

3 SITE OVERVIEW

3.1 Regional Setting

3.1.1 Biogeography

The Project lies within the East Murchison (MUR1) Interim Biogeographic Regionalisation for Australia (IBRA) subregion of the Murchison Biogeographic Region, which encompasses the northern parts of the Yilgarn Craton (McKenzie, May, & McKenna, 2003). The Murchison is an important region for flora conservation, with over 800 indigenous species occurring in the region (Curry, Payne, Leighton, Hennig, & Blood, 1994) of which 142 are Priority Flora (Department of Environment and Conservation, 2011).

The East Murchison subregion comprises the northern parts of the Craton's 'Southern Cross' and 'Eastern Goldfields' Terrains and is characterised by internal drainage and extensive areas of elevated red desert sandplains with minimal dune development. Salt-lake systems are associated with the occluded palaeodrainage system. Broad plains of red-brown soils and breakaway complexes as well as red sandplains are widespread.

3.1.2 Land Systems & Landforms

The Western Australian Department of Agriculture completed a regional survey of land systems occurring within the Murchison to develop a comprehensive description of biophysical resources and to provide an assessment of the condition of the soils and the vegetation of the north-eastern Goldfields (Pringle et al, 1994). A component of the survey was the mapping of land types, land units and land systems of the Murchison including the Project area.

The Project lies within the Brooking Land System (Pringle et al, 1994) which is characterised by prominent ridges of banded iron formation, supporting mulga shrublands and occasional minor halophytic communities in the southeast.

The geomorphology is described by Pringle et al. (1994) as linear ridges up to 8km long and occasionally greater than 60m relief, generally much lower; gently inclined slopes with colluviums and sparse, often incised, narrow drainage tracts. Stone mantles provide effective protection against soil erosion.

Western Botanical (2021) identified the following landforms.

- Low banded ironstone formation (haematite) hills (two to three parallel series) of moderate relief, estimated at 20 to 75m above the surrounding plains, with moderate outcrop and small areas of tallus slopes;
- Colluvial slopes with laterite gravel, angular BIF colluvium and minor outcrop;
- Lower slopes with lateritic gravely and sandy lateritic gravely textures, colluvium and alluvium;
- Small, disjunct low rises of weathered ferruginous duricrust;
- Subcropping weathered, fractured basalt and gabbro with associated calcrete concretion;
- Aeolian yellow sandplain west of the orebody area;
- Aeolian orange sandplain on top of weathered Archaean granite plateaux;
- Weathered Archaean granite plateaux, low breakaway cliffs of 2-5m relief, kaolinitic footslopes and associated saline plains with coarse silty sand soils; and

- Narrow to broad drainage lines, extensive alluvial floodplains and areas subject to sheet flow, often with a mantle of shallow red silty sand.

Land Systems within the Project area as identified by Western Botanical (2021) are provided in Table 3.

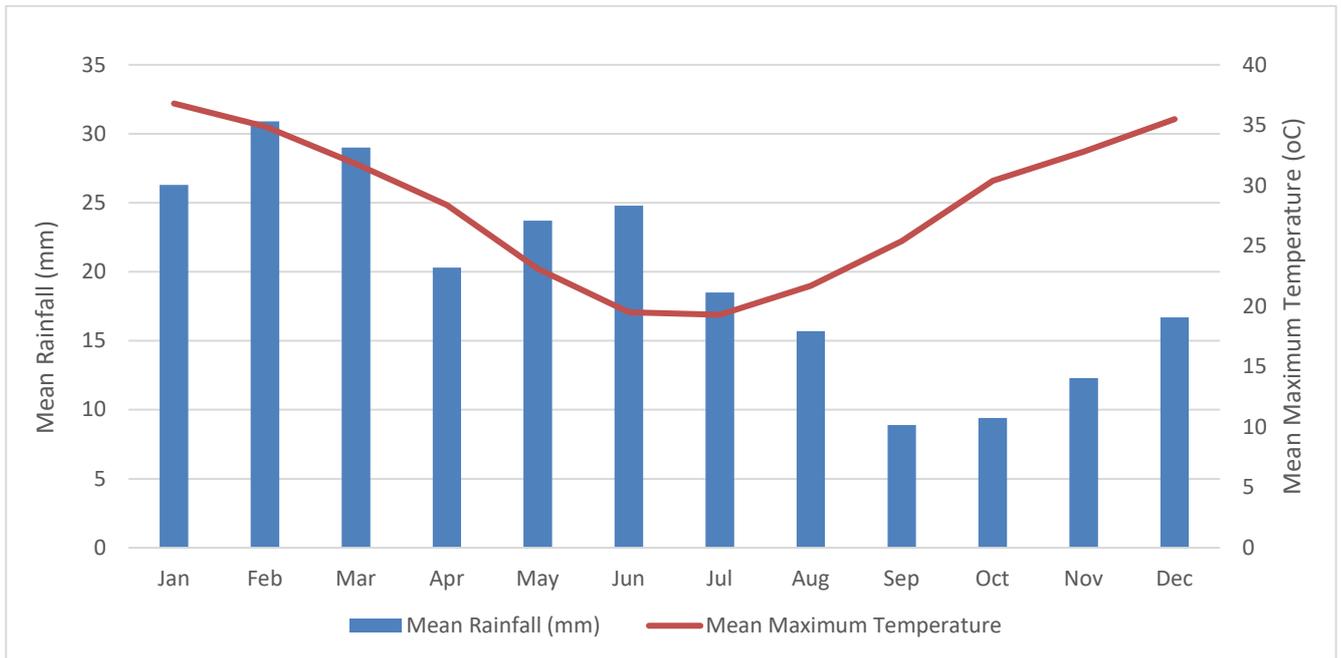
Table 3: Land Systems within the Project Area

Land System	Description
Rainbow	Hardpan plains supporting Mulga on alluvial plains subject to sheet flow; frequently with fine ironstone gravel mantles, and sparse, generally narrow and unincised concentrated drainage tracts.
Bevon	Irregular low hills supporting Mulga and Low shrubs on ?Tertiary limonite, minor Archaean greenstone and banded iron formation, extensive Quaternary colluvium and restricted areas of Quaternary alluvium and eluvium.
Brooking	Mulga shrublands, occasional minor halophytic shrublands on Archaean banded iron formation, locally quartzite, slate, shale and greywacke, with Quaternary colluvium and minor alluvium.
Waguin	<i>Acacia</i> shrublands and minor halophytic shrublands on very low breakaways (relief usually less than 4 m) with short footslopes above erosional plains and minor alluvial plains. This system usually occurs within large areas of sandplain, often occurring in parallel series.
Marmion	Gently undulating sandplains with mixed shrublands and hummock grasslands on Gently undulating sandplains with surface drainage features confined to areas fringing occasional exposures of granite.
Sherwood	Mulga shrublands, occasional minor halophytic shrublands on low breakaways (5 to 20 m relief), with pallid zone upper footslopes, depositional lower footslopes; extensive, level to gently undulating plains with pebble mantles; and lower alluvial plains and drainage floors receiving concentrated flow. Occasional low hills and tors.
Yowie	Mulga and Bowgada shrublands and patchy wanderrie grasslands on Quaternary sand and minor cemented alluvium.

