15. Few calling all sites.
- 17-20/07/16. Calling throughout.

- 1-3/03/17. Calling throughout.
- 22-25/07/18. Calling throughout.
- July 2019. Calling throughout; very vocal.
- 19-28/06/20. Calling throughout; very vocal.

58. Chestnut-rumped Thornbill.

- 25-30/06/08. Party feeding around Woolley's Hills (26/06, 27/06).
- 14-19/07/08. Seen regularly around Karara, including camp.
- 19-20/08/09. Many groups in shrublands.
- 2-6/08/11. Many groups in shrublands.
- 17-20/12/11. Small groups throughout.
- 10-13/01/12. Small groups throughout Shine
- 19-22 June 2012. Small groups throughout.
- 19-26 July 2012. Small groups throughout.
- 27/09 – 3/10/12. Small groups throughout. Some dark-eyed birds presumably juveniles.
- 7-10/05/13. Small groups throughout.
- 15-19/08/13. Parties in Bonneydoon and Kerrane.
- 28/09 – 3/10/13. Parties at most sites.
- 6-11/07/14. Small groups throughout.
- 6-11/07/14. Small groups throughout.
- 31/08 – 3/09/14. Small groups throughout.
- 15-17/06/15. Small groups throughout.
- 18-20/07/16. Small groups throughout.
- 1-3/03/17. Small group throughout, including Widdin and Hinge North.
- 23-27/07/18. Heard around Mungada.
- 19-28/06/20. Very vocal and active in both exploration areas.

59. Inland Thornbill.

- 25-30/06/08. Party at Karara near spider quadrat 5.4 (28/06).
- 14-19/07/08. One group seen on lower slope of Karara (17/08).
- 17-20/12/11. Small groups throughout.
- 19-22 June 2012. Not observed.
- 19-26 July 2012. Small groups throughout.
- 27/09 – 3/10/12. Small groups throughout. Adult with two dependent young seen in Hinge.
- 7-10/05/13. At Mungada; imitating Horsfield's Bronze-Cuckoo.
- 17-21/06/13. Few around Hinge and Gap.
- 15-19/08/13. Parties in Kerane area (17/08).
- 28/09 – 3/10/13. Party at Allegro site (only site of 24 visited).
- 6-11/07/14. Few at Tile area (10/07).
- 31/08 – 3/09/14. Several parties in Hinge.
- 22-25/07/18. Few calling around Blue Hills.
- June 2020. Small numbers in both exploration areas.

60. Yellow-rumped Thornbill.

- 25-30/06/08. Not observed.
- 14-19/07/08. Not observed.
- 17-20/12/11. Not observed.
- 19-22 June 2012. Not observed.
- 19-26 July 2012. Small group in Hinge A (20/07) and in Karara expansion area.
- 15-19/08/13. Party in Bonneydoon.
- 28/09 – 3/10/13. Few parties in Mt Mulgine area.
- 6-11/07/14. Party in south of Village tenement.
- 31/08 – 3/09/14. Party in Skink Monitoring Area 6 (1/09) and party at Hinge (2/09).
- June 2020. Two parties seen in four days in north exploration area.

61. Slaty-backed Thornbill.

- 10-13/01/12. One party seen in Wanjarri country in SW corner of Shine area.
- 31/08 – 3/09/14. One party in south-east corner of Hinge (2/09).

62. Southern Whiteface.

- 10-13/01/12.
- 19-26/07/12. One in clearing around bore in Minjar (Tom's Kitchen) and few seen in Karara Expansion area.
- 28/09 – 3/10/13. Seen at a few sites: Paradise and Target 26.
- 6-11/07/14. On edge of rehabilitated track at Terapod (9/07).
- 1-3/03/17. Pair in Widdin along drainage line.
- June 2020. Several parties in acacia shrubland in both exploration areas.

63. Weebill.

- 25-30/06/08. Around camp and along Karara ridge most days.
- 14-19/07/08. Daily around camp and Karara.
- 19-20/08/09. Amongst eucalypts throughout.
- 2-6/08/11. Amongst eucalypts throughout.
- 17-20/12/11. Amongst eucalypts throughout.
- 10-13/01/12. Few in Mulga in Shine area.
- 19-22 June 2012. Not observed.
- 19-26 July 2012. Amongst eucalypts throughout.
- 27/09 – 3/10/12. Amongst eucalypts throughout.
- 17-21/06/13. Amongst eucalypts throughout.
- 15-19/08/13. Abundant in eucalypts at Bonneydoon.
- 28/09 – 3/10/13. Amongst eucalypts throughout.
- 6-11/07/14. Amongst eucalypts throughout.
- 31/08 – 3/09/14. Amongst eucalypts throughout.
- 15-17/06/15. Amongst eucalypts throughout.
- 18-20/07/16. Amongst eucalypts throughout.
- 1-3/03/17. Amongst eucalypts throughout.
- 22-26/07/18. Amongst eucalypts throughout.
- July 2019. Amongst eucalypts throughout.
- 19-28/06/20. Amongst eucalypts throughout

64. Western Gerygone.

- 25-30/06/08. Not observed.
- 14-19/07/08. Several heard along Karara.
- 19-20/08/09. Few calling from amongst eucalypts north of Mungada Road.
- 6-11/07/14. One feeding in acacia at Terapod (9/07).
- 31/08 – 3/09/14. One heard in Skink Monitoring Cell 2 (3/09).

65. Red Wattlebird.

- 25-30/06/08. One calling at Woolley's Hills (28/06).
- 19-20/08/09. Few heard and seen in woodlands.
- 3-5/09/09. Several in woodland areas.

66. Spiny-cheeked Honeyeater.

- 25-30/06/08. Heard at Woolley's Hill (26/06).
- 14-19/07/08. Heard occasionally around Karara and also at Karara shearing sheds.
- 19-20/08/09. Heard and seen throughout.
- 2-5/08/11. Heard around Karara and Mungada.
- 17-20/12/11. Few around Goat Trap Bore.
- 10-13/01/12. Few seen in Shine area.
- 19-22 June 2012. Heard around Karara and Mungada.
- 19-26/07/12. Seen and heard throughout.

- 27/09 – 3/10/12. Seen and heard throughout.
- 7-10/05/13. Few around Mungada.
- 17-21/06/13. Few calling around Hinge and Gap.
- 15-19/08/13. Common in Bonneydoon.
- 28/09 – 3/10/13. Common throughout.
- 6-11/07/14. Common throughout.
- 31/08 - 3/09/14. Common throughout.
- 15-17/06/15. Common throughout.
- 18-20/07/16. Common throughout.
- 1-3/03/17. Heard in Widdin area.
- 22-26/07/18. Common throughout.
- July 2019. Common throughout.
- 19-28/06/20. Seen and heard very occasionally in both exploration area.

67. Yellow-throated Miner

- 19-20/08/09. Heard and seen throughout.
- 2-5/08/11. Heard at Pine Track skink relocation site (4/08).
- 17-20/12/11. Around Karara Camp and at Jasper.
- 10-13/01/12. Not observed.
- 19-22 June 2012. Not observed.
- 19-26/07/12. Party in Jasper Hill Extension and in Karara expansion area.
- 27/09 – 3/10/12. Party near Karara camp and party in Hinge.
- 7-10/05/13. Seen and heard at Mungada and near Exploration Camp.
- 15-19/08/13. Heard in Bonneydoon and at Kerrane.
- 28/09 – 3/10/13. Present at a few sites in Mt Mulgine area.
- 6-11/07/14. Party at Karara Village and at Terapod.
- 31/08 – 3/09/14. Seen occasionally throughout.
- 15-17/06/15. Party at Karara Village.
- 18-20/07/16. Party at Karara Village feeding on eremophila.
- 1-3/03/17. Party at Karara Village feeding on eremophila.
- 22-26/07/18. Occasionally throughout; conspicuous around camp.
- July 2019. Few around village.
- 19-28/06/20. Few around village and in exploration area south.

68. Singing Honeyeater.

- 25-30/06/08. Heard at Blue Hills North and Karara South regularly.
- 14-19/07/08. Daily along Karara.
- 19-20/08/09. Heard only once, in woodland north of Mungada Road.
- 2-5/08/11. Calling around Exploration camp in mornings and one heard on east side of Mungada (4/08).
- 17-20/12/11. Heard occasionally throughout.
- 10-13/01/12. Two seen in Shine area (12/01).
- 19-22 June 2012. Heard around Karara and Mungada.
- 19-26/07/12. Seen and heard throughout.
- 27/09 – 3/10/12. Seen and heard in small numbers throughout.
- 7-10/05/13. At Mungada and a few around Karara Village.
- 17-21/06/13. Few around Hinge and Gap.
- 15-19/08/13. Heard at Bonneydoon.
- 28/09 – 3/10/13. Small numbers at most Minjar sites.
- 6-11/07/14. Small numbers throughout.
- 31/08 – 3/09/14. Heard once in Skink Monitoring Cell 6 and at Hinge.
- 15-17/06/15. Heard occasionally throughout.
- 18-20 06/16. Heard occasionally throughout.

- 1-3/03/17. Few heard in Widdin and Hinge North areas.
- 22-26/07/18. Seen and heard occasionally.
- July 2019. Common throughout.
- 19-28/06/20. Few in both exploration areas.

69. Brown Honeyeater.

- 25-30/06/08. Heard at Blue Hills North (27/06), Karara (28/06).
- 14-19/07/08. Few around Karara shearing sheds in Pepper Trees.
- 19-20/08/09. Localised calling and activity around flowering eremophila.
- 2-5/08/11. Few heard throughout.
- 19-25/07/12. Many calling from a small location within Karara Expanson area; lot of York Gum over acacia.
- 6-11/07/14. Few at Terapod.
- 31/08 – 3/09/14. Few calling in Skink Monitoring Area 6 (1/09).
- 18-20/07/16. Abundant in a few locations.
- 23-27/07/18. Few heard in scattered locations.
- July 2019. Several calling amongst flowering eucalypts near lake north of Terapod.

70. Brown-headed Honeyeater.

- 25-30/06/08. Party at Gully (28/06).
- 14-19/07/08. Party in woodland west of Karara (18/08).
- 19-20/08/09. Party north of Mungada Road.
- 19-26/07/12. Party in Hinge A (20/07), Windanning A (24/07) and Karara expansion area (25/07).
- 17-21/06/13. Party in Hinge.
- 15-19/08/13. Party in Bonneydoon.
- 28/09 – 3/10/13. Party at Target 6 site.
- 23-27/07/18. Parties at Karara and Mungada.
- July 2019. Party along Mungada ridge.
- June 2020. Party in north exploration area.

71. White-fronted Honeyeater.

- 25-30/06/08. One heard at Karara along spider transect 6 (28/06), and two in same area on 29/06.
- 14-19/07/08. Heard and seen daily around Karara, particularly amongst low grevillea flowering near granites to south-west.
- 19-20/08/09. Calling throughout.
- 2-5/08/11. Not observed.
- 17-20/12/11. Not observed.
- 10-13/01/12. Not observed.
- 19-22 June 2012. Few around Karara and Mungada.
- 19-26/07/12. Common throughout although noticeably less abundant in Minjar (Tom's Kitchen) than elsewhere.
- 27/09 – 3/10/12. Heard along east-west section of Mulga Track (27/09) and few in Hinge. Pair with dependent young in Hinge.
- 7-10/05/13. Few heard around Mungada and Terrapod.
- 17-21/06/13. Few around Hinge and Gap.
- 15-19/08/13. Few around Bonneydoon.
- 28/09 – 3/10/13. Heard at Sprite (only one of 24 sites visited).
- 6-11/07/14. Common at Karara, blue Hills North, Mungada and Terapod, but not in Village tenement. Also at Blue Hills North Extension, Tile, Brick and Spyder Stage 2.
- 31/08 – 3/09/14. Few calling in Skink Monitoring Area 6 (1/09) and in Cell 2 (3/09).
- 15-17/06/15. Calling in moderate numbers all sites.
- 18-20/07/16. Common and calling throughout.

- 1-3/03/17. Few heard in Widdin area.
- 23-27/07/18. Common and calling throughout.
- July 2019. Very common and calling throughout; the most abundant bird.
- June 2020. Very scarce; heard once in south exploration area. Exception; on 25/06 in north exploration area a loose flock of bout 30 birds heading ENE. Only one or two birds seen at once and no calling; most birds did not stop. Probably part of a much more extensive mass movement.

72. White-eared Honeyeater.

- 25-30/06/08. One near camp (30/06).
- 19-20/08/09. One heard north of Mungada Road.

73. Pied Honeyeater.

- 19-20/08/09. Seen and heard throughout. Males calling strongly and sometimes seen on top-most dead branches of eucalypts. Around Karara, north of Mungada Road and at Pine Track.
- 3-5/09/09. Several heard near Rothsay/Karara Road intersection on 3/09.
- 6-11/07/14. Seen and heard throughout with males calling from high perches.

74. Black Honeyeater.

- 19-26/07/12. Pairs seen several times, including adult males, at Greater Gap. Also at intersection of Karara and Rothsay Roads.

75. Willie Wagtail.

- 25-30/06/08. One near mill north of Blue Hills North (26/06) and one at Karara (29/06).
- 14-19/07/08. One around camp daily.
- 19-20/08/09. Along Pine Track.
- 17-20/12/11. Several around Exploration Camp.
- 19-26/07/12. One along haul road just south of Minjar (23/07).
- 27/09 – 3/10/12. One in west of Hinge (29/09).
- 7-10/05/13. Single birds at Mungada, Terrapod and Karara Village.
- 17-21/06/13. One seen at Hinge.
- 15-19/08/13. One around Bonneydoon.
- 28/09 – 3/10/13. Pair around Minjar offices and pair at Monte Christo.
- 6-11/07/14. Pair at Blue Hills North, Terapod and in south of Village tenement.
- 31/08 – 3/09/14. Heard in Skink Monitoring Area 6 (1/09).
- 15-17/06/15. One near southern end of Mungada Ridge.
- 18-20/07/16. Few pairs present.
- 1-3/03/17. Heard in Widdin area.
- 23-27/07/18. Few around.
- July 2019. Few pairs present.
- 19-28/06/20. Few on tracks around exploration area south.

76. Grey Fantail.

- 25-30/06/08. Southern race. At least two foraging around Woolley's Hills (26/06) and two at Blue Hills North (27/06). One at Karara south (28/06, 29/06).
- 14-19/07/08. Southern race. Daily along Karara.
- 19-20/08/09. Southern race; seen occasionally around dense vegetation.
- 2-6/08/11. Southern race; heard around Karara.
- 19-26/07/12. Southern race in Onga Extension, Greater Gap and Minjar (Tom's Kitchen) and Karara Expansion area.
- 7-10/05/13. Southern race at Karara, Blue Hills North and Mungada.
- 17-21/06/13. Single birds in Hinge and Gap.
- 15-19/08/13. Several in Bonneydoon and at Gap.
- 6-11/07/14. Occasionally at Karara, Blue Hills North, Terapod and Mungada.
- 31/08 – 3/09/14. Several in dense thickets at Hinge (2/09).

- 15-17/06/15. Fe in dense thickets south of Mungada.
- 18-20/07/16. One heard at Karara Ridge SE.
- 19-28/06/20. Few in exploration areas.

77. Magpie-lark

- 15-17/06/15. Pair at Karara Village.
- 18-20/07/16. One seen at Karara Village.
- 23-27/07/18. Few around Village.

78. White-tailed Fantail

- 28/09 - 3/10/13. Single bird, definitely of this taxon (seen and heard with distinctive descending trill) at Target 26.

79. Black-faced Cuckoo-shrike.

- 25-30/06/08. Not confirmed.
- 14-19/07/08. Two seen south-west of Karara near granites (19/07).
- 2-6/08/11. Two along Karara (3/08).
- 17-20/12/11. Few seen throughout; several juvenile.
- 19-26/07/12. Two in Minjar (Tom's Kitchen).
- 7-10/05/13. Two near Karara Village (7/05).
- 15-19/08/13. One around Bonneydoon.
- 28/09 – 3/10/13. Pairs seen occasionally.
- 6-11/07/14. Pair at Terapod (9/07) and one seen at Spyder stage 3.
- 31/08 – 3/09/14. One seen in Hinge (2/09) and two seen at Skink Monitoring Cell 2 (3/09).
- 15-17/06/15. Pair near Skyhook.
- 18-20/07/16. Pair on eastern side of Karara.

80. White-winged Triller.

- 19-20/08/09. Heard throughout. Courting and then mating pair seen just south of Karara ridge.
- 6-11/07/14. Heard near Brick study area.
- 31/08 – 3/09/14. Several calling in Skink Monitoring Area 6 (1/09).

81. Copper-backed (Chestnut) Quail-thrush.

- 25-30/06/08. Heard and seen occasionally throughout. Early-morning calling (distinctive whistle) heard at Woolley's Hills (29/06) and two males apparently fighting.
- 14-19/07/08. Seen and heard daily on plain around Karara.
- 19-20/08/09. Heard regularly throughout shrublands just west of Karara Ridge.
- 2-6/08/11. Group heard along Mungada ridge (3/08).
- 10-13/01/12. Present in dense acacia thickets on Shine, especially on ridge.
- 19-26/07/12. Small party in Greater Gap and in Windanning 1.
- 27/09 – 3/10/12. Party seen just west of Hinge (27/09).
- 17-21/06/13. One along road south of Hinge.
- 28/09 – 3/10/13. Recorded at Sprite and Allegro.
- 6-11/07/14. Party at Terapod (9/07) and at Brick (10/07).
- 15-17/06/15. Parties along Mulga track.
- 1-3/03/17. Seen and heard in Widdin area and one along track near Hippo South.
- June 2020. Seen and heard in both exploration areas.

82. Rufous Whistler.

- 25-30/06/08. Several heard around Woolley's Hills (26/06).
- 14-19/07/08. Heard daily around Karara. Female-coloured bird chased a fledgling Crested Bellbird near granites south-west of Karara (19/07).
- 19-20/08/09. Calling throughout.
- 2-6/08/11. Calling throughout.
- 17-20/12/11. Few calling at Jasper.
- 10-13/01/12. Calling at a few locations on Shine.

- 19-26/07/12. Few calling in Greater Gap (22/07), Minjar (Tom's Kitchen), Windanning 1 and Karara Expansion area.
- 27/09 – 3/10/12. Heard occasionally in Hinge.
- 7-10/05/13. Few heard around Mungada.
- 15-19/08/13. Common in Bonneydoon, along Kerrane track and at Gap.
- 28/09 – 3/10/13. Calling throughout; very vocal!
- 6-11/07/14. A few birds heard at Mungada and Terapod. Also at Blue Hills Extension.
- 31/08 – 3/09/14. Several calling in Skink Monitoring Area 6 (1/09) and at Hinge (2/09).
- 1-3/03/17. One heard along creekline in Widdin area.
- 23-27/07/18. Heard in Karara.
- June 2020. Few seen and heard in both exploration areas.

83. Golden Whistler.

- 25-30/06/08. Heard throughout, with a coloured male at Blue Hills North (27/06).
- 14-19/07/08. Occasional around Karara. No coloured birds seen.
- 19-20/08/09. Several calling at one site north of Mungada Road, in dense acacia along a watercourse.
- 2-6/08/11. Calling throughout, including at Exploration camp.
- 27/09 – 3/10/12. Calling amongst dense acacias in Hinge.
- 7-10/05/13. Calling at Blue Hills North and Mungada.
- 15-19/08/13. Heard at Gap.
- 28/09 – 3/10/13. Present only at a few sites in Mt Mulgine area.
- 6-11/07/14. Seen and heard at Blue Hills North extension and Tile (10/07).
- 31/08 – 3/09/14. One heard in dense thickets in Hinge (2/09).
- 15-17/05/15. One calling around Karara.
- 18-20/07/16. One calling around Karara.
- July 2019. Few heard at Karara and Mungada; along dense vegetation of drainage lines.

84. Gilbert's Whistler.

- July 2024. Male heard and seen off Emu Bore track to east of Karara Ridge. First confirmed record; unconfirmed record from naer Mungada ridge in 2008.

