

ADVERTISED PLAN



IRONBARK Environmental Arboriculture

Targeted Fauna Survey
Burrowing Crayfish (*Engaeus* sp.)

Belgrave Heights Christian School
Proposed Seniors Building

Belgrave 3160 VIC

Prepared by



B.Sc EnvSc (Wildlife & Conservation Biology)



B.Sc EnvSc (Wildlife & Conservation Biology)



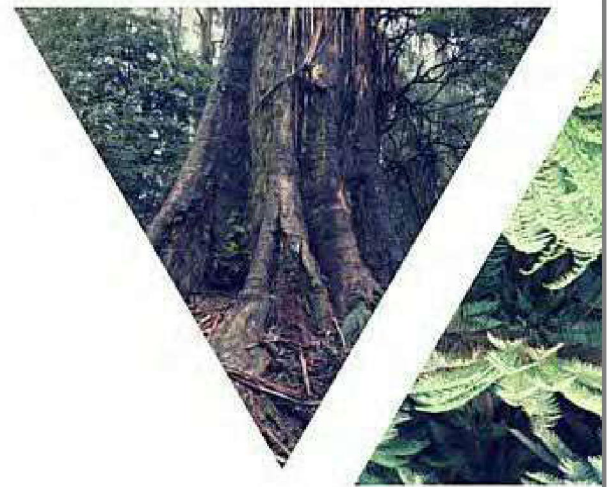
B.Sc EnvSc (Wildlife & Conservation Biology)
Dip Horticulture (Arboriculture)
Cert (Arboriculture & Forestry)

Commissioned by

Millar Merrigan

26th June 2024

Revision A



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Version Title	Action	Staff	Date
Belgrave Christian School - Burrowing Crayfish V1	Prepared	JE / SC	26/06/2024
Belgrave Christian School - Burrowing Crayfish V2	Reviewed	GH	27/06/2024
Belgrave Christian School - Burrowing Crayfish FINAL	Checked	SK	27/06/2024
Belgrave Christian School - Burrowing Crayfish Rev A	Prepared	GH	02/07/2024

Introduction

Millar Merrigan has commissioned Ironbark Environmental Arboriculture (IEA) to undertake a targeted fauna survey of *Engaeus* sp. (Burrowing crayfish) at Belgrave Heights Cristian School, Belgrave Heights.

The Department of Energy, Environment and Climate Action (DEECA) request for further information (PA2302062 15/02/2024) identifies that

“three species of Burrowing crayfish are identified as a moderate-high likelihood within the subject site and assumed to be impacted”

The *subject site* is 20 Wattle Valley Road, Belgrave (listed as 244 Morten Rd, Belgrave in the design plans). The impacted area is the western section of the site where the proposed Seniors Building and associated infrastructure is to be constructed and is subsequently referred to as the *assessment area* (Figure 1).



Figure 1: Assessment area (within yellow polygon). Adapted from NearMaps (13.05.24)

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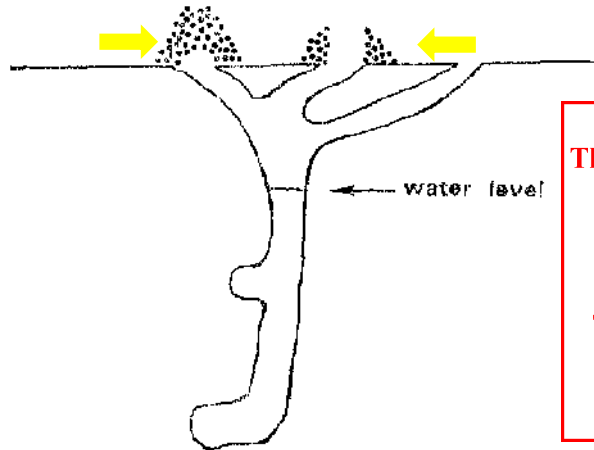
Burrowing Crayfish

Found only in southeast Australia, the cryptic invertebrates of the genus *Engaeus* (burrowing crayfish) are distinguished by their underground burrowing capabilities (Horwitz, 1990). The Yarra Ranges Shire is home to several species of burrowing crayfish, many of which are listed on the Flora and Fauna Guarantee Act 2019 (FFG).