3.2 Climate

The Project is located within the Goldfields-Esperance region of WA which is characterised by a semi-arid environment. The nearest meteorological station is Leonora, approximately 100km northeast of the Project. Leonora station has records from 1898 to 2020 for rainfall. Temperature records were from Leonora Aero station from 2007 to 2020, as temperature has not been recorded at the Leonora station since 2014 (Bureau of Meteorology, 2020).

The annual average rainfall between 1898 and 2020 was 236.5mm with the wettest period between January and June. Historic temperatures (1957-2020) vary from a winter minimum of 5.9°C (mean minimum) to a summer maximum of 37°C (mean maximum) (Bureau of Meteorology, 2020). Mean monthly rainfall and mean maximum temperatures are shown on 5.



Source: Bureau of Meteorology (2020).

*Note: temperature data was from Leonora Aero station is 2007-2020 as temperature has not been recorded at Leonora station since 2014.

Figure 5: Climate Statistics (1898-2020)*

During summer, winds are generally mild and hot, predominantly easterly in the morning, shifting southeasterly in the afternoon. During winter, winds are more variable in the morning, shifting to westerly in the afternoon.

Evaporation values for the Leonora station are shown in Table 4. Records show that the annual average evaporation is well in excess of the annual average rainfall, by more than an order of magnitude (SRK, 2012a).

Table 4: Monthly Average Precipitation and Evaporation Rates

Month	Precipitation (mm)	Evaporation (mm)
January	26	523
February	31	406
March	29	329
April	20	244
May	24	163
June	25	108
July	18	116
August	16	157
September	9	221
October	9	234

Month	Precipitation (mm)	Evaporation (mm)
November	12	378
December	17	464
Total	236	3433

3.3 Geology and Soils

3.3.1 Regional Geology

The Mt Mason iron ore deposit occurs within the Mt Ida Greenstone Belt. The most extensive area of greenstones of the Southern Cross Granite-Greenstone Terrane in the Mount Ida Greenstone Belt is in the north, in the poorly exposed area around Mt Mason. Here, shallow to steep, east-dipping units of banded iron formation (BIF), with intercalated mafic rocks, are structurally overlain by a very poorly exposed succession that appears to be dominated by metamorphosed mafic volcanic rocks, but includes gabbroic and ultramafic rocks (SRK, 2012a).

3.3.2 Project Geology

The main geological units outcropping in the area are BIF with minor associated shales and rare chert bands. Basalts and dolerites outcrop along the central area of the lease on the western side of the main scarp; granites in the southwest corner of the lease are typically overlain by a sand plain. Geological mapping is provided by Western Botanical (2021) in Appendix C.

The main geological features of the tenement described by Walsh (2005) are summarised as:

- BIF units at Mt Mason are cut by a WNW-striking fault dipping at 80° towards the north. A distinct zone of brecciation and quartz veining, associated with this fault, cross-cuts the BIF units. Weathering associated with this fault resulted in a substantial body of massive to bedded hematite. The hematite body outcrops over an approximate strike length of 600 m and width of 150 m. At the south end of the hematite body, another NNW-strike fault may cut the BIF, although field evidence is not strong. This was interpreted as an alteration boundary with minor displacement.
- Hematite mineralisation is believed to have formed by enrichment of the iron content of BIF and alteration of magnetite to hematite by the passage of iron-rich water through the system. Enrichment is localised and little is known about its controls. Hematisation generally appears to be bounded by shale units which themselves in some cases are partially mineralised. Faults and folding have been identified as possible important controls in fluid flow. The boundary between “hematised” and BIF units can be sharp (over a metre) or gradational (several metres).

3.3.3 Soils

The Project is located in the Salinaland Plains Zone of the Murchison Province soil landscape zone. It correlates with the bulk of the Wiluna, Laverton and Barlee vegetation systems of Beard (1976) and has a preponderance of the sandplains and occasional dunes with spinifex grasslands rangeland land type (Pringle et al, 1994).

Tille (2006) describes this zone as 'Sandplains (with hardpan wash plains and some mesas, stony plains and salt lakes) on granitic rocks (and some greenstone) of the Yilgarn Craton. Red loamy earths, red sandy earths, red shallow loams, red deep sands and red-brown hardpan shallow loams (with some red shallow sands and red shallow sandy duplexes) are present (KLA, 2012c).

Soils in the surveyed area are relatively uniform with little change throughout the landscape. Recurring soil profiles were observed with only 4 different soil profiles being identified from 23 excavated sites. Fine sandy loams leading into light sandy clay loams are found throughout the area. Shallow topsoils are common throughout the area and are the result of wind and water erosion (KLA, 2012c).

According to KLA (2012c) all sites have acidic horizons down the profile with pH values below 7 and are low in:

- Nitrogen;
- Phosphorus;
- Calcium;
- Magnesium;
- Sulphur;
- Potassium;
- Manganese; and
- Sodium.

The Project area is not within a known acid sulfate soil risk area.

3.4 Hydrology and Hydrogeology

3.4.1 Hydrology

Observations from surveys in the region indicate that significant creek systems drain from topographical highlands (greenstone belts) to areas of topographical low relief (sandplains and playa lakes). All major creeks are ephemeral in nature and experience a degree of flow as a response to major rainfall events. Less defined drainage lines are typified within sandplain areas. Sheet flow is likely to occur under major rainfall events given poor creek definition, and the relatively uniform gradient that exists. Runoff from outcrops of bedrock may also collect in gnamma holes or rockholes and soaks with water holes often occur next to rock outcrops, forming significant mechanisms of groundwater recharge in the region (Coffey, 2010).

The Project is located approximately 35km northwest of Lake Ballard which is listed on the Directory of Important Wetlands in Australia. There are no lakes, rivers or other significant water bodies within the Project Area.

The drainage of the Project Area is characterised by:

- Non-incised, broad, ephemeral drainage lines which drain the plains to the west of the Project; and
- Slightly incised ephemeral watercourses scattered throughout the Project Area on the sideslopes and flats associated with and to the east and west of the BIF ridge.