85. Grey Shrike-thrush.

- 25-30/06/08. Heard at Woolley's Hills and around Karara daily.
- 14-19/07/08. Heard along Karara daily.
- 19-20/08/09. Woodlands and shrublands; calling.
- 2-5/08/11. Heard at Pine Track skink relocation site (4/08).
- 17-20/12/11. Heard around Karara Camp, Hinge, Jasper and Spyder.
- 10-13/01/12. Heard from dense thickets on Shine.
- 19-22 June 2012. Heard around Karara.
- 19-26/07/12. Heard in Hinge A (20/07), Brak G, Onga Extension, Greater Gap (21/07), Minjar (Tom's Kitchen), Jasper Hill Extension, Windanning 1 and Karara expansion area.
- 27/09 – 3/10/12. Few heard in Hinge and nest with one chick found in eucalypt stump.
- 7-10/05/13. Heard around Karara and Mungada.
- 17-21/06/13. Heard at Gap.
- 15-19/08/13. Heard at Bonneydoon and Gap.
- 28/09 – 3/10/13. Heard at many sites but especially in Mt Mulgine area.
- 6-11/07/14. Heard throughout.
- 31/08 – 3/09/14. Several calling in Skink Monitoring Area 6 (1/09) and at Hinge and Skink Monitoring Cell 5 (2/09).
- 18-20/07/16. Few calling Karara and Mungada.
- 1-3/03/17. Few heard in Widdin area and in Hinge North.
- 23-27/07/18. Calling throughout.
- July 2019. Few calling throughout.

- 19-28/06/20. Few seen and heard in both exploration areas.

86. Crested Bellbird.

- 25-30/06/08. Heard at Woolley's Hills, Blue Hills North and Karara South daily. Birds seen regularly.
- 14-19/07/08. Seen and heard along Karara daily. Fledgling near granites south-west of Karara (19/07).
- 19-20/08/09. Calling throughout.
- 2-6/08/11. Calling throughout.
- 17-20/12/11. Calling throughout. Many seen on ground.
- 10-13/01/12. Scolding call heard regularly but main call only occasionally at Shine.
- 19-22 June 2012. Seen and heard at Karara.
- 19-26/07/12. Heard throughout but not at Karara Expansion area.
- 27/09 – 3/10/12. Scolding call heard occasionally in Hinge.
- 7-10/05/13. Scolding call and rarely main call at Mungada, and birds seen occasionally at Terrapod and Karara.
- 17-21/06/13. Seen occasionally along tracks but not calling.
- 15-19/08/13. Calling in Bonneydoon and at Gap.
- 28/09 – 3/10/13. Heard at most sites.
- 6-11/07/14. Heard throughout.
- 31/08 – 3/09/14. Heard throughout.
- 15-17/06/15. Few seen flying across tracks but none calling.
- 18-20/07/16. Calling around Karara and one hopping across road near Village.
- 1-3/03/17. Several herd in Widdin area.
- 23-27/07/18. Calling throughout.
- July 2019. Calling throughout.
- June 2020. Few calling. Seemed more vocal after a bit of rain.

87. Red-capped Robin.

- 25-30/06/08. Heard at Woolley's Hills and Blue Hills North, and two males at Karara South (27/06).
- 14-19/07/08. Daily along Karara. Not much calling going on.
- 19-20/08/09. Seen regularly, often in pairs and threesomes with a lot of interaction but not much calling.
- 2-5/08/11. Few heard calling Karara, Mungada and at Pine Track skink relocation site.
- 17-20/12/11. Pair with dependent young at Goat Trap Bore.
- 10-13/01/12. Few seen in Shine area.
- 19-26/07/12. Few seen in virtually every area but very seldom calling.
- 27/09 – 3/10/12. Seen occasionally in Hinge. Only once heard calling. Dependent young observed.
- 7-10/05/13. Heard around Karara.
- 28/09 – 3/10/13. Present in small numbers at some sites.
- 6-11/07/14. Present throughout with some calling.
- 31/08 – 3/09/14. Adults of both genders in Hinge but none calling (2/09).
- 18-20/07/16. Heard east side of Karara (18/07), at Mungada and adult male seen at Blue Hills.
- 1-3/03/17. One heard in Widdin area.
- 23-27/07/18. Seen and heard at Blue Hills.
- July 2019. Heard west of Mungada and at Blue Hills.
- 19-28/06/20. Few in exploration areas; little calling.

88. Jacky Winter.

- 25-30/06/08. One calling in eucalypt woodland at Terapod claypan (28/06).

89. Western Yellow Robin.

- 25-30/06/08. At Karara Ridge on transects 4 and 6 (28/06). Both in dense tall shrubland. Also one on the eastern side of the ridge (29/06). Giving a rapid "beeping" call on several occasions.
- 14-19/07/08. Daily along Karara on lower slopes in moderately dense vegetation; beeping call heard regularly.
- 17-20/12/11. One at Jasper.
- 27/09 – 3/10/12. Several in dense acacias in Hinge.
- 7-10/05/13. Heard at Mungada (9/05).
- 15-19/08/13. Seen in Bonneydoon and heard at Gap.
- 28/09 – 3/10/13. Heard only at Allanstown in Mt Mulgine area.
- 31/08 – 3/09/14. One heard in thicket at Hinge (2/09).
- June 2020. Heard in both exploration areas.

90. Hooded Robin

- June 2020. One seen in exploration area south.

91. Southern Scrub-robin.

- 15-19/08/13. Several in dense shrubland on sandplain around White Wells Station.

92. White-browed Babbler.

- 25-30/06/08. Party around Spyder Ridge (26/06, 28/06).
- 2-5/08/11. Party heard on eastern side of Mungada Ridge (4/08).
- 10-13/01/12. Few parties in Shine area.
- 19-26/07/12. Party in Hinge A, Minjar (Tom's Kitchen).
- 27/09 – 3/10/12. Heard in Hinge.
- 7-10/05/13. Heard at Mungada (9/05).
- 15-19/08/13. Parties at Bonneydoon and Kerrane.
- 28/09 – 3/10/13. At Goatsville and Gnow's nest; breeding at Goatsville.
- 6-11/07/14. Party on eastern side of Mungada (8/07), party in Terapod (9/07) and at Tile (10/07).
- 31/08 – 3/09/14. Several parties in Skink Monitoring Area 9 (1/09).
- 18-20/07/16. Party heard Mungada Ridge (19/07).
- 1-3/03/17. Party heard at Hippo South.
- 23-27/07/18. Parties at Karara, Blue Hills and Mungada.
- July 2019. Parties throughout.
- 19-28/06/20. Few parties in exploration areas.

93. Varied Sittella.

- 19-26/07/12. Party in Brak G.
- 23-27/07/18. Party at Mungada east.
- July 2019. Party at Mungada east.
- June 2020. Groups (single sightings) in both exploration areas.

94. Zebra Finch.

- 19-20/08/09. Single adult male hit by car on Karara road near Pine Track turnoff.
- 17-20/12/11. Several at Goat Trap Bore and seen occasionally at Jasper, Hinge and Spyder.
- 10-13/01/12. Small parties throughout Shine.
- 19-26/07/12. About 40 around Minjar sewage ponds.
- 27/09 – 3/10/12. Flock of five in Hinge (28/09).
- 17-21/06/13. Flock of about five at Karara Rd turnoff from Rothsay Rd (17/06).

95. Mistletoebird.

- 17-20/12/11. One over Hinge.
- 7-10/05/13. One heard over Terapod (9/05).
- July 2019. Several heard along Karara ridge.

96. Rufous Songlark.

- 19-20/08/09. One calling at Pine Track.

- 31/08 – 3/09/14. One calling at Karara Village (3/09).
- 18-20/07/16. One calling at Karara Village (18/07).

97. Australasian Pipit.

- 17-21/06/13. Few around Karara Village.
- 15-19/08/13. Few around Karara Village.
- 28/09 – 3/10/13. One at Highland Chief on bare area of ground around old mine.
- 19-28/06/20. One along track to exploration area south.

98. Tree Martin.

- 25-30/06/08. Several high over Karara (28/06, 29/06).
- 14-19/07/08. Group of about 5 on eastern side of Karara (17/07).
- 19-20/08/09. Several at Pine Track collecting mud from ground.
- 17-20/12/11. Several around Exploration and Karara Camps.
- 19-25/07/12. About 6 along east-west track south of Jasper Hill (24/07) and about 15 over Karara Expansion area (25/07).
- 27/09 – 3/10/12. Flock of about 10 around mine pits along Minjar road.
- 7-10/05/13. Several roosting on fence at offices (9/05).
- 15-19/08/13. Few around Bonneydoon and Karara Village.
- 28/09 – 3/10/13. Few around Allanstown (29/09).
- 6-11/07/14. Several around Karara Village and in south of Village tenement.
- 31/08 – 3/09/14. Few birds soaring round large York Gums in Skink Monitoring area 6 (1/09) and seen over Karara Village (2/09).
- 15-17/06/15. Few around Village.
- 18-20/07/16. Few around Village.
- 23-27/07/18. Few around Village.
- July 2019. Few around Village.
- June 2020. Few near old exploration camp.

99. Fairy Martin.

- 19-26/07/12. Old nests in breakaway caves just west of Great Gap.

100. Welcome Swallow.

- 25-30/06/08. Few over camp (30/06).
- 14-19/07/08. Few over camp daily.
- 19-20/08/09. Few around camp.
- 3-5/09/09. Few around camp.
- 2-6/08/11. Few over Karara infrastructure area.
- 7-10/05/13. Few around Karara Village.
- 17-21/06/13. Few around Karara infrastructure.
- 15-19/08/13. Common around Karara Village and infrastructure.
- 28/09 – 3/10/13. At a few sites where caves and old pits present; also around mine offices.
- 6-11/07/14. Small numbers at office, Karara Village and Sinosteel mine buildings.
- 31/08 – 3/09/14. 20-30 flying around Karara Village most of the time.
- 15-17/06/15. Few around Village and even feeding after dark around tennis court lights.
- 18-20/07/16. Many around Village.
- 1-3/03/17. Many around Village.
- 23-27/07/18. Many around Village.
- July 2019. Many around Village.

101. White-backed Swallow.

- 10-13/01/12. Two seen each day ion edge of low heath in Shine area.
- 19-26/07/12. Two over Minjar Camp (22/07).
- 27/09 – 3/10/12. Few over mine pits along Minjar Haul road.
- 7-10/05/13. Several over Terapod mine (9/05).

102. Little Woodswallow.

- 25-30/06/08. About 4 around Mungada Pit (28/06).
- 27/09 – 3/10/12. About 15 roosting in cave along Goongutha Track (27/09).
- 7-10/05/13. Few over "meteor crater" on south-east end of Mungada (8/05), and around old Mungada workings (9/05).
- 28/09 – 3/10/13. Few around Highland Chief and Minjar offices.
- 23-27/07/18. Few on western side of Mungada.
- July 2019. Few around Karara ridge.
- June 2020. Few in north exploration area.

103. Dusky Woodswallow.

- 19-20/08/09. Several at Pine Track.
- 19-26/07/12. Two over Jasper Hill Extension (20/07) and two over Windanning 1 (23/07).
- 27/09 – 3/10/12.

104. Black-faced Woodswallow.

- 17-21/12/11. One at Hinge.
- 19-26/07/12. Few along road near Minjar Camp (22/07).
- 27/09 – 3/10/12. Few in far west of Hinge (29/09).
- 28/09 – 3/10/13. Few around Gnow's Nest.
- 6-11/07/14. Few in south of Village tenement.
- 19-28/06/20. Small group in exploration area.

105. Masked Woodswallow.

- 10-13/01/12. Flocks moving west high over Shine.

106. Pied Butcherbird.

- 25-30/06/08. Along northern fenceline (26/06) and heard at Blue Hills North (27/06).
- 14-19/07/08. Heard occasionally around Karara.
- 2-6/08/11. Heard before dawn around Karara camp.
- 17-20/12/11. Few around old shearing sheds near Karara Camp.
- 10-13/01/12. Not observed.
- 19-22 June 2012. One seen near Minjar.
- 19-25/07/12. One near Minjar Camp and one near Karara Village.
- 7-10/05/13. Seen occasionally throughout.
- 17-21/06/13. Seen occasionally throughout.
- 28/09 – 3/10/13. One seen near Target 15.
- 6-11/07/14. Heard in south of Village tenement and at Blue Hills North extension.
- 31/08 – 3/09/14. Few heard around Karara Village and in Skink Monitoring Cell 6.
- 1-3/03/17. Several herd in Widdin area.
- 23-27/07/18. Few seen and heard.
- July 2019. Few seen and heard throughout.
- June 2020. Heard around village.

107. Grey Butcherbird.

- 25-30/06/08. Heard at Woolley's Hills and Blue Hills North (27/06).
- 19-20/08/09. Heard occasionally in woodland.
- 17-21/12/11. Several heard around Jasper.
- 10-13/01/12. One heard in Shine area.
- 19-26/07/12. Heard around Minjar, Brak G, Onga Extension, Greater Gap and Minjar (Tom's Kitchen).
- 27/09 – 3/10/12. Few seen and heard throughout.
- 7-10/05/13. One heard at Mungada (9/05).
- 15-19/08/13. Few around Bonneydoon.
- 28/09 – 3/10/13. Seen and heard at a few sites.
- 31/08 – 3/09/14. Few heard in Skink Monitoring Area 6 (1/09) and heard/seen in Hinge (2/09). Also heard at Cell 2 (3/09).

- 18-20/07/16. One heard Mungada east (19/07).
- 1-3/03/17. One heard in Widdin area and one in Hinge North.
- July 2019. One heard along Karara east.
- 19-28/06/20. Several heard in both exploration areas.

108. Australian Magpie.

- 25-30/06/08. One on Haul Road near Blue Hills North turnoff (27/06).
- 19-20/08/09. One group north of Mungada Road.
- 2-6/08/11. Few around Karara camp.
- 17-20/12/11. Party around Karara Camp; some mimicking Grey Butcherbird.
- 19-25/07/12. Parties near Karara Expansion area and at Karara Village.
- 27/09 – 3/10/12. Party at Karara Camp.
- 15-19/08/13. Parties at Bonneydoon and around Karara Camp.
- 6-11/07/14. Party in south of Village tenement and around Karara Village.
- 31/08 – 3/09/14. Several parties along Mungada Road west of Gate 1 and single bird near Euro Bore (3/09).
- 15-17/06/15. Pair at Euro Bore.
- June 2020. Few around village.

109. Grey Currawong.

- 25-30/06/08. Several heard around Woolley's Hills (28/06).
- 14-19/07/08. Few each day along Karara.
- 19-20/08/09. One around camp; active before dawn.
- 2-6/08/11. Heard around Karara and heard/seen around Exploration Camp.
- 17-21/12/11. Single birds around Hinge and Jasper.
- 19-26/07/12. Heard throughout.
- 27/09 – 3/10/12. One seen and heard in Hinge (29/09) and again on 30/09.
- 17-21/06/13. One near Exploration Camp (19/06).
- 15-19/08/13. Present at Bonneydoon and near Kerrane.
- 28/09 – 3/10/13. Target 6, Bugeye North and Goblin.
- 6-11/07/14. Few around general area.
- 31/08 – 3/09/14. Few heard in Skink Monitoring Cell 5 (2/09).
- 18-20/07/16. One heard Mungada east (19/07).
- 1-3/03/17. One seen in Widdin area and one heard in Hippo south.
- June 2020. Two in north exploration area (25/06) and again on 26/06.

110. Australian Raven.

- 25-30/06/08. Occasional birds all sites.
- 19-20/08/09. Heard near Exploration Camp.
- 17-21/12/11. Few throughout.
- 19-26/07/12. Few just west of Greater Gap, when there were a few Torresian Crows just to the east (22/07). Also at Karara Expansion area.
- 27/09 – 3/10/12. Small numbers throughout.
- 7-10/05/13. Small numbers around Karara Village.
- 17-21/06/13. Small numbers throughout.
- 15-19/08/13. Few around Karara area.
- 6-11/07/14. Few around Karara near rubbish tip.
- 31/08 – 3/09/14. Few around Skink Monitoring Area 9 (1/09).
- 15-17/06/15. Pair around Karara Village.
- 1-3/03/17. Heard in Widdin area and seen around Karara Village.
- 23-27/07/18. Few around rubbish site.
- July 2019. Few heard along Mungada ridge.
- June 2020. Few amongst Little Crows around rubbish tip.

111. Little Crow.

- 25-30/06/08. Flock of about 8 flew past Karara South (27/06).
- 14-19/07/08. Few daily along Karara.
- 19-20/08/09. Pair on nest in tall eucalypt south of Karara Ridge.
- 19-26/07/12. Several seen and heard in Minjar (Tom's Kitchen), Windanning A and Karara Expansion area.
- 27/09 – 3/10/12. Several heard around Hinge.
- 17-21/06/13. Flock of about 200 near rubbish tip and reported to be regular.
- 15-19/08/13. Few around Bonneydoon.
- 28/09 – 3/10/13. One seen and heard at Wolf.
- 6-11/07/14. Flock of about 100 at Karara rubbish tip and few in south of Village tenement.
- 31/08 – 3/09/14. Most common corvid in small numbers throughout.
- 15-17/06/15. Flock of about 20 near rubbish tip.
- 18-20/07/16. Flock of about 20-30 near rubbish tip.
- 1-3/03/17. One heard in Jasper area.
- July 2019. Few around rubbish tip.
- June 2020. Common around rubbish tip; group of up to 20 often.

112. Torresian Crow.

- 10-13/01/12. Small groups around Minjar and Shine area.
- 19-26/07/12. Several heard near Onga Extension and Greater Gap.
- 7-10/05/13. Several around Terrapod (9/05).
- 28/09 – 3/10/13. Small groups throughout (warble call heard occasionally).
- 23-27/07/18. One heard clearly on eastern side of Mungada and probably among corvids at rubbish site.

Echidna.

25-30/06/08. One crossing Mungarda Road on Lochada Station (25/06) and one in small cave at Blue Hills North (27/06).

14-19/07/08. One (male) found active during sunny afternoon north-west of Karara (18/07).

19-20/08/09. Scats in some large hollows.

2-6/08/11. Fresh diggings at several locations.

17-21/12/11. Fresh diggings throughout.

10-13/01/12. Diggings throughout Shine and burrows in breakaways.

19-26/07/12. Abundant diggings in all areas.

27/09 – 3/10/12. Abundant diggings in all areas.

7-10/05/13. Diggings abundant throughout.

15-19/08/13. Diggings in Bonneydoon and at Gap.

6-11/07/14. One (large male) in south of tenement village and fresh track at Blue Hills North extension. Diggings throughout.

31/08 – 5/09/14. Tracks, scats and diggings throughout.

1-3/03/17. Diggings in Widdin, Hinge North and Hippo South areas.

23-27/07/18. Diggings and scats throughout.

July 2019. Diggings throughout.

19-28/06/20. Old and fresh diggings, scats and tracks in both exploration areas. One animal found in north (25/06). Judging by abundance of diggings and the fresh diggings the day after rain, probably two or three animals along each transect (ie up and back). This would equate to 10-20 animals in each exploration area.

2004. Tracks and diggings throughout. One found just south of Village.

***Pseudantechinus woolleyae*.**
25-30/06/08. Scat surveys conducted on hills in the area and confirmed presence of species at Woolley's Hills, Blue Hills North, Gully, Mungada central, Skyhook, small hill on Mid-West lease, Karara (on spider transects).
10-13/01/12. One seen on rocky outcrop near Minjar Camp spotlighting (12/01). Scats along rocky areas in Shine.
19-26/07/12. Many scats in breakaways along Greater Gap.
15-19/08/13. Many scats at Gap.
6-11/07/14. Fresh scats on ridge at Blue Hills North about 100m from mine. Also at Spyder Stage 2.

Sminthopsis dolichura
2004. Several caught.
2006. Several caught.

Kultarr.
10-13/01/12. Reported (Roger Pitman) from several locations around Badga.

Brushtail Possum.
Unconfirmed report from Karara Station mid 2000s (G. Woodman pers. Comm.)

Boodie.
15-19/08/13. Old warrens at Bonneydoon.
23-27/07/18. Old warren at Terapod.