Burrowing crayfish are seldom seen on land spending majority of their time underground. Their presence can be detected by the distinctive chimney-like structures made of mud, constructed at the entrances of their burrows (Figure 2).

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The identification of species is challenging due to the elusive nature of the genus and the similarities between species.



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Figure 2: Diagram of burrowing crayfish tunnel system with typical chimney structure (yellow arrows) at entrance of burrow (Grow 1981).

Mostly nocturnal, burrowing crayfish are most active following wet conditions in their breeding season from July to December (Parks Victoria, 2011). In warmer months when rainfall is scarce, crayfish retreat further underground towards the water table. Therefore, surveying efforts should coincide with increased rainfall to maximize the likelihood of detection.

Due to historically low capture rates within the Yarra Ranges Shire, distribution and habitat preferences between species is not well understood however given the presence of threatened burrowing crayfish species, due diligence is imperative. Consequently, all signs of crayfish occurrence should be treated as indicative of an endangered species.

Records of Occurrence

A search of *NatureKit* (DEECA 2024) found two (2) records of Burrowing Crayfish species within 3km of the assessment area in the last 20 years (Table 1).

Table 1: *NatureKit* Occurrence of Burrowing Crayfish

Botanical Name	Common Name	FFG Status	No. of records	Date
<i>Engaeus affinis</i>	Central Highlands Burrowing Crayfish	NA	1	2014
<i>Engaeus tuberculatus</i>	Tubercle Burrowing Crayfish	Endangered	1	2014

This includes one (1) FFG listed species, Tubercle Burrowing Crayfish.

