GOVERNMENT OF
WESTERN AUSTRALIA

CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

Purpose Permit number:	CPS 10114/1
Permit Holder:	Commonwealth Scientific, Industry and Research Organisation's (CSIRO)
Duration of Permit:	From 24 July 2023 to 24 July 2028

The permit holder is authorised to clear *native vegetation* subject to the following conditions of this permit.

PART I – CLEARING AUTHORISED

1. Clearing authorised (purpose)

The permit holder is authorised to clear *native vegetation* for the purpose of the construction of the Square Kilometre Array (SKA) low project, including SKA low core, central processing facility, track and trench, cluster areas and AARNET fibre link.

2. Land on which clearing is to be done

Lot 18 on Deposited Plan 220344, South Murchison

Lot 502 on Deposited Plan 55945, South Murchison

Beringarra-Pindar Road Reserve (PINs 11665424, 11665425, 11708250 and 11708252), South Murchison

Boolardy-Kalli Road Reserve (PIN 11708251), South Murchison; and

Unnamed Road Reserve (PIN 11668859), South Murchison.

3. Clearing authorised

The permit holder must not clear more than 578.6 hectares of *native vegetation* within the area cross-hatched yellow in Figure 1(a), 1(b), 1(c) and 1(d) of Schedule 1.

4. Application

This permit allows the permit holder to authorise persons, including employees, contractors and agents of the permit holder, to clear *native vegetation* for the purposes of this permit subject to compliance with the conditions of this permit and approval from the permit holder.

PART II – MANAGEMENT CONDITIONS

5. Avoid, minimise, and reduce impacts and extent of clearing

In determining the *native vegetation* authorised to be cleared under this permit, the permit holder must apply the following principles, set out in descending order of preference:

(a) avoid the clearing of *native vegetation*;

(b) minimise the amount of *native vegetation* to be cleared; and

(c) reduce the impact of clearing on any environmental value.

6. Weed management

When undertaking any clearing authorised under this permit, the permit holder must take the following measures to minimise the risk of introduction and spread of *weeds* as per the Environmental Management Plan prepared by AECOM (2023), including but not limited to:

(a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;

(b) ensure that no known *weed*-affected soil, *mulch*, *fill*, or other material is brought into the area to be cleared; and

(c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

7. Wind erosion management

The permit holder must commence activities related to the purpose of the clearing, no later than three (3) months after undertaking the authorised clearing activities to reduce the potential for wind erosion.

8. Directional clearing

The permit holder must:

(a) conduct clearing authorised under this permit from one direction to the other towards adjacent *native vegetation*; and

(b) allow a reasonable time for fauna present within the areas being cleared to move into adjacent *native vegetation* ahead of the clearing activity.

9. Fauna management – western spiny-tailed skink

The permit hold must undertake fauna management measures as per the Environmental Management Plan (AECOM, 2023) and the Environmental Management Plan – *Egernia stokesii* subsp. *badia* (AECOM, 2021), including but not limited to the following:

(a) Within seven (7) days prior to undertaking any clearing authorised under this permit, the permit holder shall engage a *fauna specialist* to undertake pre-clearance surveys within the areas cross-hatched yellow on Figures 1, 2, 3 and 4 of Schedule 1 for the western spiny-tailed skink (*E. stokesii* subsp. *badia*).

(b) Where population(s) of the western spiny-tailed skink are identified under condition 9(a), the permit holder must;

  (i) demarcate the population and surrounding *habitat*

  (ii) construct temporary fencing around the *habitat*; and

(iii) establish a 50-metre buffer around the identified population.

(c) The permit holder must engage a *fauna specialist* to inspect any new sightings of the western spiny-tailed skink in areas not identified under condition 9(a). Where new population(s) of western spiny-tailed skink are identified, the permit holder must repeat the activities required by condition 9(b).

(d) Where the western spiny-tailed skink is identified during clearing activities, the permit holder must:
   (i) cease the activities until individual(s) of the western spiny-tailed skink have moved on from that area to adjoining *habitat*; and
   (ii) undertake control measures for a suspected environmental incident, as described in section 5.2 of the Environmental Management Plan – *Egernia stokesii* subsp. *badia* (AECOM, 2021).

(e) Where western spiny-tailed skink individual(s) are identified under condition 9(a), 9(c) and/or 9(d), the permit holder shall include the following in a report submitted to the *CEO* within two months of undertaking any clearing authorised under this permit:
   (i) the number of individuals identified;
   (ii) the date each individual was identified;
   (iii) the location where each individual was identified recorded using a Global Positioning System (GPS) unit set to Geocentric Datum Australia 2020 (GDA2020), expressing the geographical coordinates in Eastings and Northings or decimal degrees
   (iv) actions taken to avoid the clearing of *habitat*
   (v) a description of the actions undertaken in accordance with conditions 9(i), (ii) and (iii)
   (vi) the reasons why the clearing footprint (including track or pad) could not be moved to avoid further impacts on the western spiny-tailed skink in accordance with condition 9(d)(ii); and
   (vii) details pertaining to the circumstances of any death of, or injury sustained by, an individual.

(f) Immediately after construction has concluded, the permit holder must;
   (i) engage a *fauna specialist* to survey the areas demarcated and fenced under 9(a) and 9(c) to determine if the western spiny-tailed skink population is still present
   (ii) collect information on the numbers of individuals
   (iii) collect mortality data
   (iv) remove temporary fencing immediately after the fauna survey required under condition 9(e)(i) has been undertaken; and
   (v) prepare an annual technical monitoring report.

10. Fauna management – trench design

The permit holder must provide ramps at the ends of trenches open for more than 24 hours to enable fauna to escape before the heat of the day.

PART III - RECORD KEEPING AND REPORTING

11. Records that must be kept

The permit holder must maintain records relating to the listed relevant matters in accordance with the specifications detailed in Table 1.

Table 1: Records that must be kept

No.	Relevant matter	Specifications
1.	In relation to the authorised clearing activities generally	(a) the species composition, structure, and density of the cleared area; (b) the location where the clearing occurred, recorded using a Global Positioning System (GPS) unit set to GDA2020, expressing the geographical coordinates in Eastings and Northings; (c) the date that the area was cleared; (d) the size of the area cleared (in hectares); (e) actions taken to avoid, minimise, and reduce the impacts and extent of clearing in accordance with condition 5; (f) actions taken to minimise the risk of the introduction and spread of *weeds* in accordance with condition 6; (g) actions taken to minimise the risk of wind erosion in accordance with condition 7; (h) action taken in accordance within condition 8; and (i) the actions taken in accordance with condition 10.
2.	In relation to fauna management pursuant to condition 9	(a) results of the pre-clearance surveys undertaken in accordance with condition 9 of this permit; and (b) a copy of the *fauna specialist's* report.

12. Reporting

(a) The permit holder must provide to the *CEO*, on or before 30 June of each calendar year, a written report containing:

(i) the records required to be kept under condition 11; and

(ii) records of activities done by the permit holder under this permit between 1 January and 31 December of the preceding calendar year.

(b) If no clearing authorised under this permit has been undertaken, a written report confirming that no clearing under this permit has been undertaken, must be provided to the *CEO* on or before 30 June of each calendar year.

(c) The permit holder must provide to the *CEO*, no later than 90 calendar days prior to the expiry date of the permit, a written report of records required under condition 11, where these records have not already been provided under condition 12(a).

DEFINITIONS

In this permit, the terms in Table have the meanings defined.

Table 2: Definitions

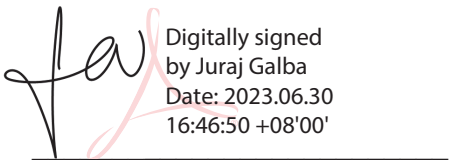
Term	Definition
CEO	Chief Executive Officer of the department responsible for the administration of the clearing provisions under the *Environmental Protection Act 1986*.
clearing	has the meaning given under section 3(1) of the EP Act.
condition	a condition to which this clearing permit is subject under section 51H of the EP Act.
department	means the department established under section 35 of the *Public Sector Management Act 1994* (WA) and designated as responsible for the administration of the EP Act, which includes Part V Division 2.
EP Act	*Environmental Protection Act 1986* (WA)
fauna specialist	means a person who holds a tertiary qualification specialising in environmental science or equivalent, and has a minimum of 2 years work experience in fauna identification and surveys of fauna native to the region being inspected or surveyed, or who is approved by the *CEO* as a suitable fauna specialist for the bioregion, and who holds a valid fauna licence issued under the *Biodiversity Conservation Act 2016*.
fill	means material used to increase the ground level, or to fill a depression.
habitat	means habitat known to support western spiny-tailed skink (*Egernia stokesii* subsp. *badia*) within the known current distribution of the species, typically characterised by rock crevices in large, isolated rocky outcrops, typically granite.
mulch	means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation.
native vegetation	has the meaning given under section 3(1) and section 51A of the EP Act.
weeds	means any plant – (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or (b) published in a Department of Biodiversity, Conservation and Attractions species-led ecological impact and invasiveness ranking summary, regardless of ranking; or (c) not indigenous to the area concerned.

REFERENCES

AECOM. (2021). *Environmental Management Plan – Egernia stokesii subsp. badia.* Prepared on 22 December 2021 for Department of Industry, Science, Energy and Resources. Received by the department on 28 April 2023 (ref: DWERDT771218). Available at Index of /permit/10114 (dwer.wa.gov.au).

AECOM. (2023). *Native Vegetation Clearing Permit Application – Supporting document.* Prepared on 10 March 2023 for Wajarri Enterprises Limited. Received by the department on 28 April 2023 (ref: DWERDT771218). Available at Index of /permit/10114 (dwer.wa.gov.au).

END OF CONDITIONS



Juraj Galba
A/MANAGER
NATIVE VEGETATION REGULATION

Officer delegated under Section 20
of the Environmental Protection Act 1986

30 June 2023

Schedule 1

The boundary of the area authorised to be cleared is shown in the map below (Figure 1a to 1d).