Red Kangaroo.
25-30/06/08. One on farmland of last farm before pastoral stations (25/06).
14-19/07/08. Up to 6 foraging on bluebush plain near Karara shearing shed daily.
19-20/08/09. Seen along road south of Old Karara.
19-26/07/12. Few alone haul road south of Minjar and at Euro Bore near Karara Expansion area.
15-19/08/13. Present in Bonneydoon and several seen around Karara.
6-11/07/14. Pair near Karara Village (8/07) and one in south of Village tenement.
19-28/06/20. Group of three near village (19/06).

Euro.
25-30/06/08. One crossing Mungada Road on Lochada Station (25/06) and one at Karara South (27/08).
14-19/07/08. One on western side of Karara (17/08).
19-20/08/09. Scats and tracks throughout.
10-13/01/12. Few seen in Shine area and lot of small caves being used.
19-22 June 2012. Few around Karara.
19-26/07/12. Tracks and occasional animals throughout.
0-10/05/13. Tracks and occasional animals throughout.
15-19/08/13. Present in Bonneydoon and several seen around Karara.
6-11/07/14. Scats and tracks throughout.

31/08 – 5/09/14. Pair along Mungada Road 15km west of Gate 1 and occasional animals throughout.
15-17/06/15. Occasional animals throughout.
1-3/03/17. Few seen in Widdin area. One on haul road near Hinge.
23-27/07/18. Seen occasionally and tracks throughout.
June 2020. Several in exploration area south; males are magnificent red-brown.

***Chalinolobus gouldii*.**
7-10/05/13. One sleeping on screen door in Karara Village; photographed by cleaner (9/05).

***Tadarida australis*.**
25-30/06/08. At least one foraging each night around camp.
14-19/07/08. Not staying at camp and no opportunity to observe for species at Perenjori.
19-20/08/09. Four-five calling around camp each night.
19-26/07/12. Few at night around Minjar camp.
27/09 – 3/10/12. At least one around Minjar Camp each night.
7-10/05/13. Few around Karara Village each night.
6-11/07/14. Heard one night at Karara Village.
31/08 – 5/09/14. Few around Karara Camp each night.
15-17/06/15. Few around Karara Village each night.
July 2019. One heard over camp night of 23/07.
June 2020. Few over village.

Stick-nest rat *Leporillus* sp..
Old nests in breakaway just west of Greater Gap.
15-19/08/13. Old nests in breakaway at Bonneydoon.

Notomys mitchelli.
19-26/07/12. Burrows at Hinge A and dead specimen found at Jasper Hill Extension.
15-19/08/13. Burrows in Bonneydoon.

Mus musculus
2006. Several caught.

Pesudomys hermannsburgensis
2006. Several caught.

Fox.
14-19/07/08. Fresh tracks seen regularly.
19-20/08/09. Fresh tracks seen regularly.
10-13/01/12. Fresh tracks throughout Shine area.
19-26/07/12. Scats at Onga Extension, Windanning A and Greater Gap. Probable earth at Greater Gap.
July 2019. Fresh tracks at Terapod.
19-28/06/20. Scats in exploration area south.

Dingo.
14-19/07/08. Young animal seen south-east of Karara (18/07) and a young animal following us around (calling, fresh tracks) south of Karara (19/07). Appeared to be full-blood.
June 2020. Recent tracks in both exploration areas.
July 2024. Recent tracks several locations. Two animals north of Terapod.

Cat.
14-19/07/08. Large black cat reported near camp, but unconfirmed.
19-20/08/09. Tracks appeared widespread.
10-13/01/12. Fresh tracks in Shine area.
19-26/07/12. Fresh tracks throughout.
27/09 – 3/10/12. Fresh tracks throughout.
15-19/08/13. Fresh tracks at Bonneydoon and Gap.
Report: Annie Shaw trapped 23 in first 6 months of 2013.
6-11/07/14. Fresh tracks at Terapod.
19-28/06/20. Fresh scratching in Malleefowl mound in exploration south. Also a long-dead animal. Lots of tracks in north exploration area especially near rubbish tip.

Rabbit.
2-5/08/11. Fresh tracks and scats at Pine Track skink relocation site.
17-21/12/11. Abundant diggings at Jasper and Hinge.
10-13/01/12. Abundant diggings in Shine area.
19-22 June 2012. Abundant diggings in Karara and Mungada areas.
19-26/07/12. Fresh tracks, diggings and scats throughout.
27/09 – 3/10/12. Fresh tracks, scats and diggings throughout.
7-10/05/13. Fresh tracks, scats and diggings throughout.
15-19/08/13. Abundant at Bonneydoon and some seen near Euro bore.
6-11/07/14. Scats and diggings throughout.
31/08 – 5/09/14. Scats and diggings throughout.
15-17/06/15. Scats and diggings throughout.
1-3/03/17. Scats and digging in Widdin area.
23-27/07/18. Scats and diggings throughout.
July 2019. Scats, tracks and diggings throughout.
19-28/06/20. Scats, tracks and diggings throughout exploration areas.

Goat.
25-30/06/08. Several near caves at north end of Karara Ridge (29/08).
14-19/07/08. Tracks found regularly around Karara; very fresh tracks at new accommodation site (19/07).
19-20/08/09. One seen along Pine Track.
2-5/08/11. Fresh scats and tracks at Mungada, Karara and Pine Track skink relocation site. Mob of about 20 at southern end of Mungada (4/08).
10-13/01/12. Mobs of about 4-5 animals seen regularly through Shine. About 25 around open cut in the mornings.
19-22 June 2012. Appear common; fresh scats throughout Karara and Mungada.

19-26/07/12. Small groups seen regularly near Minjar and fresh tracks occasionally throughout. About 100 near mine pits just south of Minjar Camp some mornings.
27/09 – 3/10/12. Small groups virtually throughout and many around old pits near Minjar.
7-10/05/13. Mob of about 15 near Karara Village (8/05); not previously seen in this area in such numbers. Also one at old Mungada workings (9/05).
15-19/08/13. Abundant at Bonneydoon and throughout Karara area.
6-11/07/14. Small parties and evidence such as scats throughout, but a lot have been removed.
15-17/06/15. Fresh scats of young animals around Karara east track.
1-3/03/17. Several skeletons in Widdin area.
23-27/07/18. Small party at Karara and near operations.

Appendix 10. Species observed in Wheatbelt Area

Latin Name	Common Name	Notes
BIRDS		
Anas gracilis	Grey Teal	
Ocyphaps lophotes	Crested Pigeon	
Circus assimilis	Spotted Harrier	
Falco berigora	Brown Falcon	
Falco cenchroides	Nankeen Kestrel	
Himantopus leucocephalus	Pied Stilt	Adult with juvenile
Eolophus roseicapilla	Galah	
Barnardius zonarius	Australian Ringneck	
Malurus splendens	Splendid Fairy-wren	
Malurus pulcherrimus	Blue-breasted Fairy-wren	
Smicrornis brevirostris	Weebill	
Manorina flavigula	Yellow-throated Miner	
Epthianura tricolor	Crimson Chat	
Artamus cinereus	Black-faced Woodswallow	
Gymnorhina tibicen	Australian Magpie	
Grallina cyanoleuca	Magpie-lark	
Rhipidura leucophrys	Willie Wagtail	
Corvus coronoides	Australian Raven	
Cincloramphus mathewsi	Rufous Songlark	
Cheramoeca leucosterna	White-backed Swallow	
Petrochelidon nigricans	Tree Martin	
Anthus novaeseelandiae	Australasian Pipit	
MAMMALS		
Osphranter robustus	Euro, Biggada	

Appendix 11. Conservation significant invertebrate species returned by database search.

Status codes:

CS1, CS2, CS3 = (summary) levels of conservation significance. See Appendix 1 for full explanation.

EPBC Act listings: CR = Critically Endangered, EN = Endangered, VU = Vulnerable, M = Migratory, Mar = Marine (see Appendix 3).

Biodiversity Conservation Act 2016 listings: S1 to S3 = Schedules 1 to 3, D1 to D3 = Divisions 1 to 3 (see Appendix 3).

DBCA Priority species: P1 to P4 = Priority 1 to 4 (see Appendix 3).

Source: A = DBCA threatened and priority fauna list Midwest region, B = DBCA threatened and priority fauna search (40 km around entire DE), C = protected matters search tool, D = Naturemap, E = BCE surveys for KML between 2014-2019, F = previous reports (IBSA)

Species Name	Common Name	EPBC listing	WA listing	Expected Occurrence		Source
				Mine Area	Wheatbelt Area	
Snails						
Bothriembryon perobesus	a bothriembryontid land snail (Moore River)		P1	Out of range	Out of range	A
Bothriembryon whitleyi	Whitley's bothriembryontid land snail (Geraldton)		S3	Extinct	Extinct	A
Crustaceans						
Branchinella denticulata	a fairy shrimp (Carnavon to Kalgoorlie)		P3	Out of range	Out of range	A
Branchinella simplex	a fairy shrimp (inland WA)		P1	Out of range	Out of range	A B D
Branchinella wellardi	a fairy shrimp (Carnarvon and Murchison)		P3	Out of range	Out of range	A
Daphnia jollyi	a water flea (inland south west)		P1	Out of range	Out of range	A
Insects						
Austrosaga spinifer	spiny katydid (Swan Coastal Plain)		P2	Out of range	Out of range	A
Hemisaga vepreculae	thorny bush katydid (Moora)		P2	Out of range	No habitat	A
Phasmodes jeeba	springtime corroboree stick katydid (Eneabba)		P3	Out of range	Out of range	A B D
Psacadonotus seriatus	a fan-winged katydid (Champion Bay)		P1	Out of range	Out of range	A
Throscodectes xederoides	Mogumber bush cricket, Northern Throsco		P3	Out of range	Out of range	A
Synemon gratiosa	graceful sunmoth		P4	Out of range	Out of range	A
Neopasiphae simplicior	a short-tongued bee	CR	S2D2	Out of range	Out of range	A
Hylaeus globuliferus	woolybush bee		P3	Out of range	Out of range	A
Spiders						

Species Name	Common Name	EPBC listing	WA listing	Expected Occurrence		Source
				Mine Area	Wheatbelt Area	
Idiosoma arenaceum	Geraldton Sandplain shield-backed trapdoor spider		P3	Out of range	Unlikely as habitat degraded	A B
Idiosoma castellum	tree-stem trapdoor spider		P4	No habitat	Out of range	A B
Idiosoma clypeatum	Northern Shield-backed Trapdoor Spider		P3	Resident	Out of range	B D E F
Idiosoma dandaragan	Dandaragan Plateau shield-backed trapdoor spider		P2	Out of range	Out of range	A
Idiosoma formosum	ornate shield-backed trapdoor spider		S2D2	Resident	Out of range	B E
Idiosoma gutharuka	Gutha Pintharuka Shield-backed Trapdoor Spider		P1	No habitat	Out of range	A B F
Idiosoma incomptum	Carnavon Shield-backed Trapdoor Spider		P3	Out of range	Out of range	A
Idiosoma intermedium	Coolgardie Shield-backed Trapdoor Spider		P3	No habitat	Out of range	B F
Idiosoma kwongan	Kwongan Heath Shield-backed Trapdoor Spider		P1	Out of range	Out of range	A B
Idiosoma nigrum	Shield-backed Trapdoor Spider, Black Rugose Trapdoor Spider	VU	S2D2	Out of range (note taxonomy change)	Out of range	A C D
Teyl sp. (MYG693)	Minnivale trapdoor spider		S2D1	Possible in both areas – DBCA records c. 40km north of central portion of DE		A B

Appendix 12. Locations of sightings (scats and individuals) and potential colony sites for the Western Spiny-tailed Skink.

GDA94; Zone 50.

Sightings and scats from 2020 and 2024.

DATE	Easting	Northing	LABEL	OBSERVER	COMMON_NAM	Type	Notes
22/06/2020	477237.9	6773075.7	W53	SKS	Western Spiny-tailed Skink	Scats	scats present
27/06/2024	468102.0	6766362.0	ReptScats	BS	Western Spiny-tailed Skink	Scats	
30/06/2024	480585.0	6776940.0	SKINKTAIL	ARB	Western Spiny-tailed Skink	Sighting	Spiny-tailed skink tail
30/06/2024	480585.3	6776940.1	SKINKTAIL	ARB	Western Spiny-tailed Skink	Sighting	Spiny-tailed skink tail

Suitable habitat for Western Spiny-tailed Skink colonies: 2020 and 2024 observations. Coordinates are for Zone 50J.

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	475402.0	6772573.5	W1	PMS	habitat only
22/06/2020	475518.4	6772529.7	W2	PMS	habitat only
22/06/2020	475662.2	6772580.9	W3	PMS	habitat only
22/06/2020	475784.0	6772578.5	W4	PMS	habitat only
22/06/2020	475783.5	6772556.3	W5	PMS	habitat only
22/06/2020	475855.5	6772563.7	W6	PMS	habitat only
22/06/2020	476744.6	6772578.9	W7	PMS	habitat only
22/06/2020	476037.9	6772552.2	W8	PMS	habitat only
22/06/2020	476119.9	6772591.0	W9	PMS	habitat only
22/06/2020	476073.4	6772582.5	W10	PMS	habitat only
22/06/2020	476044.7	6772624.5	W11	PMS	habitat only
22/06/2020	476039.5	6772603.7	W12	PMS	habitat only
22/06/2020	475896.3	6772598.6	W13	PMS	habitat only
22/06/2020	475526.3	6772593.8	W14	PMS	habitat only
22/06/2020	475273.9	6773092.0	W15	PMS	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	475506.6	6773095.0	W16	PMS	habitat only
22/06/2020	475649.8	6773096.8	W17	PMS	habitat only
22/06/2020	476999.8	6773086.9	W18	PMS	habitat only
22/06/2020	477209.6	6773126.9	W19	PMS	habitat only
22/06/2020	477154.5	6773132.6	W20	PMS	habitat only
22/06/2020	477254.2	6773129.2	W21	PMS	habitat only
22/06/2020	477047.8	6773106.4	W22	PMS	habitat only
22/06/2020	477370.6	6773128.6	W23	PMS	habitat only
22/06/2020	476735.0	6772526.1	W24	SKS	habitat only
22/06/2020	476662.6	6772621.2	W25	SKS	habitat only
22/06/2020	476149.3	6772614.0	W26	SKS	habitat only
22/06/2020	476064.2	6772621.7	W27	SKS	habitat only
22/06/2020	475807.2	6772622.5	W28	SKS	habitat only
22/06/2020	475704.4	6772627.9	W29	SKS	habitat only
22/06/2020	475614.7	6772626.0	W30	SKS	habitat only
22/06/2020	475593.6	6772620.8	W31	SKS	habitat only
22/06/2020	475571.9	6772623.3	W32	SKS	habitat only
22/06/2020	475416.7	6772614.9	W33	SKS	habitat only
22/06/2020	475360.6	6772620.7	W34	SKS	habitat only
22/06/2020	475271.8	6773067.7	W35	SKS	habitat only
22/06/2020	475308.8	6773057.7	W36	SKS	habitat only
22/06/2020	475421.6	6773062.8	W37	SKS	habitat only
22/06/2020	475446.7	6773059.3	W38	SKS	habitat only
22/06/2020	475487.8	6773066.3	W39	SKS	habitat only
22/06/2020	475526.3	6773064.8	W40	SKS	habitat only
22/06/2020	475551.4	6773066.2	W41	SKS	habitat only
22/06/2020	475620.0	6773051.8	W42	SKS	habitat only
22/06/2020	475661.3	6773057.5	W43	SKS	habitat only
22/06/2020	475686.6	6773059.2	W44	SKS	habitat only
22/06/2020	476135.9	6773038.1	W45	SKS	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	476167.0	6773053.8	W46	SKS	habitat only
22/06/2020	476196.4	6773057.4	W47	SKS	habitat only
22/06/2020	476200.9	6773075.9	W48	SKS	habitat only
22/06/2020	476335.0	6773039.2	W49	SKS	habitat only
22/06/2020	476357.7	6773047.1	W50	SKS	habitat only
22/06/2020	477050.9	6773066.6	W51	SKS	habitat only
22/06/2020	477076.0	6773055.6	W52	SKS	habitat only
22/06/2020	477313.7	6773044.1	W54	SKS	habitat only
22/06/2020	477347.2	6773068.7	W55	SKS	habitat only
22/06/2020	477516.7	6773050.9	W56	SKS	habitat only
22/06/2020	477542.3	6773058.4	W57	SKS	habitat only
22/06/2020	476968.3	6773157.2	W58	SKS	habitat only
22/06/2020	476435.0	6773164.5	W59	SKS	habitat only
22/06/2020	476345.9	6773142.2	W60	SKS	habitat only
22/06/2020	476337.9	6773161.9	W61	SKS	habitat only
22/06/2020	475472.0	6773129.1	W62	SKS	habitat only
22/06/2020	475465.1	6773153.4	W63	SKS	habitat only
22/06/2020	475421.7	6773177.1	W64	SKS	habitat only
22/06/2020	475395.9	6773168.5	W65	SKS	habitat only
22/06/2020	475343.3	6773141.7	W66	SKS	habitat only
22/06/2020	475301.7	6772518.5	W67	JB	habitat only
22/06/2020	476761.5	6772492.5	W68	JB	habitat only
22/06/2020	476789.0	6772526.4	W69	JB	habitat only
22/06/2020	476711.5	6772651.2	W70	JB	habitat only
22/06/2020	476448.7	6772641.8	W71	JB	habitat only
22/06/2020	475769.2	6772652.2	W72	JB	habitat only
22/06/2020	476061.2	6772620.5	W73	JB	habitat only
22/06/2020	475729.0	6772634.8	W74	JB	habitat only
22/06/2020	475553.4	6772651.2	W75	JB	habitat only
22/06/2020	475423.0	6772661.1	W76	JB	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	475293.5	6773019.5	W77	JB	habitat only
22/06/2020	475376.0	6773052.8	W78	JB	habitat only
22/06/2020	475737.5	6772494.4	W79	JB	habitat only
22/06/2020	475388.0	6773036.7	W80	JB	habitat only
22/06/2020	475433.5	6773036.1	W81	JB	habitat only
22/06/2020	475467.3	6773037.1	W82	JB	habitat only
22/06/2020	475489.1	6773028.0	W83	JB	habitat only
22/06/2020	475609.3	6773031.8	W84	JB	habitat only
22/06/2020	475673.0	6773030.4	W85	JB	habitat only
22/06/2020	475725.4	6773022.2	W86	JB	habitat only
22/06/2020	475691.5	6773031.3	W87	JB	habitat only
22/06/2020	475843.8	6773031.5	W88	JB	habitat only
22/06/2020	476114.4	6773025.9	W89	JB	habitat only
22/06/2020	476189.5	6773029.2	W90	JB	habitat only
22/06/2020	475789.1	6772493.1	W91	JB	habitat only
22/06/2020	476234.1	6773030.5	W92	JB	habitat only
22/06/2020	476259.9	6773028.3	W93	JB	habitat only
22/06/2020	476296.7	6773038.5	W94	JB	habitat only
22/06/2020	476349.2	6773028.9	W95	JB	habitat only
22/06/2020	476390.6	6773027.3	W96	JB	habitat only
22/06/2020	476409.7	6773027.6	W97	JB	habitat only
22/06/2020	476452.5	6773035.7	W98	JB	habitat only
22/06/2020	477003.0	6773035.3	W99	JB	habitat only
22/06/2020	477067.5	6773025.4	W100	JB	habitat only
22/06/2020	477100.2	6773018.9	W101	JB	habitat only
22/06/2020	475802.8	6772513.3	W102	JB	habitat only
22/06/2020	477119.0	6773031.9	W103	JB	habitat only
22/06/2020	477223.4	6773048.2	W104	JB	habitat only
22/06/2020	477212.1	6773019.9	W105	JB	habitat only
22/06/2020	477239.8	6773022.4	W106	JB	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	477328.3	6773028.7	W107	JB	habitat only
22/06/2020	477310.2	6773042.2	W108	JB	habitat only
22/06/2020	477382.8	6773021.5	W109	JB	habitat only
22/06/2020	477658.1	6773189.9	W110	JB	habitat only
22/06/2020	477138.8	6773176.8	W111	JB	habitat only
22/06/2020	477279.0	6773186.3	W112	JB	habitat only
22/06/2020	475851.0	6772487.1	W113	JB	habitat only
22/06/2020	476398.4	6773168.2	W114	JB	habitat only
22/06/2020	476336.7	6773166.3	W115	JB	habitat only
22/06/2020	476309.9	6773170.2	W116	JB	habitat only
22/06/2020	476097.6	6773176.0	W117	JB	habitat only
22/06/2020	475518.1	6773163.5	W118	JB	habitat only
22/06/2020	475472.2	6773171.1	W119	JB	habitat only
22/06/2020	475419.8	6773181.8	W120	JB	habitat only
22/06/2020	475349.3	6773183.4	W121	JB	habitat only
22/06/2020	475318.2	6773169.1	W122	JB	habitat only
22/06/2020	476673.0	6772505.8	W123	JB	habitat only
22/06/2020	476214.8	6772515.8	W124	JB	habitat only
22/06/2020	476692.2	6772506.9	W125	JB	habitat only
22/06/2020	476687.7	6772490.5	W126	JB	habitat only
22/06/2020	476735.8	6772512.0	W127	JB	habitat only
22/06/2020	475692.3	6772674.6	W128	MJB	habitat only
22/06/2020	477076.7	6773011.6	W129	MJB	habitat only
22/06/2020	475702.3	6772475.5	W130	MJB	habitat only
22/06/2020	476682.5	6772448.2	W131	MJB	habitat only
22/06/2020	476706.5	6772460.7	W132	MJB	habitat only
22/06/2020	476708.8	6772494.2	W133	MJB	habitat only
22/06/2020	476731.5	6772471.4	W134	MJB	habitat only
22/06/2020	476796.9	6772522.2	W135	MJB	habitat only
22/06/2020	476933.6	6772602.4	W136	MJB	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	476516.9	6772709.8	W137	MJB	habitat only
22/06/2020	476092.5	6772699.6	W138	MJB	habitat only
22/06/2020	476040.4	6772669.5	W139	MJB	habitat only
22/06/2020	476069.0	6772690.5	W140	MJB	habitat only
22/06/2020	475970.1	6772659.4	W141	MJB	habitat only
22/06/2020	475928.4	6772623.7	W142	MJB	habitat only
22/06/2020	475917.2	6772639.5	W143	MJB	habitat only
22/06/2020	475865.3	6772694.7	W144	MJB	habitat only
22/06/2020	475450.6	6772677.0	W145	MJB	habitat only
22/06/2020	475425.9	6772668.6	W146	MJB	habitat only
22/06/2020	475324.5	6772980.1	W147	MJB	habitat only
22/06/2020	475356.5	6772683.7	W148	MJB	habitat only
22/06/2020	475467.1	6773011.5	W149	MJB	habitat only
22/06/2020	475555.2	6772999.5	W150	MJB	habitat only
22/06/2020	475603.3	6773009.3	W151	MJB	habitat only
22/06/2020	475653.2	6773000.7	W152	MJB	habitat only
22/06/2020	475730.5	6773001.2	W153	MJB	habitat only
22/06/2020	475798.5	6772988.5	W154	MJB	habitat only
22/06/2020	476111.5	6773008.1	W155	MJB	habitat only
22/06/2020	476227.1	6772986.5	W156	MJB	habitat only
22/06/2020	476276.9	6773013.4	W157	MJB	habitat only
22/06/2020	476303.8	6773008.3	W158	MJB	habitat only
22/06/2020	476354.4	6773006.5	W159	MJB	habitat only
22/06/2020	476397.7	6773001.9	W160	MJB	habitat only
22/06/2020	476459.9	6772992.1	W161	MJB	habitat only
22/06/2020	476441.6	6772999.0	W162	MJB	habitat only
22/06/2020	476443.4	6772964.9	W163	MJB	habitat only
22/06/2020	476494.0	6772995.9	W164	MJB	habitat only
22/06/2020	476506.4	6772985.6	W165	MJB	habitat only
22/06/2020	477024.8	6773002.0	W166	MJB	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
22/06/2020	477380.6	6773021.7	W167	MJB	habitat only
22/06/2020	477087.3	6772988.7	W168	MJB	habitat only
22/06/2020	477412.8	6773001.5	W169	MJB	habitat only
22/06/2020	477115.3	6773003.4	W170	MJB	habitat only
22/06/2020	477477.3	6772987.8	W171	MJB	habitat only
22/06/2020	477371.6	6773206.0	W172	MJB	habitat only
22/06/2020	477329.1	6773208.3	W173	MJB	habitat only
22/06/2020	477270.6	6773222.9	W174	MJB	habitat only
22/06/2020	477257.2	6773197.6	W175	MJB	habitat only
22/06/2020	477221.8	6773210.4	W176	MJB	habitat only
22/06/2020	476990.7	6773200.5	W177	MJB	habitat only
22/06/2020	477190.5	6773233.1	W178	MJB	habitat only
22/06/2020	476967.9	6773198.6	W179	MJB	habitat only
22/06/2020	476505.8	6773192.2	W180	MJB	habitat only
22/06/2020	476476.8	6773183.3	W181	MJB	habitat only
22/06/2020	476434.5	6773202.0	W182	MJB	habitat only
22/06/2020	476391.3	6773209.3	W183	MJB	habitat only
22/06/2020	476355.1	6773198.1	W184	MJB	habitat only
22/06/2020	476296.9	6773212.3	W185	MJB	habitat only
22/06/2020	476262.8	6773228.1	W186	MJB	habitat only
22/06/2020	476219.3	6773205.6	W187	MJB	habitat only
22/06/2020	476162.3	6773201.9	W188	MJB	habitat only
22/06/2020	475498.9	6773203.2	W189	MJB	habitat only
22/06/2020	475339.2	6773218.1	W190	MJB	habitat only
23/06/2020	476736.4	6773767.3	W191	SKS	habitat only
23/06/2020	476779.7	6773757.5	W192	SKS	habitat only
23/06/2020	476815.3	6773762.5	W193	SKS	habitat only
23/06/2020	477219.5	6773754.3	W194	SKS	habitat only
23/06/2020	477792.9	6773759.6	W195	SKS	habitat only
23/06/2020	477121.0	6773836.3	W196	SKS	habitat only

