Ecological & Aboriginal Cultural Heritage Assessment

Project Horizon

MOOL CEV Location

VOCUS
Project Horizon
SEE something. SAY something

RED-GUM ENVIRONMENTAL CONSULTING

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Executive Summary

Vocus Fibre Pty Ltd (Vocus) are planning the installation of a fibre optic cable (FOC) in central and northern Western Australia, which is to be installed starting in the south of the project area from a location near Beringarra-Pindar Road, East Murchison, and runs for the most-part along the Great Northern Highway via Cue, Meekatharra, Newman and then terminates near the Fortescue Dave Forrest Airport, near Nullagine. In addition to long runs of underground cable installations, there will also be controlled environment vault (CEV) installations at set distances along the alignment, generally located at each T-Section junction. The CEV structures will require an access track from the road/highway to be constructed to the CEV (10 metre wide impact zone with a length generally in the vicinity of 30 to 50 metres) and the CEV facility, including the perimeter fence, will be approximately 20 by 20 metres (0.002 hectares), where secure buildings and solar panels will be situated, all of which will be considered impacted and lost because of the development. *There is no Asset Protection Zone for this CEV site.*

This report describes the results of an assessment of the MOOL CEV Site at the junction of the T-09 and T-10 sections of the alignment. The survey was undertaken over a single day by a Senior Ecologist & Heritage Advisor from Red-Gum Environmental Pty Ltd in August 2024. The aim of the targeted survey is to conduct an Ecological & Aboriginal Cultural Heritage Assessment of the CEV site and gather field data to build on that which was gathered as part of the rapid surveys, which were conducted in December 2022 and May 2023 by Red-Gum, prior to the roll out of the overall FOC installation.

The proposed CEV construction site (approximately 0.42 ha) was assessed with the aim of searching for the targeted flora and fauna that is recorded from the broader area, as well as any other significant species or communities which may be present in the small loss area. While the scale of the site was small (approximately 60x60m), care was taken to traverse the entire footprint. The survey took place in early August 2024. Shrub diversity and cover across the site was generally low to moderate, with diversity and cover generally low within the ground layer except where there were some scattered Chenopods and herbaceous species tending to clump together on occasion. Given the preceding weather conditions, grasses were effectively absent, and where present, were unable to be identified. This is a reflection of a relatively low quality site, as well as seasonal conditions leading into the survey being dry.

The wider assessment area possessed occasional scattered Mulga (*Acacia aneura*) and other low to medium acacias and a variety of small to medium growing shrub species such as numerous Wattles (*Acacia* spp.), Needle Bush (*Hakea preissii*), Rattle-pod Grevillea (*Grevillea stenobotrya*), and various Emu Bushes (*Eremophila* spp.). The understorey was dominated by bare ground and rock with scattered occurrences of Tall Mulla Mulla (*Ptilotus exaltatus*), *Ptilotus obovatus* (Cottonbush), Copperburrs (*Sclerolaena sp.*) and Bluebush (*Maireana sp.*). No (zero) areas of mapped WA Priority Ecological Communities (PECs) occurred in or adjacent to the site assessment area.

The assessment involved a vegetation of the CEV footprint and areas immediately adjacent to determine any potential indirect impacts on species or habitat. The assessment detected a total of twenty-two (22) species or subspecies of flora, representing ten (10) genera. No (zero) exotic flora species were detected during the survey, although there were some exotic species on the immediate road verge, which were not included in the site assessment flora list. The site consists of one vegetation unit (based on those described by Beard et al (1978)), being *Low Woodland, Open Low Woodland and Sparse Woodland; Mulga*, where vegetation is relatively sparse, and where persisting, small to medium shrubs are dominating. In addition, no (zero) Aboriginal objects were identified on site.

None of the vegetation in the study area is considered *regionally significant* when compared to the contiguous vegetation values surrounding the loss area and given that the vegetation represents a widely occurring vegetation association. None of the targeted flora or fauna were recorded during the study. Furthermore,

there were no other WA priority flora recorded. Habitat for any threatened species that might be using the area opportunistically, is likely to be present over a large area beyond the study area limits. Given the proposed development is very small, it is not expected that the development will have significant impacts upon flora or vegetation in the region. There are, however, a number of recommendations to ensure flora and vegetation impacts are minimised, including:

- If threatened species are located in the field by contract staff or the ecologists/botanists, then work must halt until an agreed approach can be determined via discussions with the appropriate authority involved (Department of Biodiversity, Conservation and Attractions (DBCA)).
- If threatened flora are detected prior to construction of the CEV, the appropriate approvals (via liaison with DBCA) and permits to conduct works (impacts) to the 50 m radius ESA (applied around threatened flora records) are required (given a 50 m ESA zone is not able to be avoided in a narrow road reserve corridor). If feasible, consideration should be given to altering the location of the CEV footprint to avoid the flora ESA.
- All staff involved with the construction project need to be tool-boxed (inducted) on the locations of known threatened species records, as well as any species that are located prior to the construction works. The induction should include basic advice on identifying the known species that have been recorded and the steps to take if unsure, or if threatened species or communities are encountered during works.
- Any EPBC Act listed threatened species or communities encountered during the works will need a Significant Impact Criteria assessment (SIC) to be completed by a suitably qualified person (ecologist). Liaison with the responsible Commonwealth department is also recommended if EPBC Act species or communities are found or suspected during construction.
- The management of exotic vegetation (weeds) must be conducted to best practice standards, ensuring machinery is decontaminated prior to works starting, and where any weed infestations are unavoidable, decontamination must be undertaken to ensure weeds are not pushed into clean parts of the construction area.

To minimise potential impacts on fauna, the following recommendations have been made:

- An ecologist or a suitable trained wildlife handler should be present when clearing the CEV site. Appropriate equipment needs to be on hand to ensure any animals that are displaced or injured as a result of the construction are adequately rescued and cared for until they are relocated to a safer area away from the development, or until they can be taken to the nearest veterinarian or wildlife rescue facility for treatment and eventual reintroduction.
- If threatened fauna species are located in the field by contract staff or the ecologists/botanists, work must halt until an agreed approach can be determined via discussions with the appropriate authority involved (DBCA).
- All staff involved with the construction project are to be tool-boxed (inducted) on the locations of known threatened species (if any) as well as any species that are located during the construction works. The induction should include basic advice on identifying the known species that have been recorded and the steps to take if unsure, or if threatened species are encountered during works.
- Any EPBC Act listed threatened fauna species encountered during the works will need a Significant Impact Criteria assessment (SIC) to be completed by a suitably qualified person (ecologist). Liaison with the responsible Commonwealth department is also recommended if EPBC Act species are found or suspected during construction.

As part of this report, the proposed development was assessed against the 10 Western Australian clearing principles. Red-Gum contends that, given the small size of the MOOL CEV and its position in a well-represented vegetation community, the impacts at that site will also not be in significant conflict with any of the 10 vegetation clearing principles.

1 Project Overview

Vocus Fibre Pty Ltd (Vocus) are planning the installation of a fibre optic cable in central and northern Western Australia, which is to be installed starting in the south of the project area from a location near Beringarra-Pindar Road, East Murchison, and runs for the most-part along the Great Northern Highway via Cue, Meekatharra, Newman and then terminates near the Fortescue Dave Forrest Airport, near Nullagine.

In addition to long runs of underground cable installations, there will also be controlled environment vault (CEV) installations at set distances along the alignment, generally located at each T-Section junction. The CEV structures will require an access track from the road/highway to the CEV to be constructed (10 metre wide impact zone with a length generally in the vicinity of 30 to 50 metres). The CEV facility will include a perimeter fence with dimensions of approximately 20 by 20 metres (0.002 hectares), where secure buildings and solar panels will be situated. The entire footprint of the CEV and fence area will be considered impacted and lost because of the development. *There is no Asset Protection Zone for this CEV site.*

This report describes the results of an Ecological & Aboriginal Cultural Heritage Assessment of the MOOL CEV Site on the junction of the T-09 and T-10 sections of the alignment, undertaken over a single day, by Senior Ecologist & Heritage Advisor, Damian Wall of Red-Gum Environmental Pty Ltd in August 2024.

2 Scope of the Assessment

This report provides a description of the natural assets encountered within the bounds of the MOOL CEV location (Map 1 & 2) and offers recommendations on impact minimisation where required, to help reduce the overall impact of the project on the receiving environment.

The survey took place on August 1st 2024 and included detailed surveying of the CEV site and adjacent areas, targeted searches for Threatened Species and WA Priority Species that have previously been recorded within 20 km of the site (Section 5.9). The components of the survey are as follows:

- A detailed single-phase field survey of the MOOL CEV site and access road (loss area) and immediate surrounds (study area).
- A cultural heritage inspection not involving Traditional Owners.
- Data analysis and species identifications for species detected during field survey.
- Development of maps that show significant species records, vegetation types and vegetation condition classes across the study area.
- Preparation of a technical report (this report) detailing the aims, methodology and results of the field survey, as well as impact minimisation recommendations.

Map 1: Location of MOOL CEV Site – T-09 & T-11 Section junction, Great Northern Highway.

Map 2: Site assessment area at MOOL CEV.

3 Anticipated Impacts & Construction Method

The proposed CEVs will accommodate the necessary IT equipment to service the fibre route. The proposed works are for the earthworks including an access track, site preparation, installation, and commissioning of a CEV building, complete with (in the case of a solar powered site) a battery hut and solar array, supported by a self-contained, emergency diesel powered generator set on its own separate footing (**Figure 1**). *There is no Asset Protection Zone for this CEV.*

The site will be completed with a full-scale galvanised security fence surrounding the buildings and equipment. Construction of the development includes the placement of temporary site huts, delivery via semi-trailer and on site craneage into position of the CEV and the emergency generator.

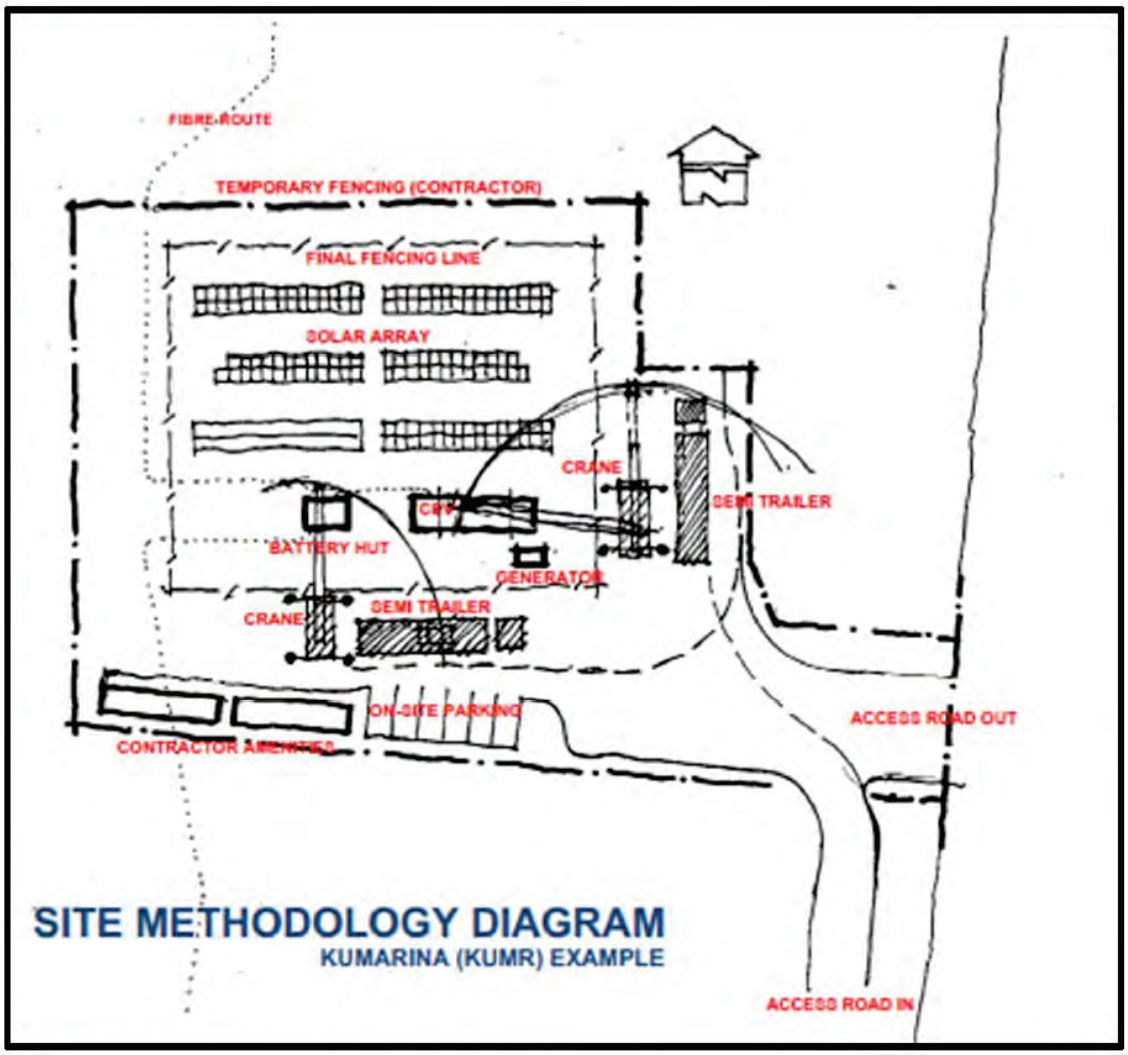


Figure 1: Example CEV Layout. Source: Vocus Pty Ltd, 2024

4 Environmental & Heritage Legislation Relevant to the Proposal

4.1 Native Vegetation Clearing

Under the Western Australian *Environmental Protection Act 1986* (EP Act) it is an offence to clear native vegetation unless the clearing work is done in accordance with a clearing permit issued by the appropriate authority, or if an exemption applies to the land or type of clearing being undertaken. Schedule 6 of the EP Act contains the exemptions available under written laws or statutory processes, and exemptions do apply to ESAs. There are exemptions available for certain low-impact land management practices and works, with these being prescribed in the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (EP Regs).