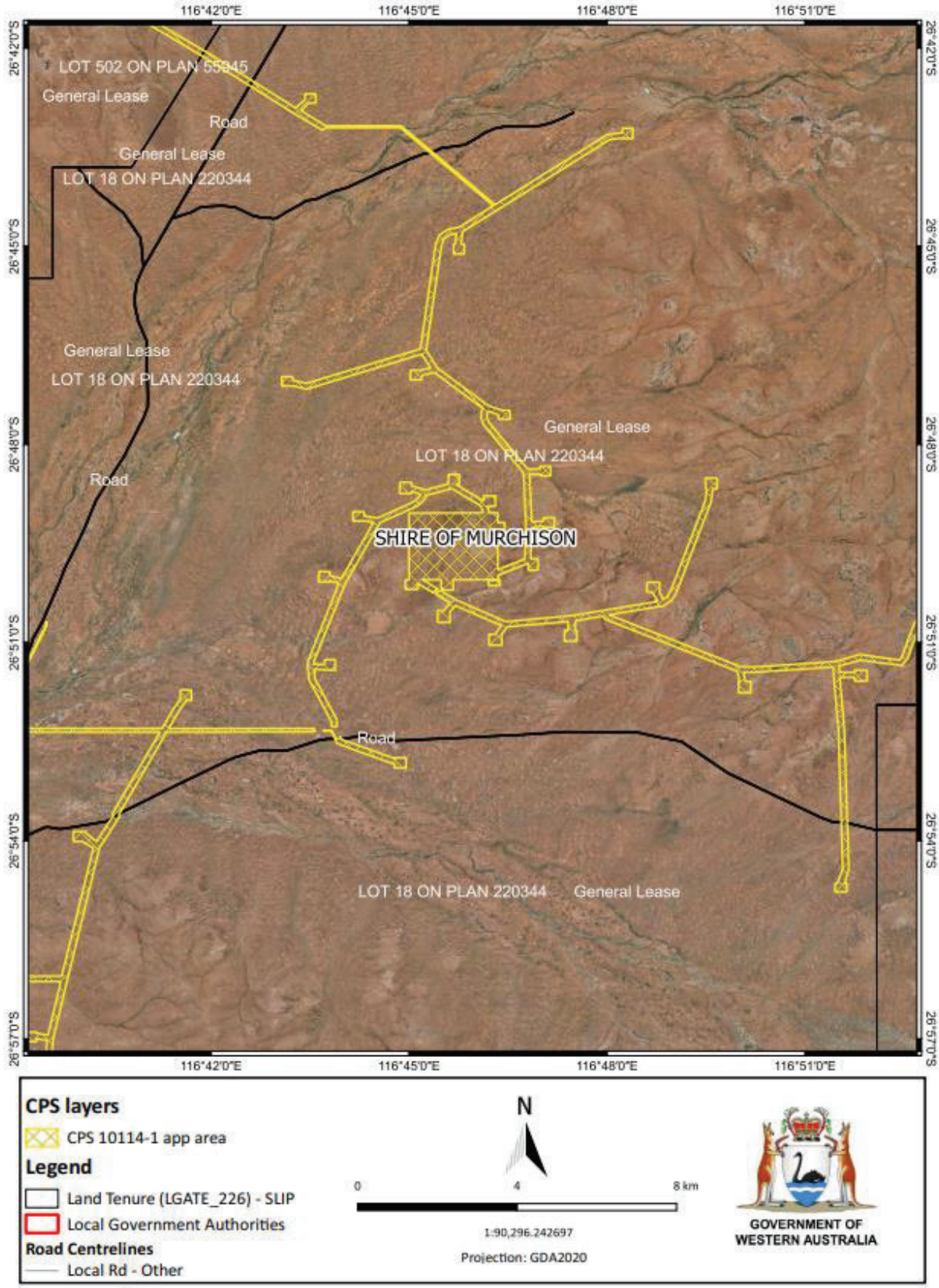


Figure 1a: Map of the boundary of the area within which clearing may occur

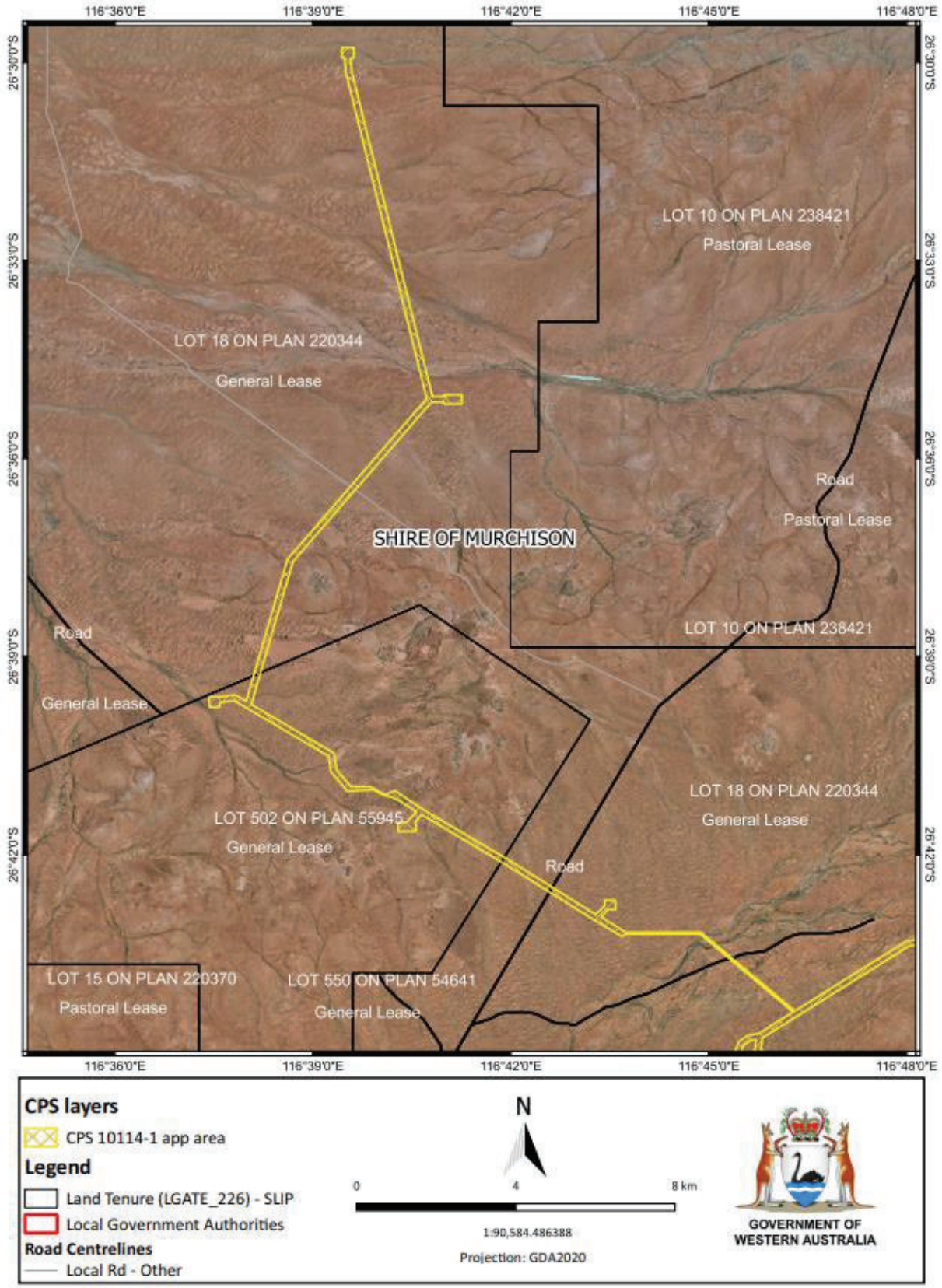


Figure 1b: Map of the boundary of the area within which clearing may occur

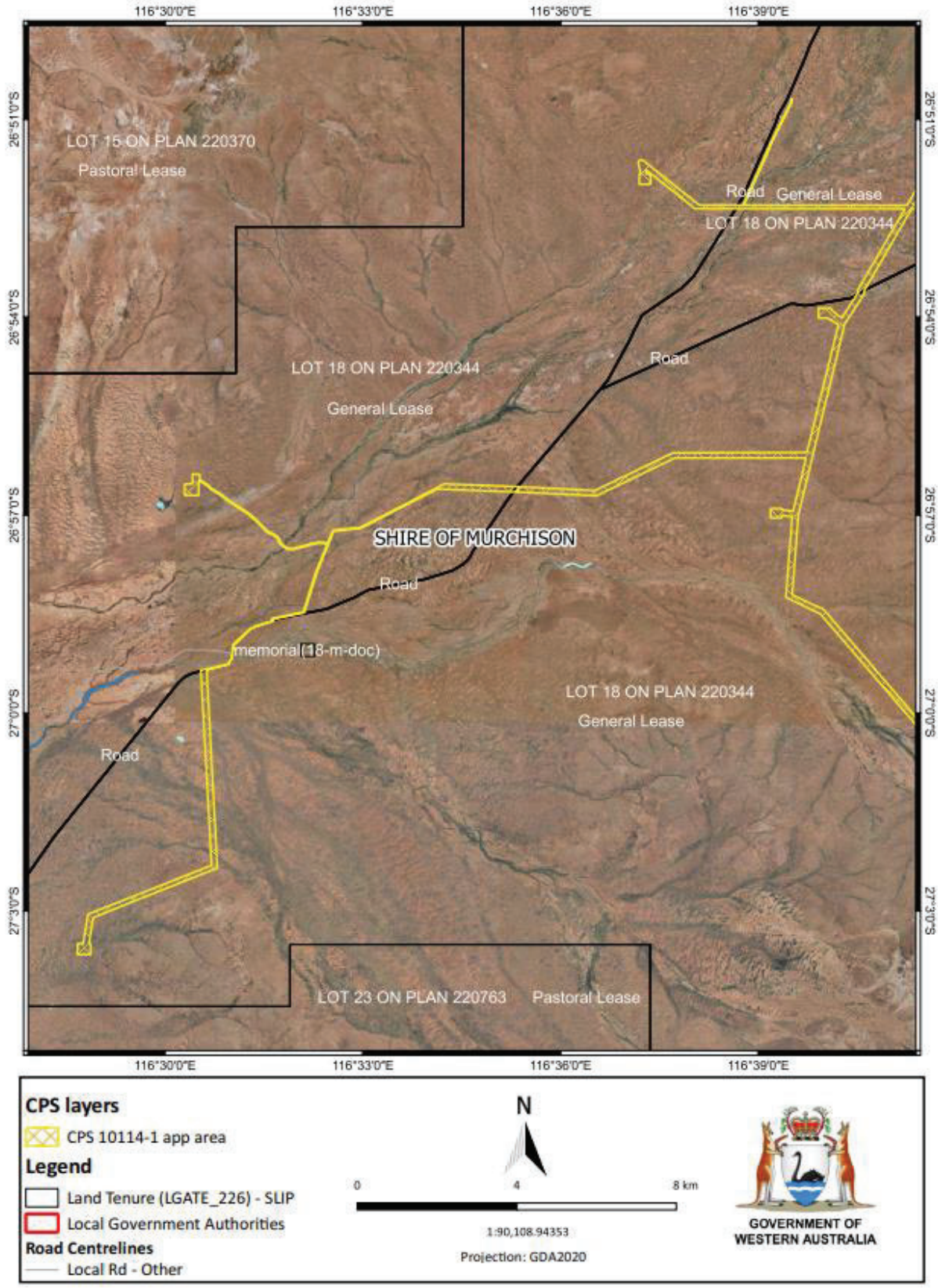


Figure 1c: Map of the boundary of the area within which clearing may occur

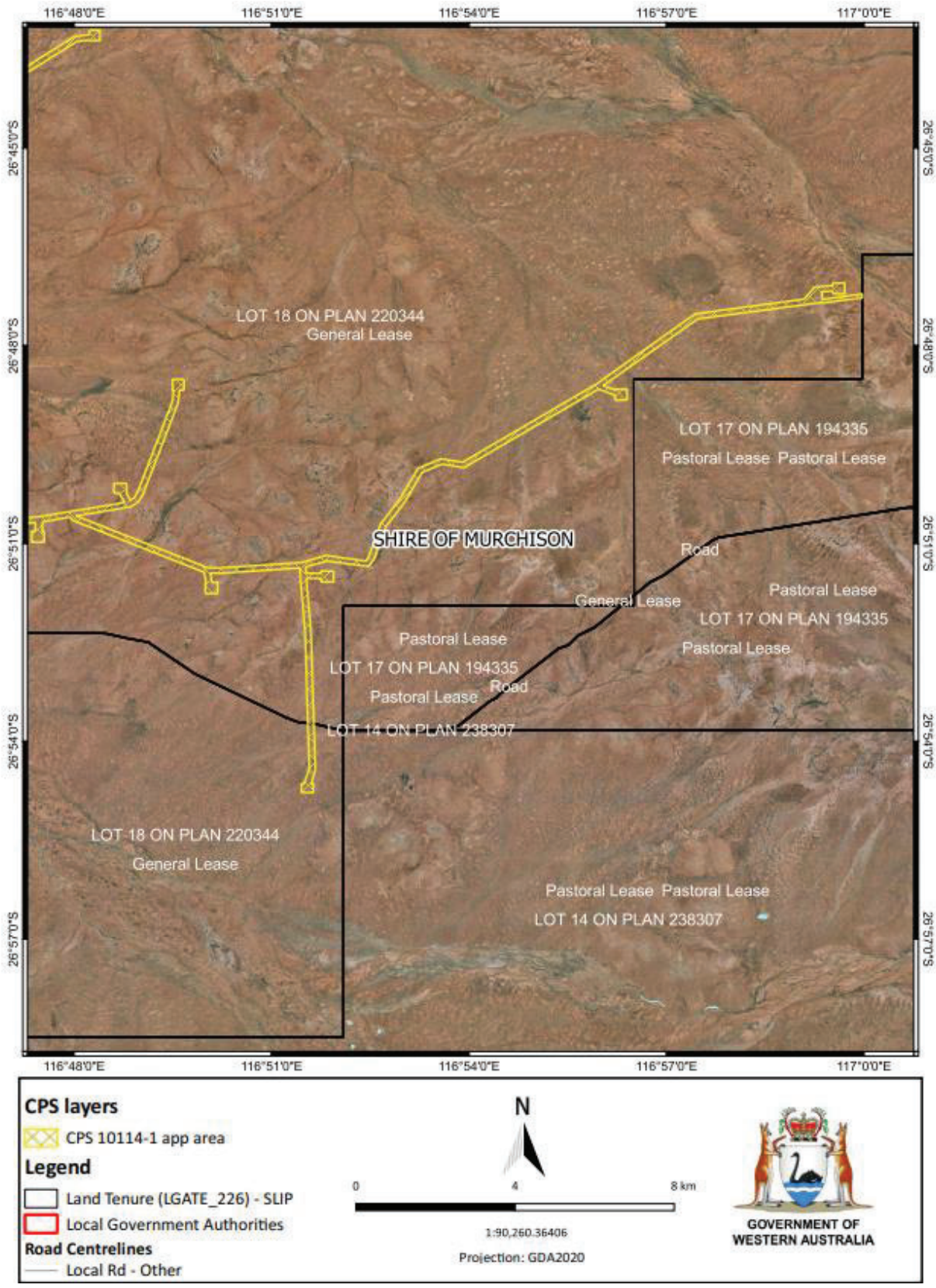


Figure 1d: Map of the boundary of the area within which clearing may occur

Government of Western Australia
Department of Water and Environmental Regulation

Clearing Permit Decision Report

1 Application details and outcome

1.1. Permit application details

Permit number:	CPS 10114/1
Permit type:	Purpose permit
Applicant name:	Commonwealth Scientific, Industry and Research Organisation's (CSIRO)
Application received:	13 March 2023
Application area:	578.6 hectares of native vegetation within a 3,132.9 hectare clearing footprint
Purpose of clearing:	Construction of the SKA Low project, including SKA low core, central processing facility, track and trench, cluster areas and AARNET fibre link.
Method of clearing:	Mechanical
Property:	Lot 18 on Deposited Plan 220344, Lot 502 on Deposited Plan 55945, Beringarra-Pindar Road reserve (PINs 11665424, 11665425, 11708250 and 11708252), Boolardy-Kalli Road Reserve (PIN 11708251), Unnamed Road Reserve (PIN 11668859)
Location (LGA area/s):	Shire of Murchison
Localities (suburb/s):	South Murchison

1.2. Description of clearing activities

The proposed clearing area of 578.6 hectares is proposed for the Commonwealth Scientific, Industry and Research Organisation's (CSIRO) Square Kilometre Array (SKA) project. This project is a large international radio telescope project which aims to answer key cosmological questions using radio waves from across the universe to look back into the cosmic dark ages. The majority of array stations will be in a densely populated core and the remainder located in groups of six stations at multiple locations along three spiral arms (see Figure 1, Section 1.5).