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23/06/2020	476677.8	6773830.4	W197	SKS	habitat only
23/06/2020	477490.2	6773714.2	W198	JB	habitat only
23/06/2020	476485.8	6773723.2	W199	JB	habitat only
23/06/2020	476616.9	6773725.7	W200	JB	habitat only
23/06/2020	476635.1	6773734.0	W201	JB	habitat only
23/06/2020	476653.8	6773742.5	W202	JB	habitat only
23/06/2020	476663.8	6773715.3	W203	JB	habitat only
23/06/2020	476739.0	6773726.1	W204	JB	habitat only
23/06/2020	476775.9	6773741.3	W205	JB	habitat only
23/06/2020	476982.7	6773725.7	W206	JB	habitat only
23/06/2020	477390.0	6773728.9	W207	JB	habitat only
23/06/2020	477554.9	6773725.8	W208	JB	habitat only
23/06/2020	478218.1	6773731.2	W209	JB	habitat only
23/06/2020	477827.9	6773901.5	W210	JB	habitat only
23/06/2020	477815.3	6773887.2	W211	JB	habitat only
23/06/2020	477762.8	6773875.8	W212	JB	habitat only
23/06/2020	477500.9	6773888.0	W213	JB	habitat only
23/06/2020	477429.1	6773887.2	W214	JB	habitat only
23/06/2020	477308.7	6773880.5	W215	JB	habitat only
23/06/2020	476883.7	6773876.3	W216	JB	habitat only
23/06/2020	476850.7	6773870.2	W217	JB	habitat only
23/06/2020	476741.8	6773887.4	W218	JB	habitat only
23/06/2020	476722.2	6773871.9	W219	JB	habitat only
23/06/2020	476700.3	6773894.3	W220	JB	habitat only
23/06/2020	476627.5	6773892.9	W221	JB	habitat only
23/06/2020	476504.8	6773889.4	W222	JB	habitat only
23/06/2020	476400.0	6773864.4	W223	JB	habitat only
23/06/2020	476497.1	6773705.8	W224	MJB	habitat only
23/06/2020	476673.1	6773688.2	W225	MJB	habitat only
23/06/2020	476692.6	6773705.5	W226	MJB	habitat only

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23/06/2020	476733.4	6773710.6	W227	MJB	habitat only
23/06/2020	476769.0	6773702.4	W228	MJB	habitat only
23/06/2020	476854.8	6773695.0	W229	MJB	habitat only
23/06/2020	476929.0	6773695.4	W230	MJB	habitat only
23/06/2020	476955.9	6773712.1	W231	MJB	habitat only
23/06/2020	477357.2	6773714.7	W232	MJB	habitat only
23/06/2020	477081.5	6773711.3	W233	MJB	habitat only
23/06/2020	477710.7	6773666.6	W234	MJB	habitat only
23/06/2020	477435.3	6773686.3	W235	MJB	habitat only
23/06/2020	477722.5	6773699.8	W236	MJB	habitat only
23/06/2020	477758.2	6773702.7	W237	MJB	habitat only
23/06/2020	477794.9	6773914.3	W238	MJB	habitat only
23/06/2020	477966.4	6773705.3	W239	MJB	habitat only
23/06/2020	477766.2	6773923.6	W240	MJB	habitat only
23/06/2020	477718.8	6773905.6	W241	MJB	habitat only
23/06/2020	477480.7	6773912.2	W242	MJB	habitat only
23/06/2020	477411.7	6773931.3	W243	MJB	habitat only
23/06/2020	477268.2	6773910.2	W244	MJB	habitat only
23/06/2020	477188.3	6773911.9	W245	MJB	habitat only
23/06/2020	476860.1	6773928.5	W246	MJB	habitat only
23/06/2020	476828.3	6773921.5	W247	MJB	habitat only
23/06/2020	476742.8	6773920.0	W248	MJB	habitat only
23/06/2020	476692.6	6773896.4	W249	MJB	habitat only
23/06/2020	476615.1	6773913.3	W250	MJB	habitat only
23/06/2020	476054.6	6773909.4	W251	MJB	habitat only
23/06/2020	476592.1	6773908.5	W252	MJB	habitat only
23/06/2020	477339.3	6773923.6	W253	MJB	habitat only
23/06/2020	476815.2	6773794.2	W254	PMS	habitat only
23/06/2020	477358.7	6773775.7	W255	PMS	habitat only
23/06/2020	477279.7	6773821.9	W256	PMS	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
23/06/2020	477461.9	6773777.1	W257	PMS	habitat only
25/06/2020	477750.9	6774426.6	W258	JB	habitat only
25/06/2020	477623.2	6774431.1	W259	JB	habitat only
25/06/2020	477475.8	6774414.3	W260	JB	habitat only
25/06/2020	477452.0	6774423.9	W261	JB	habitat only
25/06/2020	477296.5	6774418.2	W262	JB	habitat only
25/06/2020	477249.8	6774422.6	W263	JB	habitat only
25/06/2020	477116.6	6774422.2	W264	JB	habitat only
25/06/2020	477084.6	6774421.6	W265	JB	habitat only
25/06/2020	477002.2	6774434.9	W266	JB	habitat only
25/06/2020	476734.2	6774435.4	W267	JB	habitat only
25/06/2020	477091.9	6774575.9	W268	JB	habitat only
25/06/2020	477326.4	6774569.8	W269	JB	habitat only
25/06/2020	477832.9	6774576.2	W270	JB	habitat only
25/06/2020	477859.7	6774578.6	W271	JB	habitat only
25/06/2020	477980.3	6774571.0	W272	JB	habitat only
25/06/2020	478068.2	6774576.3	W273	JB	habitat only
25/06/2020	478182.0	6774586.4	W274	JB	habitat only
25/06/2020	478199.6	6774573.8	W275	JB	habitat only
25/06/2020	478278.3	6774587.8	W276	JB	habitat only
25/06/2020	478509.7	6774567.1	W277	JB	habitat only
25/06/2020	478604.8	6774597.0	W278	JB	habitat only
25/06/2020	479413.0	6774578.6	W279	JB	habitat only
25/06/2020	479443.8	6774580.8	W280	JB	habitat only
25/06/2020	479486.9	6774579.4	W281	JB	habitat only
25/06/2020	479729.8	6774582.5	W282	JB	habitat only
25/06/2020	479926.0	6774581.4	W283	JB	habitat only
25/06/2020	480051.5	6774591.3	W284	JB	habitat only
25/06/2020	480112.8	6774571.2	W285	JB	habitat only
25/06/2020	479180.7	6774420.2	W286	JB	habitat only

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25/06/2020	479157.6	6774431.6	W287	JB	habitat only
25/06/2020	478930.9	6774429.7	W288	JB	habitat only
25/06/2020	478901.9	6774429.7	W289	JB	habitat only
25/06/2020	478790.4	6774437.7	W290	JB	habitat only
25/06/2020	478763.7	6774432.4	W291	JB	habitat only
25/06/2020	478508.9	6774436.1	W292	JB	habitat only
25/06/2020	478455.8	6774428.6	W293	JB	habitat only
25/06/2020	478398.3	6774434.0	W294	JB	habitat only
25/06/2020	478342.1	6774430.7	W295	JB	habitat only
25/06/2020	478258.8	6774436.8	W296	JB	habitat only
25/06/2020	478215.6	6774422.8	W297	JB	habitat only
25/06/2020	478139.7	6774427.3	W298	JB	habitat only
25/06/2020	478119.0	6774412.3	W299	JB	habitat only
25/06/2020	478074.4	6774425.7	W300	JB	habitat only
25/06/2020	477277.1	6774590.3	W301	JB	habitat only
25/06/2020	477299.5	6774584.2	W302	JB	habitat only
25/06/2020	479222.2	6774411.9	W303	MJB	habitat only
25/06/2020	479162.5	6774408.7	W304	MJB	habitat only
25/06/2020	479087.8	6774401.2	W305	MJB	habitat only
25/06/2020	479078.0	6774402.8	W306	MJB	habitat only
25/06/2020	479068.9	6774410.9	W307	MJB	habitat only
25/06/2020	478957.6	6774415.5	W308	MJB	habitat only
25/06/2020	478217.7	6774393.2	W309	MJB	habitat only
25/06/2020	478184.4	6774401.0	W310	MJB	habitat only
25/06/2020	478168.9	6774394.7	W311	MJB	habitat only
25/06/2020	478140.9	6774394.4	W312	MJB	habitat only
25/06/2020	478094.3	6774381.9	W313	MJB	habitat only
25/06/2020	478061.6	6774413.2	W314	MJB	habitat only
25/06/2020	477923.9	6774395.0	W315	MJB	habitat only
25/06/2020	477878.2	6774391.7	W316	MJB	habitat only

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25/06/2020	477482.0	6774402.5	W317	MJB	habitat only
25/06/2020	477453.5	6774396.8	W318	MJB	habitat only
25/06/2020	477350.5	6774381.9	W319	MJB	habitat only
25/06/2020	477297.3	6774387.9	W320	MJB	habitat only
25/06/2020	477276.6	6774397.5	W321	MJB	habitat only
25/06/2020	477238.0	6774400.1	W322	MJB	habitat only
25/06/2020	477186.2	6774380.3	W323	MJB	habitat only
25/06/2020	477153.9	6774384.7	W324	MJB	habitat only
25/06/2020	477045.9	6774394.1	W325	MJB	habitat only
25/06/2020	476991.3	6774634.3	W326	MJB	habitat only
25/06/2020	476986.5	6774391.8	W327	MJB	habitat only
25/06/2020	477031.7	6774609.2	W328	MJB	habitat only
25/06/2020	477014.6	6774621.3	W329	MJB	habitat only
25/06/2020	477278.2	6774595.3	W330	MJB	habitat only
25/06/2020	477420.7	6774626.7	W331	MJB	habitat only
25/06/2020	477439.9	6774631.4	W332	MJB	habitat only
25/06/2020	477803.1	6774615.7	W333	MJB	habitat only
25/06/2020	477822.2	6774596.5	W334	MJB	habitat only
25/06/2020	477866.2	6774604.2	W335	MJB	habitat only
25/06/2020	478113.7	6774587.2	W336	MJB	habitat only
25/06/2020	477925.2	6774612.8	W337	MJB	habitat only
25/06/2020	478174.5	6774603.3	W338	MJB	habitat only
25/06/2020	478188.8	6774599.6	W339	MJB	habitat only
25/06/2020	478257.3	6774615.4	W340	MJB	habitat only
25/06/2020	478305.3	6774624.3	W341	MJB	habitat only
25/06/2020	478443.2	6774607.4	W342	MJB	habitat only
25/06/2020	478481.7	6774590.4	W343	MJB	habitat only
25/06/2020	478505.2	6774619.8	W344	MJB	habitat only
25/06/2020	478516.1	6774601.9	W345	MJB	habitat only
25/06/2020	478661.6	6774622.7	W346	MJB	habitat only

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25/06/2020	478557.0	6774597.4	W347	MJB	habitat only
25/06/2020	478729.4	6774618.1	W348	MJB	habitat only
25/06/2020	478770.4	6774629.1	W349	MJB	habitat only
25/06/2020	479485.4	6774617.7	W350	MJB	habitat only
25/06/2020	479526.8	6774624.2	W351	MJB	habitat only
25/06/2020	479721.9	6774603.3	W352	MJB	habitat only
25/06/2020	479942.8	6774606.2	W353	MJB	habitat only
25/06/2020	480078.9	6774611.8	W354	MJB	habitat only
25/06/2020	478703.0	6774483.4	W355	PMS	habitat only
25/06/2020	478217.4	6774473.2	W356	PMS	habitat only
25/06/2020	477729.7	6774502.6	W357	PMS	habitat only
25/06/2020	477959.5	6774455.7	W358	PMS	habitat only
25/06/2020	477661.4	6774497.2	W359	PMS	habitat only
25/06/2020	477044.4	6774520.1	W360	PMS	habitat only
25/06/2020	478063.6	6774515.1	W361	PMS	habitat only
25/06/2020	478643.4	6774525.4	W362	PMS	habitat only
25/06/2020	478264.2	6774500.4	W363	PMS	habitat only
25/06/2020	478936.8	6774545.2	W364	PMS	habitat only
25/06/2020	479302.0	6774511.0	W365	PMS	habitat only
25/06/2020	479879.9	6774462.5	W366	SKS	habitat only
25/06/2020	478558.8	6774459.1	W367	SKS	habitat only
25/06/2020	478270.8	6774441.7	W368	SKS	habitat only
25/06/2020	478322.2	6774443.3	W369	SKS	habitat only
25/06/2020	478247.8	6774463.4	W370	SKS	habitat only
25/06/2020	478137.9	6774458.3	W371	SKS	habitat only
25/06/2020	477962.8	6774456.5	W372	SKS	habitat only
25/06/2020	477288.5	6774478.6	W373	SKS	habitat only
25/06/2020	478075.8	6774536.3	W374	SKS	habitat only
25/06/2020	479343.7	6774555.2	W375	SKS	habitat only
25/06/2020	479375.7	6774567.9	W376	SKS	habitat only

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25/06/2020	479529.5	6774533.0	W377	SKS	habitat only
26/06/2020	479937.0	6774720.1	W378	SKS	habitat only
26/06/2020	479347.5	6775013.1	W379	SKS	habitat only
26/06/2020	478867.6	6775016.3	W380	SKS	habitat only
26/06/2020	478660.0	6775050.5	W381	SKS	habitat only
26/06/2020	478589.1	6775025.4	W382	SKS	habitat only
26/06/2020	478478.0	6775034.8	W383	SKS	habitat only
26/06/2020	477753.8	6775037.0	W384	SKS	habitat only
26/06/2020	477414.3	6775042.6	W385	SKS	habitat only
26/06/2020	477274.0	6775029.0	W386	SKS	habitat only
26/06/2020	477245.1	6774994.7	W387	SKS	habitat only
26/06/2020	477333.4	6775168.9	W388	SKS	habitat only
26/06/2020	477735.3	6775178.4	W389	SKS	habitat only
26/06/2020	477742.6	6775167.4	W390	SKS	habitat only
26/06/2020	479060.6	6775178.7	W391	SKS	habitat only
26/06/2020	479186.5	6775177.1	W392	SKS	habitat only
26/06/2020	479385.8	6775010.4	W393	PMS	habitat only
26/06/2020	479363.1	6774969.4	W394	PMS	habitat only
26/06/2020	479215.7	6774982.0	W395	PMS	habitat only
26/06/2020	478944.9	6775006.2	W396	PMS	habitat only
26/06/2020	478943.9	6774961.0	W397	PMS	habitat only
26/06/2020	478852.8	6775012.2	W398	PMS	habitat only
26/06/2020	478370.2	6774983.4	W399	PMS	habitat only
26/06/2020	477978.7	6774940.0	W400	PMS	habitat only
26/06/2020	477725.6	6774997.3	W401	PMS	habitat only
26/06/2020	477624.0	6774987.3	W402	PMS	habitat only
26/06/2020	477300.7	6775204.9	W403	PMS	habitat only
26/06/2020	479882.7	6774682.9	W404	JB	habitat only
26/06/2020	479734.4	6774782.8	W405	JB	habitat only
26/06/2020	479711.7	6774651.1	W406	JB	habitat only