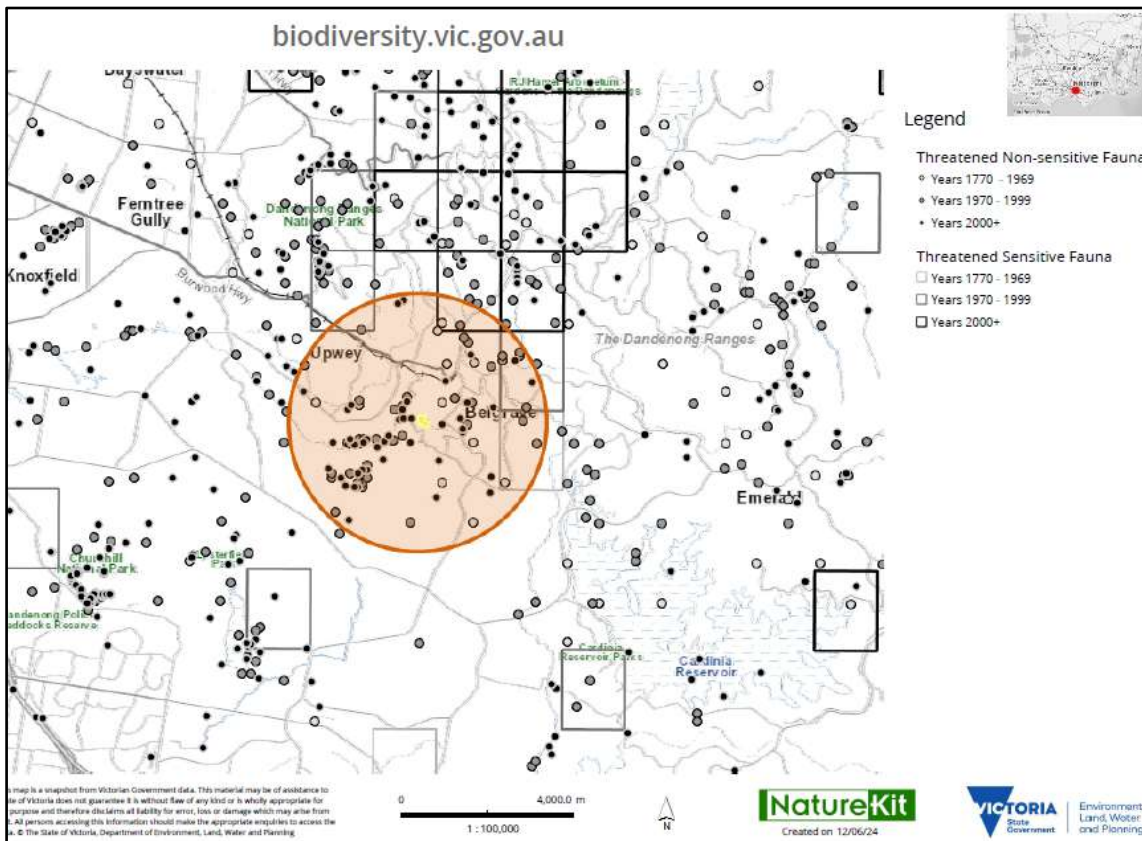


Figure 3: *NatureKit* (DEECA 2024) export showing the search area (3km circle) centered on the assessment area.

Additionally, a search of the same search area in *iNaturalist* identified six (6) observations of Tubercle Burrowing Crayfish since 2018.

Site Conditions

The assessment area appears to have a history of slashing, with the most northerly section of the open space being utilised as staff car park overflow. Gravel has been introduced to facilitate the car parking area.

The western border of the assessment area is bordered by a fence that divides the subject site and the residential dwellings on Mt Morten Road. Wattle Valley Rd borders the eastern boundary of the assessment area. The south-eastern and south-western boundaries have been revegetated with indigenous plants and maintained within mulch beds.

Given the recent rainfall, areas of well-drained soil were evident, particularly along the fence line and roads bordering the assessment area.

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Ecological vegetation class (EVC) mapping (DEECA 2024) shows the north of the site to be predominately *Herb-rich Foothill Forest* (EVC 23) with a small section of *Riparian Forest* (EVC 18) (Figure 4).

EVC 18 aligns with the habitat type where burrowing crayfish are most frequently observed as soil is “regularly inundated and permanently moist”.

Similarly EVC 23 is characterised by “moderately well-drained soils...of moderate to high rainfall” (DEECA 2024).



Figure 4: EVC mapping, showing *Herb-rich Foothill Forest* (green polygons) and *Riparian Forest* (blue polygon). Adapted from NatureKit, DEECA 2024.

Site Context Images		
<p>Well-drained soils are most evident along fence lines of the assessment area</p>	<p>Burrowing crayfish activity is apparent in low-lying areas.</p>	<p>The chimneys made by the crayfish are the most obvious indication of their presence.</p>

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Survey Method

Targeted surveys were undertaken by James Egan of IEA on 08/04/2024. There was abundant rainfall prior to the date of the site survey, resulting in favourable conditions for the detection of burrowing crayfish

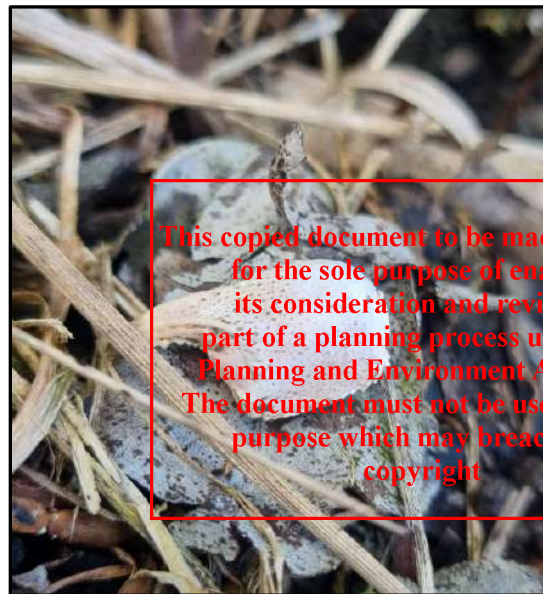
Targeted surveys were undertaken within areas that reflect the habitat requirements of burrowing crayfish. Key habitat types include low-lying areas, drainage sites and areas with moist soils. In addition, random meandering transects throughout the assessment area were undertaken to detect potential crayfish in various types of habitat.