The proposed clearing area includes:

- SKA Low core (280 hectare clearing area)
- Central Processing Facility (9 hectare clearing area)
- Track and Trench: Core to station clusters (209.1 hectare clearing area)
- Cluster areas (74 hectare clearing area); and
- AARNET Fibre Link (6.5 hectare clearing area).

1.3. Decision on application

Decision:	Granted
Decision date:	30 June 2023
Decision area:	578.6 hectares of native vegetation within a 3,132.9 hectare clearing footprint, as depicted in Section 1.5, below.

1.4. Reasons for decision

This clearing permit application was submitted, accepted, assessed and determined in accordance with sections 51E and 51O of the *Environmental Protection Act 1986* (EP Act). The Department of Water and Environmental Regulation (the department) advertised the application for 21 days and no submissions were received.

In making this decision, the Delegated Officer had regard for the site characteristics (see Appendix A), relevant datasets (see Appendix E.1), the findings of a flora and fauna assessment (AECOM, 2022; see Appendix D), the clearing principles set out in Schedule 5 of the EP Act (see Appendix B), relevant planning instruments and any other matters considered relevant to the assessment (see Section 3).

The Delegated Officer has also acknowledged that the applicant:

- revised the project design and array configuration to avoid impacts to culturally important sites and environmental values, including Priority flora, western spiny-tailed skink and northern shield-back trapdoor spider, identified during Aboriginal heritage and biodiversity surveys, respectively
- has committed to conducting the project activities in accordance with an environmental management plan (EMP) developed by an external party which includes, but is not limited to, protocols related to:
    - environmentally sensitive areas – flora
    - vegetation – clearing and revegetation; and
    - weed control – earthmoving vehicle inspections; and
- has commissioned ecologists and environmental scientists to develop an EMP for the western spiny-tailed skink (*Egernia stokesii subsp. badia*) to maximise the ongoing protection and long-term conservation of this species. The plan aims to avoid project activities having direct impacts on the species and mitigate indirect impacts on it in, and adjacent to, the clearing footprint during construction and operation of the SKA project.

The Delegated Officer has further considered the following:

- approximately 0.11 percent of the clearing footprint contains native vegetation that provides suitable habitat for the western spiny-tailed skink (VU)
- the proposed clearing may introduce and spread weeds into adjacent vegetation, impacting on the quality of the adjacent vegetation and its habitat values, and
- the soils in the application area are prone to wind erosion and the proposed clearing may increase this risk.

After consideration of the available information, as well as the applicant's minimisation and mitigation measures (see Section 3.1), the Delegated Officer determined that the following requirements will be conditioned on the clearing permit to manage and address the impacts of clearing:

- avoid and minimise measures to reduce the impacts and extent of clearing
- take hygiene steps to reduce the risk of introducing and spreading weeds into adjacent areas of native vegetation
- undertake construction activities within three months of clearing activities to reduce the exposure time of bare sandy soils and minimise the risk of wind erosion
- undertake slow, progressive one directional clearing to allow terrestrial fauna to move into adjacent habitat ahead of the clearing activity
- conduct pre-clearance surveys for western spiny-tailed skink
- demarcate, temporarily fence and establish a 50-metre buffer for western spiny-tailed skink habitat identified within the clearing permit area; and
- provide ramps at the ends of trenches open for more than 24 hours to enable fauna to escape before the heat of the day.

The Delegated Officer determined that the proposed clearing is unlikely to lead to an unacceptable risk to the environment, noting that the above conditions will manage and address the environmental impacts of clearing.

1.5. Site map

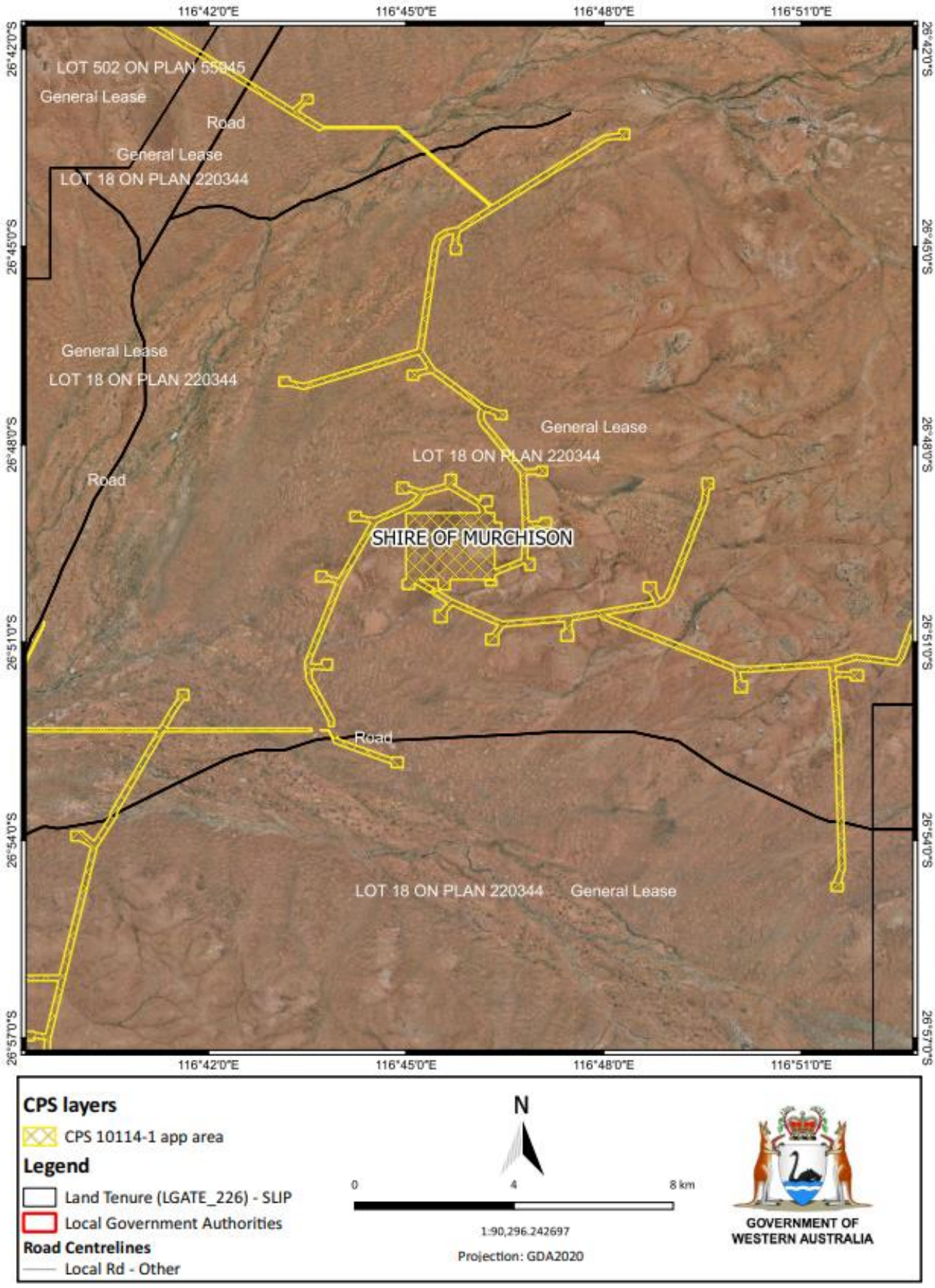


Figure 1a Map of the application area

The area crosshatched yellow indicates the area authorised to be cleared under the granted clearing permit.

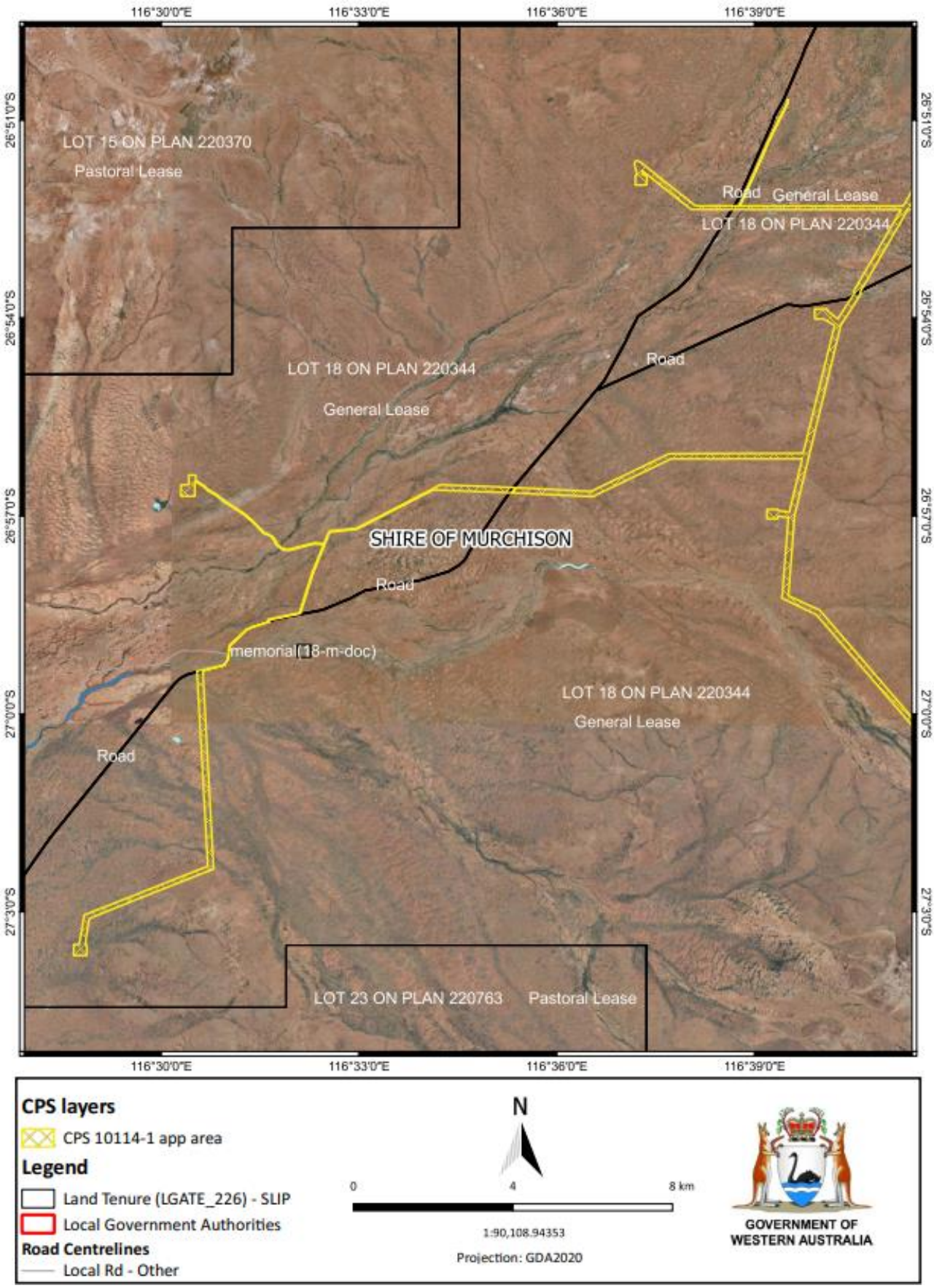


Figure 1b Map of the application area

The area crosshatched yellow indicates the area authorised to be cleared under the granted clearing permit.