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26/06/2020	479467.1	6775069.0	W407	JB	habitat only
26/06/2020	478948.0	6775052.5	W408	JB	habitat only
26/06/2020	478879.8	6775076.6	W409	JB	habitat only
26/06/2020	478570.8	6775071.6	W410	JB	habitat only
26/06/2020	478529.9	6775067.4	W411	JB	habitat only
26/06/2020	478478.6	6775068.9	W412	JB	habitat only
26/06/2020	477789.4	6775053.7	W413	JB	habitat only
26/06/2020	477719.1	6775058.9	W414	JB	habitat only
26/06/2020	477611.8	6775061.0	W415	JB	habitat only
26/06/2020	477573.3	6775060.0	W416	JB	habitat only
26/06/2020	477418.8	6775065.7	W417	JB	habitat only
26/06/2020	477411.6	6775041.4	W418	JB	habitat only
26/06/2020	477366.9	6775072.2	W419	JB	habitat only
26/06/2020	477336.2	6775066.9	W420	JB	habitat only
26/06/2020	477208.9	6775071.8	W421	JB	habitat only
26/06/2020	477130.3	6775156.9	W422	JB	habitat only
26/06/2020	477298.5	6775148.2	W423	JB	habitat only
26/06/2020	477325.0	6775150.2	W424	JB	habitat only
26/06/2020	477373.0	6775167.3	W425	JB	habitat only
26/06/2020	477394.7	6775160.0	W426	JB	habitat only
26/06/2020	477678.6	6775152.1	W427	JB	habitat only
26/06/2020	478683.3	6775160.8	W428	JB	habitat only
26/06/2020	478823.2	6775141.4	W429	JB	habitat only
26/06/2020	478723.5	6775146.8	W430	JB	habitat only
26/06/2020	478914.5	6775142.2	W431	JB	habitat only
26/06/2020	479065.3	6775150.8	W432	JB	habitat only
26/06/2020	479173.1	6775152.9	W433	JB	habitat only
26/06/2020	479201.7	6775144.9	W434	JB	habitat only
26/06/2020	479719.5	6774802.9	W435	MJB	habitat only
26/06/2020	479680.0	6774722.9	W436	MJB	habitat only

DATE	Easting	Northing	LABEL	OBSERVER	Notes
26/06/2020	479276.0	6775120.8	W437	MJB	habitat only
26/06/2020	478948.2	6775098.2	W438	MJB	habitat only
26/06/2020	478908.5	6775093.3	W439	MJB	habitat only
26/06/2020	478792.9	6775084.3	W440	MJB	habitat only
26/06/2020	477803.9	6775089.1	W441	MJB	habitat only
26/06/2020	478686.4	6775083.2	W442	MJB	habitat only
26/06/2020	477779.0	6775091.5	W443	MJB	habitat only
26/06/2020	478447.9	6775087.9	W444	MJB	habitat only
26/06/2020	477689.1	6775117.2	W445	MJB	habitat only
26/06/2020	477654.2	6775111.2	W446	MJB	habitat only
26/06/2020	477617.3	6775113.9	W447	MJB	habitat only
26/06/2020	477572.3	6775066.8	W448	MJB	habitat only
26/06/2020	477522.2	6775078.6	W449	MJB	habitat only
26/06/2020	477392.2	6775095.8	W450	MJB	habitat only
26/06/2020	477358.4	6775075.9	W451	MJB	habitat only
26/06/2020	477757.0	6775115.6	W452	MJB	habitat only
26/06/2020	477318.4	6775109.9	W453	MJB	habitat only
26/06/2020	478899.4	6775129.7	W454	MJB	habitat only
26/06/2020	477406.2	6775112.0	W455	MJB	habitat only
26/06/2020	477205.9	6775071.9	W456	MJB	habitat only
26/06/2020	477244.0	6775114.9	W457	MJB	habitat only
26/06/2020	479338.0	6775098.1	W458	MJB	habitat only
26/06/2020	477250.7	6775080.9	W459	MJB	habitat only
20/06/2020	477295.1	6766147.9	W460	JB	Habitat only.
20/06/2020	476481.2	6766341.9	W461	JB	Habitat only.
20/06/2020	476491.5	6766820.4	W462	JB	Habitat only.
20/06/2020	476470.6	6767901.8	W463	JB	Habitat only.
20/06/2020	476481.5	6768010.4	W464	JB	Habitat only.
20/06/2020	477113.0	6766696.1	W465	JB	Habitat only.
20/06/2020	477129.6	6766776.9	W466	JB	Habitat only.

DATE	Easting	Northing	LABEL	OBSERVER	Notes
20/06/2020	476626.5	6767034.1	W467	JB	Habitat only.
20/06/2020	476614.2	6768160.1	W468	JB	Habitat only.
20/06/2020	476633.3	6766865.8	W469	JB	Habitat only.
20/06/2020	476632.0	6766828.5	W470	JB	Habitat only.
20/06/2020	476620.2	6766790.6	W471	JB	Habitat only.
20/06/2020	476626.4	6766784.1	W472	JB	Habitat only.
20/06/2020	476622.8	6766693.8	W473	JB	Habitat only.
20/06/2020	476462.9	6766302.2	W474	JB	Habitat only.
20/06/2020	477344.1	6766642.5	W475	MJB	Habitat only.
20/06/2020	476646.8	6766798.4	W476	MJB	Habitat only.
20/06/2020	476647.6	6766787.3	W477	MJB	Habitat only.
20/06/2020	476640.9	6766739.4	W478	MJB	Habitat only, group of 6 large York Gum.
20/06/2020	476664.7	6766704.3	W479	MJB	Habitat only.
20/06/2020	476639.3	6766692.6	W480	MJB	Habitat only.
20/06/2020	476443.9	6766231.9	W481	MJB	Habitat only.
20/06/2020	476453.4	6766250.4	W482	MJB	Habitat only, group of 5 large York Gum.
20/06/2020	476459.8	6766280.0	W483	MJB	Habitat only.
20/06/2020	476434.7	6766298.6	W484	MJB	Habitat only.
20/06/2020	476442.0	6766847.0	W485	MJB	Habitat only.
20/06/2020	476465.8	6767042.9	W486	MJB	Habitat only.
20/06/2020	477321.3	6766141.5	W487	MJB	Habitat only.
20/06/2020	477139.0	6766091.4	W488	MJB	Habitat only.
20/06/2020	477096.9	6766778.2	W489	MJB	Habitat only.
20/06/2020	477094.2	6766865.6	W490	MJB	Habitat only.
20/06/2020	476651.4	6768124.6	W491	MJB	Habitat only.
20/06/2020	476655.3	6768079.4	W492	MJB	Habitat only.
20/06/2020	476632.2	6767281.6	W493	MJB	Habitat only.
20/06/2020	476678.3	6767175.8	W494	MJB	Habitat only.
20/06/2020	476648.6	6767020.2	W495	MJB	Habitat only.
20/06/2020	476662.5	6766796.0	W496	MJB	Habitat only.

DATE	Easting	Northing	LABEL	OBSERVER	Notes
20/06/2020	477211.2	6766578.0	W497	PMS	Habitat only.
20/06/2020	476526.6	6766788.0	W498	PMS	Habitat only.
20/06/2020	477217.1	6766086.7	W499	PMS	Habitat only.
20/06/2020	477202.6	6766082.9	W500	PMS	Habitat only.
20/06/2020	477171.1	6766760.2	W501	PMS	Habitat only.
20/06/2020	477174.4	6766798.7	W502	PMS	Habitat only.
20/06/2020	476601.0	6768183.9	W503	PMS	Habitat only.
20/06/2020	476570.1	6768178.7	W504	PMS	Habitat only.
20/06/2020	476538.2	6768103.0	W505	PMS	Habitat only.
20/06/2020	476551.7	6767006.3	W506	PMS	Habitat only.
20/06/2020	476606.5	6766702.5	W507	PMS	Habitat only.
20/06/2020	477158.4	6766793.7	W508	SKS	Habitat only.
20/06/2020	476597.5	6768171.6	W509	SKS	Habitat only.
20/06/2020	476598.1	6766968.5	W510	SKS	Habitat only.
20/06/2020	476510.3	6766833.0	W511	SKS	Habitat only.
20/06/2020	476616.6	6766721.1	W512	SKS	Habitat only.
20/06/2020	476519.6	6766836.5	W513	SKS	Habitat only.
21/06/2020	475972.8	6767679.5	W514	PMS	Habitat only.
21/06/2020	475968.5	6767558.4	W515	PMS	Habitat only.
21/06/2020	476035.6	6767626.8	W516	PMS	Habitat only.
21/06/2020	476013.3	6767596.7	W517	PMS	Habitat only.
21/06/2020	475982.6	6768133.8	W518	PMS	Habitat only.
21/06/2020	475993.0	6767633.4	W519	PMS	Habitat only.
21/06/2020	475989.7	6768188.1	W520	PMS	Habitat only.
21/06/2020	475956.6	6766749.8	W521	SKS	Habitat only.
21/06/2020	475940.3	6767599.4	W522	SKS	Habitat only.
21/06/2020	475941.1	6767724.6	W523	SKS	Habitat only.
21/06/2020	475929.6	6767762.1	W524	SKS	Habitat only.
21/06/2020	476030.1	6768157.4	W525	SKS	Habitat only.
21/06/2020	476062.7	6767760.2	W526	SKS	Habitat only.

DATE	Easting	Northing	LABEL	OBSERVER	Notes
21/06/2020	476031.9	6767688.8	W527	SKS	Habitat only.
21/06/2020	475935.3	6766648.6	W528	SKS	Habitat only.
21/06/2020	475950.8	6766682.9	W529	SKS	Habitat only.
21/06/2020	475958.7	6766704.6	W530	SKS	Habitat only.
21/06/2020	476080.3	6768070.6	W531	JB	Habitat only.
21/06/2020	475927.9	6768177.6	W532	JB	Habitat only.
21/06/2020	475921.2	6766144.3	W533	JB	Habitat only.
21/06/2020	476059.8	6767673.1	W534	JB	Habitat only.
21/06/2020	475918.3	6766176.6	W535	JB	Habitat only.
21/06/2020	475936.9	6767598.6	W536	JB	Habitat only.
21/06/2020	475920.9	6766695.2	W537	JB	Habitat only.
21/06/2020	475913.4	6767626.1	W538	JB	Habitat only.
21/06/2020	475926.9	6767761.2	W539	JB	Habitat only.
21/06/2020	475896.9	6767814.8	W540	JB	Habitat only.
21/06/2020	475912.3	6768012.1	W541	JB	Habitat only.
21/06/2020	475856.8	6768041.2	W542	MJB	Habitat only.
21/06/2020	476096.2	6767747.0	W543	MJB	Habitat only.
21/06/2020	476113.4	6766406.7	W544	MJB	Habitat only.
21/06/2020	476101.7	6766302.5	W545	MJB	Habitat only.
21/06/2020	475886.6	6766167.2	W546	MJB	Habitat only.
21/06/2020	475883.7	6766192.8	W547	MJB	Habitat only.
21/06/2020	475884.4	6766259.3	W548	MJB	Habitat only.
21/06/2020	475881.7	6766811.2	W549	MJB	Habitat only.
21/06/2020	475900.3	6767741.9	W550	MJB	Habitat only.
21/06/2020	475868.0	6766855.7	W551	MJB	Habitat only.
21/06/2020	475876.6	6767814.0	W552	MJB	Habitat only, 5 log piles.
21/06/2020	475882.0	6767863.3	W553	MJB	Habitat only, 8 large York Gum over 1 ha.
21/06/2020	475876.3	6767928.6	W554	MJB	Habitat only.
21/06/2020	475883.4	6767951.0	W555	MJB	Habitat only, 3 York Gum in group.
21/06/2020	475897.2	6767986.3	W556	MJB	Habitat only.

DATE	Easting	Northing	LABEL		OBSERVER	Notes
21/06/2020	475884.3	6768002.7	W557		MJB	Habitat only.
21/06/2020	475874.6	6768036.5	W558		MJB	Habitat only.
21/06/2020	475877.0	6768071.6	W559		MJB	Habitat only.
27/06/2024	468321.0	6766778.4	FallTree		BS	Fallen tree with hollows
27/06/2024	468609.6	6767183.2	FallTree2		BS	Fallen tree with hollows
27/06/2024	470126.9	6767135.2	FallTree3		BS	Fallen tree with hollows
30/06/2024	481185.1	6776562.1	POTSKHAB		PMS	Potential Spiny-tailed Skink habitat. Single fallen hollow log with many branches in contact with ground surface. PMS photo 100-262.
30/06/2024	481373.8	6776612.0	POTSKHAB		PMS	Potential Spiny-tailed Skink habitat. Multiple fallen hollow logs in good condition.
30/06/2024	481429.6	6777300.6	POTSKHAB		PMS	Potential Spiny-tailed Skink habitat. Many fallen hollow logs in good condition.
30/06/2024	481641.9	6776707.7	POTSKHAB		PMS	
30/06/2024	481692.5	6776609.9	POTSKHAB		PMS	Potential Spiny-tailed Skink habitat. Many fallen hollow logs in good condition.
30/06/2024	481839.8	6777274.2	POTSKHAB		PMS	Potential Spiny-tailed Skink habitat. Many fallen hollow logs in good condition.
27/06/2024	468164.1	6766752.8		1548	MJB	Typical skink log. All others labelled as â€˜sk treeâ€™ or â€˜skink treeâ€™.
27/06/2024	468146.5	6767012.3	POTSKHAB		PMS	Potential skink habitat, numerous fallen Eucalyptus sp logs on ground. No skinks found. PMS photo 100-0254.
27/06/2024	468848.4	6766982.2	POTSKHAB		MJB	Potential skink tree
27/06/2024	469000.9	6767007.0	POTSKHAB		MJB	Potential skink tree
27/06/2024	469060.7	6766977.6	POTSKHAB		MJB	Potential skink tree
27/06/2024	469076.1	6766975.3	POTSKHAB		MJB	Potential skink tree
27/06/2024	469081.6	6766990.2	POTSKHAB		MJB	Potential skink tree
27/06/2024	469154.3	6767106.8	POTSKHAB		MJB	Potential skink tree
27/06/2024	469560.0	6767015.7	POTSKHAB		MJB	
27/06/2024	469675.1	6766997.2	POTSKHAB		MJB	
27/06/2024	469754.2	6766992.1	POTSKHAB		MJB	

DATE	Easting	Northing	LABEL		OBSERVER	Notes
27/06/2024	469742.0	6767045.6	POTSKHAB		ARB	Tree with Hollows
27/06/2024	469752.3	6767042.7	POTSKHAB		ARB	Tree with Hollows
27/06/2024	469795.2	6767051.3	POTSKHAB		ARB	Tree with Hollows
27/06/2024	470187.8	6767007.5	POTSKHAB		MJB	
27/06/2024	470098.9	6767029.5	POTSKHAB		ARB	Tree with Hollows
27/06/2024	467874.4	6770300.3	Falltree1		BS	Fallen tree with hollows
28/06/2024	468258.6	6770356.8		1048	ARB	Tree with Hollows
28/06/2024	468131.8	6770297.7	FallTree02		BS	Fallen tree with hollows
28/06/2024	468152.2	6770295.2	Falltree03		BS	Fallen tree with hollows
28/06/2024	468263.3	6770308.9	FallTree04		BS	Fallen tree with hollows
28/06/2024	468304.9	6770292.6	Falltree05		BS	Fallen tree with hollows
28/06/2024	468316.6	6770293.7	FallTree06		BS	Fallen tree with hollows
28/06/2024	468352.4	6770305.5	FallTree7		BS	Fallen tree with hollows
28/06/2024	468389.2	6770317.0	FallTree08		BS	Fallen tree with hollows
28/06/2024	468427.7	6770296.7	FallTree09		BS	Fallen tree with hollows
28/06/2024	468454.6	6770294.5	FallTree10		BS	Fallen tree with hollows
28/06/2024	468660.7	6769512.4	POTSKHAB		MJB	
28/06/2024	468629.9	6769522.5	POTSKHAB		MJB	
28/06/2024	468644.8	6769652.4	POTSKHAB		PMS	Potential Skink habitat. Some fallen Eucalyptus sp. logs with scattered shrubs. No skinks found. PMS photo 100-257.
28/06/2024	468729.1	6769529.2	FallTree11		BS	Fallen tree with hollows
28/06/2024	468498.6	6769601.5	POTSKHAB		ARB	Tree with Hollows
28/06/2024	468504.6	6769515.4	POTSKHAB		MJB	
28/06/2024	468561.4	6769673.3	POTSKHAB		PMS	Potential Skink habitat. Some fallen Eucalyptus sp. logs with scattered shrubs. No skinks found.
28/06/2024	468351.1	6769541.3	FallTree12		BS	Fallen tree with hollows
28/06/2024	468239.2	6769503.5	POTSKHAB		MJB	
28/06/2024	468201.7	6769597.2	POTSKHAB		ARB	Tree with Hollows
28/06/2024	468204.4	6769502.5	POTSKHAB		MJB	
28/06/2024	468286.5	6769554.7	FallTree13		BS	Fallen tree with hollows

DATE	Easting	Northing	LABEL	OBSERVER	Notes
28/06/2024	468219.8	6769546.6	FallTree14	BS	Fallen tree with hollows
28/06/2024	468192.0	6769657.7	POTSKHAB	PMS	
29/06/2024	471251.8	6773107.6	FallTreeAverage	BS	Fallen tree with hollows
29/06/2024	471093.4	6772980.4	POTSKHAB	MJB	
29/06/2024	471111.6	6773112.5	TreeHols	BS	
29/06/2024	470946.7	6773103.9	FalltreeNoVeg	BS	Fallen tree with hollows
29/06/2024	470920.4	6773117.4	FallTree	BS	Fallen tree with hollows
29/06/2024	470849.7	6773175.3	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Multiple fallen hollow logs suitable for Spiny-tailed Skink colonies. Several searched but no skinks found.
29/06/2024	470796.9	6773206.9	FalTree	BS	Fallen tree with hollows
29/06/2024	470830.3	6773325.4	Falltree	BS	Fallen tree with hollows
29/06/2024	470947.2	6773333.5	Falltree	BS	Fallen tree with hollows
29/06/2024	470988.3	6773249.7	POTSKHAB	ARB	Tree with Hollows
29/06/2024	470987.7	6773357.7	FallTree&echidLatrin	BS	Tree with Hollows and Echidna latrine
29/06/2024	471233.7	6773260.3	POTSKHAB	MJB	
29/06/2024	472487.2	6773223.6	POTSKHAB	MJB	
29/06/2024	471698.5	6770548.2	Faltree-bushes	BS	Fallen tree with hollows
29/06/2024	471896.8	6770685.5	POTSKHAB	MJB	
29/06/2024	471929.5	6770567.4	FalTree	BS	Fallen tree with hollows
29/06/2024	471945.0	6770672.5	POTSKHAB	MJB	
29/06/2024	472071.5	6770701.4	POTSKHAB	MJB	
29/06/2024	471937.4	6770610.5	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Many fallen hollow logs. Several searched but no skinks found, PMS photo 100-259.
29/06/2024	472155.3	6770686.8	POTSKHAB	MJB	
29/06/2024	472167.7	6770559.9	FalltreeWiBushes	BS	Fallen tree with hollows
29/06/2024	471916.4	6770663.7	POTSKHAB	ARB	Tree with Hollows
29/06/2024	472203.8	6770544.4	FallTree	BS	Fallen tree with hollows
29/06/2024	472306.4	6770695.0	POTSKHAB	MJB	
29/06/2024	472289.7	6770728.7	POTSKHAB	MJB	