3.4.2 Hydrogeology

A general assessment of the regional distribution of playa lakes from the hydrogeological map of WA suggests that the drainage systems of the region comprise broad, structurally confined, sub parallel features with a suggested drainage direction in a south-easterly direction for systems north of the township of Kalgoorlie and an easterly direction for systems south of Kalgoorlie. The Playa lake systems mark the courses of palaeorivers that ceased to flow when the climate became arid during the Tertiary period. These palaeorivers are regionally referred to as palaeodrainages and tend to discharge into the large playa lakes that exist throughout the area (Coffey, 2010).

The Project lies within the Goldfields Groundwater Proclamation Area under the *Rights in Water and Irrigation Act 1914* (RIWI Act).

Groundwater levels in the Project area vary between 29m below ground level (bgl) and 67m bgl. There are two distinct areas, a northern and a southern area. The division line between the two areas follows a SW-NE trend and coincides with an inferred fault that crosses the Project area. The southern area presents a steep gradient with water moving from the top of the ridge away in every direction. The northern area presents a much lower gradient with water moving from the ridge towards the northeast (SRK, 2012b).

The groundwater table in the area occurs at approximately 480 m RL (40-50 m bgl) where the Main pit will be developed. The proposed pit will be excavated down to 420 m RL, thus requiring 60 m of saturated rock to be dewatered to allow dry mining conditions. The groundwater level is below the depth of the adjacent mining pod to the south of the Main pit.

Groundwater samples were collected from four bores. The samples were analysed, and the pH of the groundwater was found to be near neutral, ranging from pH 6.8 to 8.5. Groundwater salinity was low and total dissolved solids (TDS) ranged from 507 to 1,060mg/L. Dissolved concentrations of minor and trace elements were low. Groundwater quality results are provided in Table 5.

These values provide a clear indication that recharge for this groundwater is recent or subject to rapid throughflow as opposed to the groundwater in the surrounding plains, which can have TDS values in the order of 50,000 to 100,000 mg/L (SRK, 2012b). However, prolonged pumping for dewatering purposes may lead to deterioration of the water chemistry, by the possible drawing in of saltier water from the surrounding alluvial aquifers, possibly along regional transmissive faults in the area (SRK, 2012b).

Table 5: Groundwater Quality, Mt Mason

Analyte	Units	Average	Analyte	Units	Average
pH	pH units	7.1	Conductivity	µS/cm	1124
Total Alkalinity as CaCO ₂	mg/L	6.7	Cadmium	mg/L	<0.0001
Sulphate	mg/L	81	Chromium	mg/L	<0.001
Chloride	mg/L	237	Cobalt	mg/L	<0.001
Fluoride	mg/L	0.9	Copper	mg/L	0.004
Total Phosphorus as P	mg/L	0.4	Iron	mg/L	0.06
Calcium	mg/L	23	Lead	mg/L	0.001
Magnesium	mg/L	29	Manganese	mg/L	0.007

Analyte	Units	Average	Analyte	Units	Average
Potassium	mg/L	14	Molybdenum	mg/L	0.02
Sodium	mg/L	138	Nickel	mg/L	0.005
Aluminium	mg/L	0.01	Selenium	mg/L	<0.01
Antimony	mg/L	0.001	Silver	mg/L	<0.001
Arsenic	mg/L	<0001	Strontium	mg/L	0.15
Barium	mg/L	0.02	Tin	mg/L	<0.001
Boron	mg/L	0.6	Zinc	mg/L	0.024

Sourced: SRK (2012b).

3.5 Vegetation and Flora

3.5.1 Vegetation and Flora Surveys

The following flora and vegetation surveys have been undertaken for the Project:

- Reconnaissance survey and gap analysis, April 2021, targeted at orebody and infrastructure areas (Western Botanical, 2021) (Appendix C);
- Level 1 Flora and Vegetation Survey of the proposed Mount Mason Haul Road by Native Vegetation Solutions (NVS), May 2012 (Appendix D); and
- Mt Mason Project, Level 2 Flora and Vegetation Survey: Part 1–October 2011 & Part 2–March 2012 by NVS, Spring 2011 and Autumn 2012 (Appendix E).

Surveys were undertaken in accordance with:

- Environmental Protection Authority (EPA) *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) (2021 survey only);
- Environmental Protection Authority (EPA) Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (Environmental Protection Authority, 2002); and
- EPA Guidance Statement No. 51 *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (Environmental Protection Authority, 2004a).

The Final Report, Review of Flora and Vegetation of the Mt Mason and Yundaga Siding Study Areas has been submitted to IBSA (Ref: IBSA-2021-0303).

3.5.2 Vegetation

Vegetation of the area is dominated by Mulga woodlands and is often rich in ephemerals, hummock grasslands, saltbush shrublands and *Halosarcia* shrublands (McKenzie, May, & McKenna, 2003).

The Project lies within the following Beard (1975) vegetation units (NVS, 2012b):

- Vegetation Association 18: Low woodland; mulga (*Acacia aneura*);
- Vegetation Association 483 Hummock grassland, mixed sandplain and open Mallee;
- Vegetation Association 202: Shrublands; mulga and *Acacia quadrimarginea* scrub; and
- Vegetation Association 484: Shrublands; jam thicket.

A summary of the current extent and representation of these associations is presented in the Table 6.

Table 6: Extent and Representation of Vegetation Associations at a Regional Scale

Beard Vegetation Association	Description	Pre-European Extent, WA (ha)*	Remaining (%)
484	Shrublands; jam thicket	70,235	100%
202	Shrublands; mulga & <i>Acacia quadrimarginea</i> scrub	365,344	100%
483	Hummock grasslands, mixed sandplain - open Mallee over sparse dwarf shrubs with <i>spinifex</i> ; red Mallee & mixed sparse dwarf shrubs over <i>Triodia basedowii</i>	395,106	100%
18	Lowwoodland; mulga (<i>Acacia aneura</i>)	22,029,557	100%
Total		22,860,242	

* Source: Shepherd (2002).

There are thirty-four recognised vegetation associations at the NVIS Level V Association where three dominant species in each stratum is used to define vegetation associations. Of these (Western Botanical, 2021):

- 23 are Mulga Woodlands, ranging from tops of BIF ridges to low lying drainage tracts;
- 1 is a Casuarina Woodland on outcropping calcrete over basalt;
- 5 are Eucalyptus woodlands with either calcrete influenced soils or on clay;
- 1 represents a tall *Allocasuarina* shrubland on duricrust outcrop; and
- 4 represent low shrublands with emergent *Acacia* on Archaean granite plateaux or duricrust outcrops.

A full list of the vegetation associations and maps are provided in the flora survey report in Appendix C.

The April 2021 survey identified 135 species, the majority of which are well known and widespread in the region and are not considered significant species. A species list from the 2021 survey is provided in Appendix C.