*It must be noted, however, that CEVs are not low impact facilities and therefore these exemptions **DO NOT** apply.*

4.2 Low Impact Works Exemption

There are a number of exemptions to vegetation clearing under the EP Act and EP Regulations, however none explicitly refer to telecommunications installations. Under Part 4 of the Commonwealth *Telecommunications Act 1997*, there are exemptions for installation of underground facilities (for fixed line networks). These exemptions are available provided the cable is underground in a trench not more than 450 mm wide, or installed via direct burial, or bore directional drilled at least 600 mm below the surface, and where business premises access is not restricted between 8 am and 6 pm, and in residential areas where more than 200m of excavation is left open at any time and vehicle access to property is not lost for more than 8 hours. Cable location posts or markings are also exempt.

Underground optical splice enclosures are exempt provided they form part of (or are integrated with) a cable, and the substantive volume of the enclosure is not more than 0.046 m^3. Underground optical fibre access terminals are exempt if the substantive volume is not more than 0.02 m^3. Underground network equipment is also exempt, provided the substantive volume is not more than 0.23 m^3, and that it is to be part of a national network used for the high-speed carriage of communications, on a wholesale only and non-discriminatory basis.

*As referred to elsewhere in the report, it is important to note that the exemptions for vegetation clearing under the Telecommunications Act 1997 **DO NOT** apply in ESAs or for the installation of the CEV (non-low impact facility).*

4.3 Threatened Ecological Communities (Western Australia)

There is a list of threatened ecological communities (TEC) which were endorsed under the *Biodiversity Conservation Act 2016* by the Minister for Environment in June 2018. There are currently 20 critically endangered TECs, 17 endangered TECs, 28 vulnerable TECs and 4 presumed destroyed TECs. Of these 69 WA TECs, 25 are concurrently listed as a threatened community under the Commonwealth's *Environmental Protection and Biodiversity Act 1999* (EPBC Act). *Where the route alignment impacts a TEC (which is considered to be an ESA), a clearing permit is required and a permit to modify an occurrence of a TEC is also required under the BC Act.*

There is also a Priority Ecological Community (PEC) list for Western Australian containing an additional 390 ecological communities which are not listed as threatened due to there being insufficient information on the communities to be considered a TEC. These communities are not considered to be currently threatened and are therefore not currently afforded the protection that TECs are given (DBCA 2021).

Despite their current non-listing as 'threatened', these PECs are still of high value, and some may go on to become TECs in the future, therefore some level of protection and avoidance should take place in the PECs to help preserve their values.

4.4 Threatened Species (Western Australia)

Clearing of any state-listed threatened flora species (or vegetation impacts within 50 m of that species in areas where vegetation is contiguous) will require a vegetation clearing permit and a permit authorising the take of or disturbance to threatened flora. If the CEV installation is likely to impact on threatened fauna habitat to a significant extent, then a permit may also be required.

4.5 National Threatened Species (EPBC Act)

Potential impacts to any EPBC threatened species will need to be assessed for their significance (Significant Impact Criteria (SIC) assessment) and a referral to the relevant Commonwealth department and offsets may be required if the impacts are deemed significant.

Impacts to EPBC Act listed species will require a SIC assessment. However, given the small impact area and efforts being made to avoid significant vegetation and habitats, it is unlikely that this level of clearing would constitute a significant impact to flora species or faunal habitats (as per the Significant Impact Guidelines).

4.6 National Threatened Ecological Communities (EPBC Act)

In addition to the 69 WA TECs, there are a number of nationally listed threatened ecological communities (TECs) which have been declared under the Commonwealth EPBC Act. Impacts to national TECs will need to undergo a SIC assessment to determine if the impact will be of a significant nature.

Any significant impacts to nationally listed TECs will be considered to be a matter of National Environmental Significance (MNES) and will require a referral to the Department of Climate Change, Energy, the Environment and Water (DCEEW). Impacts to MNES may require an offset to be generated to account for the losses being experienced by the receiving nationally listed TEC.

Impacts to EPBC Act listed TECs will require a SIC assessment. However, given the small impact area and efforts being made to avoid significant vegetation and habitats, it is unlikely that this level of clearing would constitute a significant impact to TECs.

4.7 Environmentally Sensitive Areas (ESAs)

The Western Australian Minister for the Environment can declare under section 51B of the EP Act that an area of Western Australia or a class of areas in the state is a declared Environmentally Sensitive Area (ESA). The ESAs are listed in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005*.

This dataset was obtained from the relevant department and formed the basis of site maps and site inspections for where the route alignment intersected these mapped ESAs. According to DWER (2020), Environmentally Sensitive Areas (ESAs) are any of the following:

- A declared World Heritage property as defined in section 13 of the EPBC Act of the Commonwealth.
- An area that is included on the Register of the National Estate, because of its natural heritage value, under the *Australian Heritage Council Act 2003* of the Commonwealth.

- A defined wetland and the area within 50 m of the wetland (defined wetlands include Ramsar wetlands, conservation category wetlands and nationally important wetlands).
- The area covered by vegetation within 50 m of rare (threatened) flora, to the extent to which the vegetation is continuous with the vegetation in which the rare (threatened) flora is located.
- The area covered by a TEC.
- A Bush Forever site listed in Bush Forever volumes 1 and 2 (2000), published by the Western Australia Planning Commission.
- The areas covered by the *Environmental Protection (Gnangara Mound Crown Land) Policy 1992*.
- The areas covered by the *Environmental Protection (Western Swamp Tortoise Habitat) Policy 2002*.
- The areas covered by the lakes to which the *Environmental Protection (Swan Coastal Plain Lakes) Policy 1992* applies.
- Protected wetlands as defined in the *Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998*.

From the above categories, the most relevant ESA types for this assessment are:

1. Designated wetlands (Ramsar, conservation category and nationally important wetlands) and areas within 50 m of a mapped designated wetland.
2. Areas within 50 m of threatened flora species.
3. Areas determined to be a state or national TEC.
4. The area covered by vegetation within 50 m of rare (threatened) flora, to the extent to which the vegetation is continuous with the vegetation in which the rare (threatened) flora is located.
5. Areas on the National Estate Register (i.e. Collier Range National Park).

As mentioned in the previous section, the usual exemptions for low impact works like installation of subterranean cables do not apply to ESAs. Where works are entering these ESAs (and any others listed above) a permit must be granted to allow works to take place and may consist of a vegetation clearing permit, and for TECs may require an additional permit to modify an occurrence of a TEC. Further information for impacts to ESAs and clearing permits can be obtained from the Department of Water and Environmental Regulation (the department) via their Native Vegetation Regulation Branch by phone on (08) 6364 7098 or via email to info@dwer.wa.gov.au

4.8 Aboriginal Heritage Act 1972 (AHA)

Aboriginal heritage in Western Australia has historically been protected and managed by the Aboriginal Heritage Act 1972 (AHA). In recent times, the AHA has been largely criticised for its lack of alignment with best practice heritage principles and failure to provide Aboriginal people with a voice in relation to the management of their heritage. Following the Juukan heritage incident in 2020 and the subsequent parliamentary inquiry, the AHA had become in practice 'a mechanism through which the disturbance, damage and destruction of both physical and intangible Aboriginal cultural heritage has repeatedly taken place' (A Way Forward 2021, para 4.125).

Following an extensive public consultation period, in December 2021 the Aboriginal Cultural Heritage Act 2021 (ACHA) was passed in the WA parliament. Following its initial introduction, the ACH Act Regulations and Statutory Guidelines were subject to a two-year public co-design process and the ACH Act only became fully operational on 1 July 2023. Key features of the ACH Act include:

- Broader definition of Aboriginal cultural heritage, replacing a focus on 'importance and significance' with a recognition of Aboriginal 'living culture' and 'cultural landscapes'.

- A greater role for Aboriginal people in the management and control of Aboriginal heritage through the establishment of Local Aboriginal Cultural Heritage Services. A new Directory of Aboriginal cultural heritage replacing the Register of Aboriginal Sites.
- Establishment of the ACH Council, and the Local Aboriginal Cultural Heritage Services (LACHS) to manage Aboriginal cultural heritage.
- Protecting areas of outstanding significance by declaration of Protected Areas.
- Introduction of formal due diligence assessment processed and a tiered activity process.
- Managing activities that may harm Aboriginal cultural heritage through Aboriginal Cultural Heritage Management Plans agreed by Aboriginal parties and proponents.
- Stronger compliance and enforcement, with heavier penalties, and the Minister able to issue stop activity and remediation orders.

On 8 August 2023, only one month in from the ACHA becoming fully operational, the Western Australian Government announced that it would repeal the Aboriginal Cultural Heritage Act 2021. On 9 August 2023 the Aboriginal Heritage Legislative Amendment and Repeal Bill 2023 was introduced to WA parliament. The Bill seeks to repeal the ACH Act 2021 and introduces several simple amendments to the AHA 1972. These amendments include:

- An obligation to inform the Minister of any new information related to any Aboriginal heritage site to which section 18 consent relates.
- The right of appeal via the State Administrative Tribunal to any landowner or native title party aggrieved by a decision of the Minister.
- Establishment of the Aboriginal Cultural Heritage Council in place of the Aboriginal Cultural Materials Committee.

Whilst the Aboriginal Heritage Legislative Amendment and Repeal Bill proceeds through parliament the Aboriginal Cultural Heritage Act 2021 continues to apply. It is likely that amendments to the Aboriginal Heritage Act Regulations will also be required as well as changes and updates to various Department of Planning Lands and Heritage administrative procedures and policies.

5 Desktop Assessment

5.1 Previous Archaeological Surveys in the Geographic Region

Thirty-five (35) previous heritage surveys have been undertaken within 10km of the T-8 to T-10 alignments and are listed in **Table 1**. Two (2) survey reports, prepared by Thomas et al[1] (2023) & Thomas et al[2] (2023) for the survey area and both were reviewed prior to the May (2024) assessment commencing (Section 6.2.1 & 6.2.2). Wall et al (2023) also prepared a survey for the east side of the Great Northern Highway, directly opposite many of the alignments inspected as part of the May 2024 assessment (Section 6.2.3).

Table 1: Previous Surveys Intersecting the Survey Area

Survey Report ID	Author(s)	Title	Survey Type
NA	Thomas, K., et al	Survey Report of an Archaeological and Ethnographical Assessment for the Proposed Project Horizon Optic Fibre Cable Installation - Section T08, Western Australia, with the Ngoonooru Wajarri Traditional Owners.	Archaeological & Ethnographical Assessment
NA	Thomas, K., et al	Survey Report of an Archaeological and Ethnographic Assessment for the Proposed Project Horizon Optic Fibre Cable Installation - Section T09 and T10, Western Australia, with the Ngoonooru Wajarri Traditional Owners	Archaeological & Ethnographical Assessment
NA	Wall, D., Davis, A. & Forrest J.	Wall, D., Davis, A. & Forrest J. (2023). Aboriginal Heritage Work Area Clearance Archaeological & Ethnographic Survey Report. Report to Yugunga-Nya Native Title Aboriginal Corporation RNTBC (YN PBC).	Archaeological & Ethnographic
106794	Goode, B.d	A Site avoidance field survey report of the proposed Meekatharra to Wiluna Optic Fibre Route, Gascoyne District, Western Australia	Site Avoidance
200048	Huxtable, L. & Greenfield, P.	Report of an Aboriginal Heritage Survey of Strategic Materials Sources; Great Northern Highway; Shires of Meekatharra and Cue; Western Australia: July 2014 [TBD]	Site Identification Survey
200479	Coldrick, Bryn	Preliminary Advice on an Ethnographic Survey of the Goldfields Highway between Meekatharra and Wiluna: Part 1 – Meekatharra to the Rabbit Proof Fence	Ethnographic Survey
200519	Coldrick, B & McDonald, E.	Report of an Ethnographic Survey of the Goldfields Highway between Meekatharra and Wiluna: Part 1 –Meekatharra to the Rabbit Proof Fence	Ethnographic Survey
201185	Compton, S.; Thomas, K & Czastka, J.	Meekatharra Water Supply Upgrade Project - Aboriginal Ethnographical and Archaeological Heritage Survey	Site Identification Survey
28438	Tehnas, M.	An Archaeological Survey Report of the Proposed Access Track delineations and Expansions at Exploration Tenement E52/1715 Doolgunna Station	Site Identification Survey
28439	Doulman, T.	An Ethnographic Survey Report of the Proposed Access Track Creations and Expansions at Doolgunna Station	Ethnographic Survey
28447	Doulman, T.	An Ethnographic Survey Report of Exploration Tenement E52/1715 Area DGVC 004 at Doolgunna Station	Ethnographic Survey