DATE	Easting	Northing	LABEL	OBSERVER	Notes
29/06/2024	472315.8	6770729.3	POTSKHAB	MJB	
29/06/2024	472327.8	6770752.6	POTSKHAB	MJB	
29/06/2024	472373.9	6770739.3	POTSKHAB	MJB	
29/06/2024	472237.9	6770465.3	POTSKHAB	MJB	
29/06/2024	472239.7	6770509.5	TreeHols	BS	Fallen tree with hollows
29/06/2024	472072.7	6770475.5	POTSKHAB	MJB	
29/06/2024	472007.8	6770492.4	Faltree-wiBush	BS	Fallen tree with hollows
29/06/2024	471985.3	6770449.8	POTSKHAB	MJB	Group of large, old York Gum
29/06/2024	471899.7	6770487.2	Falltrees	BS	Fallen tree with hollows
30/06/2024	480283.4	6776755.3	FalltreeNoveg	BS	Fallen tree with hollows
30/06/2024	480238.1	6776773.2	Clusterfalltrees	BS	
30/06/2024	480192.6	6777241.6	POTSKHAB	ARB	Tree with Hollows
30/06/2024	480593.5	6776764.8	FallTreenoveg	BS	Fallen tree with hollows
30/06/2024	481021.7	6776643.2	POTSKHAB	MJB	
30/06/2024	481366.4	6776618.0	POTSKHAB	MJB	
30/06/2024	481462.5	6776788.4	Falltrees	BS	Fallen tree with hollows
30/06/2024	481447.7	6776638.0	POTSKHAB	MJB	
30/06/2024	481499.4	6776634.2	POTSKHAB	MJB	
30/06/2024	481486.9	6776711.7	Falltreenoveg	BS	Fallen tree with hollows
30/06/2024	481570.8	6776648.6	POTSKHAB	MJB	
30/06/2024	481593.8	6776663.9	POTSKHAB	MJB	
30/06/2024	481679.0	6776736.7	Falltreewiveg	BS	Fallen tree with hollows
30/06/2024	481751.0	6776642.7	POTSKHAB	MJB	
30/06/2024	482604.6	6777217.6	POTSKHAB	MJB	
30/06/2024	482416.3	6777261.0	POTSKHAB	ARB	Tree with Hollows
30/06/2024	482444.8	6777351.2	POTSKHAB	BS	Fallen tree with hollows
30/06/2024	482189.5	6777196.9	POTSKHAB	MJB	
30/06/2024	482087.1	6777341.0	POTSKHAB	BS	Fallen tree with hollows
30/06/2024	481869.9	6777329.3	POTSKHAB	BS	Fallen tree with hollows
30/06/2024	481833.4	6777185.5	POTSKHAB	MJB	

DATE	Easting	Northing	LABEL	OBSERVER	Notes
30/06/2024	481831.1	6777204.5	POTSKHAB	MJB	
30/06/2024	481726.9	6777195.8	POTSKHAB	MJB	
30/06/2024	481632.2	6777314.8	Falltree	BS	Fallen tree with hollows
30/06/2024	481615.1	6777188.5	POTSKHAB	MJB	
30/06/2024	481520.8	6777350.4	Falltree	BS	Fallen tree with hollows
30/06/2024	481552.3	6777176.1	POTSKHAB	MJB	
30/06/2024	481492.7	6777343.2	Falltreecluster	BS	Fallen tree with hollows
30/06/2024	481385.9	6777237.6	POTSKHAB	ARB	Tree with Hollows
30/06/2024	481147.4	6777330.8	POTSKHAB	BS	Fallen tree with hollows
30/06/2024	481051.4	6777334.6	Treeclust&sknkwood	BS	
1/07/2024	483417.7	6771895.2	POTSKHAB	MJB	
1/07/2024	483452.1	6771931.5	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483471.0	6771933.2	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483338.9	6771942.7	POTSKHAB	ARB	Tree with Hollows
1/07/2024	483404.2	6772185.1	POTSKHAB	MJB	
1/07/2024	483428.1	6772086.5	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483395.3	6772215.4	POTSKHAB	MJB	
1/07/2024	483453.9	6772132.8	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483383.8	6772238.5	POTSKHAB	MJB	
1/07/2024	483497.5	6772160.9	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483450.5	6772386.5	POTSKHAB	BS	Potential skink tree, no veg
1/07/2024	483484.1	6772450.6	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483387.7	6772456.2	POTSKHAB	ARB	Tree with Hollows
1/07/2024	483439.5	6773205.7	POTSKHAB	MJB	
1/07/2024	483411.5	6773301.8	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Few good fallen hollow logs
1/07/2024	483557.6	6773188.5	POTSKHAB	MJB	
1/07/2024	483628.5	6773185.8	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Few good fallen hollow logs.
1/07/2024	483625.0	6773183.9	POTSKHAB	MJB	

DATE	Easting	Northing	LABEL	OBSERVER	Notes
1/07/2024	483750.1	6773073.0	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Single good log with vegetation nearby
1/07/2024	483711.1	6773013.8	POTSKHAB	MJB	
1/07/2024	483660.1	6773092.6	POTSKHAB	ARB	Tree with Hollows
1/07/2024	483767.2	6772382.2	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Many good fallen logs. Eucalyptus salubris on clay loam soil. PMS photo ?
1/07/2024	483790.9	6772262.8	POTSKHAB	PMS	Potential Spiny-tailed Skink habitat. Many good fallen logs. Eucalyptus salubris on clay loam soil.
1/07/2024	483717.2	6772472.2	POTSKHAB	MJB	
1/07/2024	483681.1	6772429.0	POTSKHAB	MJB	
1/07/2024	483721.8	6772378.2	POTSKHAB	MJB	
1/07/2024	483701.0	6772286.8	POTSKHAB	MJB	
1/07/2024	483600.8	6772288.8	TreeClstr	BS	
1/07/2024	483635.0	6772123.9	Logpile	BS	Fallen tree with hollows
1/07/2024	483649.1	6772420.9	POTSKHAB	ARB	Tree with Hollows
1/07/2024	483712.9	6771967.8	POTSKHAB	MJB	
1/07/2024	483631.7	6772103.4	POTSKHAB	BS	Fallen tree with hollows
1/07/2024	483640.7	6772086.2	Tree&logcluster	BS	Fallen tree with hollows
1/07/2024	483818.4	6771960.8	POTSKHAB	PMS	
1/07/2024	483640.4	6771882.7	POTSKHAB	MJB	
1/07/2024	483556.7	6771915.1	POTSKHAB	MJB	
1/07/2024	483613.5	6772034.1	POTSKHAB	ARB	Tree with Hollows
1/07/2024	483556.5	6771922.6	POTSKHAB	ARB	Tree with Hollows
2/07/2024	483775.0	6778407.3	Tree&fal-cluster	BS	Fallen tree with hollows
2/07/2024	483761.5	6778455.0	POTSKHAB	BS	Fallen tree with hollows
2/07/2024	483722.5	6778539.0	POTSKHAB	MJB	
2/07/2024	483784.6	6778555.5	Tree&fallcluster	BS	Fallen tree with hollows
2/07/2024	483700.2	6779039.1	POTSKHAB	MJB	
2/07/2024	483300.6	6778872.3	Fallen-StahdTres	BS	Fallen tree with hollows
2/07/2024	483400.5	6778421.9	POTSKHAB	ARB	Tree with Hollows

DATE	Easting	Northing	LABEL	OBSERVER	Notes
2/07/2024	461333.5	6772053.2	POTSKHAB	MJB	Cluster trees suitable for Egernia. Tree pin-tagged 15A from historic monitoring, now unnocupied.

Appendix 13. Locations of Malleefowl mounds, tracks and scats observed by BCE in 2020 and 2024.

GDA94; Zone 50.

Date	Easting	Northing	Label	Observer	Species	Type	Photo	Notes
22/06/2020	476630.7	6772563	MFP1	PMS	Malleefowl	Mound recent to old	Yes	Mound approx 6m diameter, 0.5m high with crater to 0.4m. 10+ years old, photo 1150 .
22/06/2020	476142.8	6772520	MFJ2	JB	Malleefowl	Mound old to very old		50 years old, 150 mm crater depth, no elevation, well formed crater, clay substrate on hillside.
22/06/2020	477814	6773179	MFJ3	JB	Malleefowl	Mound old to very old		Old mound, trees growing from well defined crater at 500mm elevation.
22/06/2020	476976.9	6773204	MFMDANCIENT	MJB	Malleefowl	Mound old to very old		A rather indistinct clayey mound with no depression that had an existing waypoint
22/06/2020	476266.6	6772472	MFMDMNX1	MJB	Malleefowl	Mound old to very old		Gravel mound c. 6 across with no depression and tall shrubs in middle. >100 years??
23/06/2020	478006.1	6773848	MFS2	SKS	Malleefowl	Mound old to very old		Mound 20+ years old, 6m across, 0.5 m high, crater to 0.4m. Dead mulga in crater. Gravel.
23/06/2020	478137.6	6773900	MFMDM3	MJB	Malleefowl	Mound old to very old		Gravel mound 3m across and 0.5m high with depression. Several fallen trees over mound but mound surface still soft, suggesting not very old. Maybe 20+ years?
23/06/2020	477056.9	6773781	MFP2	PMS	Malleefowl	Mound old to very old	Yes	Mound, 20+yrs gravel 0.5m high with crater to 0.3m. Photo PMS 1153.
25/06/2020	479080.2	6774408	MFTK	MJB	Malleefowl	Malleefowl track		Mallee Fowl track.
25/06/2020	476853.4	6774482	MFP3	PMS	Malleefowl	Mound old to very old		Mound 20+ yrs, 10m diameter, 0.7m high, crater to 0.3m, gravel, mature mulga growing.
26/06/2020	477209.9	6774772	MFP4	PMS	Malleefowl	Mound old to very old	Yes	Old mound 20+ yrs gravel 15m diameter to 0.6m high, crater to 0.5. Photo.
26/06/2020	477928.4	6775089	MFMD04M	MJB	Malleefowl	Mound recent to old		Gravel mound 8m across and 0.5m high. Gravel still loose and about 5 holes probably rabbits? No clear depression. <20 years?
26/06/2020	477508.4	6775116	MFMDANTEDELUVIAN	MJB	Malleefowl	Unknown		Low gravel mound 10m across. Surface compact and dead tree in middle

Date	Easting	Northing	Label	Observer	Species	Type	Photo	Notes
26/06/2020	477206	6774771	MF	MJB	Malleefowl	Mound old to very old	Yes	Old mound 20+ yrs gravel, 15m diameter to 0.6m high, crater to 0.5. Photo.
20/06/2020	477285.3	6767562	MFM1	MJB	Malleefowl	Mound recent to old		Mound about 3m across and 0.5m high, raised perimeter and central depression higher than surrounding soil surface. Soil quite loose with lots of beetle larvae faeces. suggesting mound had recently been filled with plant material. Some shell fragments.
20/06/2020	477082	6767579	MFTKM	MJB	Malleefowl	Malleefowl track		Track
20/06/2020	477216.6	6767067	MF2	MJB	Malleefowl	Mound recent to old		Photo number 1128 PMS. 3m diameter, 0.5m high, 0.15m crater, egg shell, leaf litter, used 2-3 years ago.
20/06/2020	477237.1	6767011	MF	MJB	Malleefowl	Mound old to very old		Very old
21/06/2020	476031.4	6766414	MFS1	SKS	Malleefowl	Mound recent to old		Mound. Photo #1159 PMS. 10m diameter with fairly fresh vegetation piled on one side of 5 metre diameter fresh crater to 600mm. Veg matter pushed in last 1-2 years but not used. Much shell in dirt, used within 5 years. 2 very old mounds 100m to south.
21/06/2020	475177.9	6768119	MFMDVOLD	MJB	Malleefowl	Mound old to very old		A very old Malleefowl mound; just a distinct depression and a slightly raised circular rim. 50+ years?
21/06/2020	475887.7	6767650	MLFLTK	MJB	Malleefowl	Malleefowl track		track
24/06/2020	474791.2	6766267	MFMDACT1	MJB	Malleefowl	Mound Active		Active mound. About 5m across and 0.6m raised rim. Crater dug out with fresh littler and twigs mounded in centre. Shell fragments from past breeding and lots of beetle larvae scats from larvae feeding on old material. Scats on rim and lots of tracks
24/06/2020	474587.4	6766104	MFTK	MJB	Malleefowl	Malleefowl track		Track
27/06/2020	476385.1	6766585	MFS4	SKS	Malleefowl	Mound recent to old		2 years. Decomposing larval scats, shell. Soft centre. Mound700mm, crater 400mm, 5m diametre, small gravel stones and sand.
27/06/2020	475521	6766219	MF	Heritage survey	Malleefowl	mound active		Active, 3m diameter, sand leaves and sticks, 400mm up, crater 300mm full of fresh vegetation. vegetation. used last year, lots of shell. Fresh scratching surrounding mound for tens of metres.

Date	Easting	Northing	Label	Observer	Species	Type	Photo	Notes
27/06/2020	474788	6766266	MF	Heritage survey	Malleefowl	mound active		Active, 5 metres diameter, up 600mm, crater 500mm. scratchings, scats, egg shell. Equals MJB MFMACTIVE
27/06/2024	470365	6766438	MFM01	MJB	Malleefowl	Malleefowl Mound	Yes	Photo at 08:46. New Mound. 3.5m across and 0.5m high, with centra crater >0.6m. Deeply cratered and dug out in the centre, with what appeared to be recent material scraped into crater
27/06/2024	470332	6766314	MFM02	PMS	Malleefowl	Malleefowl Mound		
27/06/2024	470332	6766314	MFM02	PMS	Malleefowl	Malleefowl Mound	0	
27/06/2024	469667	6766347	MFM03	MJB	Malleefowl	Malleefowl Mound		
27/06/2024	469629	6766353	MFTK	MJB	Malleefowl	Track		
27/06/2024	468634	6766424	MFTK	MJB	Malleefowl	Track		
27/06/2024	468491	6766450	MFTK	MJB	Malleefowl	Track		
27/06/2024	468329	6766423	MFTK	MJB	Malleefowl	Track		
27/06/2024	468252	6766453	MFTK	MJB	Malleefowl	Track		
27/06/2024	468201	6766755	MFTK	MJB	Malleefowl	Track		
28/06/2024	469090	6770385	MFM04	MJB	Malleefowl	Malleefowl Mound		New Mound. 3m across and >0.5m high, depression 100mm. A mound of sand and loam, looks like it had been set up and covered in 2023 but not used. No shell fragments. MF scratches and dropping today
28/06/2024	468920	6770293	MFM05	BS	Malleefowl	Malleefowl Mound	Yes	New mound 4.5m across, 2m wide crater, no nest pit. Scraped vegetation outside, little inside. Sand over outer crater. MF droppings and recent tracks despite recent rain. Photo 20240628_100504.jpg
30/06/2024	482560	6776667	MFM06	MJB	Malleefowl	Malleefowl Mound		A very, very old mound; just a slight rise clear of vegetation and with larger gravel than surrounds. In area of slightly sandy loam. About 3m by 0.1m.
30/06/2024	481627	6777319	MFTK	BS	Malleefowl	Track		
30/06/2024	481580	6777344	MFTK	BS	Malleefowl	Track		
1/07/2024	483378	6772255	MFM09	MJB	Malleefowl	Malleefowl Mound	Yes	Photo at 08:17. A low, bare mound about 8m by 0.2m. Unused probably for a century and possibly an old Boodie warren
2/07/2024	489364	6778158	MFTK	MJB	Malleefowl	Track		Photo taken

Date	Easting	Northing	Label	Observer	Species	Type	Photo	Notes
2/07/2024	489363	6777907	MFTK	MJB	Malleefowl	Track		
2/07/2024	492632	6778578	Mallefowldrops	BS	Malleefowl	Scats		
2/07/2024	489536	6778236	MFTK	ARB	Malleefowl	Track	0	
2/07/2024	489536	6778236	MFTK	ARB	Malleefowl	Track		

Appendix 14. Locations of trapdoor spiders observed in 2020 and 2024 (not including results of systematic transects, shown in Appendix 15).

GDA94; Zone 50.

DATE	OBSERVER	LABEL	EASTING	NORTHING	SPECIES	MILLISCOPE	NUMBER_OF_	PHOTO	NOTES
22/06/2020	PMS	ID1	476827.2	6772582.2	Idiosoma formosum	Yes	1		Single burrow, unoccupied. Vertical material on lid .
22/06/2020	PMS	ID2	475389.6	6773097.2	Idiosoma formosum	Yes	1		Single burrow, vertical material on lid, spider feet first in burrow.
22/06/2020	PMS	ID3	476812.5	6773092.5	Idiosoma formosum	Yes	1		Single burrow, vertical material on lid, spider feet first in burrow.
22/06/2020	PMS	ID4	476793.6	6773086.4	Idiosoma formosum	Yes	2		2 burrows, some vertical material on lid, spider feet first in burrow.
22/06/2020	PMS	ID5	476973.0	6773104.3	Idiosoma formosum	Yes	5		Cluster of 2 large and 3 small burrows one with juvenile spiders as well as parent, much vertical material on lid.
22/06/2020	PMS	ID6	475370.4	6773124.3	Idiosoma formosum	Yes	2		2 burrows, vertical material on lid, spider feet first in burrow.
22/06/2020	PMS	ID7	475473.4	6772594.4	Idiosoma formosum	Yes	12		Cluster of 12, 5 large and 7 medium. 1 possibly with egg, 1 with spider juvenile i burrow with adult. Most with vertical material onfront fringe of lid. Pale soft loam soil under tall acacia sp. One specimen collected.
22/06/2020	SKS	ID8	476012.9	6772485.3	Idiosoma clypeatum	Yes	1		Single burrow. No constriction,lid flat with horizontal leaf fragments, spider feet first. specimen collected. Rocky ridge. l.intermedium.
22/06/2020	SKS	ID9	476798.5	6772623.5	Idiosoma formosum	Yes	2		2 large burrows, neat upright twigs on lids. Both burrows checked with milliscope. Both spiders retreated from milliscope while maintaning

									face first position. Loam soil under tall Acacia sp.
22/06/2020	SKS	ID10	475461.6	6772619.8	Idiosoma sp.		1		
22/06/2020	SKS	ID11	475433.0	6772628.4	Idiosoma sp.		1		
22/06/2020	SKS	ID12	476926.8	6773059.6	Idiosoma formosum		1		Single burrow with mud and acacia on lid.
22/06/2020	SKS	ID13	477064.6	6773059.2	Idiosoma formosum		2		Cluster of two with clay and acacia on lid.
22/06/2020	MJB	ID14	475427.8	6773202.3	Idiosoma formosum		1		
23/06/2020	SKS	ID15	476111.6	6773764.3	Idiosoma formosum	Yes	5	Yes	Cluster of 5, 2 large, 3 small, 1 large empty. 1 large feet first.
23/06/2020	SKS	ID16	476107.9	6773766.3	Idiosoma formosum	Yes	11		Cluster of 11, 1big empty, 1 big feet first, 6 medium 3 small. 1 big one no spider but orangey maggot segmented maggot in hollow.
23/06/2020	SKS	ID17	476109.6	6773767.3	Idiosoma formosum	Yes	2		Cluster of 2 large burrows, Callitris leaves on lid spider feet first in burrow.
23/06/2020	SKS	ID18	476202.3	6773762.7	Idiosoma formosum		2		Cluster of 2 medium burrows, vertical material on lid.
23/06/2020	SKS	ID19	476365.6	6773753.0	Idiosoma formosum		1		Single large, clay lid with vertical material on front lip.
23/06/2020	SKS	ID20	476495.8	6773755.0	Idiosoma formosum		1		Single burrow, medium, vertical rubble on lid
23/06/2020	SKS	ID21	476608.1	6773760.7	Idiosoma formosum		3		Cluster of 3 small, vertical rubble on lid
23/06/2020	SKS	ID22	476640.1	6773763.6	Idiosoma formosum		1		Single large, vertical rubble on lid
23/06/2020	SKS	ID23	476692.2	6773762.1	Idiosoma formosum		1		Big, vertical rubble on lid
23/06/2020	SKS	ID24	476698.0	6773758.0	Idiosoma formosum		15		Cluster of 15 all sizes vertical material on lid.
23/06/2020	SKS	ID25	476703.0	6773756.8	Idiosoma formosum		1		Single burrow, Medium, vertical rubble on lid
23/06/2020	SKS	ID26	476928.5	6773770.2	Idiosoma formosum		5		Cluster of 5, 1 large and 4 medium, Vertical material on lid