In respect of the haul road survey, a total of 41 Families, 108 Genera and 231 Species were recorded within the area surveyed (NVS, 2012a). The 2011 Level 2 Spring survey of the Mt Mason tenement identified a total of 83 flora species, representing 54 Genera and 28 Families while the 2011 Autumn survey identified a total of 97 flora species, representing 59 Genera and 31 Families. The 2011 Spring survey identified 8 vegetation groups and an additional 2 vegetation groups were identified in the 2011 Autumn survey.

3.5.3 Threatened and Priority Ecological Communities

No Federally or State Listed Threatened Ecological Communities (TEC) have been identified within the Project area (Western Botanical, 2021).

The orebody areas and northern parts of the proposed haul road and the camp area all lie within the Priority 1 Perrinvale/Walling vegetation assemblages (banded ironstone formation) Priority Ecological Community (PEC) (Figure 6). It is expected that some vegetation associations of the Study Area may be regionally restricted, particularly those associated with the geology of the BIF ranges and associated laterite caps and the erosion products from these ranges. These will most likely however be widespread within similar landforms of the Mt Mason / Mt Ida area (Western Botanical, 2021).

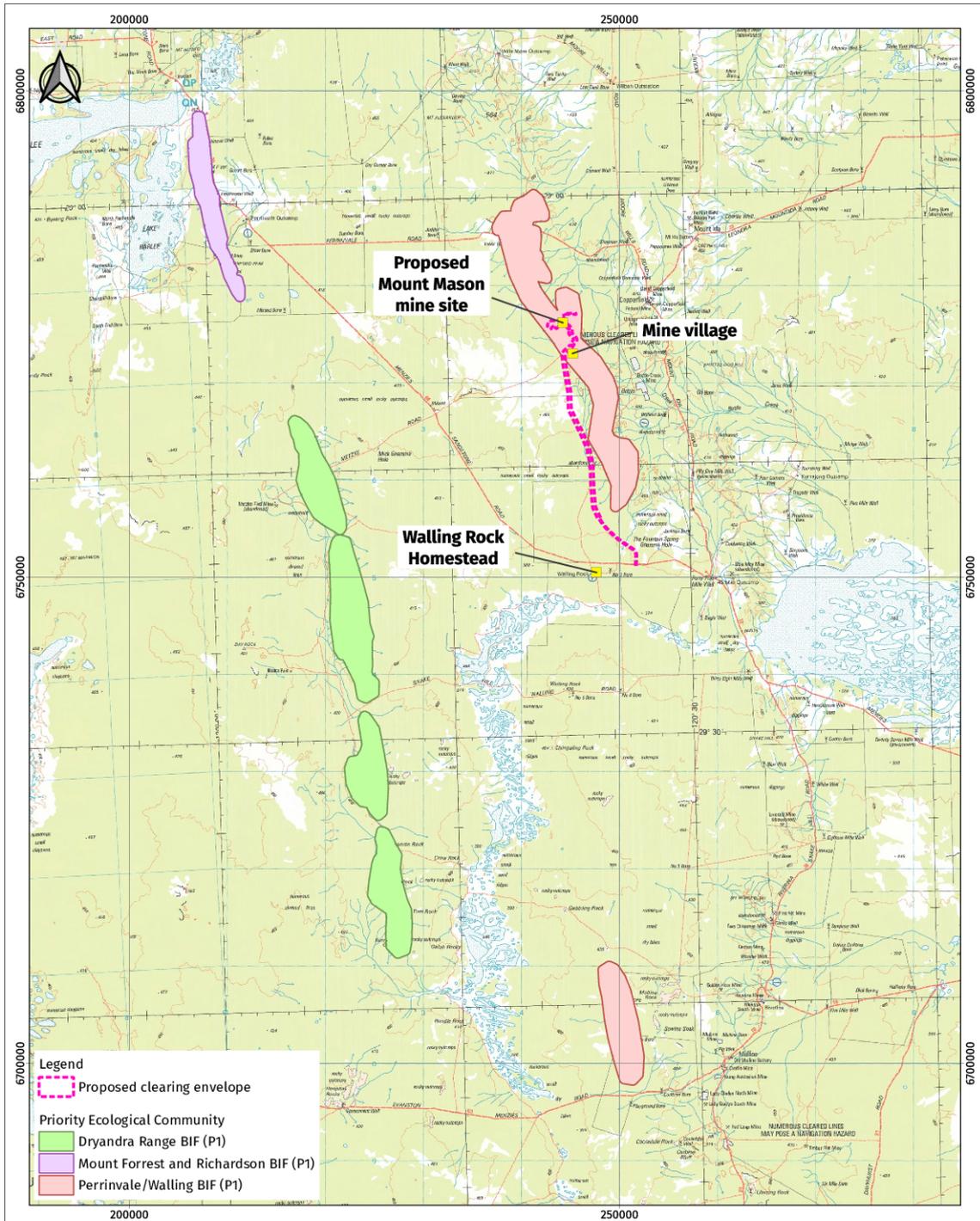


Figure 6
Priority Ecological Communities
Overview

Figure 6: Threatened and Priority Ecological Communities

3.5.4 Conservation Significant Flora

No Federally EPBC Listed Threatened Flora are known within or in the immediate vicinity of the Project area.

Further, the Level 1 and Level 2 flora surveys undertaken by NVS in 2011 and 2012 did not record any threatened species.

Four (4) species listed as Threatened Flora in Western Australia have been recorded within a 20km radius of the Project area. Three (3) of these (*Eucalyptus crucis* subsp. *Crucis*, *Myriophyllum lapidicola*, and *Ricinocarpos brevis*) are considered 'unlikely to occur within the Project area' (Western Botanical, 2021).

The fourth species (*Seringia exastia*) is listed as a Threatened Flora taxon due to a recent (2020) revision of taxonomy of species but it is widespread within central and northern Western Australia and will be removed from the Threatened Flora List following a pending meeting of the Threatened Species Scientific Committee (Western Botanical, 2021).

There are one (1) Priority 1 species and three (3) Priority 3 species that have known records of occurrence on the Project area (Table 7). There are thirty-two (32) other Priority species that have been recorded on the broader tenements (outside the Project area) or may possibly occur on the Project area as they have been recorded on nearby study areas (Appendix C).

Figure 7 and Figure 8 show the location of the priority species listed in Table 7 as having been recorded at the Mount Mason Project area.