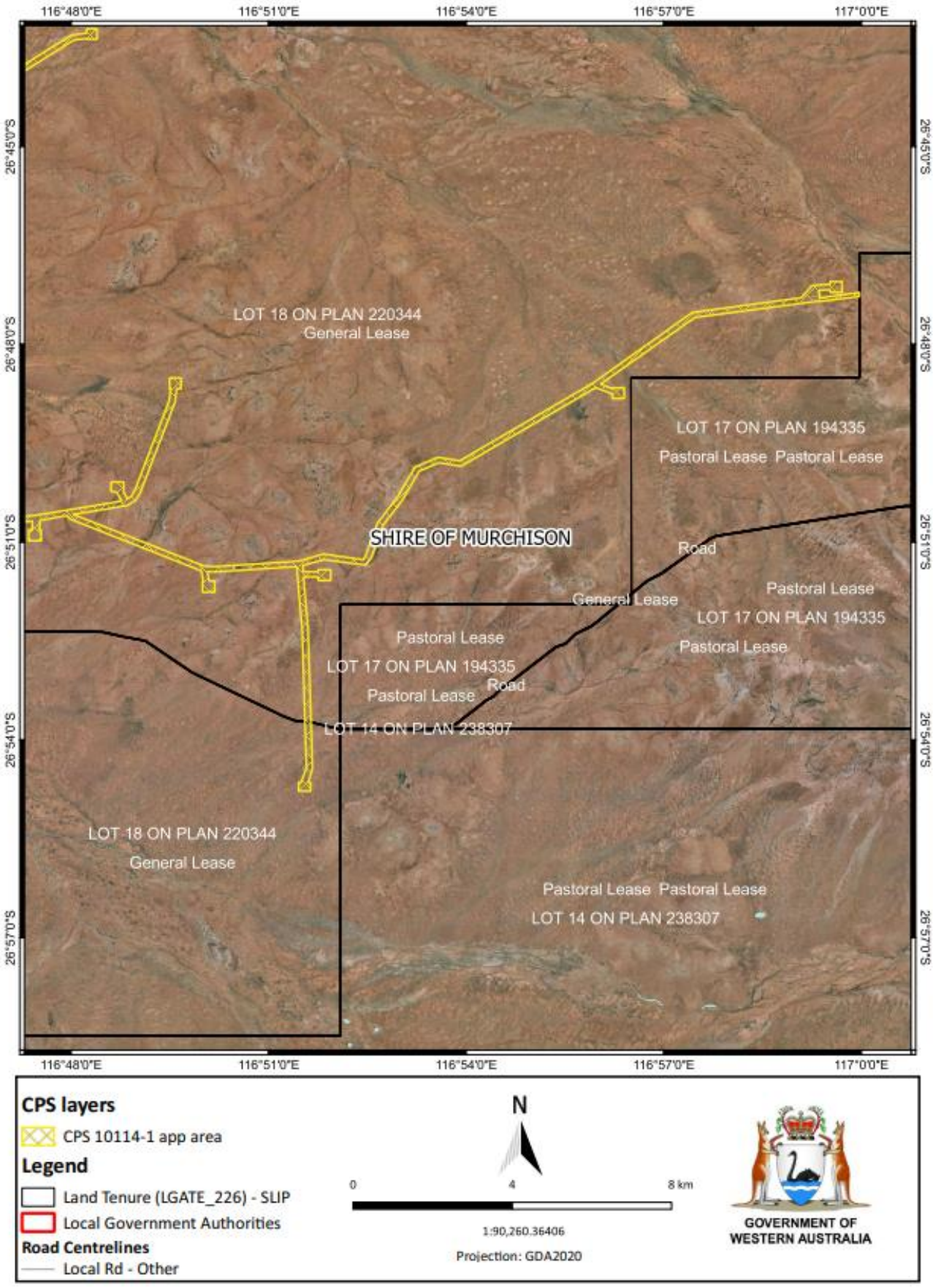


Figure 1c Map of the application area

The area crosshatched yellow indicates the area authorised to be cleared under the granted clearing permit.

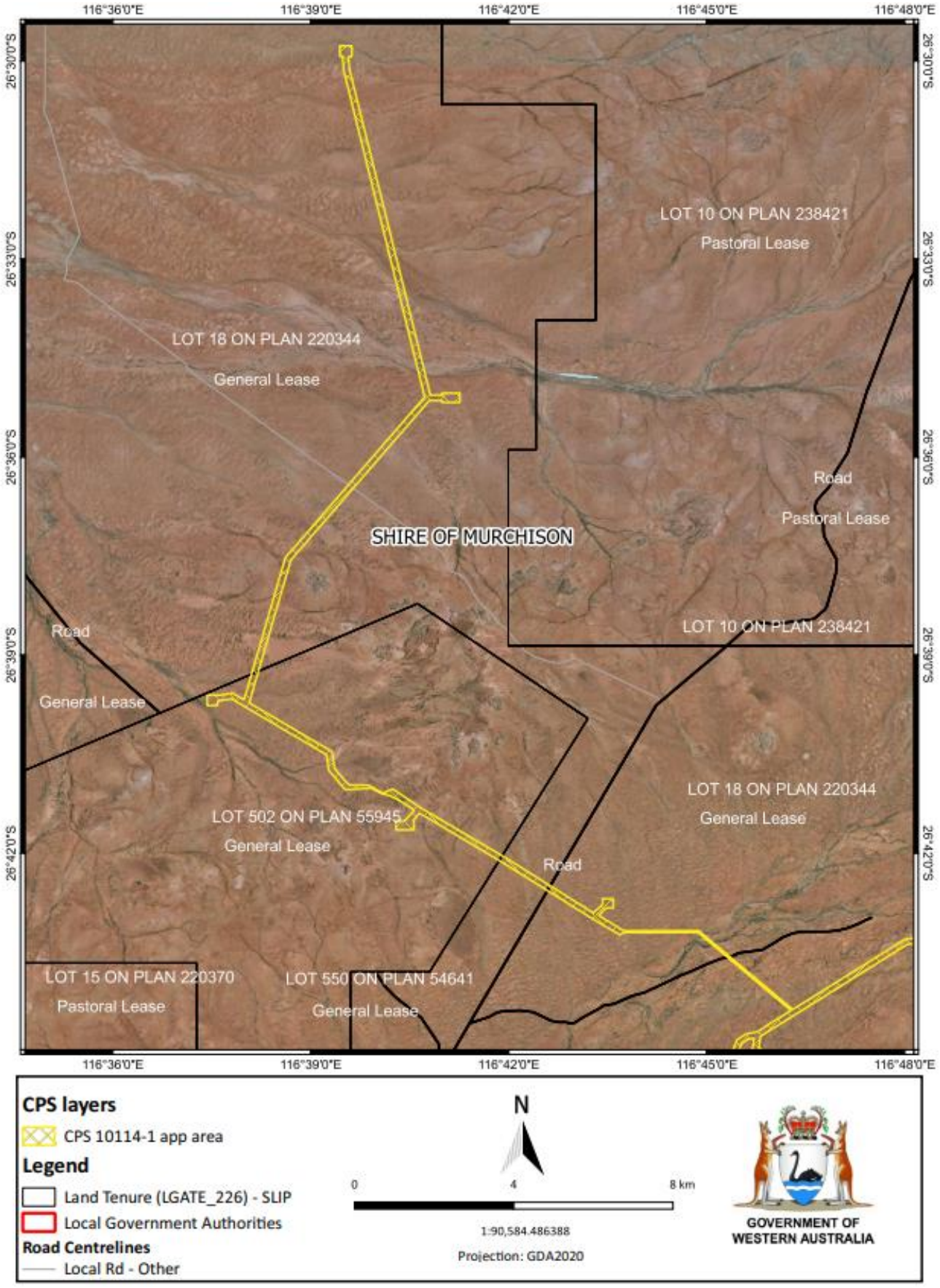


Figure 1d Map of the application area

The area crosshatched yellow indicates the area authorised to be cleared under the granted clearing permit.

2 Legislative context

The clearing of native vegetation in Western Australia is regulated under the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.

In addition to the matters considered in accordance with section 51O of the EP Act (see Section 1.4), the Delegated Officer has also had regard to the objects and principles under section 4A of the EP Act, particularly:

- the precautionary principle
- the principle of intergenerational equity; and
- the principle of the conservation of biological diversity and ecological integrity.

Other legislation of relevance for this assessment include:

- *Biodiversity Conservation Act 2016* (WA) (BC Act)
- *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act)
- *Soil and Land Conservation Act 1945* (WA)
- *Rights in Water and Irrigation Act 1914* (RIWI Act); and
- *Aboriginal Heritage Act 1972*.

The key guidance documents which inform this assessment are:

- *A guide to the assessment of applications to clear native vegetation* (DER, December 2013)
- *Procedure: Native vegetation clearing permits* (Department, 2019a)
- Technical guidance – *Flora and Vegetation Surveys for Environmental Impact Assessment* (Environmental Protection Authority (EPA), 2016); and
- Technical guidance – *Terrestrial Fauna Surveys for Environmental Impact Assessment* (EPA, 2016).

3 Detailed assessment of application

3.1. Avoidance and mitigation measures

The proposed clearing is required for the development of the Square Kilometre Array (SKA) on the Murchison Radio-astronomy observatory (MRO) site that is expanding beyond its current footprint to cover all of Boolardy Station, a 346,748 ha pastoral property. Boolardy Station was selected due to its excellent radio-quiet environment and proximity to services and infrastructure (AECOM, 2023).

CSIRO have advised the department that pre-construction design for SKA considered various factors, including avoiding geophysical, environmental and cultural constraints based on desktop analysis and consideration of the information available from heritage mapping survey and environmental survey conducted by AECOM Australia Pty Ltd (AECOM, 2023).

CSIRO has supplied an Environmental Management Plan (EMP) detailing the mitigation and management measures for fauna and vegetation across the project area (AECOM, 2023). Through this EMP CSIRO has committed to undertaking the following management measures for the proposed development (AECOM, 2023):

- Vegetation clearing management:
    - demarcate approved clearing area using GPS coordinates and flagged star pickets
    - demarcate any native vegetation within the site boundary that will be retained
    - demarcate topsoil, weed and dieback management boundaries. Approved site boundary with flagging and temporary fencing during construction
    - demarcate a 50-meter buffer around the location of any confirmed western spiny-tailed skink populations
    - restrict access by personnel, vehicles and plant into vegetated areas adjacent to project boundary
    - stockpile all cleared vegetation separately and mulch for use either on-site (for stabilisation) or for other rehabilitation projects
    - ensure no new informal tracks arise and all vehicle and personnel movements are limited to the approved project boundary; and
    - report all incidents relating to these Vegetation Clearing Management actions to CSIRO within 24 hours of incident.
- Vegetation monitoring
    - inspect clearing area to ensure flagging is intact and no boundary breach has occurred; and
    - inspect felled and cleared vegetation and identify those suitable for use in rehabilitation and revegetation works.

- Weed management:
    - conduct weed control if weeds are noted
    - ensure all vehicles, equipment and plant undergo a complete quarantine inspection prior to access to site
    - ensure fill, if used is uncontaminated, and free of weeds and disease as specified in the Landfill Waste Classification and Waste Definitions (Department, 2019)
    - control, with the aim to eradicate, any infestation of high to very high priority weeds; and
    - locate topsoil and cleared vegetation stockpiles away from areas where runoff from rainfall may occur.
- Fauna mitigation for the western spiny-tailed skink:
    - demarcating and temporarily fencing of skink population locations and their known rocky habitat during construction and whenever possible apply a 50 meter or greater buffer zone
    - providing ramps at the ends of trenches open for more than 24 hours to enable fauna, particularly lizards, to escape before the heat of the day
    - staff members and contractors working on the project participate in environmental management awareness and compliance sessions and are trained to identify the skink and their preferred habitat
    - all sightings of the skink are to be reported by staff and contractors to the organisation they report to and then reported by that organisation to the MRO Site Entity
    - any injuries/deaths/disturbance to the skink will be reported including a detailed description of circumstances
    - potential new sightings of the skink in previously unmarked locations in areas where construction or operational activities may disturb and displace the fauna will be inspected by a qualified zoologist with experience in identifying the skink. This will confirm whether realignment of the track is required
    - access to areas demarcated and being managed as skink habitat will require staff and contractors to obtain permission to access the areas prior to entry from the organisation they report to; and
    - an annual internal report will summarise all incidents relating to the skink.
- Fauna monitoring for the western spiny-tailed skink*:*
    - pre-clearance surveys will be conducted prior to clearing or disturbing potential habitat for access tracks and antenna locations. The survey objective is to confirm the absence (or presence) of the skink within demarcated cleared areas; and
    - post-development monitoring to determine whether the skink are still present at known locations.

The Delegated Officer was satisfied that the applicant has made a reasonable effort to avoid and minimise potential impacts of the proposed clearing on environmental values.

3.2. Assessment of impacts on environmental values

In assessing the application, the Delegated Officer has had regard for the site characteristics (see Appendix A) and the extent to which the impacts of the proposed clearing present a risk to biological, conservation, or land and water resource values.

The assessment against the clearing principles (see Appendix B) identified that the impacts of the proposed clearing present a risk to biological values (flora and fauna), and land and water resources. The consideration of these impacts, and the extent to which they can be managed through conditions applied in line with sections 51H and 51I of the EP Act, is set out below.