23/06/2020	SKS	ID27	476928.0	6773768.8	Idiosoma formosum		1		Single large, vertical rubble on lid
23/06/2020	SKS	ID28	476935.3	6773769.8	Idiosoma formosum		4		Cluster of 4. 1 large, 2 medium and 1 small. Vertical material on lid.
23/06/2020	SKS	ID29	477974.3	6773749.9	Idiosoma formosum	Yes	1		Single large, vertical rubble on lid. Spider feet first in burrow.
23/06/2020	SKS	ID30	477981.9	6773747.1	Idiosoma formosum	Yes	14		Cluster of 14, all sizes. Vertical material on lid. 3 burrows checked with milliscope, spiders feet first
23/06/2020	SKS	ID31	476286.6	6773844.3	Idiosoma formosum		2		2 medium burrows. Vertical material on lid. 1 open lid inactive and the other had dead spider in.
23/06/2020	SKS	ID32	476094.6	6773852.8	Idiosoma formosum		4		Cluster of 4 burrows, 1 medium and small
23/06/2020	SKS	ID33	476282.7	6773847.4	Idiosoma formosum		1		
23/06/2020	SKS	ID34	476252.5	6773852.3	Idiosoma formosum		12		Cluster of 12 medium and small burrows
23/06/2020	JB	ID35	476075.0	6773734.0	Idiosoma formosum		1		Single large burrow, legs first, black with brown hairs, vertical material on lid crest
23/06/2020	JB	ID36	476179.5	6773882.5	Idiosoma formosum		2		Cluster of 2, 1 large and l medium, vertical material on lid
23/06/2020	JB	ID37	476161.3	6773739.1	Idiosoma formosum		1		Single medium burrow vertical lid
23/06/2020	JB	ID38	476188.2	6773731.9	Idiosoma formosum		1		Single medium burrow, green vegetation on lid
23/06/2020	JB	ID39	476297.4	6773734.8	Idiosoma formosum		1		Single medium burrow vertical lid
23/06/2020	JB	ID40	477048.0	6773724.6	Idiosoma formosum		1		Single large burrow, vertical/diagonal lid
23/06/2020	JB	ID41	477969.2	6773725.4	Idiosoma formosum		1		Single medium burrow vertical lid
23/06/2020	JB	ID42	478123.3	6773728.4	Idiosoma formosum		1		Single medium burrow vertical lid
23/06/2020	JB	ID43	478273.5	6773884.4	Idiosoma formosum		4		Cluster of 4 large, vertical material on lid

23/06/2020	JB	ID44	477978.3	6773736.7	Idiosoma formosum	Yes	7		Cluster of 7, 5 large and 2 abandoned, vertical lid, feet first
23/06/2020	PMS	ID45	476065.6	6773799.4	Idiosoma formosum	Yes	1		Single burrow, vertical material on lid, Spider feet first in burrow
23/06/2020	PMS	ID46	476146.5	6773791.2	Idiosoma formosum	Yes	3		Cluster of three, vertical material on lid, spider feet first in burrow
23/06/2020	PMS	ID47	476165.8	6773785.6	Idiosoma formosum		1		Single burrow vertical material on lid
23/06/2020	PMS	ID48	476481.5	6773785.2	Idiosoma formosum		4		Cluster of 4 vertical material on lid
23/06/2020	PMS	ID49	476542.0	6773784.7	Idiosoma formosum	Yes	1		Single burrow vertical material on lid
23/06/2020	PMS	ID50	476609.1	6773795.0	Idiosoma formosum		1		Burrow taken over by ants, probably I. intermedium
23/06/2020	PMS	ID51	477981.2	6773741.6	Idiosoma formosum	Yes	1		Single burrow, little material on lid, spider abdomen visible with ridges
23/06/2020	PMS	ID52	477907.0	6773825.2	Idiosoma formosum	Yes	1	Yes	Single burrow, little material on lid, spider abdomen visible with ridges. Stoney soil. Photo 1154 & 1155
23/06/2020	PMS	ID53	476557.3	6773807.2	Idiosoma formosum	Yes	1		Single large burrow, vertical material on lid, Spider feet first in burrow, loamy soil.
23/06/2020	PMS	ID54	476519.6	6773809.2	Idiosoma formosum	Yes	1		Single large burrow, vertical material on lid, Spider feet first in burrow, loamy soil.
23/06/2020	PMS	ID55	476026.9	6773832.1	Idiosoma formosum	Yes	2		2 large burrows, vertical material on lid, Spider feet first in burrow, loamy soil.
25/06/2020	JB	ID56	479074.4	6774437.1	Idiosoma formosum		2		Cluster of 2 large, punk lid, aggressive, legs forward
25/06/2020	JB	ID57	479603.6	6774577.0	Idiosoma formosum		1		Single medium burrow, punk lid (but with leaves crossed at front), loam soil
25/06/2020	MJB	ID58	476680.1	6774392.4	Idiosoma formosum		2		Cluster of 2 burrows, 1 large and 1 Small. Red loam in slight drainage line with malee over

									mixed shrubs, Probably I.intermedium
25/06/2020	MJB	ID59	476499.7	6774391.3	Idiosoma formosum		1		
25/06/2020	MJB	ID60	476513.7	6774403.1	Idiosoma formosum		1		
25/06/2020	MJB	ID61	476661.4	6774381.3	Idiosoma formosum		1		
25/06/2020	MJB	ID62	476522.5	6774399.1	Idiosoma formosum		1		
25/06/2020	PMS	ID63	479248.8	6774494.5	Idiosoma formosum	Yes	1	Yes	Single burrow, much material on lid photo spider feet first clay loam
25/06/2020	PMS	ID64	478341.4	6774480.9	Idiosoma formosum	Yes	6	Yes	Cluster of 6, 5 very large and 1 small. Lots of material on lid. 3 abandoned burrows. Spider feet first. Clay loam. I. intermedium. Photo
25/06/2020	PMS	ID65	476748.9	6774476.9	Idiosoma formosum	Yes	2		Cluster of 2, both large, much material on lid both feet first I. Intermedium. Gritty loam soil.
25/06/2020	PMS	ID66	476687.6	6774522.2	Idiosoma formosum	Yes	1		I.intermedium, feet first, vertical material on lid, sandy loam.
25/06/2020	PMS	ID67	477360.4	6774506.8	Idiosoma formosum	Yes	18		Cluster of 18, 1 large and 17 small. I.intermedium, much material on lid, feet first.
25/06/2020	PMS	ID68	478444.7	6774520.1	Idiosoma formosum	Yes	18	Yes	Cluster of 18, 3 large, 4 medium, 11 smal,l 3 abandoned. Much verrtical material on lid. Feet first, clay loam. I.intermedium. Photo
25/06/2020	SKS	ID69	478771.4	6774462.0	Idiosoma formosum	Yes	7		Cluster of 7, 3 seen feet first. Loam. Fairly flat lids.
25/06/2020	SKS	ID70	478608.5	6774499.8	Idiosoma formosum	Yes	1		Single burrow, spider feet first, much rubble on lid, loam soil.
25/06/2020	SKS	ID71	478284.2	6774452.9	Idiosoma formosum		1		Single large burrow vertical rubble on lid. loam with gravel.
25/06/2020	SKS	ID72	478212.9	6774538.2	Idiosoma formosum		1		Single large burrow vertical rubble on lid. loam with gravel.
25/06/2020	SKS	ID73	478460.0	6774556.3	Idiosoma formosum		1		Single large burrow vertical rubble on lid. loam with gravel.
26/06/2020	SKS	ID74	479767.6	6774889.9	Idiosoma formosum	Yes	1		Single burrow, no spider seen inside.

26/06/2020	SKS	ID75	479764.1	6774743.3	Idiosoma formosum		1		Single burrow, rubble on lid. Spider feet first. I.intermedium. Loam.
26/06/2020	SKS	ID76	478998.1	6775038.8	Idiosoma formosum	Yes	1		Single burrow, not much on lid. Can't see spider. No constriction. Unoccupied. Loam.
26/06/2020	SKS	ID77	477597.4	6775177.6	Idiosoma formosum		3		Cluster of 3, 1 large, 2 medium loam soil.
26/06/2020	SKS	ID78	477679.0	6775192.6	Idiosoma formosum		1		Single burrow, large, loam soil with gravel.
26/06/2020	SKS	ID79	479212.5	6775174.7	Idiosoma formosum	Yes	32		Cluster of 32, All sizes. Feet first. Probably I.intermedium. Loam.
26/06/2020	PMS	ID80	478520.5	6774996.2	Idiosoma formosum	Yes	8	Yes	Cluster of 8, 6 large, 2 medium much material on lid with vertical fringe, feet first. I.intermedium. Clay loam. Photo.
26/06/2020	PMS	ID81	477336.9	6775204.7	Idiosoma formosum	Yes	1	Yes	Single medium sized burrow much vertical material on lid, feet first. I.intermedium, clay loam. Photo.
26/06/2020	PMS	ID82	477355.9	6775221.7	Idiosoma formosum	Yes	2		Cluster of 2 burrows, 1 medium and 1 abandoned. vertical fringe on lid. Feet first. I.intermedium. Clay loam.
26/06/2020	PMS	ID83	477675.3	6775217.9	Idiosoma formosum	Yes	1		Single burrow vertical material on lid with fringe. I.intermedium.
26/06/2020	PMS	ID84	478658.3	6775206.9	Idiosoma formosum	Yes	5	Yes	Cluster of 5, 1 large and 4 small. Large with no constriction and no material on lid. Babies in burrow.
26/06/2020	PMS	ID85	478656.2	6775203.6	Idiosoma formosum		1	Yes	Single large burrow with much vertical material on lid.
26/06/2020	PMS	ID86	478836.0	6775216.5	Idiosoma formosum	Yes	1		Single large burrow, fringe of vertical material on lid, feet first. I.intermedium. Loamy clay.

26/06/2020	PMS	ID87	479291.2	6775210.2	Idiosoma formosum		1		
26/06/2020	JB	ID88	477544.2	6775147.1	Idiosoma formosum		13		Cluster of 13,mixed sizes, legs first, aggressive, some vertical decoration at front of lid.
20/06/2020	JB	ID89	476613.2	6766439.8	Idiosoma sp.		0		
20/06/2020	JB	ID90	476491.0	6767176.3	Idiosoma sp.		0		
20/06/2020	JB	ID91	476473.4	6768016.9	Idiosoma sp.		0		
20/06/2020	JB	ID92	476631.0	6767092.6	Idiosoma sp.		0		
20/06/2020	JB	ID93	476480.7	6766926.8	Idiosoma sp.		0		
20/06/2020	MJB	ID94	476632.1	6768050.5	Idiosoma sp.		0		
20/06/2020	MJB	ID95	477239.9	6766122.5	Idiosoma sp.		0		
20/06/2020	MJB	ID96	476657.0	6767710.8	Idiosoma sp.		0		
20/06/2020	MJB	ID97	476649.5	6767126.1	Idiosoma sp.		0		
20/06/2020	MJB	ID98	476653.0	6766139.3	Idiosoma sp.		0		
20/06/2020	MJB	ID99	476447.6	6766547.7	Idiosoma sp.		0		
20/06/2020	MJB	ID100	476460.5	6766948.6	Idiosoma sp.		0		
20/06/2020	PMS	ID101	476570.3	6766573.7	Idiosoma sp.		1		Single large burrow.
20/06/2020	PMS	ID102	476559.8	6766362.0	Idiosoma sp.		1		Single medium burrow.
20/06/2020	PMS	ID103	476538.2	6766163.1	Idiosoma sp.		1		Single medium burrow.
20/06/2020	PMS	ID104	476543.1	6766264.0	Idiosoma sp.		1		Single medium burrow.
20/06/2020	PMS	ID105	476534.2	6766445.8	Idiosoma sp.		1		Single medium burrow.
20/06/2020	PMS	ID106	476539.5	6766495.9	Idiosoma sp.		1		Single large burrow 23mm diameter.
20/06/2020	PMS	ID107	476568.3	6767885.7	Idiosoma sp.		1		Single large burrow.
20/06/2020	PMS	ID108	476575.6	6767813.5	Idiosoma sp.		1		Single large burrow.
20/06/2020	PMS	ID109	476573.4	6767548.3	Idiosoma sp.		1		Single medium burrow 17mm diameter.
20/06/2020	PMS	ID110	476556.5	6767176.0	Idiosoma formosum		1		Single burrow, large, several juvenile spiders in burrow with adult.
20/06/2020	PMS	ID111	476569.8	6767142.0	Idiosoma formosum		1		Single large burrow possibly egg in burrow with adult.
20/06/2020	PMS	ID112	476570.2	6766953.8	Idiosoma sp.		2		Cluster of two large burrows.

20/06/2020	PMS	ID113	476572.1	6766881.8	Idiosoma sp.		1		Sngle burrow.
20/06/2020	SKS	ID114	477240.0	6768140.7	Idiosoma formosum	Yes	1		Single burrow, spider feet first, soft abdomen.
20/06/2020	SKS	ID115	476596.4	6766889.8	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID116	476595.0	6766884.2	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID117	476599.1	6766882.0	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID118	476600.6	6766792.5	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID119	476603.5	6766775.5	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID120	476598.7	6766639.0	Idiosoma sp.		8		Cluster of 8 , all sizes.
20/06/2020	SKS	ID121	476602.9	6766502.9	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID122	476601.0	6766329.9	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID123	476517.8	6766262.2	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID124	476512.5	6766331.7	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID125	477245.4	6767944.2	Idiosoma sp.		1		Single burrow no constriction.
20/06/2020	SKS	ID126	476522.8	6766537.4	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID127	476506.2	6766966.4	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID128	477244.5	6766637.1	Idiosoma sp.	Yes	1		Single burrow, 7.6mm diameter, no construction spider not seen.
20/06/2020	SKS	ID129	477239.0	6766149.4	Idiosoma sp.		1		Single burrow mudded at 2cm, no constriction.
20/06/2020	SKS	ID130	477151.3	6766588.9	Idiosoma sp.		1		Single burrow, no constriction.
20/06/2020	SKS	ID131	477150.4	6767420.8	Idiosoma sp.		1		Single burrow 13.4mm diameter, no constriction.
20/06/2020	SKS	ID132	476591.4	6767163.9	Idiosoma sp.		1		Single burrow 17.1mm diameter, no constriction.
20/06/2020	SKS	ID133	476598.6	6767114.0	Idiosoma sp.		1		Single burrow.
20/06/2020	SKS	ID134	476595.7	6766968.8	Idiosoma sp.		2		Cluster of 2 , 1 large, 1 medium.
21/06/2020	PMS	ID135	476015.0	6767838.9	Spiders		1		Single burrow, small - medium.
21/06/2020	PMS	ID136	476011.6	6767224.5	Idiosoma formosum		15		Cluster, 3 large, 5 medium, 7 small, 3 dug up.
21/06/2020	PMS	ID137	476011.2	6767212.6	Idiosoma clypeatum	Yes	1		Single large, I. clypeatum abdomen with ridges blocking burrow.

21/06/2020	PMS	ID138	476013.0	6767205.7	Idiosoma clypeatum	Yes	3		Cluster of 3 medium. I. clypeatum abdomen with ridges blocking burrow.
21/06/2020	PMS	ID139	476012.0	6766689.4	Idiosoma formosum	Yes	1		Single large, feet first in burrow with small vertical material on lid.
21/06/2020	PMS	ID140	475970.1	6766627.6	Idiosoma formosum		1		Single medium burrow, few vertical leaves on lid.
21/06/2020	PMS	ID141	475985.7	6766846.9	Idiosoma sp.		1		Single large burrow.
21/06/2020	PMS	ID142	475986.5	6767147.6	Idiosoma clypeatum	Yes	5		Cluster of 5, 2 large, 3 small-medium. I.clypeatum abdomen with ridges blocking burrow. No constriction, burrow gradually narrowing.
21/06/2020	PMS	ID143	475308.8	6767521.6	Idiosoma clypeatum	Yes	1	Yes	Single medium burrow. I.clypeatum abdomen with ridges blocking burrow. PHOTO # 1144.
21/06/2020	PMS	ID144	475328.8	6766814.5	Idiosoma clypeatum		1		Single large burrow, horizontal lid material.
21/06/2020	SKS	ID145	476049.7	6767196.9	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID146	476048.0	6767154.6	Idiosoma sp.		2		Cluster of 2, 1 large, 1 medium.
21/06/2020	SKS	ID147	476047.0	6767004.0	Idiosoma formosum	Yes	3		Cluster of 3, 2 large, 1 with big egg sac, legs to front. 1 medium.
21/06/2020	SKS	ID148	476044.6	6766754.5	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID149	475942.8	6767104.5	Idiosoma sp.		2		Cluster of 2, 1 medium and 1 small.
21/06/2020	SKS	ID150	475957.6	6767171.5	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID151	475955.2	6767188.6	Idiosoma sp.		2		Cluster of 2, 1 large, 1 medium.
21/06/2020	SKS	ID152	475954.9	6767648.9	Idiosoma formosum	Yes	1		Single burrow, spider feet first in burrow.
21/06/2020	SKS	ID153	475947.2	6767925.2	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID154	475339.9	6768220.9	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID155	475338.4	6767943.1	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID156	475339.1	6767344.6	Idiosoma clypeatum		3	Yes	Cluster of 3, 1 large, 1 medium, 1 small. Photo 1145 (PMS)

									ridged abdomen blocking burrow, Vertical material on lid.
21/06/2020	SKS	ID157	475339.5	6767210.6	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID158	475340.5	6767202.1	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID159	475333.8	6766819.3	Idiosoma clypeatum		1	Yes	Single burrow, Photo 1147 (PMS) shield up in burrow.
21/06/2020	SKS	ID160	475347.5	6766491.9	Idiosoma sp.		4		Cluster of 4, 1 large, 3 small.
21/06/2020	SKS	ID161	475340.8	6766364.3	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID162	475244.8	6767435.3	Idiosoma sp.		1		Single burrow.
21/06/2020	SKS	ID163	475945.6	6768002.1	Idiosoma sp.		1		Single burrow.
21/06/2020	JB	ID164	476072.4	6767053.8	Idiosoma sp.		4		Cluster of 4 burrows, 2 large and 2 abandoned . Branch fallen across 2 abandoned burrows.
21/06/2020	JB	ID165	475370.2	6767376.6	Idiosoma formosum		1		Single smal burrow, vertical lid decoration.
21/06/2020	JB	ID166	475366.6	6768196.6	Idiosoma formosum		1		Single small burrow, vertical lid decoration, lid resembles nearby tuft of vegetation.
21/06/2020	JB	ID167	475371.7	6767355.9	Idiosoma formosum		1		Single small burrow, minimal lid decoration with vertical tuft. Sandy soil.
21/06/2020	JB	ID168	475367.3	6767341.5	Idiosoma formosum		1		Single medium burrow with sandy lid.
21/06/2020	JB	ID169	475373.6	6767343.9	Idiosoma sp.		0		
21/06/2020	JB	ID170	475217.4	6767538.6	Idiosoma sp.		1		Single medium burrow.
21/06/2020	JB	ID171	475364.6	6766330.6	Idiosoma clypeatum		3		Cluster of 3 small burrows,sandy lid wth horizontal pieces on.
21/06/2020	MJB	ID172	475402.6	6767359.0	Idiosoma clypeatum		8	Yes	8 burrows in Cluster. Idiosoma clypeatum. PMS photo 1146. Specimens collected.
21/06/2020	MJB	ID173	475186.1	6767440.6	Idiosoma clypeatum		5		Cluster of 5, 1 large and 4 small . All have horizontal decorations on lid so assumed to be I.clypeatum.
21/06/2020	MJB	ID174	475190.7	6766265.9	Idiosoma sp.		0		
21/06/2020	MJB	ID175	475396.8	6767321.5	Idiosoma sp.		0		

21/06/2020	MJB	ID176	475403.1	6766928.5	Idiosoma sp.		0		
21/06/2020	MJB	ID177	475886.4	6767244.1	Idiosoma sp.		0		
21/06/2020	MJB	ID178	475193.8	6766836.4	Idiosoma sp.		0		
21/06/2020	MJB	ID179	476100.6	6767883.1	Idiosoma sp.		0		
21/06/2020	MJB	ID180	476097.8	6767825.8	Idiosoma sp.		0		
24/06/2020	PMS	ID181	474897.7	6767724.5	Idiosoma clypeatum	Yes	2		Cluster of 2, 1 large and 1 small. I.clypeatum ridged abdomen in hole, constriction, mixed rubble on lid.
24/06/2020	PMS	ID182	474260.7	6767602.2	Idiosoma clypeatum	Yes	4	Yes	Cluster of 4, 1 large and 3 small. Ridged abdomen in hole.
24/06/2020	PMS	ID183	474259.5	6767247.9	Idiosoma clypeatum	Yes	1	Yes	Single medium sized burrow, much roof decoration. Ridged abdomen in hole I.clypeatum.
24/06/2020	PMS	ID184	474259.5	6766950.0	Idiosoma clypeatum	Yes	1	Yes	Single burrow, little material on lid, ridged abdomen in hole. I.clypeatum. .
24/06/2020	PMS	ID185	474256.0	6766520.9	Idiosoma clypeatum	Yes	12	Yes	Cluster of 12, 4 large and 8 small-medium. 2 milliscoped, both ridged abdomen in hole. Little horizontal material on lid.
24/06/2020	PMS	ID186	474239.7	6766375.2	Idiosoma clypeatum	Yes	7	Yes	Cluster of 7, 1 large and 6 small. Little horizontal material on lid. I.clypeatum ridged abdomen in hole .
24/06/2020	PMS	ID187	474235.1	6766835.2	Idiosoma clypeatum	Yes	1	Yes	Single burrow, little material including lichen on lid. Ridged abdomen in hole. I.clypeatum. Sandy loam.
24/06/2020	PMS	ID188	474226.0	6767387.3	Idiosoma clypeatum	Yes	11	Yes	Cluster of 11, 2 large, 2 medium and 7 small, l with little material including lichen on lid. Ridged abdomen in hole. I.clypeatum. Sandy loam.
24/06/2020	PMS	ID189	474263.3	6767601.0	Idiosoma clypeatum	Yes	4	Yes	Cluster of 4, 1 medium, 3 small. 1 feet first, sparse roof, dug up, I. clypeatum returned to burrow .