Results

- There were no direct observations of live burrowing crayfish in the assessment area during the site survey.
- There were fifteen (15) sites identified where there was evidence of burrowing crayfish in the assessment area. These were in the form of the typical chimney structures constructed by the crayfish. Part of a chela was found at the entrance of one of the chimneys.



Chimney structures created at the entrance of a crayfish burrow



Part of a chela found at the entrance of a chimney

- Over the fifteen (15) sites, sixty (60) chimneys were observed, majority of them along the eastern border of the site.
- Two (2) of the sites are not within the footprint of the proposed works. The remaining nineteen (19) sites are within the footprint of the proposed works.

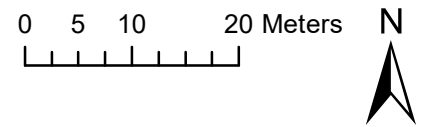
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Presence of *Engaeus* sp. (Burrowing Crayfish)

Projection: GDA 2020/ MGA Zone 55

Adapted from IEA GPS data, *Belgrave Heights Senior Learning Centre, Proposed Site*
 Plan DA0500 (smith+tracy architects 03.05.2024)
 Aerial image from Nearmaps dated 13.05.24



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Discussion

Abundant rainfall in Belgrave prior to the date of the site survey resulted in favourable conditions for the detection of burrowing crayfish. Preferred habitat types like moist soils and low-lying areas were exposed, increasing the likelihood of observation during the survey.

As identification of species is difficult, the observations of the chimneys and chela are not able to be assigned a specific species. However, due to the endangered status of Victorian burrowing crayfish, it is essential to treat all burrowing crayfish within the assessment area as potentially threatened.

A cluster of burrowing crayfish chimneys were identified in the areas marked for the construction of a carpark and road along the western border of the site. Additionally, there was a significant amount of crayfish evidence at the north-eastern zone of the assessment area where external works are proposed. To avoid the destruction of critical habitat and protect the burrowing crayfish, modification of the current development design should be considered so that these areas are unaffected.

If designs cannot be altered, it is critical to protect crayfish both within and outside the construction footprint. Crayfish outside of the footprint should be fenced off prior to commencing works.

Translocation of burrowing crayfish within the proposed footprint is recommended. Historically, there has been low trapping success of burrowing crayfish and there is limited literature surrounding the trapping and translocation of burrowing crayfish.

Van Praagh (2022) explains that the most effective methods for trapping burrowing crayfish involve a combination of crayfish traps based on the design of Bryant *et al.* (2014), bait traps and excavation techniques.

Bait traps are most useful for collecting individuals in wet burrows. Excavation, on the other hand, is practical when digging through drier soils. Hand trowels or small excavators should be used to carefully remove soil in layers down to approximately 30cm.

As layers are removed, soil should be checked for burrows and any removed sediments should be inspected for crayfish. When burrows are uncovered, they should be excavated for crayfish using a small trowel or bait pump. It is recommended to excavate each burrow down to the water table where possible.

Each captured crayfish should be assessed by a trained person. It is important to release the crayfish as close to the point of capture as possible.

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A translocation point has been carefully selected based on existing burrowing crayfish activity and habitat requirements that closely match those of the current environment. It is imperative that an expert zoologist conduct the collection and translocation of burrowing crayfish.