3.2.1. Biological values (flora and fauna) – Clearing Principles (a) and (b)

Assessment

The application area is located within the Murchison IBRA region. The proposed clearing area intersects six pre-European vegetation associations (Beard *et al*, 1976) broadly described as:

- Mulga (*Acacia aneura*) and associated species*,* and
- Wattle, teatree & other species *Acacia* spp. *Melaleuca* spp*.*

The proposed clearing area occurs within Boolardy Station, located in the arid rangeland region of mid-Western Australia which has been historically used for sheep and cattle grazing. This historical use combined with a drying climate has resulted in a loss of total biomass, erosion of the surface, soil compaction, as well as the introduction of non-native weed species. In spite of this, the vegetation across the application area was described by AECOM as relatively intact and considered to be in ‘very good’ condition (AECOM, 2022). Ten native vegetation communities were defined and mapped in the application area. The vegetation was described as largely homogenous,

characterised by mulga open woodlands on hard clay on flat terrain, sometimes with quartz on the surface (AECOM, 2022).

Conservation significant flora

A desktop assessment identified a total of 39 records of conservation significant flora within the local area (50-kilometre radius measured from the application area), none of which occur within the application area. A likelihood of occurrence assessment for threatened and priority flora within the local area was undertaken for the proposed clearing area. Noting the distribution and preferred habitat types, including soil and vegetation types mapped over the application area, the likelihood analysis concluded that eight conservation significant flora species were likely to occur within the proposed clearing area.

A detailed flora and vegetation assessment was undertaken in September 2014 for the project, however this survey only covered a portion of the application area (AECOM, 2014). Additional flora and vegetation surveys were undertaken in November 2020 and September 2022 utilising methods outlined in the EPA (2016) *Flora Survey Technical Guide,* and covering areas not surveyed in 2014 (AECOM, 2021; AECOM, 2022) (Appendix D).

During the 2020 survey, targeted searches were conducted for conservation significant flora identified by AECOM as possible or likely to occur. These searches focused on habitats such as granite outcrops, breakaways, and saline riverine areas, identified during the desktop assessment and previous surveys as providing key habitat for conservation significant flora. A total of eight priority flora species were recorded during the flora and vegetation surveys. No records of priority flora were identified within the application area, however six were recorded within 10 kilometres of the application area (Table 1). To avoid impacts to priority flora, CSIRO revised the boundaries of the clearing area post survey findings. Given the current alignment of the application area and the separation distance to the closest records of priority flora, no priority flora are expected to be directly or indirectly impacted by the proposed clearing (AECOM, 2022b).

Table 1. Conservation significant flora recorded during the flora and vegetation surveys (AECOM, 2014; 2021; 2022a).

Species	Status	Number of individuals recorded	Distance to application area (km)
Ptilotus beardii	P3	1,525	1.15
Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	210	1.43
Verticordia jamiesonii	P3	275	1.68
Eremophila simulans subsp*. megacalyx*	P3	8	7.12
Petrophile pauciflora	P3	163	7.76
Gunniopsis divisa	P3	149	8.48

***Ptilotus beardii* (P3)**

Ptilotus beardii is a compact perennial rigid shrub that grows on clayey soils, saline flats, granite outcrops and plains adjacent to granite domes and boulders (AECOM 2022). Database records indicate this species is known from 38 records across the Murchison and Yalgoo IBRA regions.

AECOM recorded six populations of *Ptilotus beardii* in 2014 comprising over 1,300 individuals. No further individuals were recorded during the following surveys. AECOM noted that while targeted searches were undertaken during the 2021 survey, the species may have finished flowering by late November and therefore could have been overlooked. During the 2022 survey no species were recorded given the lack of suitable habitat within the survey area. The closest recorded individual is located approximately 1.15 kilometres southeast of the proposed clearing area. While no individuals were recorded within the application area its occurrence cannot be ruled out (AECOM 2022). However, given the current spatial distribution of *P. beardii,* including the number of individuals recorded by AECOM outside of the application area, the proposed clearing is unlikely to impact the conservation status of this species.

***Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (P3)**

Sauropus. sp. Woolgorong is a shrub known from 35 records across the Gascoyne, Gibson Desert, Great Victoria Desert, Murchison and Yalgoo IBRA regions (Western Australian Herbarium, 1998-). In 2014, AECOM recorded 201 individuals at two locations within the survey area. Follow up surveys in 2020 recorded the species at an additional location. No individuals or populations were recorded within the application area, with the closest record located 1.43 kilometres southeast of the proposed clearing area (AECOM 2022). Given the separation distance between the

application area and the closest recorded individual of *S.* sp. Woolgorong, the proposed clearing is unlikely to have a significant impact on this species.

Verticordia jamiesonii (P3)

Verticordia jamiesonii is a short shrub that grows on sand and clay, sometimes with lateritic gravel in pockets of soil and crevices on weathered, heavy laterite on low breakaways and on rocky hills in open shrublands. Database records indicate this species is known from 34 records across the Gascoyne, Gibson Desert, Great Victoria Desert, Murchison and Yalgoo IBRA regions.

One population of 275 individuals of *Verticordia jamiesonii* was recorded during the 2014 survey within the vegetation community AiTdPd. Targeted searches in 2020 did not record this species, however AECOM noted the species may occur in areas identified as potential granite outcrops that were not accessed. No individuals or populations were recorded within the application area. The closest record occurs approximately 1.68 kilometres southeast of the proposed clearing area (AECOM 2022). Given the presumably small area of unsurveyed habitat within the application area, the wide distribution of *Verticordia jamiesonii* across Western Australia and the number of individuals recorded outside of the application area, the proposed clearing is unlikely to impact the conservation status of this species.

Eremophila simulans (potential P3)

Eremophila simulans was collected during the 2014 and 2020 surveys (AECOM, 2014; AECOM, 2021). The specimen was submitted to the WA Herbarium for format identification. However due to the lack of suitable identification material, an identification to subspecies was not determined. *E. simulans* has been assumed by AECOM to represent the priority species *E. simulans* subsp. *megacalyx* as a precaution and given it is known to occur in the local area. Database records indicate this species is known from 11 records across the Murchison IBRA region with the closest record approximately 0.6 kilometres from the application area.

Eremophila. simulans was recorded mostly within community AaEcPo, a mixed shrubland on plains with sandy surface. Two populations were recorded, comprising more than 1,0000 individuals. No individuals or populations were recorded within the application area, the closest record located approximately 1.20 kilometres east of the proposed clearing area. Given this, the proposed clearing is not considered likely to have a significant impact on this species.

Petrophile pauciflora (P3)

Petrophile pauciflora is a short robust shrub. Database records indicate this species is known from 23 records across the Avon Wheatbelt, Murchison and Yalgoo IBRA regions (WA Herbarium, 1998-). This species was recorded during the 2020 survey on and near granite outcrops. This species was considered locally common across the multiple locations, with 163 individuals recorded and where the granite outcrops extended beyond the survey area, so did the *P. pauciflora* populations (AECOM, 2021). No individuals or populations were recorded within the application area, with the closest record located approximately 7.76 kilometres east of the proposed clearing area. Given this, the proposed clearing is unlikely to have a significant impact onthis species.

Gunniopsis divisa (P3)

Gunniopsis divisa is a prostrate annual succulent herb commonly found on colluvial outwash associated with banded ironstone formations. Database records indicate this species is known from 25 records across the Murchison and Yalgoo IBRA regions. A total of nine populations of 149 individuals, of *Gunniopsis divisa* were recorded during the 2014 survey within vegetation type AvEp, along the wide ephemeral drainage line. The species was not recorded during the 2020 survey. AECOM attributed the absence of the species during the 2020 survey to survey timing, as no annuals were present at the time of the 2020 field survey. Given this and that the vegetation type AvEp occurs within the application area, it is considered that the application area may provide suitable habitat for *Gunniopsis divisa*. The closest record is located 8.48 kilometres west of the proposed clearing area (AECOM, 2021). Given the relatively small area of suitable habitat within the application area, the current distribution of *Gunniopsis divisa* and the number of individuals recorded by AECOM outside of the application area, the proposed clearing is not considered likely to impact the conservation status of this species.

Conservation significant fauna

A desktop assessment identified 18 conservation significant fauna within the local area, including 14 bird, two mammal, one invertebrate and one reptile species. In determining the likelihood of conservation significant fauna

occurring within the proposed clearing area, the department considered the results of the preferred habitat types, frequency and proximity of records to the application area (Appendix C.A.3).

A Level 1 fauna assessment was completed by AECOM in 2014 followed by targeted surveys for the Shield-backed Trapdoor Spider (*Idiosoma nigrum,* P3), undertaken by Phoenix in 2015. Additional basic fauna assessments were completed by AECOM in 2020 and 2022. Taking into account the findings of these surveys and the likelihood assessment, the application area is considered to comprises suitable habitat for three conservation significant fauna species:

- western spiny-tailed skink (*Egernia stokesii*, EN)
- northern shield-backed trapdoor spider *(Idiosoma clypeatum*, P3); and
- peregrine falcon (*Falco peregrinus*, OS).

A total of eight fauna habitats were mapped across the application area (AECOM, 2022). Over 90 per cent of the application area was mapped as 'hardpan plain with intermittent sandplain' (72.36 per cent) and 'non saline stony or gritty surfaced plains' (22.61 per cent). The remaining areas were mapped as 'channels and creek line' (3.71 per cent), 'sandplains' (1.21 per cent), 'granite boulders and heaps' (0.1 per cent), and 'granite domes' (0.02 per cent).

Western spiny-tailed skink (EN)

The western spiny-tailed skink (*Egernia stokesii badia*, VU) is a moderately large, rock dwelling reptile. Two colour forms exist; the brown form and black form, the latter is delineated from the former by its black colouration, lack of patterning in adults and differing head and scale morphology. The black form occupies rock crevices in large, isolated rocky outcrops, typically granite (Department of Environment and Conservation (DEC), 2012).

Presence of the skink is determined by direct sightings or suitable habitat (i.e. rocky crevices). Crevices occupied by the black form of western spiny-tailed skink are usually identifiable by a "latrine" or scat pile, resulting from regular defecation of all family members, in close proximity to the entrance (DEC, 2012). Direct and indirect evidence of the skink were recorded on granite outcrops during the 2014 and 2020 fauna surveys. However, due to a refinement of the clearing area after the 2014 survey, none of these records are within the proposed clearing area (AECOM, 2022).

Across the application area, rocky breakaways and granite outcrops are considered to provide suitable habitat for the western spiny-tailed skink. These areas represent 3.57 hectares, 0.12 per cent of the total clearing area. CSIRO has revised the application area after the initial 2014 surveys to avoid high quality granite habitat (AECOM, 2022). The surrounding landscape is characterised by outcropping granite, breakaways, and occasional granite hills (Appendix B). Given this, and the lack of recordings within the application area, the proposed clearing is not considered to contain significant habitat for the western spiny-tailed skink.

To ensure the ongoing protection and long-term conservation of the western spiny-tailed skink population located on Boolardy Station, CSIRO has supplied an EMP outlining various management and mitigation measures (AECOM, 2022). The main purpose of the management plan is to avoid project activities having direct impacts to western spiny-tailed skink habitat and mitigate indirect impacts during construction and operation, by demarcating and temporarily fencing western spiny-tailed skink population locations and their known rocky habitat during construction and whenever possible applying a 50 m or greater buffer zone. Further vegetation and fauna mitigation and management measures are outlined in section 3.1. These measures have been converted to a management condition imposed on the CSIRO's clearing permit.

Northern shield-backed trapdoor spider (P3)

The northern shield-backed trapdoor spider (*Idiosoma clypeatum*) was recorded during the 2014 fauna surveys and again during a targeted survey conducted in 2015. The species was recorded in rocky areas with scattered *Acacia* spp. and *Eremophila* spp. five kilometres south of the application area (AECOM, 2014; AECOM 2020). The northern shield-backed trapdoor spider was listed as Threatened at the time of the surveys but has been since delisted to a Priority 3. Exact habitat requirements for the northern shield-back trapdoor spider are unknown, and therefore a majority of the fauna habitats identified within the application area are considered potential suitable habitat (AECOM, 2022). Database records show a total of 847 records across a widespread distribution in Western Australia's inland arid zone, principally throughout the Yalgoo and Murchison bioregions. Given this, the lack of records within the application area and the availability of similar habitats within the local area, the proposed clearing is not likely to impact on significant habitat for this species.

Peregrine falcon (OS)
The peregrine falcon is a highly mobile avian species with a large home range. The channels and creek lines within the application area are considered to provide suitable habitat for this species. Noting that there are extensive areas of native vegetation within the local area (which retains 99 per cent native vegetation cover), including numerous watercourses which are likely to contain suitable habitat, the proposed clearing is not likely to impact on significant habitat for this species.

Grey falcon (VU)
AECOM recorded one individual grey falcon (*Falco hypoleucos*) during the field surveys gliding over low, open acacia shrublands (AECOM, 2022). AECOM considered the grey falcon as an uncommon visitor, likely present given the increase in prey as a result of the recent rains. Noting that there are extensive areas of native vegetation within the local area (which retains 99 per cent native vegetation cover), the proposed clearing is not likely to impact on significant habitat for this species.