Survey Report ID	Author(s)	Title	Survey Type
28450	Tehnas, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 013 at Doolgunna Station	Site Identification Survey
28467	Tehnas, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 102 at Doolgunna Station	Site Identification Survey
28468	Doulman, T.	An Ethnographic Survey Report of Exploration Tenement E52/1715 Area DGVC 102 at Doolgunna Station	Ethnographic Survey
28469	Tehnas, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 106 at Doolgunna Station	Site Identification Survey
28470	Doulman, T.	An Ethnographic Survey Report of Exploration Tenement E52/1715 Area DGVC 106 at Doolgunna Station	
28471	Field, M.	An Archaeological Survey Report of Exploration Tenement DGVC 109 at Doolgunna Station	Site Identification Survey
28472	Doulman, T.	An Ethnographic Survey Report on Exploration Tenement E52/1715 Area DGVC 109 at Doolgunna Station	
28473	Field, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 111 at Doolgunna Station	Site Identification Survey
28519	Tehnas, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 115 at Doolgunna Station	Site Identification Survey
28523	Tehnas, M.	An Archaeological Survey Report on Exploration Tenement E52/1715 Survey DGVC 118 at Doolgunna Station	Site Identification Survey
28526	Doulman, T.	An Ethnographic Survey Report on Exploration Tenement E52/1715 Area DGVC 402 at Doolgunna Station	
28528	Doulman, T.	An Ethnographic Survey Report on Exploration Tenement E52/1715 Area DGVC 403 at Doolgunna Station	
102564	Martinick McNulty Pty Ltd	Environmental assessment of the proposed design and construction of the Wiluna to Meekatharra section of Goldfields Highway (SLK 611.51 to 973.28)	Environmental Assessment
102888	Veth, P. & Moore, P.	Report of an archaeological and ethnographic survey of two road realignments along the Great Northern Highway, South of Meekatharra: 1989 [OWE]	Site Identification Survey
103299	Mattner, C. J.	Report on an archaeological survey of the Karalundi section of the Great Northern Highway, Meekatharra	Site Identification Survey
103459	Webb, E.	Rock art of the Cue Region: interim report to AIATSIS on fieldwork undertaken in respect of grant no 96/6175	Research
103461	Djidar Graphics	Report on an overview survey for Aboriginal sites of ethnographic significance in the vicinity of Meekatharra: 1992 [OWE]	
103505	O'Connor, R.	Addendum to the site survey for Aboriginal sites at Whim Creek Consolidated NL Gold mining leases in the Meekatharra area	Site Avoidance Survey
103528	O'Connor, R.	Aboriginal site survey: report of a survey for Aboriginal sites on proposed roadworks, Great Northern Highway, Cue-Nannine section	Site Avoidance Survey

Survey Report ID	Author(s)	Title	Survey Type
20424	Webb, E.	Report on a cultural heritage survey of several mining leases near Cue, WA	Review
20928	Gunn, R. G.	Art and archaeology on Coodardy, Austin Downs and Noondie Pastoral Leases, West of Cue, WA	Research
22081	Murchison Metals Ltd	Jack Hills Iron Ore Project: roadwork required for haulage of iron ore Mt Hale to Cue	Site Avoidance Survey
23032	R & E O'Connor Pty Ltd	Report on an Aboriginal Heritage survey of the Goldfields Highway, Wiluna - Meekatharra Section	Site Avoidance Survey
23795	Quartermaine, G.	Report on an Archaeological Recording Programmes at DIA Id 15818/20010 and Assessment of DIA Id 8306, 15815 and 15817 Meekatharra to Wiluna Section of the Goldfields Highway H049	Site Avoidance Survey

5.2 Previous Environmental Surveys

A search for previous surveys was conducted within approximately 50 km of the site on the IBSA system. A summary of these surveys is included below in **Table 2.** Survey reports were unavailable for some studies. Only those reports that were available are included in Table 1.

Table 2: Previous surveys conducted within 50 km of the MOOL CEV site

REPORT 1: Title	Albury Heath & Euro Mining Areas Reconnaissance & Targeted Flora & Level 1 Fauna Assessment.
Author and Year	Spectrum Ecology, 2020
Report Type	Flora and vegetation, Terrestrial vertebrate fauna
Proponent	Westgold Resources Limited
Threatened species (EPBC Act 1999 or Declared Rare Flora Species)	Nil
Priority Flora Species	*Heliotropium mitchellii* (Priority 1) *Acacia speckii* (Priority 4) *Grevillea inconspicua* (Priority 4) *Calytrix verruculosa* (Priority 3) *Grevillea inconspicua* (Priority 4)
TEC (EPBC Act 1999)	Nil
PEC (DEC)	Nil
Threatened/Priority fauna	NA
Threatened/Priority fauna habitat	The fauna habitats recorded in the Survey Area form suitable habitat for five conservation significant vertebrate fauna species; Long-tailed Dunnart (*Sminthopsis longicaudata*), Grey Falcon (*Falco hypoleucos*), Fork-tailed Swift (*Apus pacificus*), Peregrine Falcon (*Falco peregrinus*) and West Coast Mulga Slider/ Meekatharra Slider (*Lerista eupoda*).

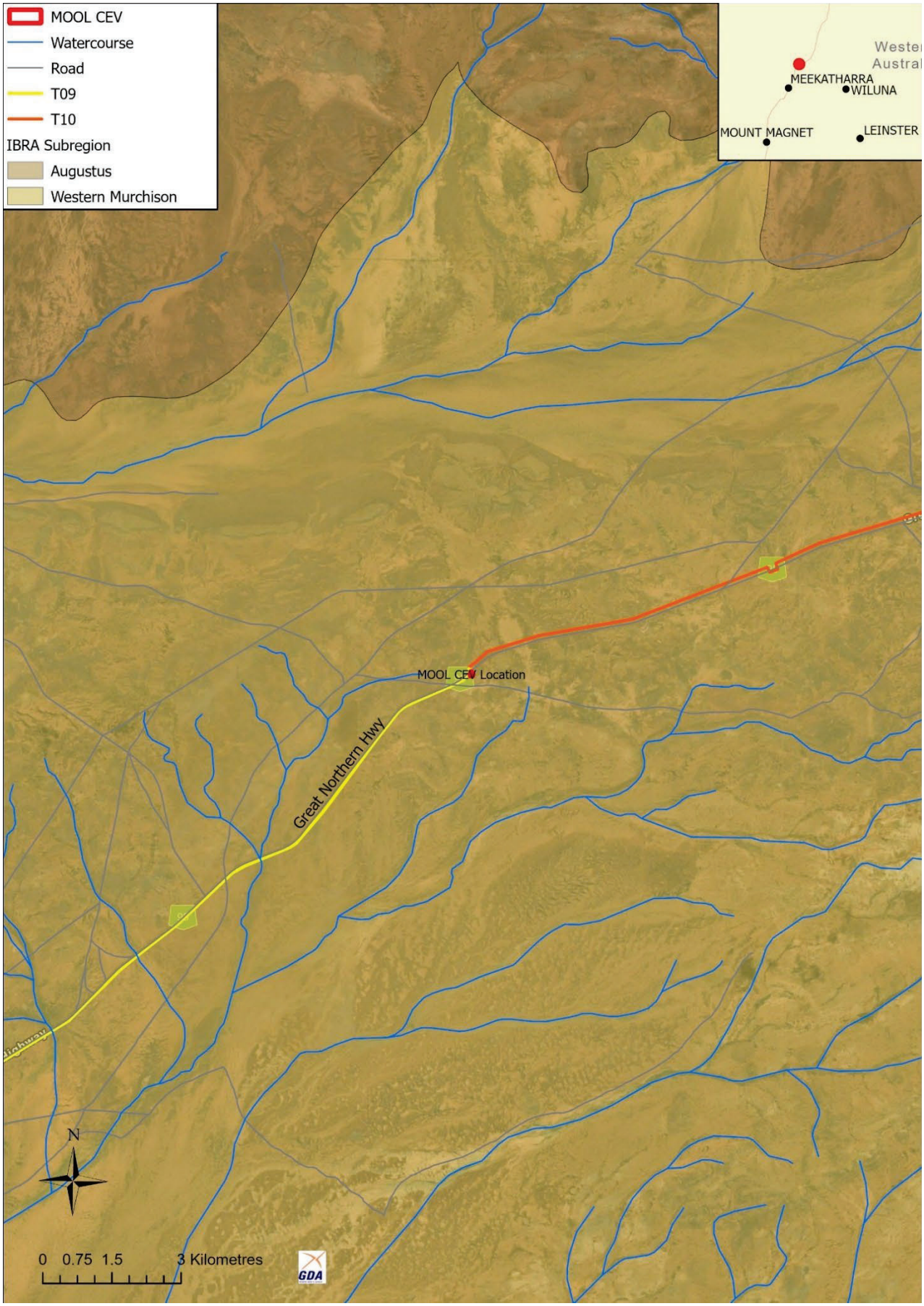
REPORT 2: Title	Level 1 Reconnaissance and Targeted Flora Survey: Labouchere
Author and Year	Maia Environmental Consultancy, 2017
Report Type	Level 1 reconnaissance and targeted flora survey
Proponent	Westgold Resources Limited
Threatened species (EPBC Act 1999 or Declared Rare Flora Species)	Nil
Priority Flora Species	*Stenanthemum mediale* (Priority 1), *Eremophila obliquisepala* (Priority 3) *Gunniopsis propinqua* (Priority 3) *Indigofera gilesii* (Priority 3) *Thryptomene sp. Leinster* (B.J. Lepschi & L.A. Craven 4362) (Priority 3) *I. ?gilesii* (?Priority 3)
TEC (EPBC Act 1999)	Nil
PEC (DEC)	Nil (three similar, but were among the most common in the area and not restricted to the area)
Threatened/Priority fauna	NA
Threatened/Priority fauna habitat	NA

5.3 Disturbance History

There is no data available on disturbance history for the study area. Unfortunately, the DBCA fire history data does not show any recent fire events in the study area, so estimates of fire history were made in the field based on fire scars and regrowth heights of fire susceptible perennial species. Disturbances associated with grazing, historic road construction and wind and water erosion are the most obvious and significant of the disturbances that are or have been in operation in the study area.

5.4 IBRA Region and Subregion

The study area is within the Murchison IBRA Region, and the IBRA Subregion of Western Murchison (**Map 3**). The Western Murchison Subregion is characterised by Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), on outcrop. The area consists of fine textured Quaternary alluvial and extensive hardpan washplains that dominate and characterise the subregion, mantling granitic and greenstone strata of the northern part of the Yilgarn Craton (Desmond et al. 2001).



Map 3: IBRA Subregions.

5.5 Land Systems

The area surrounding the CEV site has not been mapped for land systems (Rangelands_DPIRD_063). The nearest land system is the Yandil Land System, one kilometre south of the site (Table 3). The Yandil land system consists of flat, hardpan wash plains, extensively uniform and carrying a light to moderate covering of pebbles and gravels, occasional wanderrie banks and groves supporting Mulga shrublands, but widely degraded owing to grazing (Curry et. al 1994).

Table 3: Description of Land Systems intersected by the MOOL CEV site

Land System	Land System Description	Area (ha)	% of Study Area
Yandil Land System	Flat hardpan wash plains, extensively uniform and carrying light to moderate mantles of small pebbles and gravels; occasional wanderrie banks and groves; supports mulga shrublands, but widely degraded.	0.42	100%

5.6 Environmentally Sensitive Areas

The study area does not intersect any Environmentally Sensitive Areas (ESAs).

5.7 Soils & Geology

Limited data on soils and geology is available for the area, with mapping imprecise and broadscale and Land System mapping not available for the site. The site was dominated by red sandy loam in areas, with occasional areas of larger rocks.

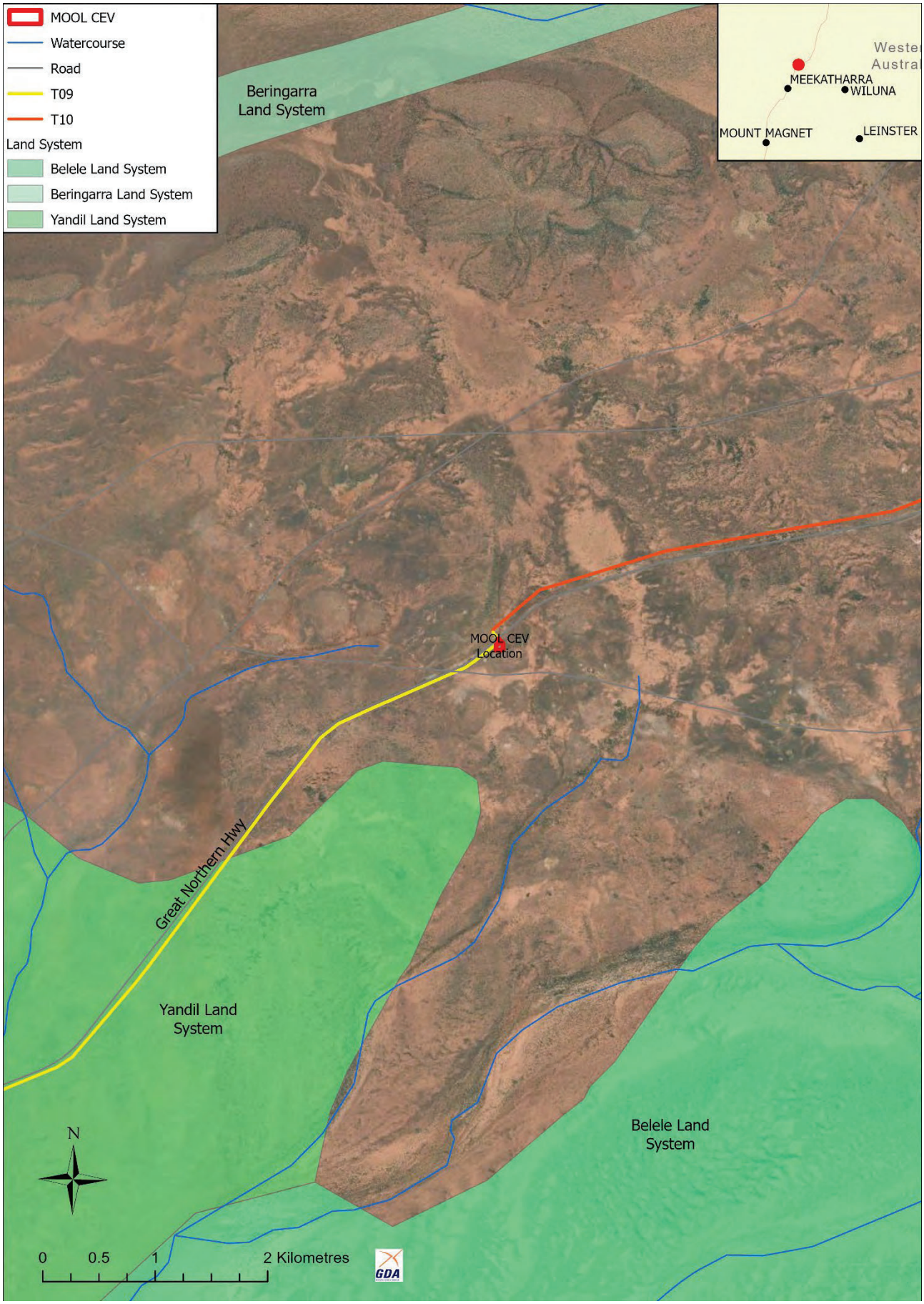
5.8 Vegetation & Community Structure

The site consists of one vegetation unit (based on those described by Beard et al (1978)), being *Low Woodland, Open Low Woodland and Sparse Woodland; Mulga*, where vegetation is relatively sparse, and where persisting, small to medium shrubs are dominating.