Table 7: Conservation Significant Flora Known Occurrences at Mount Mason Area

Taxon	Conservation Code	Comment
<i>Drosera eremaea</i> (inclusive of <i>Drosera</i> aff. <i>eremaea</i>)	P1	<i>Drosera eremaea</i> P1 is known within and in close proximity to the proposed disturbance footprint within the orebody area. One record of <i>Drosera</i> aff. <i>eremaea</i> is known within the current Exploration Camp area. Based on the regional distribution of similar species, this is likely to be <i>D. eremaea</i> P1, however, the accuracy of the position has not been verified.
<i>Calytrix hislopii</i>	P3	Populations lie well outside area of proposed development.
<i>Philotheca brevifolia</i> subsp. <i>deserti</i>	P3	Present on L 29/079. Populations lie well outside area of proposed development.
<i>Pterostylis virens</i>	P3	Associated with granitoid landforms, outside disturbance footprints.

Whilst *Hibiscus* sp. Perrinvale Station is a widely regionally collected Priority 3 species and could likely occur on the upper to lower slopes of the BIF ranges and associated duricrust outcrops within the area, it has not been recorded at the Project area. It is, however, a cryptic species and is difficult to assess in seasons outside those with favourable rainfall.

Juno therefore proposes a targeted spring survey of the Project area for both *Drosera eremaea* and *Hibiscus* sp. Perrinvale Station in more favourable conditions after winter rainfall, nominally in August/September 2021.

Hysterobaeckea longipes has also been reported through a specimen notionally recorded as adjacent to the Haul Road alignment approximately 7.75km south of the Mt Mason orebody area (NVS, 2013). It is, however, not a threatened species, and the location information is questionable as the associated species noted with the specimen do not occur in the Mount Mason area and this also represents a disjunct occurrence of this species being some 375km east of its known range in the northern Avon Wheatbelt (Western Botanical, 2021).

Similarly, *Calotis* sp. Perrinvale Station (P3) and *Chrysocephalum apiculatum* subsp. *Norsemanense* (P3) have been recorded on tenement L29/100 but are both suspected of being positionally reported errors.

3.5.5 Vegetation Condition

Vegetation (excluding areas that have been previously cleared for Pastoral management and or mining exploration) is considered to be in Pristine Condition and displaying normal characteristics for the prevailing seasonal conditions during the field survey in 2021 (Western Botanical, 2021).

Areas previously cleared for exploration have been rehabilitated and casual observations during the 2021 field survey indicated excellent recruitment of a wide range of local native species of representing all strata of the surrounding vegetation. Inclusive of tracks and rehabilitated drill pads, the entire Study Area would be considered to be in Excellent Condition (Western Botanical, 2021).

3.5.6 Introduced Flora Species

No introduced flora species were recorded in or around the Project area during the 2021 review (Western Botanical, 2021) nor the previous Level 2 survey (NVS, 2012a).

However, the following five weed species have previously been found along the proposed haul road alignment (NVS, 2012b):

- *Asphodelus fistulosus* (Wild Onion, Onion Weed);
- *Cleretum papulosum* subsp. *papulosum*;
- *Lysimachia arvensis* (Scarlet Pimpernel);
- *Pentameris airoides* subsp. *airoides*; and
- *Portulaca oleracea* (Wild Portulaca, Pigweed).

The majority of these species were found along existing side tracks and disturbed sites. None of these species are considered declared plants as defined by the Department of Agriculture WA.