Migratory birds
A number of records are associated with migratory bird species that may be transient visitors of the application area after rains. Habitat requirements for these species primarily consist of coastal wetland habitats. The relatively small areas of creekline habitat within the application area present only marginal habitat for these species. Given the availability of surrounding vegetation and suitable habitat, the proposed clearing area is not considered to contain significant habitat for these species.

Ecological linkage

The area comprises largely of Acacia open woodland with pockets of granite outcrops and ephemeral drainage lines. The most valuable linkages occur within the drainage channels and creeks that intersect the application area. Noting that there are extensive areas of native vegetation within the local area (which retains 99 per cent native vegetation cover), the proposed clearing is unlikely to have a significant impact to ecological linkage and dispersal values of the local area.

Conclusion

There are no records of conservation significant flora or vegetation within the application area. Based on the above assessment, the proposed clearing is not likely to impact on conservation significant habitat for conservation significant flora. The proposed clearing has the potential to facilitate the spread of weeds into the surrounding adjacent vegetation. It is considered that the impact of clearing can be mitigated through the implementation of the abovementioned EMP and weed management condition imposed on the clearing permit.

While no conservation significant fauna species were recorded in the application area, suitable habitat for the western spiny-tailed skink was identified within the application area. Given this, fauna management conditions, including pre-clearance surveys and demarcation of populations and habitat will be conditioned on the permit.

In addition, the proposed clearing may impact on any fauna species utilising the application area at the time of clearing. Slow, directional clearing to allow for dispersal of species into other areas of remnant vegetation will mitigate this risk.

Conditions
To address the above impacts, the following management measures will be required as conditions on the clearing permit:

- avoid and minimise measures to reduce the impacts and extent of clearing
- slow directional clearing to allow fauna to move into adjacent vegetation ahead of the clearing activity
- weed control and vegetation management as outlined in the EMP (see section 3.1); and
- fauna management as outlined in the EMP (see section 3.1).

3.2.2. Land and water resources - Clearing Principles (f) and (g)

Assessment

Water courses and wetlands

The application area intersects several ephemeral drainage lines which are largely reliant on weather patterns (AECOM, 2022). No perennial watercourses and wetlands occur within the proposed clearing area. Two vegetation communities were commonly mapped across these ephemeral drainage lines (AECOM, 2023):

- AiAbSa - Acacia Woodland associated with undefined broad drainage and flat terrain, described as *Acacia incurvaneura*, *Hakea lorea* subsp. *lorea* and *Acacia aneura* low open woodland over *Acacia burkittii*, *Acacia tetragonophylla* and *Acacia victoriae* subsp. *victoriae* tall shrubland over *Senna artemisioides* subsp. *helmsii*, *Ptilotus obovatus* and *Senna artemisioides* subsp. x *sturtii* low to mid sparse shrubland. Approximately 82.58 hectares of this vegetation community is mapped across the application area.
- AcAsTd - Casuarina Woodland associated with major drainage channels, described as *Allocasuarina campestris* low to mid woodland over *Acacia sclerosperma* subsp. *sclerosperma*, *Exocarpos aphyllus* and *Scaevola spinescens* mid to tall open shrubland over *Tecticornia doliiformis*, *Atriplex amnicola* and *Tecticornia* ?*indica* mid chenopod shrubland. Approximately 2.4 hectares of this vegetation community is mapped across the application area.

The proposed clearing within these vegetation types is required for tracks and cable trench (buried high density cable management structure), approximately 8-10 metres wide (AECOM, 2023) (see Appendix D). Given the linear shape, the purpose and the relatively small extent of the proposed clearing across these vegetation types within these drainage lines, the proposed clearing is not expected to impact the function or alter hydrological flows of intersecting drainage lines.

Land degradation

The varying conditions across the across the Murchison region are largely accredited to the cumulative impacts by grazing animals and pastoral management, in particular, the loss of perennial vegetation has led to accelerated soil erosion (Curry *et al*. 1994). AECOM noted the presence of cattle (and feral goats) was prevalent across the application area. This combined with a reduction in average rainfall has resulted in a decline in perennial vegetation, large areas of exposed bare ground and accelerated soil erosion (AECOM, 2014).

The mapped soils across the application area indicate a high risk of susceptibility to wind and water erosion. Given rainfall is limited and evaporation is high, the risk from water erosion is considered to be restricted to high rainfall events. Due to the lack of ground cover, the loose soils are prone to wind erosion. Increased wind erosion can lead to dust build up on plants, which may affect the plant health and subsequent quality of adjacent vegetation (Matsuki *et al*. 2016).

To mitigate this, the applicant proposes to use extracted ground water for dust suppression (Department, 2023). Noting this and the linear and narrow shape of the clearing area, and the current condition of soils across the region, it is considered that although clearing may lead to some land degradation in the form of soil erosion and dust deposition, these impacts are likely to be minor, localised and temporary. Limiting the exposure time of cleared areas to wind can mitigate these potential impacts.

Conclusion

Based on the above assessment, the proposed clearing is considered unlikely to impact the function or alter hydrological flows of intersecting drainage lines. In addition, the proposed clearing is unlikely to lead to appreciable or long-term land degradation.

Conditions

To address the above impacts, the following management measure will be required as a condition on the clearing permit:

- commencement of construction works no later than three months after authorised clearing.

3.3. Relevant planning instruments and other matters

The proposed clearing area is located in the Boolardy Station, a 346,748-hectare pastoral property. A lease was granted by the Minister for Lands under the *Land Acquisition Act 1969* to CSIRO, with permitted uses that includes developing, operating, undertaking and decommissioning the SKA-1 Low project (AECOM, 2023).

The SKA project was referred to the EPA under Part IV of the EP Act, and the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW) under the EPBC Act in 2017. The EPA determined not to assess the project and DCCEEW determined that it was 'Not a Controlled Action' (CSIRO, 2023).

The proposed clearing area is located within the Pilbara Groundwater Area proclaimed under the RIWI Act. There are no Public Drinking Water Source Areas, rivers or waterways within the application area.

Four production bores will be constructed to abstract water for construction use, dust suppression and camp water supply. Under the RIWI Act, a licence to construct or alter a well and to take ground water is required. On 17 May 2023 a licence to construct a bore/s was issued. A licence to take groundwater is still progressing and no issues preventing the issuing of a permit have been identified (Department, 2023).

Several Aboriginal sites of significance have been mapped within the local area and the clearing footprint. It is the permit holder's responsibility to comply with the *Aboriginal Heritage Act 1972* (WA) and ensure that no Aboriginal Sites of Significance are damaged through the clearing process.

End

Appendix A. Site characteristics

A.1. Site characteristics

The information provided below describes the key characteristics of the area proposed to be cleared and is based on the best information available to the department at the time of this assessment. This information was used to inform the assessment of the clearing against the Clearing Principles, contained in Appendix B.

<table>
<tr><th>Characteristic</th><th>Details</th></tr>
<tr><td>Local context</td><td>The application area is part of an expansive tract of native vegetation in the Murchison Bioregion, in the locality of South Murchison.
Spatial data indicates the local area (50km radius from the centre of the application area) retains approximately 99.99 per cent of its original native vegetation cover.</td></tr>
<tr><td>Ecological linkage</td><td>According to available datasets, the application area is not within any formal ecological linkages and is unlikely to provide any specific linkage values, noting the extent of surrounding native vegetation.</td></tr>
<tr><td>Conservation areas</td><td>The nearest Nature Reserve is 17.4 kilometres west of the application area.</td></tr>
<tr><td>Vegetation description</td><td>Flora and vegetation surveys (AECOM, 2022) recorded ten vegetation units across the application area. Survey descriptions and maps are available in Appendix D. These vegetation types were mostly consistent with the mapped pre-European vegetation associations.
<table>
<tr><th>Vegetation association</th><th>Description</th></tr>
<tr><td>18</td><td>Mulga Acacia aneura and associated species.</td></tr>
<tr><td>29</td><td>Mulga Acacia aneura and associated species.</td></tr>
<tr><td>39</td><td>Wattle, teatree & other species Acacia spp. Melaleuca spp.</td></tr>
<tr><td>204</td><td>Mulga, other wattle Atriplex spp, Maireana spp. with Acacia aneura & other Acacia spp.</td></tr>
<tr><td>341</td><td>Mulga (Acacia aneura) and associated species.</td></tr>
<tr><td>2081</td><td>Wattle, teatree & other species Acacia spp. Melaleuca spp.</td></tr>
</table>
The mapped vegetation associations retain over 99 per cent of their original extent (Government of Western Australia, 2019).</td></tr>
<tr><td>Vegetation condition</td><td>Flora and vegetation survey (AECOM, 2022) indicate the vegetation within the proposed clearing area is in very good (99.9%) to completely degraded (0.01%) condition (Trudgen, 1991) condition.
The full Trudgen (1991) condition rating scale is provided in Appendix C. Survey descriptions and mapping are available in Appendix D.</td></tr>
<tr><td>Climate and landform</td><td>The Shire of Murchison has an arid climate with a mean annual rainfall of 190-240 millimeters. Rainfall varies significantly depending on the occurrence of sporadic significant rainfall events that are driven by cyclonic weather from the north and cold fronts from the southwest (AECOM, 2021).</td></tr>
<tr><td>Soil description</td><td>Nine soil systems are mapped across the application area.
<table>
<tr><th>Soil system</th><th>Description</th></tr>
<tr><td>272Bg - Beringarra System</td><td>Riverine plains with floodplains and channels, supporting halophytic shrublands, mixed acacia shrublands and low woodlands with minor perennial grasses.</td></tr>
<tr><td>272Ch - Challenge System</td><td>Gently undulating gritty and sandy surfaced plains, occasional granite hills, tors and low breakaways, supporting acacia shrublands and occasional halophytic shrublands.</td></tr>
<tr><td>272Er - Ero System</td><td>Tributary floodplains with shallow, erodible duplex soils on red-brown hardpan, more or less saline and supporting acacia shrublands with halophytic and non-halophytic undershrubs.</td></tr>
</table></td></tr>
</table>

Characteristic	Details	
	272Ka - Kalli System	Elevated gently undulating red sandplains edged by stripped surfaces on laterite and granite, supporting acacia tall shrublands with wanderrie grass understoreys.
	272Ko - Koonmarra System	Quartz-strewn stony plains and low rises with outcropping granite, gneiss and schist, supporting scattered mulga shrublands and other mainly non-saline shrubs.
	272Ml - Millrose System	Level or very gently undulating stony plains on hardpan and granite with irregularly distributed sandy banks supporting mostly scattered mulga shrublands with minor grasses.
	272Ro - Roderick System	Broad, saline riverine plains, mainly supporting chenopod shrublands; also numerous grassy drainage foci, claypans and non-saline marginal hardpan plains with acacia shrublands.
	272Sh - Sherwood System	Breakaways, kaolinised footslopes and extensive gently sloping plains on granite supporting mulga shrublands and minor halophytic shrublands.
	272Yg - Yanganoo System	Almost flat hardpan wash plains, with or without small wanderrie banks and weak groving; supporting mulga shrublands and wanderrie grasses on banks.
Land degradation risk	The soils mapped across the application area and local area have a high susceptibility to wind erosion, water erosion and flooding.	
Waterbodies	No perennial rivers or wetlands are mapped within the application area, several non-perennial rivers intersect the application area. A portion of the application area is subject to inundation as a result of the Roderick River.	
Hydrogeography	The application area is located within the Murchison river catchment area and Gascoyne Groundwater Area proclaimed under the RIWI Act.	
Flora	A total of 39 conservation significant flora are recorded within the local area. There are records of two priority flora within one kilometre, both of which are found on the same soil type as the application area. No conservation significant flora were recorded within the application area (AECOM, 2022).	
Ecological communities	One Priority 1 PEC was identified seven kilometres south of the nearest infrastructure corridor during the desktop assessment: “Meka calcrete groundwater assemblage type on Murchison palaeodrainage on Meka Station”.	
Fauna	A total of 18 conservation significant fauna species are recorded within the local area, including two mammal, one invertebrate, one reptile and 14 bird species. No conservation significant fauna species were recorded within the application area (AECOM, 2022).	

A.2. Flora analysis table

With consideration for the site characteristics set out above, relevant datasets (see Appendix E.1), and biological survey information (AECOM, 2022), impacts to the following conservation significant flora required further consideration.