Shrub diversity and cover across the site was generally low to moderate, with diversity and cover generally low within the ground layer except where there were some scattered Chenopods and herbaceous species tending to clump together on occasion. Given the preceding weather conditions, grasses were effectively absent, and where present, were unable to be identified. This is a reflection of a relatively low quality site, as well as seasonal conditions leading into the survey being dry. The wider assessment area (Map 2) possessed occasional scattered Mulga (*Acacia aneura*) and other low to medium acacias and a variety of small to medium growing shrub species such as numerous Wattles (*Acacia* spp.), Needle Bush (*Hakea preissii*), Rattle-pod Grevillea (*Grevillea stenobotrya*), and various Emu Bushes (*Eremophila* spp.). The understorey was dominated by bare ground and rock with scattered occurrences of Tall Mulla Mulla (*Ptilotus exaltatus*), *Ptilotus obovatus* (Cottonbush), Copperburrs (*Sclerolaena sp.*) and Bluebush (*Maireana sp.*). Vegetation type is discussed further in Section 7.

5.9 Variation & Microhabitats

There is little variation in the vegetation and habitats across the site, given its small size (0.42 Ha). There are no mapped waterways within the study area, and there is little distinguishable difference between flora in the proposed CEV impact area compared to that beyond the boundaries of the site. There is no significant rock or major elevation changes throughout the study area. The site assessment was able to effectively capture the variation across the site. Areas adjacent to the CEV footprint were also searched for targeted flora and fauna.



Map 4: Land Systems in the vicinity of the MOOL CEV Survey Area.

5.10 Local & Regional Populations of Significant Flora & Fauna

5.10.1 WA Priority Species Within 20 km of the CEV location

There were four (4) WA Priority Species (and two additional species concurrently listed as WA Priority Species and EPBC ACT Threatened species, discussed in **Section 5.9.2**) within 20km of the CEV site. There were two WA Priority Species flora species within 20 km of the CEV site: *Eremophila saxatilis A.P.Br* (P1) (previous known as *Eremophila sp. Meekatharra (D.J. Edinger 4430))*;l and *Goodenia berringbinensis* (P4).

There was a single record of multiple specimens of *Eremophila saxatilis A.P.Br*. from 2000, from approximately 9.7 km east of the site (**Photo 1**). *Eremophila saxatilis A.P.Br*. is an erect, spindly shrub 1–2.5 m high, 0.6–1.2 m wide. Its branches are grey/white to pale brown and with green leaves that are alternate, erect or spreading, clustered at the ends of branches. New growth is resinous. Its flowers are bluish mauve to mauve with a dense covering of simple hairs. It flowers between June and October and is known from a narrow geographic range north-east of Karalundi in the Murchison Bioregion, growing on the tops and slopes of rocky mesas with *Acacia spp*., *Dodonaea pachyneura* and *Ptilotus obovatus*. The species is known from just two populations (Brown and Davis, 2023).

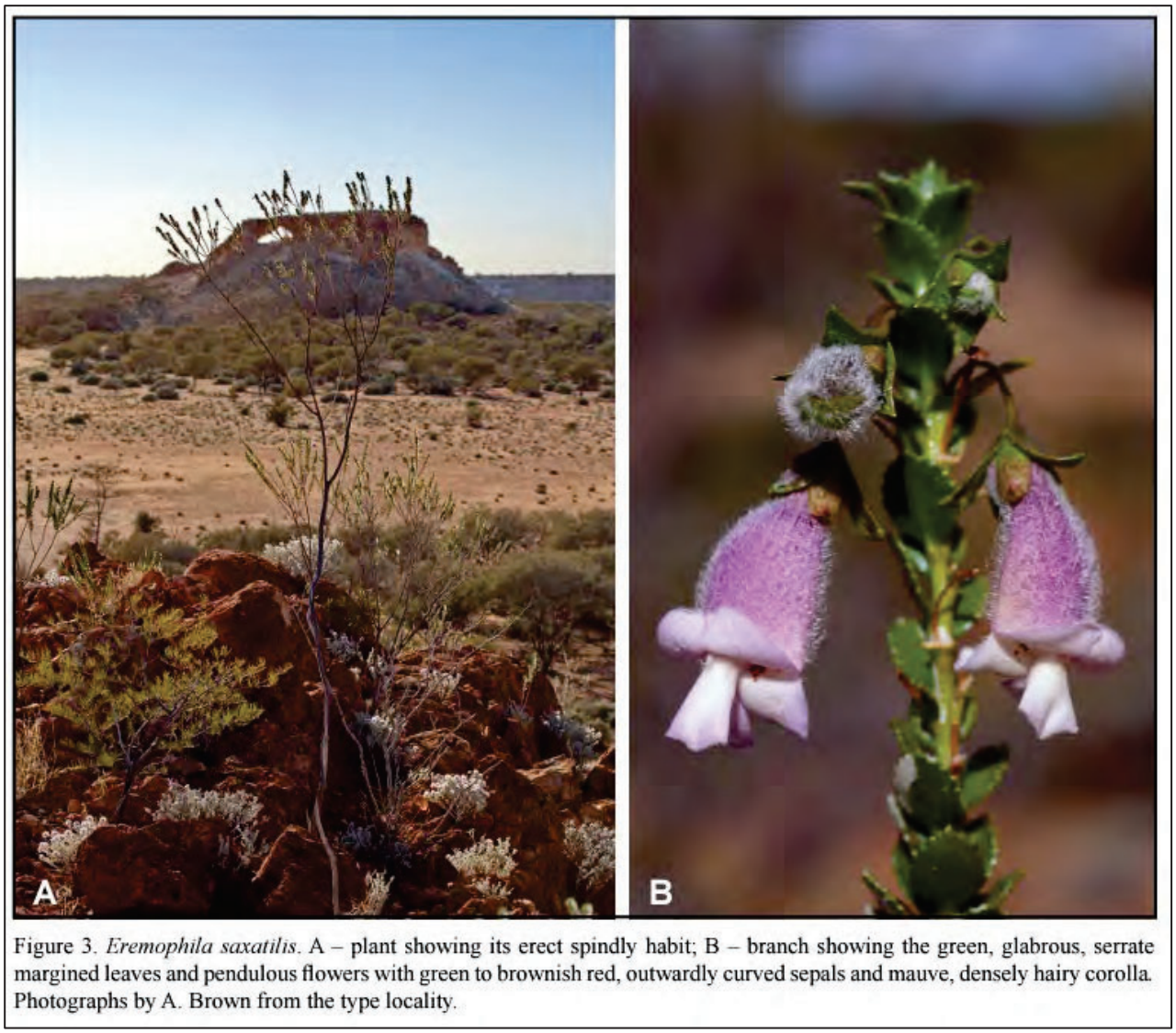


Figure 3. *Eremophila saxatilis*. A – plant showing its erect spindly habit; B – branch showing the green, glabrous, serrate margined leaves and pendulous flowers with green to brownish red, outwardly curved sepals and mauve, densely hairy corolla. Photographs by A. Brown from the type locality.

Photo 1: Example photo of *Eremophila saxatilis A.P.Br.* Photo: A Brown. Source: Brown and Davis, 2023.

There are two records of multiple specimens of *Goodenia berringbinensis* (P4) from the year 2000, approximately 11.5km west of the site (near the Murchison River and its tributaries) (Photo 2). It is an ascending annual herb, 0.1-0.3 m high with yellow flowers in October. It occurs along water courses on red sandy loam (Gibson 2014).

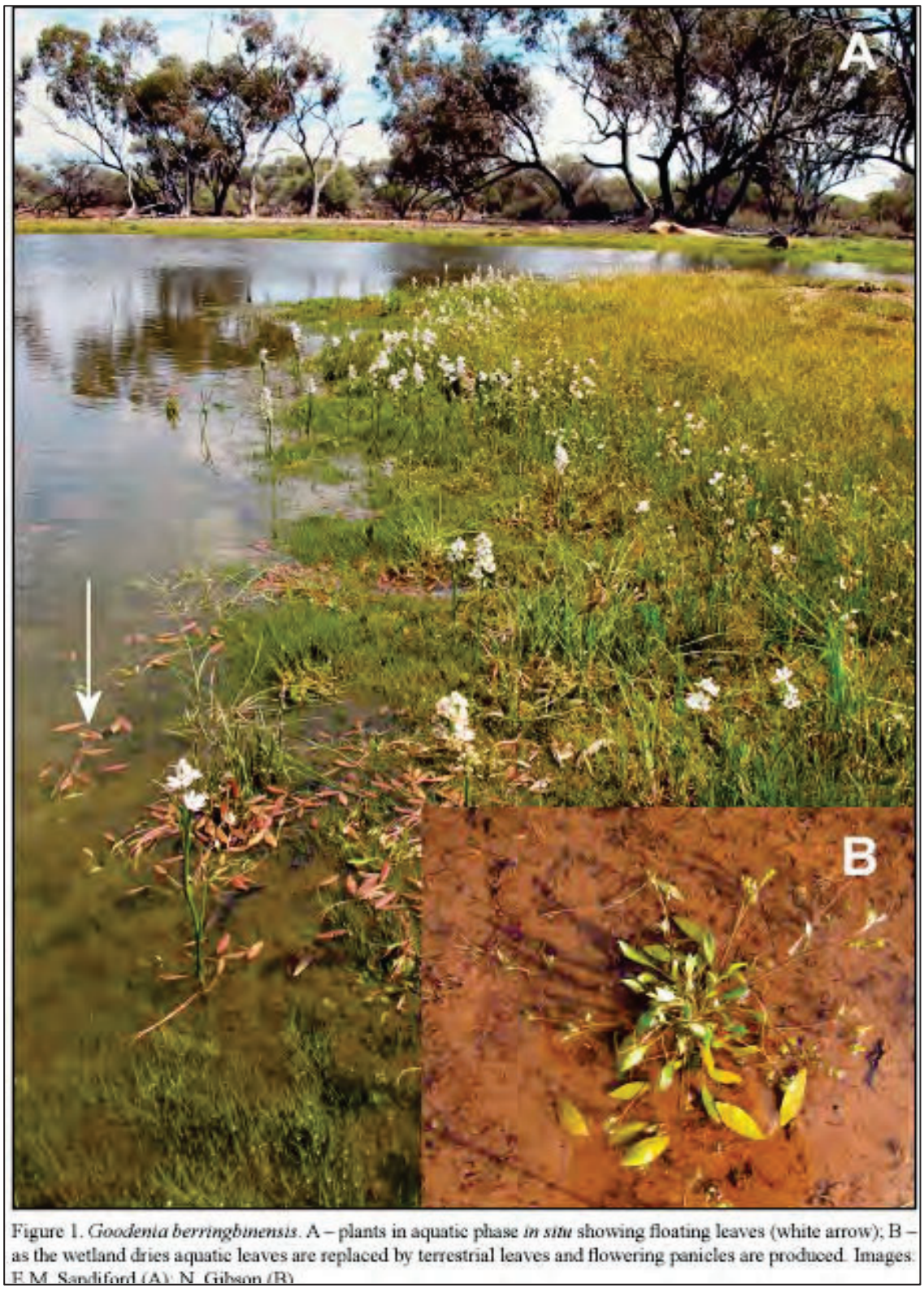


Figure 1. *Goodenia berringbinensis*. A – plants in aquatic phase *in situ* showing floating leaves (white arrow); B – as the wetland dries aquatic leaves are replaced by terrestrial leaves and flowering panicles are produced. Images: E.M. Sandiford (A); N. Gibson (B).

Photo 2: Example photo of *Goodenia berringbinensis.* Photo: E.M. Sandiford and N Gibson. Source: Gibson 2014.