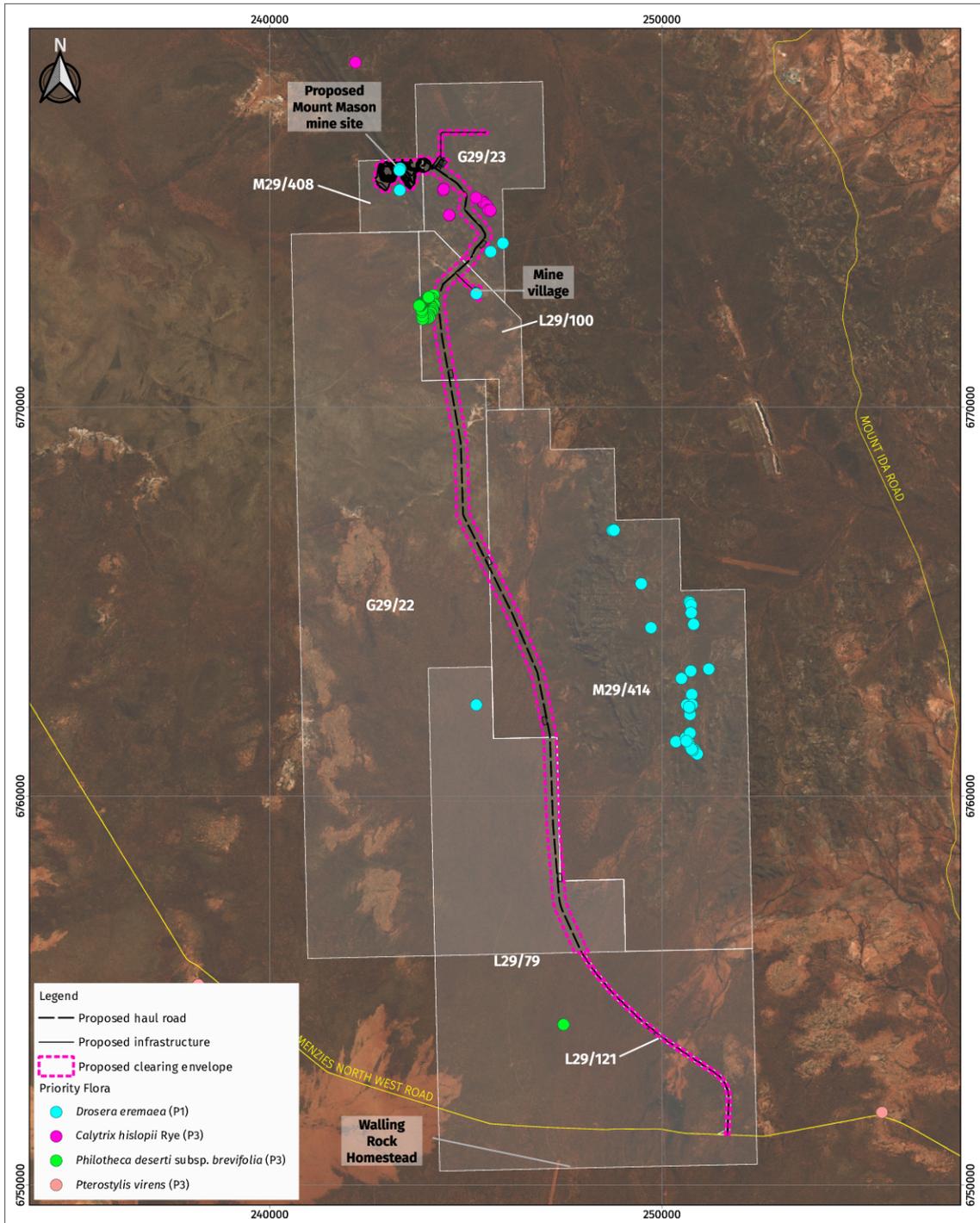


Figure 7
Priority Flora
Overview

Figure 7: Priority Flora – Overview

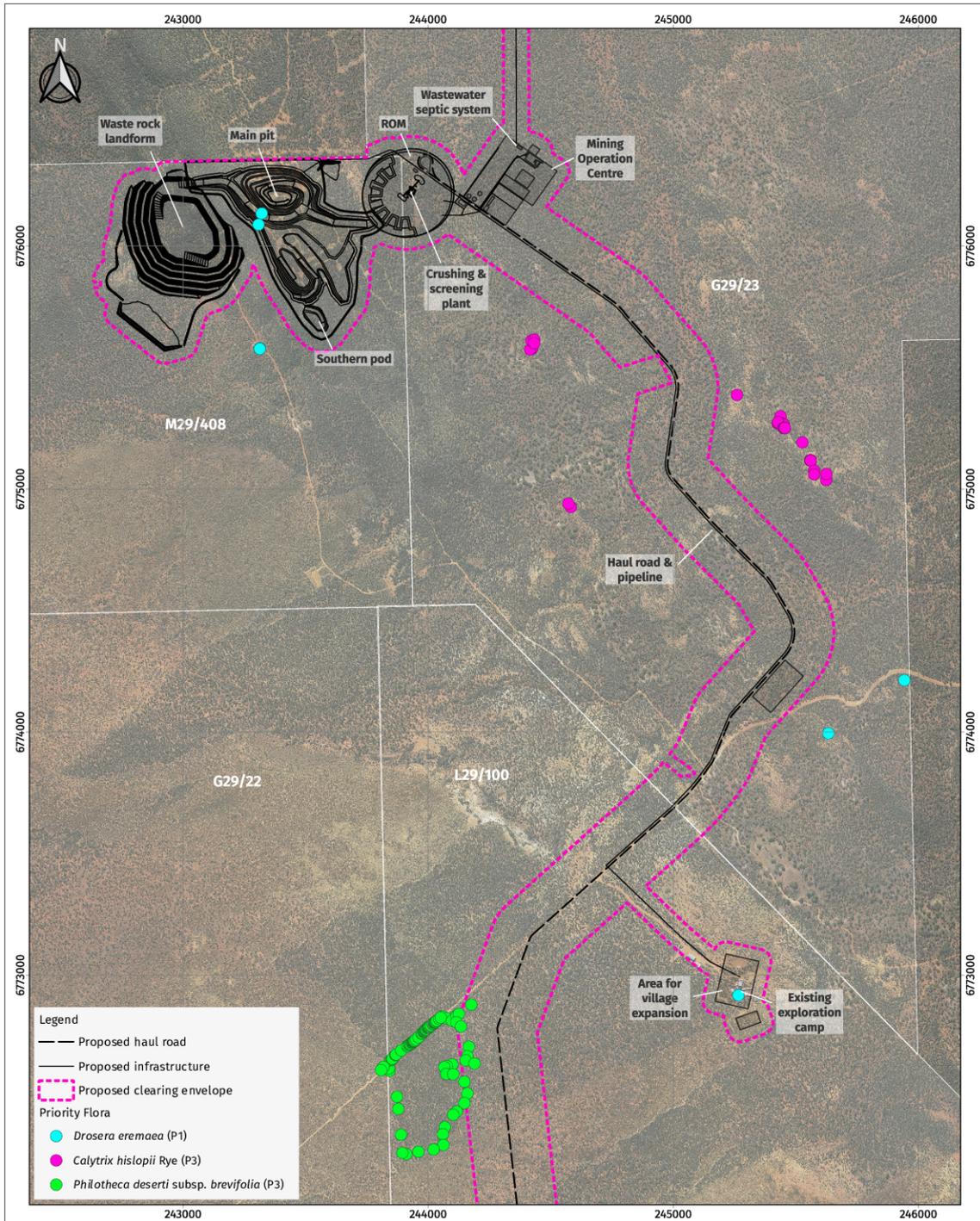


Figure 8
Priority Flora
Main Project Area

Figure 8: Priority Flora - Main Project Area

3.6 Fauna

3.6.1 Fauna Surveys

The following fauna surveys relevant to the Project and the wider area have been undertaken:

- Targeted Fauna Survey June 2021 for Malleefowl, Long-tailed Dunnart, Night Parrot and the Arid Bronze Azure Butterfly (Appendix F);
- Level 2 Fauna Survey of the Mt Mason Mining Tenement (M29/408) by Keith Lindbeck Associates in Spring 2011 and Autumn 2012 (Appendix G);
- Targeted EPBC Survey by Keith Lindbeck Associates in Autumn 2012 (Appendix H);
- Targeted Malleefowl Survey of Non-process Infrastructure Areas by GHD in Spring 2012;
- Central Yilgarn Iron Project, Terrestrial Short-Range Endemic Invertebrate Survey by Outback Ecology 2011; and
- Central Yilgarn Iron Project, Subterranean Fauna Pilot Study at Mt Mason by Rockwater 2012.

The 2021 Targeted Fauna Survey was completed in accordance with the following EPA, DBCA and DAWE requirements for the environmental surveying and reporting of fauna surveys in WA, where relevant and practical, and as documented in:

- EPA Technical Guidance – Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020);
- Interim Guideline for preliminary surveys of Night Parrot (*Pezoporus occidentalis*) in Western Australia (WA Department of Parks and Wildlife [DPaW] 2017);
- Survey Guidelines for Australia's Threatened Birds. EPBC Act survey guidelines 6.2 (2010) (DSEWPaC);
- National Recovery Plan for Malleefowl (*Leipoa ocellata*), Department for Environment and Heritage (Benshemesh 2007); and
- Guideline for the survey of arid bronze azure butterfly (ABAB) in Western Australia (DBCA 2020).

3.6.2 Fauna

A total of 59 vertebrate fauna species were recorded in the Level 2 surveys, comprising 13 reptile species, 5 native terrestrial mammal species and 1 non-native terrestrial mammal species, 6 species of bats and 34 bird species (KLA, 2012d).

A targeted Short Range Endemic (SRE) survey was conducted in 2008 in the Mt Mason area with sample sites all located within the BIF. Results indicate that of the specimens collected only one species *Aganippe* 'MYG224' (Family *Idiopidae*) is an SRE (KLA, 2012b).