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Conclusion

- The environmental conditions of the assessment area closely reflect the preferred habitat of burrowing crayfish.
- Whilst there were no observations of live burrowing crayfish, there were fifteen (15) sites where evidence of burrowing crayfish was observed in the assessment area. Sixty (60) chimneys were observed over these sites. Therefore, there is little doubt that burrowing crayfish inhabit the assessment area.
- Due to the incidence of threatened burrowing crayfish species near the assessment area, the crayfish within the site should be treated as threatened.
- The majority of the crayfish activity is within the footprint of the proposed developments.
- Burrowing crayfish within the construction footprint should be collected and translocated prior to the commencement of construction. Crayfish habitat outside of the footprint should be fenced off and protected during construction.

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Expertise to Provide Consultancy Services

James Egan

I have over eighteen (18) years of experience in remnant bushland management, endangered butterfly conservation management, significant roadside vegetation management and data collection of rare flora and high-threat weed species.

I have over ten (10) years of ecological and environmental consultancy experience, specialising in minimising environmental impacts within large linear infrastructure projects and the associated risks to rare and threatened flora and fauna.

My relevant experience, training and qualifications enable me to provide impartial and informed independent assessments of issues pertaining to the management of vegetation and associated fauna.

Yours Sincerely,



Zoologist & Environmental Consultant

Grant Harris

I have over twenty (20) years of experience in arboricultural and ecological industries, including over sixteen (16) years of consultancy.

I have training and experience in the collection of biological samples and data for scientific research. I have co-authored papers published in peer-reviewed scientific journals. My qualifications, experience and expertise are in the fields of arboriculture, planning and wildlife biology, which ensures that I am qualified to make informed independent assessments of issues pertaining to the management of vegetation and associated fauna.

Yours Sincerely



Director and Principal Consultant

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Grow L (1981), 'Burrowing behaviour in the crayfish, Cambarus Diogenes Diogenes girard', *Animal Behaviour*, 29(2): 351-356

Horwitz, P (1990) 'A Taxonomic Revision of Species in the Freshwater Crayfish Genus *Engaeus* Erichson (Decapoda: Parastacidae)' *Invertebrate Taxonomy* 4(3):427-614

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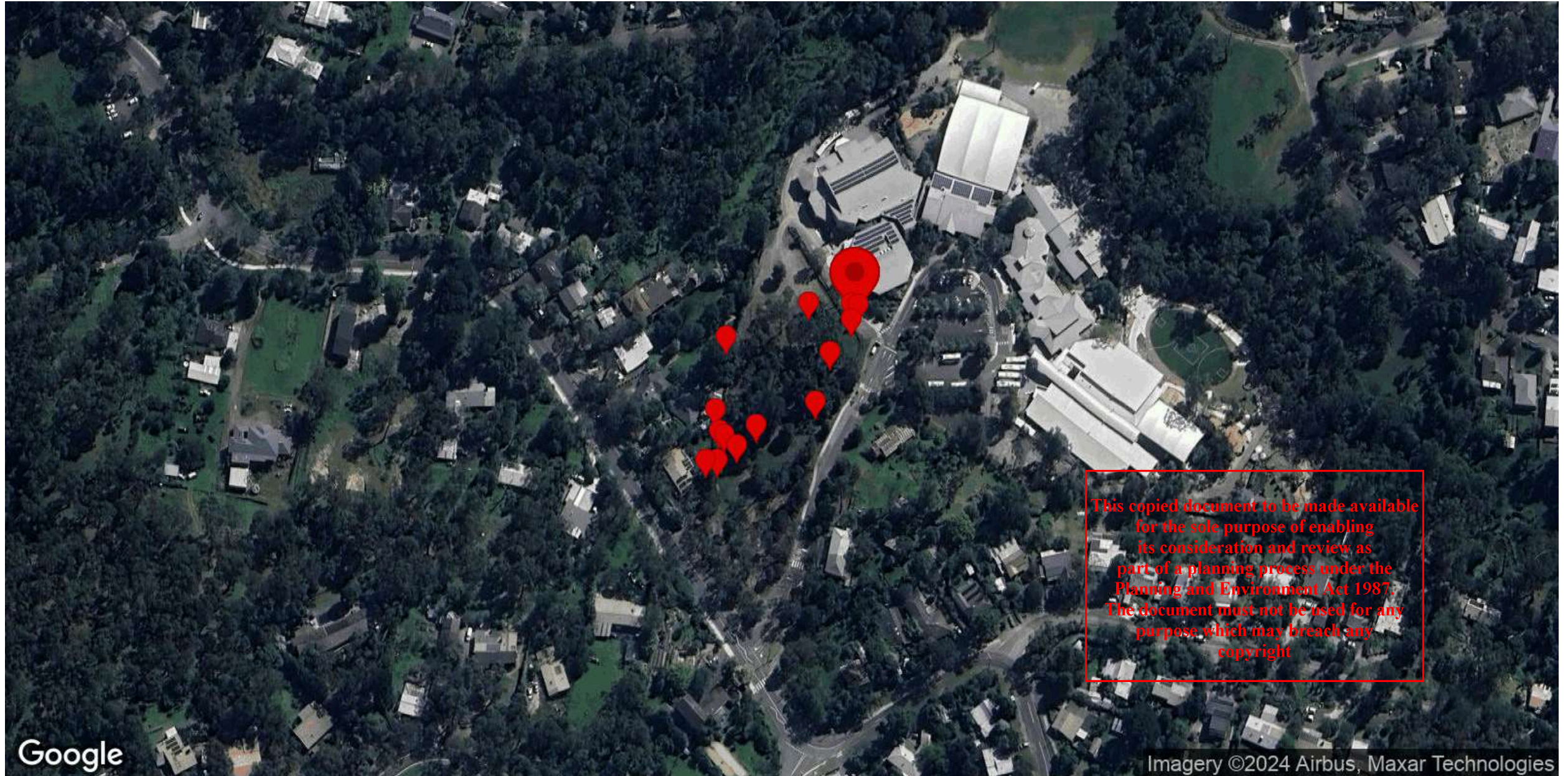
Targeted Fauna Survey