Neither of these Priority Species of flora were located after targeted searches in the assessment area. The *Eremophilia* is a conspicuous perennial species and it would be expected that these species, if present, would be identifiable given their unique vegetative characteristics. The site lacks the suitable aquatic habitat for *Goodenia berringbinensis*. The high degree of disturbance in the site also means the presence of these two species is unlikely. It is noted that species with the WA 'Priority' status are *not* declared threatened species and are *not* afforded the same protections as declared WA and EPBC threatened species under WA and Commonwealth legislation (i.e. a flora 50 m ESA is not required around Priority flora species).

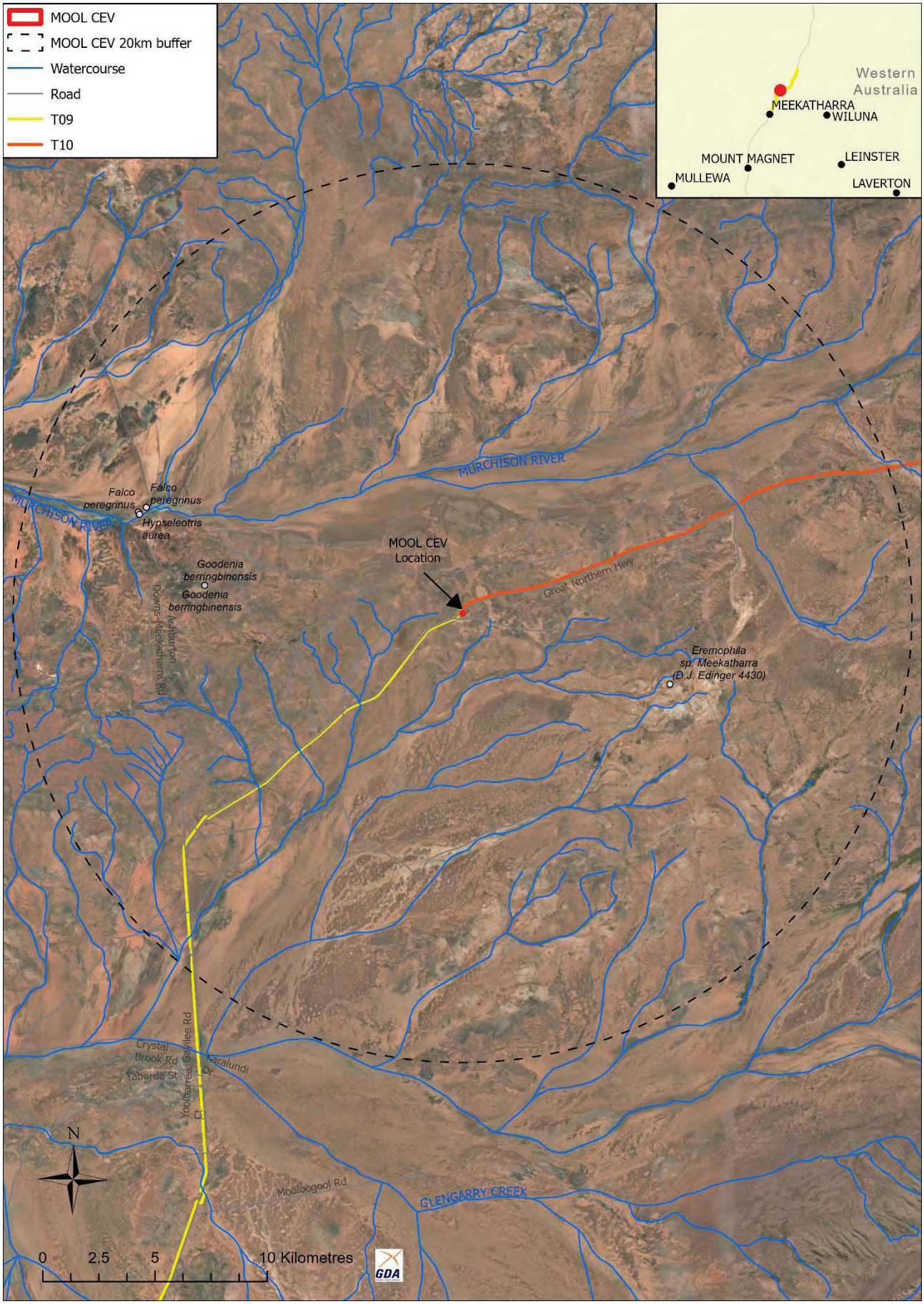
There were records for 2 WA Priority fauna species within 20km of the site. There are two records of Peregrine Falcon (OS) from 1999 and 2007, approximately 15 km west of the site. *Falco peregrinus* (Peregrine falcon) (Photo 3) is a large bird of prey found in most habitats and altitudes, from rainforests to the arid zone. It requires abundant prey and secure nest sites (Australian Museum, 2019), usually on cliffs, but can also use hollows, sticks nests and artificial structures (Atlas of Living Australia, n.d.A).

Photo 3: Example photo of *Falco peregrinus*. Photo: Andrew Allen. Source: Atlas of Living Australia n.d,A.

There was a single record of *Hypseleotris aurea* (Golden gudgeon P2) from 2015, 15 km west of the site at the Murchison River. The Golden Gudgeon is found in rock pools in the Murchison and Gascoyne Rivers. It reaches 8cm in length (Atlas of Living Australia, n.d.B) (Photo 4).

Photo 4: Example photo of *Hypseleotris aurea*. Photo: Mark Allen. Source: Gomon and Bray 2022.

Neither of these Priority Species of fauna were located after targeted searches in the assessment area. The site does not include a watercourse or aquatic habitat. The site lacks any suitable habitat for *Falco peregrinus.*



Map 5: Records of WA Priority Species within 20km of the MOOL CEV.

5.10.2 Threatened Species Within 20 km of the CEV location

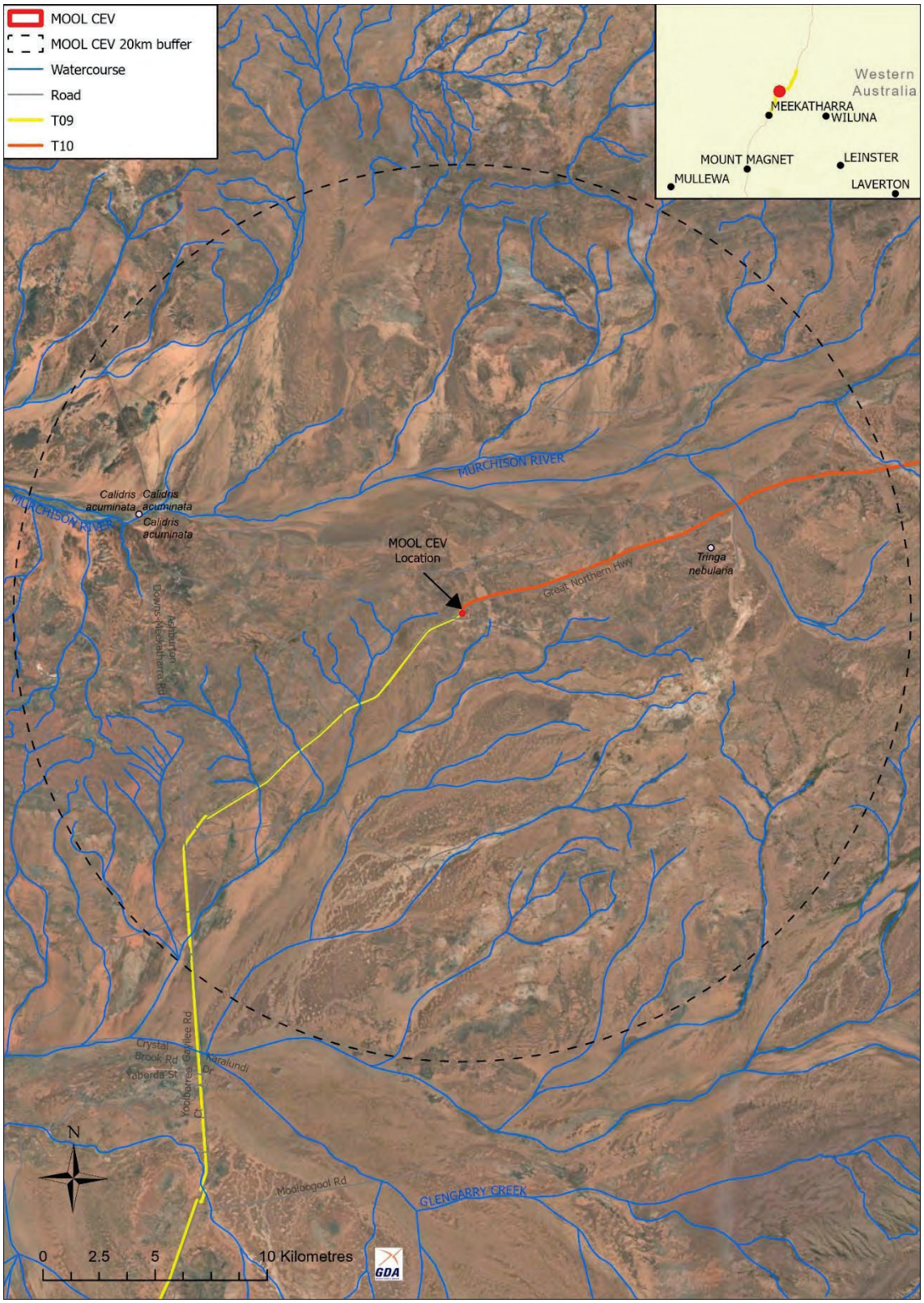
There was a single record of *Tringa nebularia* (Common greenshank) (MI BC Act WA, Endangered EPBC Act), 11.6km north east of site from 1980. *Tringa nebularia* is a migratory bird species and is listed as Endangered (Photo 5). It does not breed in Australia and occurs in all types of wetlands (permanent and ephemeral) and sheltered coastal habitats of varying salinity. Habitats include bays, harbours, river estuaries, deltas and lagoons, less often in round tidal pools, rock-flats and rock platforms. The edges of the wetlands used are generally of mud or clay, occasionally of sand, bare or with emergent or fringing vegetation (DCCEEW 2024).

Photo 5: Example photo of *Tringa nebularia*. Photo: Lancelot239. Source: Atlas of Living Australia n.d., C

There are three records of *Calidris acuminata* (Sharp-tailed sandpiper, MI BC Act WA; Vulnerable EPBC Act) from 2014 from approximately 15 km west of the site near the Murchison River (Photo 6). The Sharp-stailed Sandpiper breeds in Siberia before migrating to Austrlaia, arriving in September and departing in February-March. The birds habitat includes intertidal mudflatas, freshwater swamps and saltwater lakes.

Photo 6: Example photo of *Calidris acuminata*. Source: Atlas of Living Australia n.d.,D

Migratory species records are strongly correlated with the presence of large wetlands and salt lakes in the region. As a result, migratory species are *not* considered likely to be impacted given a) the CEV site avoids all wetland habitat areas, b) the species' have a transient nature and c) there are substantial areas of habitat for these species beyond those areas being impacted by the CEV site. None of these Priority Species were located after targeted searches in the assessment area.



Map 6: Records of Threatened Species within 20km of the MOOL CEV.

5.11 Likelihood of Threatened Species Occurrence

Table 4 summarises the likelihood assessment findings for each species described in Section 5.9 and provides justification for the likelihood category selected.

Table 4: Overview of species likelihood of occurrence assessment

Species name	Common name	Likelihood rating	Preferred habitat	Justification
Flora				
Eremophila saxatilis A.P.Br	NIL	Low	Known from a narrow geographic range north-east of Karalundi in the Murchison Bioregion, growing on the tops and slopes of rocky mesas with Acacia spp., Dodonaea pachyneura and Ptilotus obovatus. The species is known from just two populations	This species of Eremophila is only known from two populations. There were no Eremophilas present in the study area that resembled the growth habit, leaf structure features or preferred habitat of this species.
Goodenia berringbinensis	NIL	Low	Prefers red sandy loam along watercourses along. Know from a site 15km west of the CEV location on the Murchison River.	This species grows along watercourses. The CEV site lacks any suitable habitat.
Fauna				
Calidris acuminata	Sharp-tailed Sandpiper	Negligible	Habitat includes intertidal mudflatas, freshwater swamps and saltwater lakes.	There is no suitable lake, wetland or waterway within or near the site. This species would not frequent this area.
Hypseleotris aurea	Golden Gudgeon	NA	Found in rock pools in the Murchison and Gascoyne Rivers.	There is no suitable lake, wetland or waterway within or near the site.
Falco peregrinus	Peregrine Falcon	Low	Wide range of habitats across its enormous distribution. It requires cliffs and rock outcrops for breeding, which are nearby woodlands and water.	Although known to frequent the airspace above the site on occasion, the site provides no valuable terrestrial habitat for this species. At best would be an extremely rare visitor to the site when hunting prey.
Tringa nebularia	Common Greenshank	Negligible	Prefers freshwater habitats such as swamps, lakes, coastal areas, salt lakes and large rivers.	There is no suitable lake, wetland or waterway within or near the site. This species would not frequent this area.

6 Climate and Weather Leading up to & During Survey

The climate of the study area is arid, with hot daytime temperatures and patchy and generally unreliable rainfall, with the potential for significant daily rainfall totals during the wet season (over the summer months). A survey conducted six to eight (6-8) weeks post wet season (usually March – June) is the recommended timing of surveys in the *Eremaean Botanical Province*, according to EPA (2016). The weather history for the four months leading up to the study for the station at Meekatharra Airport, WA, is provided in Figure 2 and Figure 3.