24/06/2020	SKS	ID190	474742.8	6767723.6	Idiosoma clypeatum	Yes	2	Yes	Cluster of 2 burrows, just off granite, I.clypeatum. Shield abdomen. Medium and small.
24/06/2020	SKS	ID191	474741.2	6767573.9	Idiosoma clypeatum	Yes	9	Yes	Cluster of 9 loam. 2 definite shield back. Medium and small.
24/06/2020	SKS	ID192	474734.8	6767570.5	Idiosoma clypeatum	Yes	2		Cluster of 2 big and small , loam. definite shield abdomen presented.
24/06/2020	SKS	ID193	474734.6	6766450.2	Idiosoma formosum	Yes	1		Single burrow gravel rise. face first, I.intermedium. Big, horizontal rubble on lid.
24/06/2020	SKS	ID194	474648.6	6766394.4	Idiosoma clypeatum	Yes	1		Single burrow,gravel rise. Shield back. vertical rubble on lid.
24/06/2020	SKS	ID195	474645.1	6766397.6	Idiosoma clypeatum	Yes	1		Single burrow, gravel rise. Shield back. constriction
24/06/2020	SKS	ID196	474641.2	6766400.8	Idiosoma clypeatum	Yes	3	Yes	Cluster of 3 , 1 large and 2 small, gravel rise. Shield back, constriction.
24/06/2020	SKS	ID197	474638.0	6766401.2	Idiosoma clypeatum	Yes	1	Yes	Gravel rise. 1 big medium. Shield back, constriction.
24/06/2020	SKS	ID198	474639.1	6766390.0	Idiosoma clypeatum		2		Cluster of 2, 1 big 1 small, gravel rise.
24/06/2020	SKS	ID199	474296.3	6767899.0	Idiosoma clypeatum		1		Single medium burrow, sandy granite. Constriction therefore probably I.clypeatum.
24/06/2020	SKS	ID200	474291.7	6767450.0	Idiosoma clypeatum		1		Single medium burrow, sandy granite. Constriction therefore probably I.clypeatum.
24/06/2020	SKS	ID201	474293.2	6767437.5	Idiosoma clypeatum		1		Single medium burrow, sandy granite. Constriction therefore probably I.clypeatum.
24/06/2020	SKS	ID202	474282.6	6766934.7	Idiosoma clypeatum	Yes	7		Cluster of 7, 1 large, 6 very small, shield abdomen, plain lid with few vertical rubble, sandy loam.
24/06/2020	SKS	ID203	474202.8	6766578.6	Idiosoma clypeatum		1		Single burrow, very small, sandy grantic soil
24/06/2020	SKS	ID204	474205.3	6767329.2	Idiosoma sp.		2		Cluster of 2, sandy loam.

24/06/2020	SKS	ID205	474206.5	6768018.5	Idiosoma sp.	Yes	1	Yes	Single medium, sandy loam. Vertical rubble on lid , spider front first. Collected. Soft abdomen.
24/06/2020	JB	ID206	474586.6	6766777.4	Idiosoma clypeatum	Yes	4		Cluster of 4, 1 large and 3 small shield back, sandy lid with bits on it, burrow constriction, sandy loam soil.
24/06/2020	JB	ID207	474586.1	6766762.4	Idiosoma clypeatum	Yes	7		Cluster of 7 , 3 large, 3 medium and 1 abandoned. loamy gravelly soil, constricted tunnel, shield back, rough debris on lid.
24/06/2020	JB	ID208	474608.2	6767440.2	Idiosoma clypeatum	Yes	1		Single medium burrow, sandy soil, messy lid decoration, horizontal material on rim, sheild back, tunnel constriction.
24/06/2020	JB	ID209	474614.7	6767564.4	Idiosoma clypeatum		7		Cluster of 7, 1 large, 6 small, messy lid with horizontal rim materials, slight constriction, loamy soil.
24/06/2020	JB	ID210	474322.0	6767404.6	Idiosoma clypeatum		9		Cluster of 9, 3 medium, 5 small and 1 large abandoned, messy lids, loamy soil.
24/06/2020	JB	ID211	474326.2	6767362.9	Idiosoma clypeatum		2		Cluster of 2, 1 large and 1 small, messy lid, loamy soil.
24/06/2020	JB	ID212	474175.9	6767055.1	Idiosoma clypeatum	Yes	4	Yes	Cluster of 4, 3 large and 1 small, loamy soil, 1 with vertical decoration but not as neat as a punk lid. All had shield back, 2 with very messy lids. Slight constrictions.
24/06/2020	JB	ID213	474166.0	6767561.5	Idiosoma clypeatum		3		Cluster of 3 large, loam soil, messy lids.
24/06/2020	JB	ID214	474172.8	6766277.3	Idiosoma clypeatum		0		
24/06/2020	MJB	ID215	474132.6	6767428.5	Idiosoma clypeatum		4		Cluster of 4, 1 large and 3 small.
24/06/2020	MJB	ID216	474347.7	6767101.7	Idiosoma clypeatum		5		Cluster of 5, 1 large and 4 small.
24/06/2020	MJB	ID217	474128.2	6766975.0	Idiosoma clypeatum		5		Cluster of 5, 2 large and 3 small.
24/06/2020	MJB	ID218	474564.8	6766810.7	Idiosoma formosum		0		

24/06/2020	MJB	ID219	474592.9	6767589.5	Idiosoma formosum		0		
27/06/2024	BS	Idio?1bur	469129.5	6767149.3	Idiosoma				One Burrow
27/06/2024	BS	Idio?1bur	469138.3	6767138.5	Idiosoma				One Burrow
27/06/2024	PMS	SBTDS01	470295.3	6766320.1	Idiosoma clypeatum	Yes			1 burrow @ 22mm, 3 @ 15mm. Ridged abdomen dispalyed to milliscope
27/06/2024	PMS	SBTDS02	470264.8	6766362.3	Idiosoma clypeatum				Single burrow @ 22mm
27/06/2024	PMS	TDS01	468897.3	6766408.5	Idiosoma formosum	Yes	1		Single burrow @15mm. Feet first when viewed by milliscopoe. ARB photo at 11.12 (within MJB spider search #2).
27/06/2024	ARB	BURROWNOLID	468398.5	6766412.1	Idiosoma				Old spider burrow
27/06/2024	PMS	SBTDS03	468321.1	6766364.0	Idiosoma clypeatum			Yes	16 burrows in cluster ranging from 1 @ 22mm down to 8mm. Ridged abdomen displayed. MJB photo at 12.14.in Melaleuca tall shrubland on loam flat. Not the usual habitat for the species.
27/06/2024	PMS	SBTDS04	468227.8	6766381.3	Idiosoma clypeatum			Yes	(Mandy found) 3 large and 8 smaller. Ridged abdomen displayed to milliscope.ARB photo 12.41.
27/06/2024	PMS	SBTDS05	468228.2	6766386.1	Idiosoma clypeatum			Yes	1 burrow @ 12mm and 2 smaller. Ridged abdomen displayed. ARB photo 12.45.
27/06/2024	PMS	SBTDS06	468195.3	6766397.5	Idiosoma clypeatum				1 large burrow and 15 smaller burrows.Ridged Abdomen displayed.
27/06/2024	PMS	SBDS07	468210.1	6767102.5	Shield Backed Spider	Yes			Burrowscope
27/06/2024	PMS	SBTDS08	468928.2	6767086.2	Idiosoma clypeatum				Single burrow @ 10mm. Ridged abdomen displayed
27/06/2024	MJB	I CLY 6	469108.6	6767165.0	Idiosoma clypeatum				
27/06/2024	PMS	SBTDS09	469105.6	6767153.3	Idiosoma clypeatum				2 burrows @ 20mm
27/06/2024	PMS	SBTDS10	469121.2	6767134.4	Idiosoma formosum			Yes	Poss formosum. 1 large and 11 smaller burrows PMS photo 100-255.

27/06/2024	PMS	SBTDS11	469147.4	6767089.8	Idiosoma clypeatum				1 large and 1 small burrow. Ridged abdomen displayed
27/06/2024	PMS	SBTDS12	469317.1	6767058.1	Idiosoma sp	Yes			2 large and 1 smaller burrow. Feet first when viewed in miliscope. Specimen collected.
27/06/2024	MJB	I CLY 2	470269.8	6767006.9	Idiosoma clypeatum				
27/06/2024	PMS	SBTDS13	470303.7	6767106.7	Idiosoma clypeatum				1 large burrow and 4 smaller burrows. Ridged abdomen displayed.
28/06/2024	PMS	SBTDS14	468191.0	6770408.6	Idiosoma formosum	Yes			Single large burrow. Feet first and attacking probe when viewed in milliscope. Much material vertical on burrow lid
28/06/2024	BS	Form01-1Burr	468439.4	6770284.7	Idiosoma formosum				One Burrow
28/06/2024	PMS	SBTDS15	468974.1	6769569.3	Idiosoma formosum	Yes			Idiosoma formosum. Single burrow @15mm. feet first when viewed in milliscope. Much vertical material on lid
28/06/2024	BS	Iclypeatum9burrs	468038.5	6769559.9	Idiosoma clypeatum				Nine burrows
28/06/2024	MJB	I CLY 1	468040.6	6769548.6	Idiosoma clypeatum				
28/06/2024	PMS	SBTDS16	467944.0	6769654.2	Idiosoma formosum	Yes			Single medium burrow. Poor fan with little material on lid. Face first when viewed in milliscope.
29/06/2024	MJB	SPSEARCH11	471991.2	6773258.2	Idiosoma formosum		1	Yes	12:32 photo. Several photos of burrow around 12:26. Acacia mid-open shrubland on loam. One I. formosum.
1/07/2024	PMS	SBTDS17	483293.8	6772672.6	Idiosoma formosum			Yes	Single burrow @ 15mm diameter. Ornate lid with much vertical material. MJB Photo 9.09.
1/07/2024	BS	Iformosum3burrs	483275.1	6772658.2	Idiosoma formosum		3		3 burrows of I formosum. Sp based on arrangement of vegetation on lid
1/07/2024	ARB	IFORMOSA1039ARB	483657.3	6773145.5	Idiosoma formosum				
1/07/2024	PMS	SBTDS18	483748.0	6772046.0	Idiosoma formosum			Yes	Cluster of 6 burrows, 1 large, 2 medium and 3 small. Vertical

									material on leading edge of lid. Spider feet first when viewed with Milliscope. PMS photo 266
1/07/2024	BS	Iform1burrow	483292.9	6771999.3	Idiosoma formosum				One Burrow
1/07/2024	PMS	SBTDS19	483289.1	6771993.4	Idiosoma clypeatum				3 burrows, 2 medium and 1 small. Little material on lid. Spider feet first but disappeared around corner so not really confirmed.
1/07/2024	ARB	ICLYPEATUMWITHEGGS	483287.2	6771977.8	Idiosoma clypeatum		1		
1/07/2024	BS	Iclyp2burrs	483261.1	6772015.3	Idiosoma clypeatum				Two Burrows
2/07/2024	MJB	IFORMOSUM	483714.3	6778425.7	Idiosoma formosum			Yes	Photos at 1:23pm on 2/07/24. West of M line. Photos of burrow and of surrounding vegetation.
2/07/2024	ARB	ICLYPEATUM	489403.5	6778477.3	Idiosoma clypeatum			Yes	12mm diameter burrow. two photos taken on ARB phone. From field notes

Appendix 15. Results of spider transect surveys

GDA94; Zone 50.

Southern expansion area, 2020. Coordinates are for Zone 50J.

DATE	LABEL	EASTING	NORTHING	NUMBER IN TRANSECT	SPECIES	DISTANCE ALONG TRANSECT	NOTES
27/06/2020	ST SOUTH 1 START	476701.048	6768002.09	0			
27/06/2020	ST SOUTH 1 END	476707.568	6767950.694				
27/06/2020	ST SOUTH 2 END	476601.142	6767853.972	0			
27/06/2020	ST SOUTH 2 START	476599.194	6767903.273				
27/06/2020	ST SOUTH 3 END	476602.609	6767754.591	0			
27/06/2020	ST SOUTH 3 START	476602.707	6767801.458				
27/06/2020	ST SOUTH 4 END	476699.907	6767704.046	0			
27/06/2020	ST SOUTH 4 START	476703.795	6767656.744				
27/06/2020	ST SOUTH 5 START	476396.881	6767550.524	1	*I. Intermedium*	7.1m	Large burrow, vertical rubble on lid, loam soil.
27/06/2020	ST SOUTH 5 END	476401.442	6767600.946				
27/06/2020	ST SOUTH 6 START	476298.434	6767452.155	0			
27/06/2020	ST SOUTH 6 END	476300.178	6767501.352				
27/06/2020	ST SOUTH 7 START	476005.23	6767254.99	1	*I. Intermedium*	18.8	
27/06/2020	ST SOUTH 7 END	475999.884	6767301.624				

DATE	LABEL	EASTING	NORTHING	NUMBER IN TRANSECT	SPECIES	DISTANCE ALONG TRANSECT	NOTES
27/06/2020	ST SOUTH 8 START	475897.823	6767352.264	0			
27/06/2020	ST SOUTH 8 END	475900.836	6767398.472				
27/06/2020	ST SOUTH 9 END	475798.966	6767495.757	1	*I. Intermedium*	41	Medium. Rubble on lid.
27/06/2020	ST SOUTH 9 START	475800.225	6767446.076	1	*I. Intermedium*	41.2	Medium. Rubble on lid.
				1	*I. Intermedium*	38.8	Small.
27/06/2020	ST SOUTH 10 END	475601.989	6767545.328	1	*I. Intermedium*	34.9	Small. *I.intermedium*
27/06/2020	ST SOUTH 10 START	475602.517	6767597.049	3	*Idiosoma sp.*	35.7	Small
				5	*Idiosoma sp.*	20.8	Small
				8	*Idiosoma clypeatum*	33.9	1 big, 7 small
				1	*Idiosoma sp.*	25.2	Small
				2	*Idiosoma sp.*	31.9	1 medium, 1 small
				2	*Idiosoma sp.*	30	Big, medium
				4	*Idiosoma sp.*	29.7	Big, 3 medium
				1	*Idiosoma sp.*	29	Small
				1	*Idiosoma sp.*	27.5	Small
27/06/2020	ST SOUTH 11 END	475305.348	6766150.616	0			
27/06/2020	ST SOUTH 11 START	475302.59	6766199.817				
27/06/2020	ST SOUTH 12 END	474283.195	6766353.011	0			
27/06/2020	ST SOUTH 12 START	474299.227	6766397.587				

DATE	LABEL	EASTING	NORTHING	NUMBER IN TRANSECT	SPECIES	DISTANCE ALONG TRANSECT	NOTES
27/06/2020	ST SOUTH 13 END	474494.165	6766750.69	2	*I. Intermedium*	21.8	Sandy loam oam. No constriction. *I.intermedium* . Medium
27/06/2020	ST SOUTH 13 START	474501.251	6766797.794	1	*I. Intermedium*	3.4	Sandy loam oam. No constriction. *I.intermedium* . Medium
27/06/2020	ST SOUTH 14 END	475228.547	6767761.773	1	*I. Intermedium*	10.4	Vertical rubble on lid . Clay with bit of gravel.
27/06/2020	ST SOUTH 14 START	475198.729	6767796.72	1	*I. Intermedium*	12	Vertical rubble on lid . Clay with bit of gravel.
				1	*I. Intermedium*	16.2	Big. Gravelly loam, face first. Aggressive.
				1	*Idiosoma clypeatum*	26.5	

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Label	Easting	Northing	Zone	Number of *I. formosum*	Number of *I. clypeatum*
ST NORTH 1 END	479198.7	6774550	50J		
ST NORTH 1 START	479199.4	6774498	50J	0	0
ST NORTH 2 START	479000.8	6774398	50J	0	0
ST NORTH 2 END	478989.7	6774446	50J		
ST NORTH 3 END	478689.5	6774546	50J		
ST NORTH 3 START	478701.7	6774496	50J	0	0
ST NORTH 4 END	478596.8	6774542	50J		
ST NORTH 4 START	478601.5	6774497	50J	0	0
ST NORTH 5 END	478381.1	6774545	50J		
ST NORTH 5 START	478397.5	6774494	50J	6	0
ST NORTH 6 END	477291.2	6774551	50J		

Label	Easting	Northing	Zone	Number of *I. formosum*	Number of *I. clypeatum*
ST NORTH 6 START	477301	6774504	50J	0	0
ST NORTH 7 END	476739.4	6774547	50J		
ST NORTH 7 START	476746.8	6774501	50J	2	0
ST NORTH 8 END	476648.7	6774432	50J		
ST NORTH 8 START	476661.8	6774384	50J	3	0
ST NORTH 9 END	478531.1	6774949	50J		
ST NORTH 9 START	478528.6	6774997	50J	1	0
ST NORTH 10 END	478224.8	6775056	50J		
ST NORTH 10 START	478199.4	6775097	50J	0	0
ST NORTH 11 END	477367.6	6775089	50J		
ST NORTH 11 START	477367.4	6775136	50J	43	0
ST NORTH 12 END	477550.1	6775101	50J		
ST NORTH 12 START	477547.1	6775158	50J	0	0
ST NORTH 13 END	478583.8	6775103	50J		
ST NORTH 13 START	478599.4	6775148	50J	2	0
ST NORTH 14 END	479194.5	6775152	50J		
ST NORTH 14 START	479202.2	6775199	50J	0	0