Millar Merrigan

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Date	April 8, 2024
Assessor	[REDACTED]
Client	[REDACTED]

Assessment

Fauna (15 Items)

Fauna - 1. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Part of Engaeus claw located approx 400mm from active Engaeus burrow.

Fauna - 2. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Older mud surrounding burrow, some fresh excavation evident. Refer to photos.

Fauna - 3. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes | Fresh excavation activity evident.

Fauna - 4. Engaeus Chimney

Target Fauna Presence | Yes

Species | Engaeus sp.

Fauna recorded | Engaeus Chimney

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Notes

Approximately 10 Engaeus burrow entrances within 1m2.

Fauna - 5. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes | Fresh excavations evident.

Fauna - 6. Engaeus Chimney

Target Fauna Presence | Yes

Species | Engaeus sp.

Fauna recorded | Engaeus Chimney

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Notes | Recent excavations evident at the base of chain link fence

Fauna - 7. Engaeus Chimney

Target Fauna Presence | Yes

Species | Engaeus sp.

Fauna recorded | Engaeus Chimney

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Notes

Adjacent to fence less than 1m from stormwater drain.

Fauna - 8. Other

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Other

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Notes

Older burrow entrance no signs of recent excavation.

Fauna - 9. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Two (2) burrows within 1m of drainage line. Larger burrow displays very recent excavation.

Fauna - 10. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

21 burrow entrances counted with 1m2. Very active. Associated with drainage line.

Fauna - 11. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Fauna - 12. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Engaeus activity within soft spoil adjacent to fence / drainage line.

Fauna - 13. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Approx 12 burrows within 3m2, beneath neighbouring *Acacia melanoxylon*.

Fauna - 14. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Notes

Approximately 7+ burrows evident on the high side of a Acacia melanoxylon stand.

Fauna - 15. Engaeus Chimney

Target Fauna Presence	Yes
Species	Engaeus sp.
Fauna recorded	Engaeus Chimney

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Fauna images



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Notes

Burrow located on upper high side of drainage ditch.

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