The average maximum temperature in the period of April to July 2024 was 24 degrees Celsius. The period had seen little rain, with a couple of events of approximately 20mm in that time being all to note. It must also be noted that the study area is 75 kilometres north of Meekatharra, and establishing whether the rainfall extended that far and was of a similar quantity to the weather station readings is difficult to determine. Nevertheless, the weather systems in the wet season are generally far-reaching and it is assumed that some rainfall likely fell in the study area around the same time. The weather in the period leading up to the survey was dry with temperatures ranging from the low 30s to the mid-teens as winter progressed.

This is outside the ideal time to conduct floristic surveys according to the EPA (2016) guidelines, which is March to June, and the weather leading up to the survey was dry. However, a reasonable number of species encountered had flowers, seeds, pods or fruit present on at least some of the specimens, allowing identifications to be made for the majority of flora species encountered. There were, however, some species that were sterile and therefore unable to be accurately identified to species level. Conditions during the survey were mild. While the survey was conducted outside of the optimal time, the site was disturbed, compacted, with bare ground and lacked any habitats that would be used by more sensitive species.

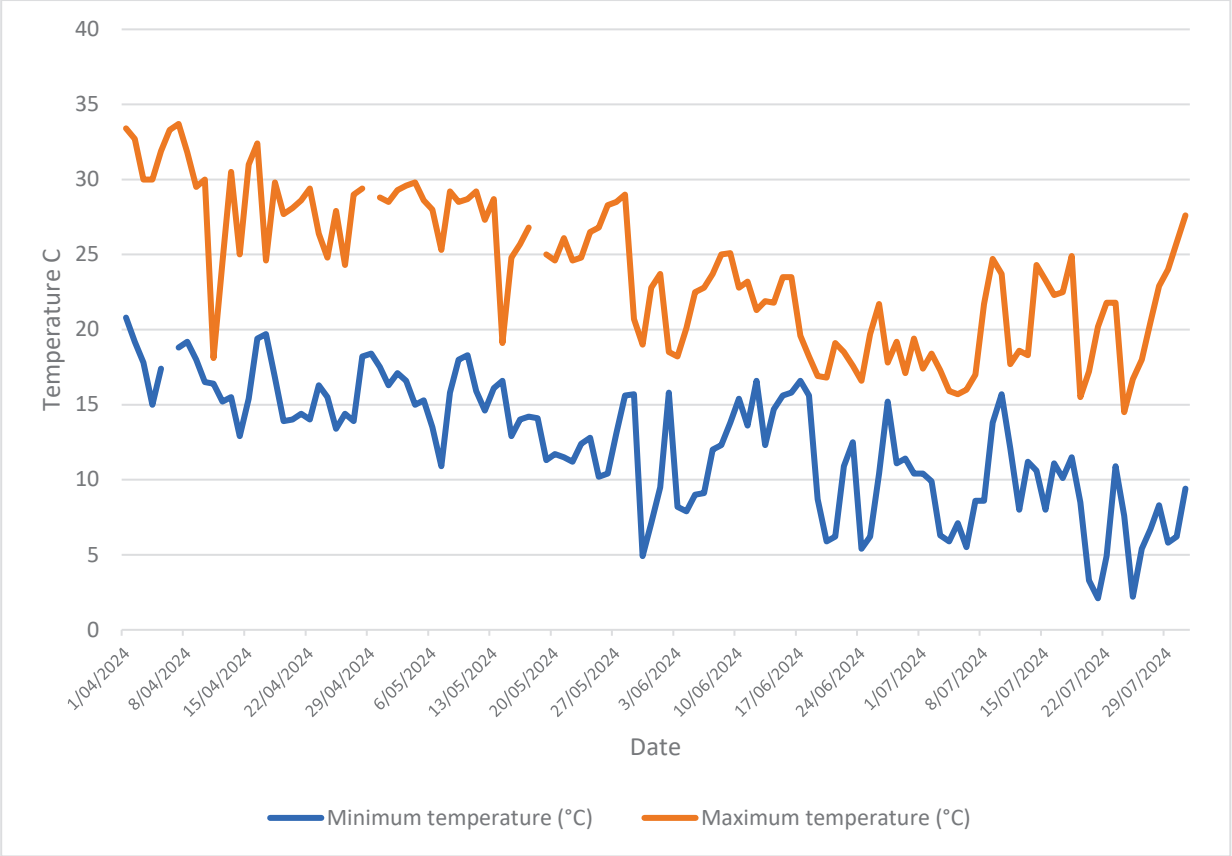


Figure 2: Minimum and maximum temperature observations for Meekatharra Airport from 1 April 2024 to 31 July 2024 (Source: BOM 2024)

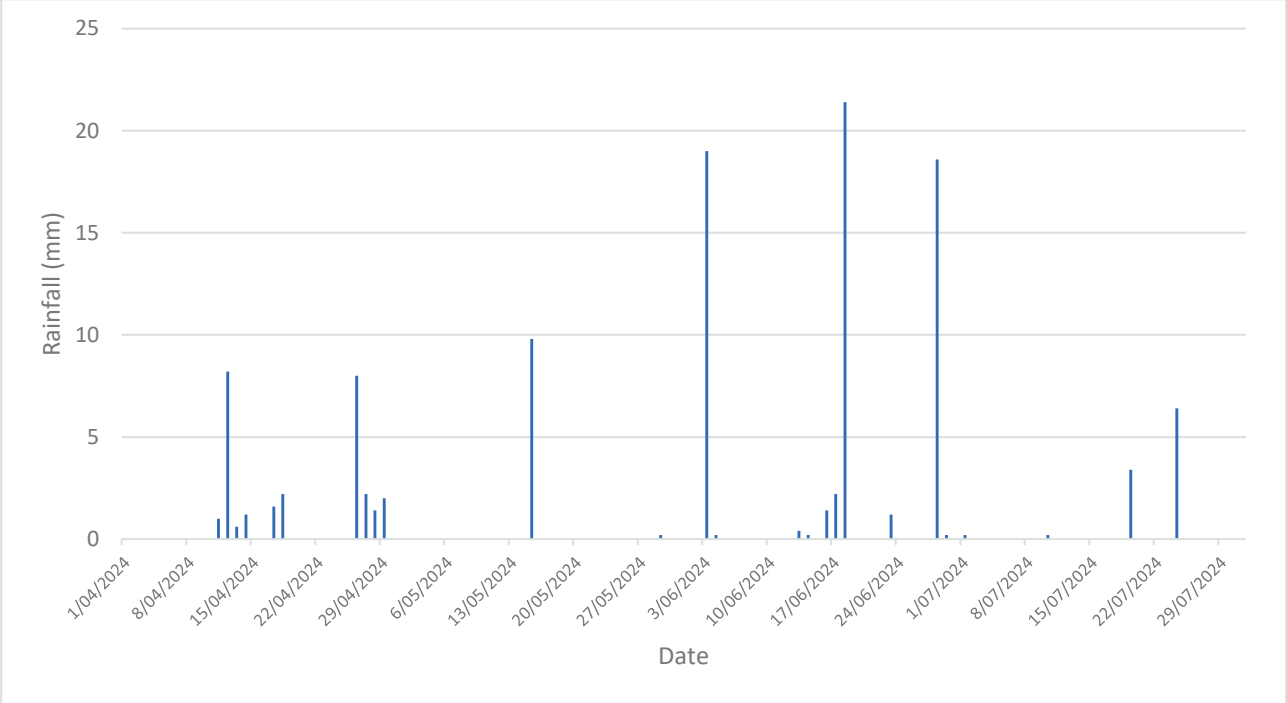


Figure 3: Daily rainfall observations for Meekatharra Airport from 1 April 2024 to 31 July 2024 (Source: BOM 2024)

7 Field Survey Method

The section below provides an overview of the methodology used for the study and explains the overarching principles upon which the vegetation and flora survey for the MOOL CEV site were based.

7.1 Aboriginal Cultural Heritage Inspection

Red-Gum completed pedestrian transects spaced at approximately 5 to 10m. Spatial data and transects were recorded on handheld Garmin GPS units. Information in relation to the ground surface visibility and any previous disturbance within the assessment area was also recorded. Archaeological Aboriginal heritage places were to be defined as areas in which a density of artefacts was observed to be greater than 5 artefacts in a 5 m² area or areas where cultural material was identified.

7.1.1 Determining Archaeological Sensitivity & Risk

Red-Gum acknowledge that *"The possibility of a landscape containing Aboriginal sites will differ between land which has had considerable previous land use, for example intensive land clearing or development, and land which is largely in its natural state or is remote and undisturbed by previous development"* (AHDD Guidelines, 2013:9). Furthermore, "some landforms are more likely than others to serve as an indicator of Aboriginal traditional activity than others." (AHDD Guidelines, 2013:10).

In conducting this assessment, Red-Gum have reviewed the likely impacts of the project on the receiving environment and contend that in reference to Schedule 1 of the AHDD Guidelines (2013), the works are likely best categorized as "Significant Disturbance". After review of the existing studies (Section 6), it has been assumed that the receiving environment is likely a "Significantly Altered Environment" within 20m of the existing Highway (edge of seal) ranging to a "Minimally Altered Environment" the further the distance from the edge of the road.

Red-Gum have used this assessment as an opportunity to assess the archaeological sensitivity of the receiving environment in a rapid assessment format, in accordance with Section 2.28 of the AHDD Guidelines (2013).

Previous Land Use	LAND ACTIVITIES – CATEGORIES 1-5					
		1. Negligible disturbance	2. Minimal disturbance	3. Moderate disturbance	4. Significant disturbance	5. Major disturbance
	Built Environment - e.g. urban environment, towns, metropolitan region.	Low	Low	Low	Low	Medium
	Significantly Altered Environment - e.g. cultivated and cleared land.	Low	Low	Low	Medium	High
	Moderately Altered Environment - e.g. partially cleared lands, re-vegetated landscape.	Low	Low	Medium	Medium	High
	Minimally Altered Environment - e.g. urban bush land, regrowth areas	Low	Medium	Medium	High	High
	Unaltered Environment - e.g. protected areas or pristine environment.	Low	Medium	High	High	High

Risk Assessment	Actions
Low Risk (Review)	Review the landscape and proposed activity (see sections 2.4 - 2.8 - assessing the landscape and the activity). Refer to the AHIS.
Medium Risk (Review /Exercise Caution)	Review the landscape and proposed activity (as above). The precautionary principle (see page 2) applies. Refer to the AHIS and contact the DAA. A range of actions may be recommended, including: no action, consultation with the relevant Aboriginal people, an Aboriginal heritage survey or modification of the proposed activity to avoid or minimise site impact.
High Risk (Consult / Survey / Approvals)	Refer to the AHIS. Consult with the DAA and the relevant Aboriginal people. Dependent on consultation outcomes you may need to include: an Aboriginal heritage survey, modification of the proposed activity to avoid or minimise (see sections 2.24 - 2.28) impact to the site and/or other heritage management strategies. The land user may also need to apply for approval or consent (see section 2.26) to the activity.
For major development projects refer to sections 2.10 - 2.12 for further advice.	

Figure 4: Schedule 2 of ACHDD Guidelines – Aboriginal Heritage Risk Matrix

7.2 Desktop Review

A desktop review was conducted to ascertain information about the local and regional environment using a number of Western Australian and Commonwealth government resources, and covered items such as searches for previous surveys conducted in the area, disturbance history for the study area, as well as land classification systems such as bioregions, land systems, soils and geology. Species searches were also conducted using WA databases to determine what threatened flora and fauna and vegetation communities were located (previously recorded or modelled as likely to occur) in the vicinity of the study area. Where relevant, maps were produced to spatially represent some of the relevant items identified from the background search.

7.3 Data Standards

The survey methodology and the specific data to be captured during the surveys has been based on the requirements outlined in the EPA's 'Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment'.

7.4 Survey Type

The type of survey conducted is a flora and vegetation survey as per the EPA guidelines. The survey gathered comprehensive information on the presence or absence of threatened and priority ecological communities, fauna and recorded all flora located during the survey of the CEV site and immediate surrounding areas. The survey also mapped vegetation types and quality across the study area. Where a population of significant flora or fauna extend beyond the CEV footprint boundary, the full extent of the population was to be mapped. The following sections describe more detail about the survey effort.

7.5 Flora Survey

The predominant survey type was a vegetation assessment of the CEV footprint and immediate surrounding area. According to EPA (2016) *"Floristic composition vegetation classification is the preferred classification system for a detailed survey as the method is repeatable and is considered more suitable for identification of significant vegetation as it focuses on the suite of species present within a quadrat"*.

7.6 Fauna Survey

Locations of scats, tracks and burrows were recorded during surveys. To supplement visual searches, any predator scats observed were to be collected and sent to fauna experts (Enviro DNA) for analysis. Where burrows were located, photographs were taken with scale (standard ruler) and burrows were GPS recorded.

7.7 Vegetation Units

The vegetation types (units) encountered were mapped according to the visible structural units and main species composition of the dominant strata (as per NVIS Level III vegetation association), as captured during field observations. The vegetation types will then be mapped using ArcGIS Pro by plotting the boundaries captured in field onto aerial photos.

7.8 Vegetation Condition Mapping

The Trudgen (1988) scale is used for the assessment of vegetation condition within the *Eremaean Botanical Province*. The vegetation condition relates to vegetation structure observed, the level of disturbance noted within each of the three structural layers, and the likely ability of the vegetation to self-regenerate in the absence of further disturbance (Table 5).