Species name	Conservation status	Suitable habitat features ? [Y/N]	Suitable vegetation type? [Y/N]	Suitable soil type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Eremophila simulans subsp. *megacalyx*	3	Y	Y	Y	0.58	8	N
Angianthus microcephalus	2	Y	Y	Y	0.89	1	Y
Eremophila muelleriana	3	Y	Y	Y	1.18	7	Y
Calandrinia butcherensis	1	Y	Y	Y	6.91	1	Y

Species name	Conservation status	Suitable habitat features ? [Y/N]	Suitable vegetation type? [Y/N]	Suitable soil type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Calandrinia sp. Boolardy Station (P. Jayasekara 719-JHR-01)	1	Y	unknown	unknown	7.07	1	Y
Isotropis sp. Yalgoo (S. Patrick 2375)	1	Y	N	Y	13.25	1	Y
Petrophile pauciflora	3	Y	N	Y	14.20	4	Y
Indigofera eriophylla	1	Y	N	Y	17.22	1	Y
Frankenia confusa	4	Y	N	Y	20.03	3	Y
Gunniopsis divisa	3	Y	N	Y	22.33	5	N
Hemigenia tysonii	3	Y	N	Y	22.96	6	Y
Ptilotus beardii	3	Y	Y	Y	26.39	6	N
Verticordia jamiesonii	3	Y	Y	Y	27.31	8	N
Maireana murrayana	3	Y	N	Y	27.95	2	Y
Psammomoya ephedroides	3	Y	N	Y	34.39	2	Y
Drosera eremaea	1	Y	N	Y	40.29	1	Y
Dicrastylis linearifolia	3	Y	N	Y	42.63	1	Y
Eremophila obliquisepala	3	Y	Y	Y	47.14	1	Y

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

A.3. Fauna analysis table

Species name	Conservation status	Suitable habitat features? [Y/N]	Suitable vegetation type? [Y/N]	Distance of closest record to application area (km)	Number of known records (total)	Are surveys adequate to identify? [Y, N, N/A]
Egernia stokesii badia (western spiny-tailed skink)	VU	Y	Y	1.38	13	Y
Idiosoma clypeatum (northern shield-backed trapdoor spider)	P3	Y	Y	5.52	738	Y
Oxyura australis (blue-billed duck)	P4	N	Y	12.60	2	Y
Actitis hypoleucos (common sandpiper)	MI	N	N	15.54	2	Y
Calidris acuminata (sharp-tailed sandpiper)	MI	N	N	22.58	3	Y
Calidris ferruginea (curlew sandpiper)	CR			22.58	2	Y
Calidris subminuta (long-toed stint)	MI	N	N	22.58	2	Y
Gelochelidon nilotica (gull-billed tern)	MI	N	N	22.58	19	Y
Plegadis falcinellus (glossy ibis)	MI	N	N	22.58	8	Y
Tringa glareola (wood sandpiper)	MI	N	N	22.58	2	Y
Falco peregrinus (peregrine falcon)	OS	Y	Y	24.86	5	Y
Tringa nebularia (common greenshank)	MI	N	N	31.57	2	Y
Chlidonias leucopteris (white-winged black tern)	MI	N	N	39.05	2	Y

T: threatened, CR: critically endangered, EN: endangered, VU: vulnerable, P: priority

Appendix B Assessment against the clearing principles

Assessment against the clearing principles	Variance level	Is further consideration required?
Environmental value: biological values		
Principle (a): *"Native vegetation should not be cleared if it comprises a high level of biodiversity."* Assessment: The proposed clearing area contains largely homogenous vegetation, characterised by Acacia Woodlands on hardpan plain with intermittent sandplain. The proposed clearing area may contain suitable habitat for priority flora and the western spiny-tailed skink (VU). However the application area does not contain vegetation in better condition than that in the surrounding region, noting that it has been subject to historical grazing pressures.	Not likely to be at variance	Yes *Refer to Section 3.2.1, above.*
Principle (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."* Assessment: No conservation significant fauna were recorded within the application area. Secondary evidence of the western spiny-tailed skink (VU) was recorded adjacent to the application area (AECOM, 2023). The area proposed to be cleared is considered not to contain significant habitat for conservation significant fauna.	Not likely to be at variance	Yes *Refer to Section 3.2.1, above.*
Principle (c): *"Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, threatened flora."* Assessment: No threatened flora were recorded within the local area, and no threatened flora were recorded during the flora and vegetation surveys (AECOM, 2022). The area proposed to be cleared is considered unlikely to contain habitat for flora species listed under the BC Act.	Not likely to be at variance	No
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."* Assessment: No threatened ecological communities are mapped within the proposed clearing area and none were recorded during the flora and vegetation survey (AECOM, 2022). The vegetation proposed to be cleared is therefore not considered necessary for the maintenance of, a threatened ecological community.	Not likely to be at variance	No
Environmental value: significant remnant vegetation and conservation areas		
Principle (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."* Assessment: The extent of the mapped vegetation type and native vegetation in the local area is well above (99 per cent) the national objectives and targets for biodiversity conservation in Australia. The vegetation proposed to be cleared	Not at variance	No

Assessment against the clearing principles	Variance level	Is further consideration required?
is not considered to be part of a significant ecological linkage in the local area.		
Principle (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."* Assessment: Given the distance to the nearest conservation area, the proposed clearing is not likely to have an impact on the environmental values of adjacent or nearby conservation areas.	Not likely to be at variance	No
Environmental value: land and water resources		
Principle (f): *"Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland."* Assessment: The application area transects several non-perennial drainages. No major or perennial waterlines or wetlands are in the vicinity of the application area.	At variance	Yes *Refer to Section 3.2.2, above.*
Principle (g): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation."* Assessment: The mapped soils may be susceptible to wind or water erosion when vegetation cover is removed. Impacts are considered to be localised and temporary. Noting the long narrow shape of the application area, the proposed clearing is not likely to have an appreciable impact on land degradation.	Not likely to be at variance	Yes *Refer to Section 3.2.2, above.*
Principle (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."* Assessment: The proposed clearing area is located within the proclaimed Gascoyne Groundwater Area. However, the proposed clearing will not intercept permanent water courses, wetlands or Public Drinking Water Sources Areas. Ground water will be abstracted for resource for construction use, dust suppression and camp water supply. Taking into consideration the low abstraction from a water resource that is not of high risk, any significant impacts to the water quality are unlikely (Department, 2023).	Not likely to be at variance	*No*
Principle (j): *"Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding."* Assessment: The application area intersects several minor intermittent watercourses, no permanent rivers or wetlands intersect the proposed clearing area. Given the linear nature of the application area, the proposed clearing is unlikely to exacerbate the incidence or intensity of flooding.	Not likely to be at variance	No

Appendix C Vegetation condition rating scale

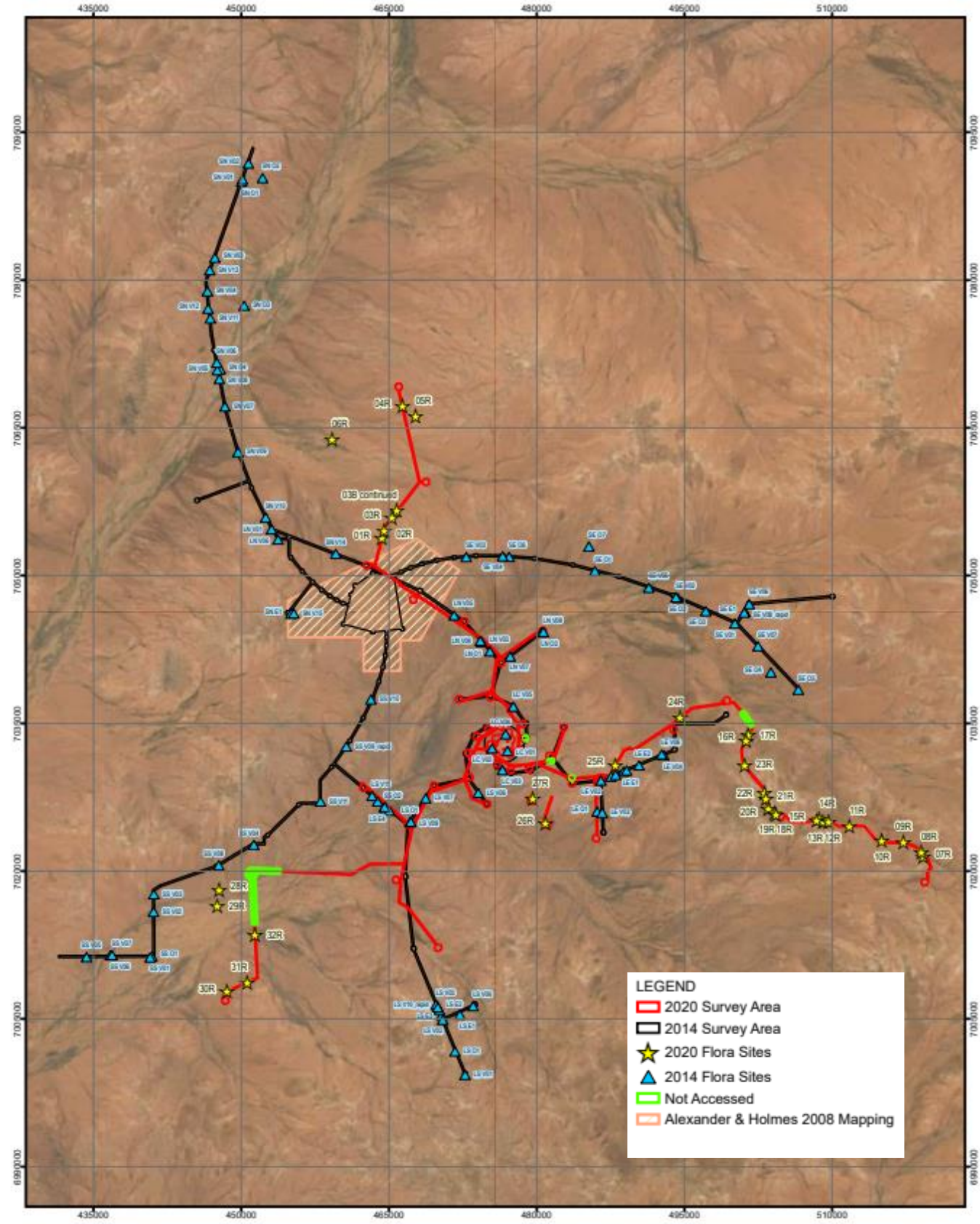
Vegetation condition is a rating given to a defined area of vegetation to categorise and rank disturbance related to human activities. The rating refers to the degree of change in the vegetation structure, density and species present in relation to undisturbed vegetation of the same type. The degree of disturbance impacts upon the vegetation's ability to regenerate. Disturbance at a site can be a cumulative effect from a number of interacting disturbance types.

Considering its location, the scale below was used to measure the condition of the vegetation proposed to be cleared. This scale has been extracted from Trudgen, M.E. (1991) *Vegetation condition scale* in National Trust (WA) 1993 Urban Bushland Policy. National Trust of Australia (WA), Wildflower Society of WA (Inc.), and the Tree Society (Inc.), Perth.

Measuring vegetation condition for the Eremaean and Northern Botanical Provinces (Trudgen, 1991)

Condition	Description
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.
Very poor	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.

Survey effort (AECOM, 2021)



Vegetation types recorded within the application area (AECOM, 2022)