A targeted invertebrate survey was undertaken by Keith Lindbeck Associates in 2012. Of the 19 species identified, the classification of six species could not be determined. It is also noted that one of the six, while the sample collected could not be identified, is likely to belong to a genus in which all species are considered to be SREs. The remaining 13 species are not considered to be SREs. No evidence of the species *Aganippe* 'MYG224' was recorded or collected during this survey (KLA, 2012b). The potential SRE habitat supported by these ranges is extensive and is not limited to the area of proposed impact at Mt Mason (KLA, 2012d).

A subterranean fauna sampling programme (pilot study) was undertaken within the survey area by Rockwater Pty Ltd (2012) from November 2011 to May 2012, in accordance with the relevant EPA guidelines (Environmental Protection Authority, 2003). Results indicate the stygofauna community within the Project area are represented by only one stygal group (*Nematoda*), suggesting a depauperate complexity for arid parts of WA. Nematodes are a widespread group with few representatives confined to subterranean environments. It is considered unlikely that the Project will affect their conservation status and they do not warrant further investigation (Rockwater, 2012).

Dedicated troglifauna sampling by trapping and netting yielded no troglobitic fauna within the Project area. The sampling intensity implemented in the Project area exceeded that set by the EPA for a pilot troglifauna survey and further sampling is not required. It is therefore concluded that troglifauna is not a relevant environmental factor for the Project (Rockwater, 2012).

3.6.3 Conservation Significant Fauna

No invertebrate species of conservation significance are listed for the Project area under the EPBC Act, the *Wildlife Conservation Act 1950* (WC Act) or in the DPaW Threatened and Priority Fauna Database.

Searches of DPaW's Threatened and Priority Fauna Database and the EPBC Act list a potential for 11 vertebrate species of conservation significance to occur in the Project area. A summary of the potential fauna species of conservation significance is presented in Table 8, including reference to the Long-tailed Dunnart, which did not appear in desktop searches but was recorded during the Spring 2011 survey.

Table 8: Presence of Conservation Significant Fauna

Common Name Scientific Name	Likelihood of Occurrence	Conservation Status	
		EPBC	WA
Invertebrates			
Arid Bronze Azure Butterfly <i>Ogyris subterrestris petrina</i>	May occur	Critically Endangered	
Mammals			
Long-tailed Dunnart <i>Sminthopsis longicaudata</i>	Confirmed		Priority 4
Reptiles			
Woma <i>Aspidites ramsayi</i>	Not likely to occur		Schedule 4
Birds			
Slender-billed Thornbill <i>Acanthiza iredalei iredalei</i>	Not likely to occur ¹	Vulnerable	
Fork-tailed Swift <i>Apus pacificus</i>	May occur	Migratory	
Great Egret <i>Ardea alba modesta</i>	Not likely to occur	Migratory	
Peregrine Falcon <i>Falco peregrinus</i>	Not likely to occur		Schedule 4

¹ KLA (2012a).

Common Name Scientific Name	Likelihood of Occurrence	Conservation Status	
		EPBC	WA
Australian Bustard <i>Ardeotis australis</i>	Not likely to occur		Priority 4
Hooded Plover <i>Thinornis rubricollis</i>	Not likely to occur		Priority 4
Rainbow Bee-eater <i>Merops ornatus</i>	Confirmed	Migratory	
White-browed Babbler <i>Pomatostomus superciliosus</i>	Confirmed		Priority 4
Crested Bellbird <i>Oreoica gutturalis</i> subsp. <i>gutturalis</i>	Confirmed		Priority 4
Malleefowl <i>Leipoa ocellata</i>	Confirmed	Vulnerable	Schedule 1
Night Parrot <i>Pezoporus occidentalis</i>	Not likely to occur	Endangered	

3.6.3.1 Malleefowl

Malleefowl (*Leipoa ocellata*) is listed as vulnerable under the EPBC Act and Schedule 1 (rare and likely to become extinct) under the WC Act. The Project was referred by Jupiter to the Department of Sustainability, Environment, Water, Population and Community (DSEWPaC) in May 2013 and was assessed as 'Not a Controlled Action if undertaken in a particular manner' (Appendix I).

Malleefowl are large ground dwelling birds belonging to the Megapodiidae family. The Malleefowl is omnivorous and typically has a large home range in woodlands or shrublands that have a deep layer of leaf litter which is used in building nesting mounds. It occupies semi-arid to arid regions of WA, inhabiting dense shrublands and thickets of Mallee (*Eucalyptus* spp.), Boree (*Melaleuca lanceolata*) and Bowgada (*Acacia linophylla*) (Johnstone, R.E. and Storr, G.M., 1998).

Two Malleefowl were observed in the June 2021 Targeted Fauna Survey, one near the beginning of the haul road and inside the project area and one near the bottom of the haul road, but just outside the project area. Malleefowl mounds were recorded at eight locations during the survey (Figure 9 and 10), however only three of these were within the proposed clearing area, and all three were old and disused. Only one mound near the southern end of the haul road, outside of the proposed clearing area was considered under construction (Figure 9) (Western Ecological, 2021).

Historic surveys in 2011 and 2012 by KLA and GHD, and another by Jupiter of the explosives magazine and associated access track and the camp expansion, found 54 Malleefowl mounds, some of which were found outside the Project footprint. Surveys relevant to the Project identified 6 active mounds, and 2 inactive mounds considered to be less than 20 years old (Figure 9 and Figure 10). The density of active mounds varies dependent on the terrain and between tenements. There are no active Malleefowl mounds within the surveyed area of the Mason pits (M29/408) which is likely to be directly related to the terrain with the BIF outcrop (main pit area) being unsuitable nesting habitat. The sandy plain areas to the south of the pits provide more appropriate habitat (KLA, 2012a).

3.6.3.2 *Night Parrot*

The June 2021 Targeted Fauna Survey did not record any Night Parrot calls on any of the three SM4s that were placed out at Mount Mason (two units) and in the haul road (one unit). There is no habitat for Night Parrots in the Mount Mason and haul road sections of the project area (Western Ecological, 2021).

3.6.3.3 *Long-tailed Dunnart*

The Long-tailed Dunnart (*Sminthopsis longicaudata*) was recorded at the base of rocky scree in the Mount Mason section of the project area in 2011 (one individual) and 2012 (one individual) (KLA 2012). This species was not recorded in the project area during the June 2021 Targeted Fauna Survey on any of the five camera traps that were placed out in Mulga shrubland on rocky ridges and rocky hill slopes.

Given the limited number of captures during the historic survey and no captures on camera traps during the 2021 survey, the Long-tailed Dunnart is likely to occur in very low densities in this area (Western Ecological, 2021).

3.6.3.4 *Arid Bronze Azure Butterfly*

There were no records of the Arid Bronze Azure Butterfly (ABAB) in three database searches conducted in June 2021, as this species is known from only two locations. The Project lies within the very large area that has been very broadly mapped as the potential distribution of the Sugar Ant which is the Arid Bronze Azure Butterfly host.