Table 5: Vegetation condition scale used to classify vegetation condition (Source: EPA 2016)

Trudgen (1988) Vegetation Condition Categories (Eremaean Botanical Province)	
Pristine	Not applicable to Eremaean Botanical Province.
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e. areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

7.9 Personnel

The survey of MOOL CEV location took place on 1st August 2024 by Senior Ecologist Damian Wall of Red-Gum Environmental Consulting Pty Ltd (**Table 6**). The CEV site was inspected on foot. Flora, fauna and important habitat zones within the survey area were recorded, including the location of any ESAs and areas of environmental sensitivity, where applicable.

Table 6: Contact Details and Qualifications of Assessor

Assessor name	Contact details	Relevant experience
Damian Wall Bachelor of Applied Science (Parks, Recreation & Heritage), Master Environmental Management & Restoration, Graduate Certificate Cultural Heritage Management.	E: damian.wall@red-gum.com.au P: 0402 344 574	Damian is Managing Director and Senior Ecologist at Red-Gum Environmental Consulting Pty Ltd. Damian has authored 107 Cultural Heritage Due Diligence Assessments, 83 Cultural Heritage Management Plans across 4 states including WA and the NT. Damian has personally negotiated Native Title Agreements for large Petroleum Exploration companies for 6 years in QLD, NT, NSW & WA and is an accredited Biodiversity and Native Vegetation assessor in both NSW and VIC. Damian has 20 years in the environmental industry and has conducted field work throughout the NT, WA and eastern states to author 96 Ecological Assessments (VIC), 49 Assessment of Significance (NSW) reports and 21 Review of Environmental Factor (NSW) documents. Damian is also a Geographic Information Systems (GIS) specialist proficient in all aspects of field data capture and presentation via ArcGIS.

7.10 Survey Effort & Timing

The flora and fauna assessment for the site was conducted in early August, which is outside of the optimal time for survey (March to June) in the arid zones of Western Australia. The weather station at Meekatharra Airport had not received a suitable rain event in the four months prior to the survey. The weather leading up to the survey was dry. However, despite this, sufficient numbers of flora were in flower or were retaining sufficient vegetative material to aid in their identification.

7.11 Survey Limitations

The timing of the survey was outside the ideal time for survey of flora in the arid zone of Western Australia. The optimal survey time is usually 6 to 8 weeks post wet season, which normally coincides with the months of March through to June. The survey took place in early August. Care was taken to identify the key species present within the survey site, however, the species list should be considered a 'snapshot in time' and is not considered a complete list of the species occurring at the site.

8 Results

8.1 Aboriginal Cultural Heritage

Following the field visit in Augusr 2024, Red-Gum concluded that no (zero) Aboriginal Cultural Object concentrations or isolated artefacts were located within the CEV location.

8.2 General Vegetation Condition

According to the Trudgen (1988) scale, which is used for the assessment of vegetation condition within the *Eremaean Botanical Province*, the majority of the study area was in poor condition, with the area dominated by hardpan, with shallow topsoils and rocky areas. Where there was sandy loam topsoil present, there were pockets of vegetation persisting, but those areas were still of relatively low diversity. There were no higher quality areas that would be conducive for harboring threatened species, with only the more hardy, drought-tolerant species remaining. Disturbances associated with grazing, historic road construction and wind and water erosion are the most obvious and significant of the disturbances that are or have been in operation in the study area. A reasonable number of species encountered had flowers, seeds, pods or fruit present on at least some of the specimens, allowing identifications to be made for the majority of flora species encountered. There were, however, some species that were sterile and therefore unable to be accurately identified to species level.

The assessment involved a vegetation survey of the CEV footprint and areas immediately adjacent to determine any potential indirect impacts on species or habitat. The assessment detected a total of twenty-two (22) species or subspecies of flora, representing ten (10) genera. No (zero) exotic flora species were detected during the survey, although there were some exotic species on the immediate road verge, which were not included in the site assessment flora list. The site consists of one vegetation unit (based on those described by Beard et al (1978)), being *Low Woodland, Open Low Woodland and Sparse Woodland; Mulga*, where vegetation is relatively sparse, and where persisting, small to medium shrubs are dominating.

Shrub diversity and cover across the site was generally low to moderate, with diversity and cover generally low within the ground layer except where there were some scattered Chenopods and herbaceous species tending to clump together on occasion. Given the preceding weather conditions, grasses were effectively absent, and

where present, were unable to be identified. This is a reflection of a relatively low quality site, as well as seasonal conditions leading into the survey being dry. The wider assessment area possessed occasional scattered Mulga (*Acacia aneura*) and other low to medium acacias and a variety of small to medium growing shrub species such as numerous Wattles (*Acacia* spp.), Needle Bush (*Hakea preissii*), Rattle-pod Grevillea (*Grevillea stenobotrya*), and various Emu Bushes (*Eremophila* spp.). The understorey was dominated by bare ground and rock with scattered occurrences of Tall Mulla Mulla (*Ptilotus exaltatus*), *Ptilotus obovatus* (Cottonbush), Copperburrs (*Sclerolaena sp.*) and Bluebush (*Maireana sp.*). No (zero) areas of mapped WA Priority Ecological Communities (PECs) occurred in or adjacent to the site assessment area. See Appendix 1 for the flora species recorded and Photos 7 and 8 for examples of vegetation encountered).

No (zero) areas of mapped WA Priority Ecological Communities (PECs) occurred in or adjacent to the site assessment area. The *Yagahong Land System* and *Killara North calcrete groundwater assemblage types on Murchison palaeodrainage on Killara Station* were noted as being closest to the site, approximately 15km to the south-west and south.

Photo 7: MOOL CEV site. Photo: D.Wall, 2024

Photo 8: MOOL CEV. Photo: D.Wall, 2024

8.3 Environmentally Sensitive Areas (ESA) – Vegetation Communities

There were no (zero) ESAs located within the site and therefore and ESA vegetation clearing permit is NOT required.

8.4 WA Priority Ecological Communities (PECs)

PECs are not afforded the same protection as TECs, yet they are listed for their potential to become TECs in the future (Section 4.3). No (zero) PECs were identified within the assessment site nor in the vicinity of the CEV location itself, hence they are not considered in detail further in this report (see Map 7 for the location of the nearby PECs).

8.5 Environmentally Sensitive Areas (ESA) – Threatened Flora & Fauna Records

In addition to the mapped sensitive areas in the Western Australian and Commonwealth datasets, according to DWER, the area within 50 m of an existing threatened flora species record is also to be considered an ESA and afforded the appropriate protections, including a requirement for a permit if disturbance is to occur within that 50 m zone. No flora listed as targeted flora species (Section 5.9) were detected at the MOOL CEV site and there were also no (zero) threatened flora species or WA Priority flora species recorded in the wider study area. Furthermore, there were no unidentifiable plants detected that resembled or possessed the characteristics of any of the WA Priority species that were recorded within 20 km of the CEV.

There were no (zero) threatened flora or fauna within the MOOL CEV site and therefore there were no (zero) threatened flora species 50m radius ESAs that need to be applied for this section.

8.6 Public Land (Crown Reserves & National Estate)

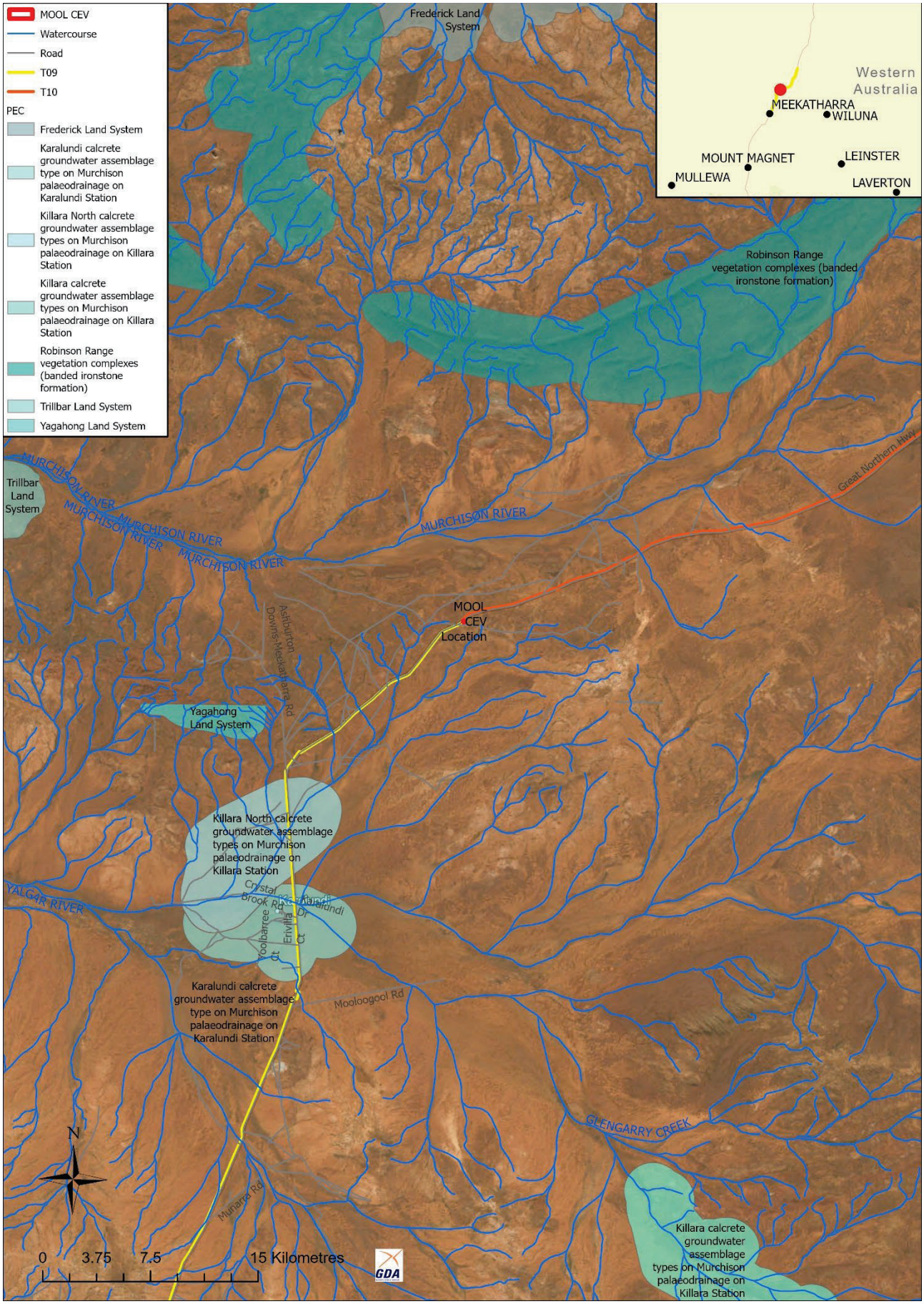
The method for assessing these areas is the same method used for inspecting the vegetation communities, however they are being addressed separately as they are of a different land tenure / classification. There are no (zero) areas of public land (Crown reserves and national estate) located nearby or being intersected by the MOOL CEV assessment area.

There are no Crown Reserves or National Estate areas located within or adjacent to the MOOL CEV site.

8.7 Weeds

There were very low numbers of weed species identified within the MOOL CEV assessment area. This is likely a reflection of the inhospitable conditions that occur in the rangelands of Western Australia and the remoteness of the subject area. It must be noted that the field assessment has only provided a snapshot of species present at the MOOL CEV location and inevitably, there will be weeds present that have not been identified as part of this assessment. It is important that contractors are made aware of the key high threat weed species which may be encountered during the construction (Table 7). Where high threat weeds are seen, they must be avoided, or the weed infestations should be removed prior to machinery entering the area. Once an infestation of weeds has been intersected and machinery is advanced clear of where the weeds are located, machinery must be adequately cleaned down and inspected for weed seeds/propagules prior to work continuing, to prevent further spread of the weeds.

Machinery should be decontaminated when leaving towns and disturbed sites and prior to entering the MOOL CEV location.



Map 7: Overview of PECs in the T-09 and T10 Sections showing the MOOL Site.

Table 7: High Threat Weed Species Which May Be Encountered in the Pilbara

Weed Name	Brief Description	Management Approach
Mesquite – *Prosopis spp.*	Weed of National Significance (WoNS). Can resemble Acacia species but has distinctive zig-zag branches and very long spikes in pairs at base of leaves, catkin flowers.	Avoid. Manually remove prior to work. Wash down machinery prior to continuing. Caution needed to avoid contact with spines.
Parkinsonia – *Parkinsonia aculeata*	WoNS. Large yellow flowers, its many branches are lined with two rows of tiny oval-shaped leaflets. Leaflets drop off plant in dry weather. Thorns are present at the base of leaf stems.	Avoid. Manually remove prior to work. Wash down machinery prior to continuing. Caution needed to avoid contact with spines.
Mimosa Bush – *Vachellia farnesiana*	Many branched shrub with bi-pinnate feathery leaves, bright yellow globular flowers (pom-poms), cigar-like pods, thorns on zig-zag branches.	Avoid. Manually remove prior to work. Wash down machinery prior to continuing. Caution needed to avoid contact with spines.
Prickly Pear / Cactus – *Opuntia* spp. and *Cylindropuntia* spp.	WoNS. Very distinctive cactus plants which grow in segments. Segments covered in spines. Spreads easily if fruit or segments are moved on machinery.	Avoid. Manually remove prior to work. Manually check machinery for cactus segments and remove prior to continuing. Caution needed to avoid contact with spines.
Athel Tree – *Tamarix aphylla*	WoNS. She-oak like shrub or tree which prefers waterways, often grows in thickets. Leaves resemble pine tree leaves. Pinkish-white flowers on ends of branches.	Avoid. Manually remove prior to work. Wash down machinery prior to continuing.
Castor Oil Plant – *Ricinus communis*	Reddish brown stems, green leaves, plant to 3 m high, with large palmate (Cannabis-like) leaves, distinctive spikey flowers/seeds on the ends of flower stalks. Seeds are poisonous.	Avoid. Manually remove prior to work. Wash down machinery prior to continuing. Caution needed to avoid contact with sap.