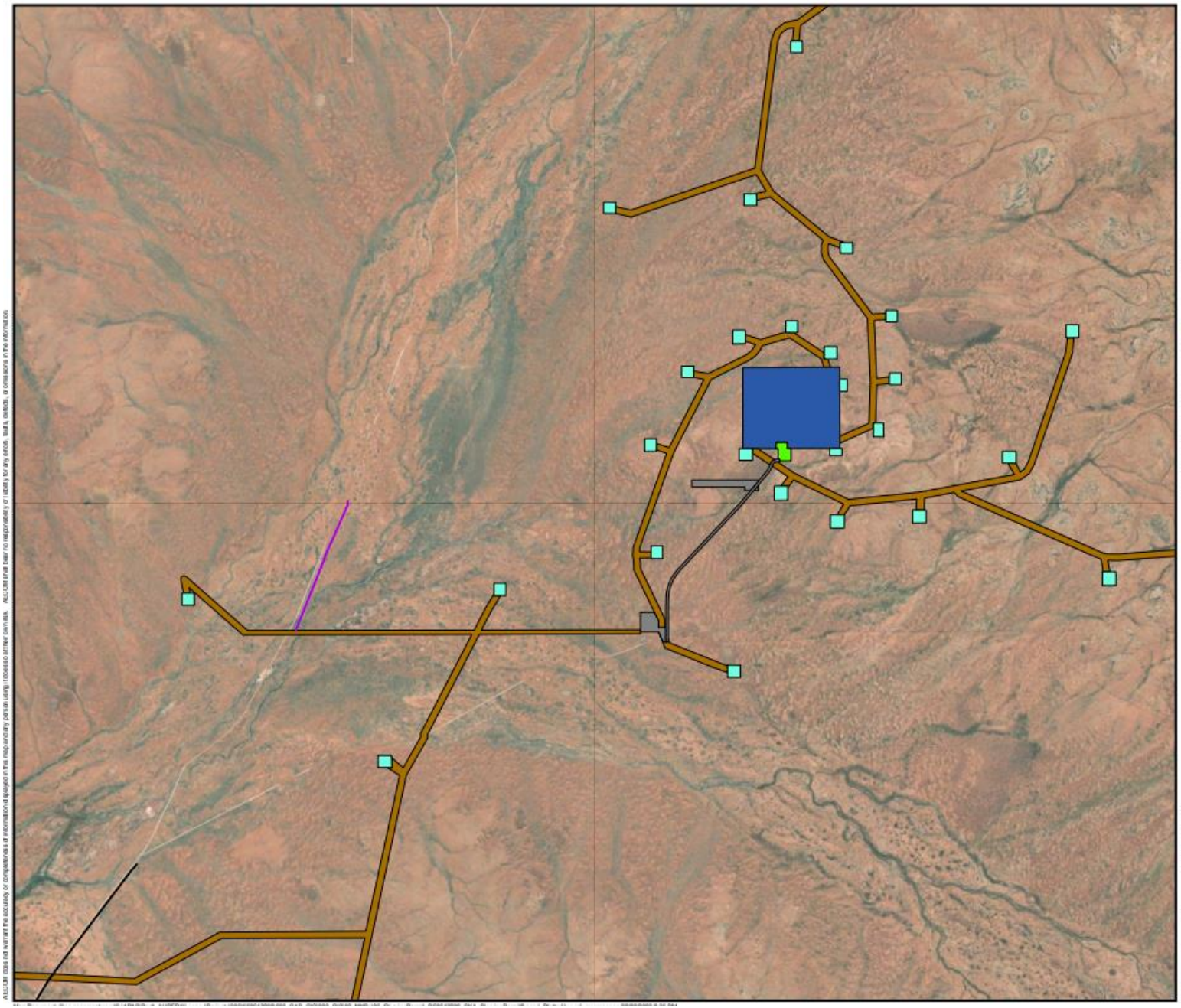
Description	Site Details	Photo
Plains		
AfSa Acacia Woodland *Acacia fuscaneura, Acacia incurvaneura* and occasional *Acacia pruinocarpa* low open woodland over *Senna artemisioides* subsp. *helmsii, Acacia tetragonophylla* and *Senna* sp. Meekatharra (E. Bailey 1-26) mid to tall sparse shrubland.	Plains, rarely with quartz on the surface. Red clay soils. Extent within survey area (ha): 654.1 ha Species richness: • 2022 – 19 native species • Total – 41 native species Quadrats: • 2020 – 1 site • 2014 – 4 quadrats	
AfEfPo Acacia Woodland *Acacia fuscaneura, Acacia incurvaneura* and *Acacia victoriae* subsp. *victoriae* low open woodland over *Eremophila forrestii* subsp. *forrestii, Acacia tetragonophylla* and *Eremophila phyllopoda* low to tall open shrubland over *Ptilotus obovatus, Solanum lasiophyllum* and *Maireana planifolia* low sparse shrubland.	Common community found across variety of landscapes including hardpan clays, clay loams and clay sandy soils on flat terrain. May have quartz or granite rocks (small to large) on surface. Extent within survey area (ha): 924.6 ha Species richness: • 2020 – 58 native species • Total – 110 native and 1 weed species Quadrats: • 2020 – 11 sites • 2014 – 10 quadrats	

Description	Site Details	Photo
AiAtEf Acacia Woodland *Acacia incurvaneura, Acacia craspedocarpa* and *Acacia fuscaneura* low open woodland over *Acacia tetragonophylla, Acacia kempeana* and *Acacia oswaldii* sparse tall shrubland over *Eremophila fraseri* subsp. *parva, Senna artemisioides* subsp. *helmsii* and *Eremophila macmillaniana* sparse mid shrubland.	Flat terrain with red clay with a variable soil profile reflecting erosion. Alluvial sands found close to drainage channels transition to clay loams on flats. Extent within survey area (ha): 683.5 ha Species richness: • 2022 – 62 native species • Total – 76 native and 2 weed species Quadrats: • 2020 – 4 sites • 2014 – 13 quadrats	
AvEp Acacia Woodland *Acacia victoriae* subsp. *victoriae, Acacia sclerosperma* subsp. *sclerosperma* and *Acacia tetragonophylla* tall shrubland over *Eremophila pterocarpa* subsp. *pterocarpa, Senna* sp. Meekatharra (E. Bailey 1-26) and *Atriplex amnicola* mixed chenopod shrubland	Hardwash plains with red-brown sandy loam clay soils. Extent within survey area (ha): 121.0 ha Species richness: • 2022 – 38 native species • Total – 50 native and 3 weed species Quadrats: • 2020 – 1 site • 2014 – 5 quadrats In 2014 a population of Priority 3 *Gunniopsis divisa* was recorded (outside the 2020 survey area).	

Description	Site Details	Photo
AaEcPo Acacia Woodland *Acacia aptaneura, Acacia aneura* and *Acacia incurvaneura* low open woodland over *Eremophila compacta, Eremophila simulans* and *Eremophila gilesii* mid open shrubland over *Ptilotus obovatus, Ptilotus drummondii* and *Aristida* sp. low mixed shrub and grassland.	Low rises or plains with deep sandy red soils. Extent within survey area (ha): 148.3 ha Species richness: • 2020 – 42 native species Quadrats: • 2020 – 8 sites	
ApAgEf Acacia Woodland *Acacia pteraneura* low woodland to open woodland over *Acacia grasbyi* and *Acacia tetragonophylla* tall sparse shrubland over *Eremophila forrestii* subsp. *forrestii, Senna artemisioides* subsp. *helmsii* and *Eremophila fraseri* subsp. *parva* mid shrubland.	Undulating flat terrain with red-brown sandy loam soils. Extent within survey area (ha): 667.6 ha Species richness: • 2022 – 14 native species • Total – 48 native species Quadrats: • 2020 – 0 sites • 2014 – 8 quadrats	

Description	Site Details	Photo
Granite		
AiTdPb Mixed Shrubland *Acacia incurvaneura, Acacia fuscaneura* and *Acacia caesaneura* low isolated clumps of trees over *Thryptomene decussata, Eremophila forrestii* subsp. *forrestii* and *Acacia oswaldii* mid open shrubland over *Ptilotus drummondii, Eragrostis eriopoda* and *Solanum lasiophyllum* low sparse mixed shrub and grassland.	Granite outcrops on undulating terrain. Extent within survey area (ha): 64.0 ha Species richness: • 2020 – 29 native species • Total – 29 native species Quadrats: • 2020 – 4 sites • 2014 – 1 quadrat In 2014 populations of Priority 3 *Ptilotus beardii* and *Verticordia jamiesonii* were recorded (outside the 2020 survey area).	
ArCc Mixed Shrubland *Acacia rhodophloia* low open woodland over *Corchorus crozophorifolius, Cymbopogon ambiguus* and *Eremophila platycalyx* subsp. *platycalyx* mixed low to mid shrub and grassland.	Granite domes and boulders with light brown sand loam soils. Also includes *Dodonaea viscosa* subsp. *spathulata* and *Eremophila latrobei* subsp. *latrobei*. Extent within survey area (ha): 73.8 ha Species richness: • 2020 – 20 native species • Total – 31 native species Quadrats: • 2020 – 2 sites • 2014 – 2 quadrats In 2014 populations of Priority 3 *Ptilotus beardii* were recorded (outside the 2020 survey area). In 2020 populations of Priority 3 *Petrophile pauciflora* were recorded.	

Description	Site Details	Photo
Drainage		
AiAbSa Acacia Woodland *Acacia incurvaneura, Hakea lorea* subsp. *lorea* and *Acacia aneura* low open woodland over *Acacia burkittii, Acacia tetragonophylla* and *Acacia victoriae* subsp. *victoriae* tall shrubland over *Senna artemisioides* subsp. *helmsii, Ptilotus obovatus* and *Senna artemisioides* subsp. x *sturtii* low to mid sparse shrubland.	Undefined broad drainage and flat terrain. Red-brown sandy loam soils. Extent within survey area (ha): 88.4 ha Species richness: • 2022 – 18 native species • Total – 33 native and 2 weed species Quadrats: • 2020 – 1 site • 2014 – 3 quadrats	
AcAsTd Casuarina Woodland *Allocasuarina campestris* low to mid woodland over *Acacia sclerosperma* subsp. *sclerosperma, Exocarpos aphyllus and Scaevola spinescens* mid to tall open shrubland over *Tecticornia doliiformis, Atriplex amnicola and Tecticornia ?indica* mid chenopod shrubland.	Associated with major drainage channels. Exposed granite at some locations. Soils are light red sand to sandy clay. Trees are confined to banks of channels. Extent within survey area (ha): 2.4 ha Species richness: • 2022 – 26 native species • Total – 46 native and 2 weed species Quadrats: • 2020 – no sites • 2014 – 3 quadrats In 2014 a population of Priority 3 *Frankenia confusa* was recorded in this community (outside the 2020 survey area).	



PROJECT ID 60647200
CREATED BY ROB.MCGREGOR
APPROVED BY PEDERICKJ
LAST MODIFIED 22 FEB 2023

AECOM
www.aecom.com

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DATUM GDA2020 MGA Zone 50

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Kilometres

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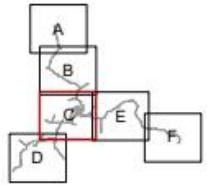
LEGEND

- SKA Low core - clearing area,280ha (within 412.5ha clearing envelope)
- Central Processing Facility ,9ha (within a 12ha clearing envelope)
- Track & Trench: Core to station clusters, 209.1ha (within 2756.3ha clearing envelope)
- Cluster areas,74ha (within 380.5ha clearing envelope)
- AARNET Fibre Link,6.5ha (within 6.5ha clearing envelope)
- Clearing Permit 9547-1

Typically, the area that has been subject to a heritage survey has been much larger than the area likely to be cleared. The area noted in this Legend is the area expected to be cleared.

Areas to be cleared shown on the map and legend are indicative and include an amount that allowed flexibility while finalising the project design. The project design and specified requirements have focused on minimising the amount of clearing required and it is expected to be less than the areas shown.



Data sources:
World Imagery: Earthstar Geographics

Base Data: (c) Based on information provided by and with the permission of the Western Australian Land Information Authority trading as Landgate (2015).

Proposed Clearing Areas

INDUSTRY AUSTRALIA, CSIRO

SQUARE KILOMETRE ARRAY

BOOLARDY STATION,
WESTERN AUSTRALIA

Figure
2C

Map of the proposed activities within the proposed clearing area (AECOM, 2023)

Appendix E. Sources of information

E.1. GIS databases

Publicly available GIS Databases used (sourced from www.data.wa.gov.au):

- 10 Metre Contours (DPIRD-073)
- Aboriginal Heritage Places (DPLH-001)
- Aboriginal Heritage Places (DPLH-001)
- Cadastre (LGATE-218)
- Cadastre Address (LGATE-002)
- Contours (DPIRD-073)
- DBCA – Lands of Interest (DBCA-012)
- DBCA Legislated Lands and Waters (DBCA-011)
- Directory of Important Wetlands in Australia – Western Australia (DBCA-045)
- Environmentally Sensitive Areas (DWER-046)
- Flood Risk (DPIRD-007)
- Groundwater Salinity Statewide (DWER-026)
- Hydrography – Inland Waters – Waterlines
- Hydrological Zones of Western Australia (DPIRD-069)
- IBRA Vegetation Statistics
- Imagery
- Local Planning Scheme – Zones and Reserves (DPLH-071)
- Native Title (ILUA) (LGATE-067)
- Offsets Register – Offsets (DWER-078)
- Pre-European Vegetation Statistics
- Public Drinking Water Source Areas (DWER-033)
- Ramsar Sites (DBCA-010)
- Regional Parks (DBCA-026)
- Remnant Vegetation, All Areas
- RIWI Act, Groundwater Areas (DWER-034)
- RIWI Act, Surface Water Areas and Irrigation Districts (DWER-037)
- Soil Landscape Land Quality – Flood Risk (DPIRD-007)
- Soil Landscape Land Quality – Phosphorus Export Risk (DPIRD-010)
- Soil Landscape Land Quality – Subsurface Acidification Risk (DPIRD-011)
- Soil Landscape Land Quality – Water Erosion Risk (DPIRD-013)
- Soil Landscape Land Quality – Water Repellence Risk (DPIRD-014)
- Soil Landscape Land Quality – Waterlogging Risk (DPIRD-015)
- Soil Landscape Land Quality – Wind Erosion Risk (DPIRD-016)
- Soil Landscape Mapping – Best Available
- Soil Landscape Mapping – Systems
- Wheatbelt Wetlands Stage 1 (DBCA-021)

Restricted GIS Databases used:

- ICMS (Incident Complaints Management System) – Points and Polygons
- Threatened Flora (TPFL)
- Threatened Flora (WAHerb)
- Threatened Fauna
- Threatened Ecological Communities and Priority Ecological Communities
- Threatened Ecological Communities and Priority Ecological Communities (Buffers)

E.2. References

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