8.8 Range Extensions

There were no range extensions for any of the flora species identified during the assessment.

8.9 Unidentifiable Flora

There are several unidentified flora species which were unable to be identified fully, as they lacked appropriate vegetative material to facilitate correct identifications.

8.10 Survey Limitations

The limitations and their potential/actual impact upon the survey results are outlined in **Table 8**.

Table 8: Potential limitations and their effect on the study

Limitation	Impacted the study (Y/N)	Comments
Competency / experience of survey personnel	No	The field assessment staff and report authors have adequate experience with terrestrial flora and fauna surveys in arid regions of Australia and across the Pilbara region of WA.
Permits and licences required for the assessment	No	Given the results of the desk top and the very small site, it was deemed that a Permit would not be required and therefore one was not applied for prior to the survey.
Scope and completeness of study	No	The entire CEV footprint and immediate areas were effectively covered.
Survey intensity/effort	No	As above. The survey effort is considered appropriate for the objectives of the survey, the survey area being assessed, and the species being targeted.
Data available on targeted species	No	A number of the WA Priority Species being targeted for survey lacked sufficient detailed descriptions to assist with the identification of the species in the field, with several also lacking any adequate pictures of the plant or plant parts which would otherwise aid in the identification of the species.
Proportion of flora identified	No	Weather leading into the survey was favourable and a reasonable number of plants were in flower or contained sufficient material to aid identifications.
Availability of adequate contextual information	No	The rapid assessment surveys conducted prior to this detailed survey, as well as the background assessment conducted as part of this survey, provided adequate contextual information for the study.
Timing of survey and weather conditions	No	The weather leading up to the survey period was dry, and the survey was conducted in August (outside of the ideal surveying window). Survey conditions were therefore less than ideal.
Remote location and site access	No	The whole of the study area was accessible by foot and had easy access by vehicle. The methodology used for fauna survey is considered adequate for the purposes of the detailed flora and vegetation study.
Disturbances which may affect the results	No	No disturbances occurred during the survey which would have impacted the results.

9 Discussion

9.1 Aboriginal Cultural Heritage Values

Red-Gum contends that the CEV site is deemed to be 'Medium' to 'Low' Archaeological Risk, in a zone that has been historically highly mechanically disturbed, cleared and subject to annual road maintenance activities involving "Major Disturbance" as it is defined in Schedule 1 of the ACH DD Guidelines (2013).

9.2 Presence of Targeted Flora

None of the targeted flora or fauna (Section 5.9) were encountered during the survey. However, given seasonal variations, species lifecycles and climatic preferences, the presence of some of these species across the wider study area cannot be completely ruled out.

9.3 MOOL CEV - Vegetation Condition & Extent

The vegetation in the MOOL CEV is considered to have relatively low regional conservation significance, as the vegetation resembles that which is adjacent to the study area, and which is adequately represented throughout a significant area of the regional landscape. Furthermore, the vegetation that exists beyond the study area is of higher quality and is less disturbed than the vegetation within the study area, which has had historical disturbances from vegetation clearing for road construction and disturbance caused by erosion and grazing.

There were no (zero) state or Commonwealth listed TECs or PECs identified during the survey, with the vegetation encountered being representative of the broad vegetation associations of *Low Woodland, Open Low Woodland and Sparse Woodland; Mulga*, where vegetation is relatively sparse, and where persisting, small to medium shrubs are dominating.

It is considered that, based on the above, the vegetation within the study area is an example of a widespread vegetation community that is well represented across large parts of the West Murchison region. Habitat for potential threatened or priority flora is not considered present, and is more extensively available and likely to be higher quality beyond the boundaries of the study area, given the lower levels of disturbance in those areas further away from roads and other human disturbances.

Some commentary around the ten clearing principles are provided in Table 9, with the aim of describing the potential for native vegetation impacts (from FOC installation & CEV construction) within the study area to be at variance with any of the clearing principles. Red-Gum contends that, given the small size of the MOOL CEV and its position in a well-represented vegetation community with no threatened species or communities considered present, the impacts at that site will also not be in significant conflict with any of the 10 vegetation clearing principles.

Table 9: Assessment of proposed study area impacts against the 10 clearing principles

Clearing Principle	Assessment of project against principle
A). Native vegetation should not be cleared if it comprises a high level of biological diversity	• Vegetation in the study area is generally low to moderate diversity Woodland. • The vegetation in the study area is representative of vegetation types that are extensive throughout the West Murchison subregion. • There are no PECs or TECs located within the study area. • Suitable habitat is not considered present for a number of threatened and WA Priority entities, and there are no threatened flora or WA Priority flora known to be present within the study area. • Native vegetation clearing is small (<1 ha). • The biological diversity is not likely to be permanently reduced as a result of the proposed development actions.
B) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia	• The study area does not contain suitable habitat for a variety of native fauna. • There were no signs present of the targeted species, which have different habitat requirements or large home ranges and there is abundant adjoining habitat available for these species either side of the study area. • Measures are to be put in place to minimise impacts to fauna and faunal habitats, including pre-construction surveys for fauna and habitats at the CEV location.
C) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora	• There are no known rare flora present within the study area. • There are no flora habitats within the study area which are not present immediately adjacent to the study area.

Clearing Principle	Assessment of project against principle
D) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a Threatened Ecological Community (TEC)	• The vegetation in the study area is representative of vegetation types that are extensive throughout the West Murchison subregion. • There are no PECs or TECs located within the study area.
E) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared	• The proposed clearing is not significant (0.42 ha). • The study area is not a significant and isolated remnant patch of native vegetation.
F) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland	• There are no waterways or waterbodies in the study area. • There are no minor man-made drains present in the study area. • There are no wetlands present in the study area.
G) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation	• The impacts associated with the CEV are small and isolated within a much larger contiguous patch of native vegetation. • Measures are to be put in place to ensure the development footprint is strictly adhered to during construction. • The CEMP has actions in place to ensure that works are not completed if high winds or significant rain events are expected during or a short time after construction takes place. • As a result of the above factors, it is highly unlikely that the clearing of vegetation is likely to cause any appreciable land degradation.
H) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area	• The impacts are not near a National Park, gazetted crown land or road reserve. • There are measures to be put in place via the project CEMP to ensure weeds, erosion and other construction issues are adequately managed to ensure there are no direct or indirect impacts on adjoining areas.
I) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water	• There are no significant waterways in the study area. • There are measures to be put in place via the project CEMP to ensure sediment, erosion and other construction issues are adequately managed to ensure there are no direct or indirect impacts on the adjoining or nearby waterways. • The works are shallow and are not expected to impact or affect groundwater storages within the study area.
J) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	• The proposed works are not likely to contribute to or exacerbate flooding risks or associated flood damage from future rain events.

9.4 Fauna

No evidence of the presence of the targeted fauna were identified in the study area. There are numerous strategies that can be implemented to minimise potential impacts to fauna with a focus on *impact minimisation* including:

- An ecologist or a suitable trained wildlife handler should be present when the initial clearing of the CEV site is being conducted. Appropriate equipment needs to be on hand to ensure any animals that are displaced or injured as a result of the construction are adequately rescued and cared for until they are relocated to a safer area away from the development, or until they can be taken to the nearest veterinarian or wildlife rescue facility for treatment and eventual reintroduction.
- If threatened fauna species are located in the field, then work must halt until an agreed approach can be determined via discussions with the appropriate authority involved (Department of Biodiversity, Conservation and Attractions).
- All staff involved with the construction project need to be tool-boxed (inducted) on any species that may be located during the works. The induction should include basic advice on identifying the known species that have been recorded and the steps to take if unsure, or if threatened species or communities are encountered during works.

10 Recommendations

The suggested recommendations from the above sections to help minimise the impacts of the development and are summarised in Table 10.

Table 10: Summary of recommendations to reduce impacts from the development

Topic	Recommendation source	Recommendation
Targeted / threatened flora	2023 T-09/10 Ecological Assessment / This report	The potential impacts are to be minimised as much as possible via pre-construction surveys and micro-siting of the final alignment to avoid targeted or other threatened flora, wherever possible.
	This report	Targeted flora – Despite low likelihood of detection, it is recommended that the targeted species be included on the list of species to avoid during pre-construction inspections and micro-siting efforts through the area.
	2023 T-09/10 Ecological Assessment	The areas within 50 metres radius of a threatened flora record (where the vegetation in that 50-metre zone is contiguous with that around the species record) is considered to be an ESA and afforded the same protection. No threatened flora was identified within the study area, however, if detected during construction, the appropriate approvals and permits to conduct works (impacts) to the 50 metre radius ESA are required. A permit may also need to be sought if a threatened flora species is listed in legislation as one of the classes of threatened species (i.e. NOT a priority 1, 2, 3 or 4 species) and the impact area will be in contiguous vegetation within 50 metres of the threatened flora species record. If the threatened flora species is not able to be avoided, consultation with the appropriate authority must be undertaken.
Targeted / threatened fauna	This report	The potential impacts are to be minimised as much as possible via pre-construction inspections.
Threatened species (general)	2023 T-09/10 Ecological Assessment	If threatened species are located in the field by contract staff, then work must halt until an agreed approach can be determined via discussions with the appropriate authority involved (Department of Biodiversity, Conservation and Attractions).

Topic	Recommendation source	Recommendation
	2023 T-09/10 Ecological Assessment	If threatened species are identified, then the species locations are to be flagged and recorded with a GPS, a more suitable route is to be determined to avoid impacting the species, and a temporary exclusion fence is to be erected around the species to prevent any inadvertent impacts during construction works.
	2023 T-09/10 Ecological Assessment	All staff involved with construction project need to be tool-boxed (inducted) on the locations of known threatened species records on the route, as well as any species that are located during the construction works. The induction should include basic advice on identifying the known species that have been recorded and the steps to take if unsure, or if threatened species or communities are encountered during works.
EPBC Act TECs or species	2023 T-09/10 Ecological Assessment	Any EPBC Act listed threatened species or communities encountered during the works will need a Significant Impact Criteria assessment (SIC) to be completed by a suitably qualified person (ecologist). Liaison with the responsible Commonwealth department is also recommended if EPBC Act species or communities are found or suspected during construction.
Waterways	2023 T-09/10 Ecological Assessment / this report	The study area does not posses any significant waterways, floodways or drainage lines.
Weeds	2023 T-09/10 Ecological Assessment / this report	Machinery must be thoroughly decontaminated prior to entering the CEV location.
	2023 T-09/10 Ecological Assessment	Where high threat weeds are seen, they must be avoided or the weed infestations should be removed prior to machinery entering the area. Once an infestation of weeds has been intersected and machinery is advanced clear of where the weeds are located, machinery must be adequately cleaned down and inspected for weed seeds/propagules prior to work continuing, to prevent further spread of the weed.
	2023 T-09/10 Ecological Assessment	Machinery operators should be trained in identifying the key high threat weeds likely to be intercepted by machinery in the rangelands region of Fortescue. The CEMP is to list some of the main and highly visible weed species to be on the lookout for.
	2023 T-09/10 Ecological Assessment	Machinery operators need to be wary of any species which are unfamiliar, and methods be put in place to identify any unknown and weed-like plants that are encountered along the route. This is not only important for avoiding high threat weeds which may be present but is also important for identifying any rare or threatened species of plants which may also be encountered on site.
Impact minimisation & management	2023 T-09/190 Ecological Assessment	A CEMP should contain details of key contacts for responsible authorities, wildlife rescuers and handlers, and flora experts, and need to contain more detail on the impact minimisation approach and the step-by-step process if threatened species or threatened communities are found or suspected of being present on site.
Aboriginal cultural heritage	This report	The CEMP must include an unexpected finds protocol to adequately deal with European or Aboriginal cultural values or artefacts that are discovered during the construction process.

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12 Appendices

Appendix 1: Flora List

Scientific Name	Common Name	Status
Acacia aneura	Mulga	Native
Acacia coolgardiensis	Sugar Brother	Native
Acacia cuspidifolia	Wait-a-While	Native
Acacia pachyacra	Shiny-pod Wattle	Native
Acacia pteraneura	Wattle	Native
Acacia rhodophloia	Dagger Wattle	Native
Atriplex codonocarpa	Flat-topped Saltbush	Native
Eremophila latrobei	Crimson Turkey Bush	Native
Eremophila maculata	Native Fuscia	Native
Eremophila sp. 1 sterile	Eremophila	Native
Eremophila sp. 2 sterile	Eremophila	Native
Grevillea stenopbotrya	Rattle-pod Grevillea	Native
Hakea preissii	Needle Bush	Native
Maireana sp.	Bluebush	Native
Maireana trichoptera	Downy Bluebush	Native
Ptilotus exaltatus	Tall Mulla Mulla	Native
Ptilotus obovatus	Cottonbush	Native
Sclerolaena bicornis	Goathead Burr	Native
Sclerolaena cuneata	Tangled Copperburr	Native
Scleroleana obliquicuspus	Limestone Bindii	Native
Solanum lasiophyllum	Flannel-bush	Native
Unidentified grass	Grass	Native