There are two small patches of potentially suitable habitat in the Mount Mason and haul road section of the Project area. However, as the ABAB is currently only known from two populations, both of which are hundreds of kilometres from the project area, and there is only limited potential habitat in the project area, this species is unlikely to be present (Western Ecological, 2021).

3.6.4 *Introduced Fauna Species*

The EPBC Protected Matters Search Tool lists four invasive species that are likely to occur in the Project area, *Capra hircus* (Goat), *Felis catus* (Cat), *Oryctolagus cuniculus* (Rabbit) and *Vulpes vulpes* (Fox). Evidence of *F. catus* and *O. cuniculus* was recorded during the 2012 survey. Canid faeces were noted but were unable to be attributed to *Canis lupis* sp. being either a Dingo or a non-native Dog. Anecdotal sightings of *Equus asinus* (Donkey) were also reported.

3.7 Biodiversity

The Project was referred for assessment under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) in May 2013 (EPBC Ref 2013/6870). Notification was received on 24 June 2013 that the proposed action was not a controlled action, provided it is undertaken in accordance with the manner described in the decision document (Appendix I):

- Clearing must not exceed 115ha;
- Construction activities must not be undertaken within 250m buffer radius of active Malleefowl mounds;
- Inactive Malleefowl mounds outside the development footprint to be retained with a buffer of 50m;

- Prior to construction the development footprint must contain fire trails for the safe transit of fire fighting vehicles to mitigate the effects of advancing fires; and
- Prior to construction “Malleefowl Ahead” warning signs and advisory speed limit signs, must be installed along main access roads within the development footprint.

Western Ecological (2021) reports that the presence of the Arid Bronze Azure Butterfly and the Night Parrot are unlikely due to there being limited habitat, or no habitat, on the Project area for these species. The same report suggests that the Long-tailed Dunnart is likely to occur in very low densities in this area, and that there are also a relatively large number of records of the Long-tailed Dunnart to the south of the Project area associated with rocky areas at Mount Ida (Western Ecological, 2021).

The 2021 flora review searched similar landforms and geology to those of the Project area within other relevant Western Botanical survey reports (Appendix C). The search found that:

- *Drosera* sp. in the *macrantha* – *D. eremaea* complex (noted then as *Drosera macrantha* subsp. *macrantha*) were recorded at the Brooking Hills and Mt Richardson survey sites (these may in fact reflect *Drosera eremaea*); and
- *Hibiscus* sp. *Perrinvale Station was also reported at the Churchill survey east of Leonora (Western Botanical, 2021).*

The proposal is unlikely to have any significant impact on the biodiversity attributed through these species.

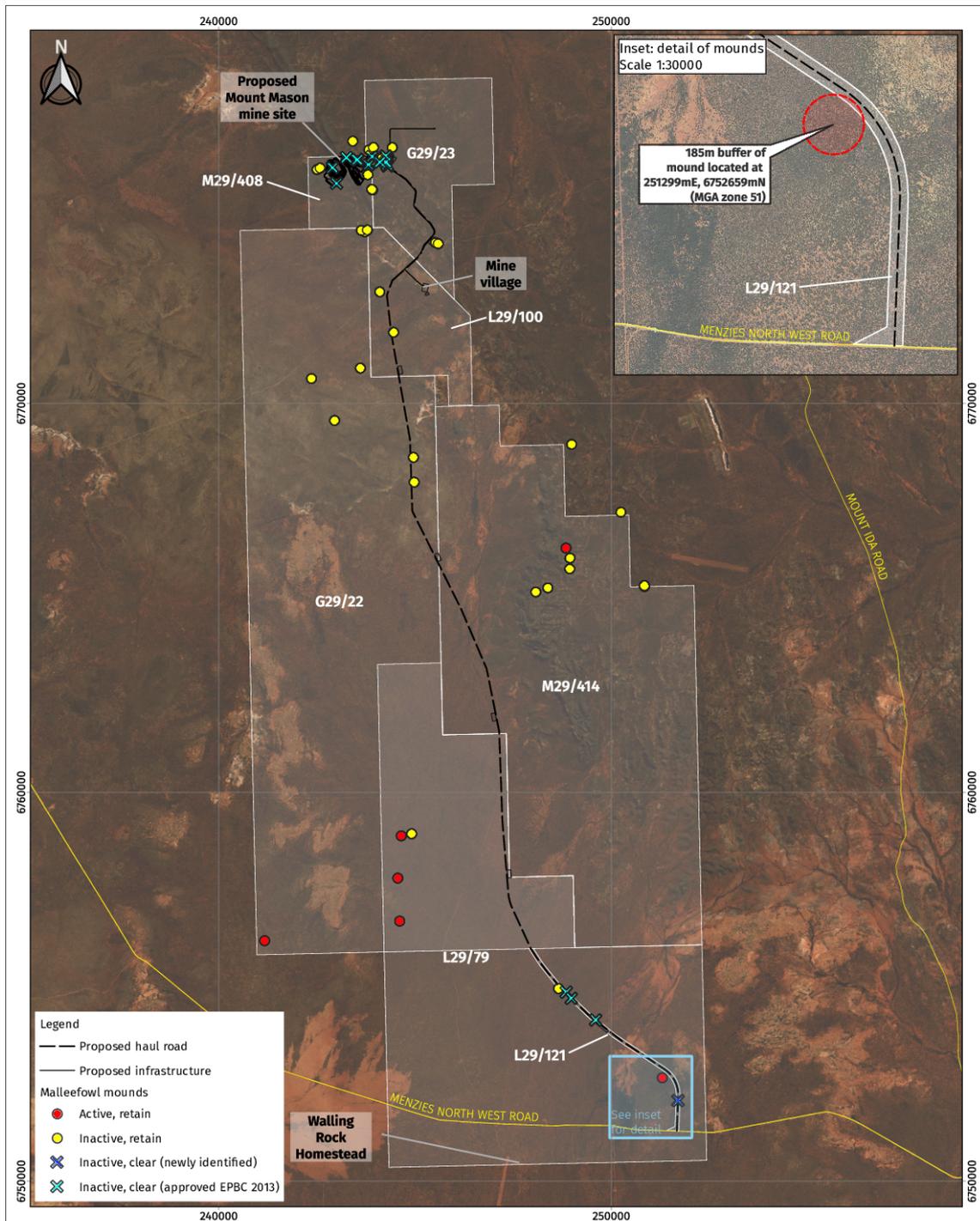


Figure 9
Malleefowl Mound Locations
Overview

Figure 9: Malleefowl Mound Locations – Overview

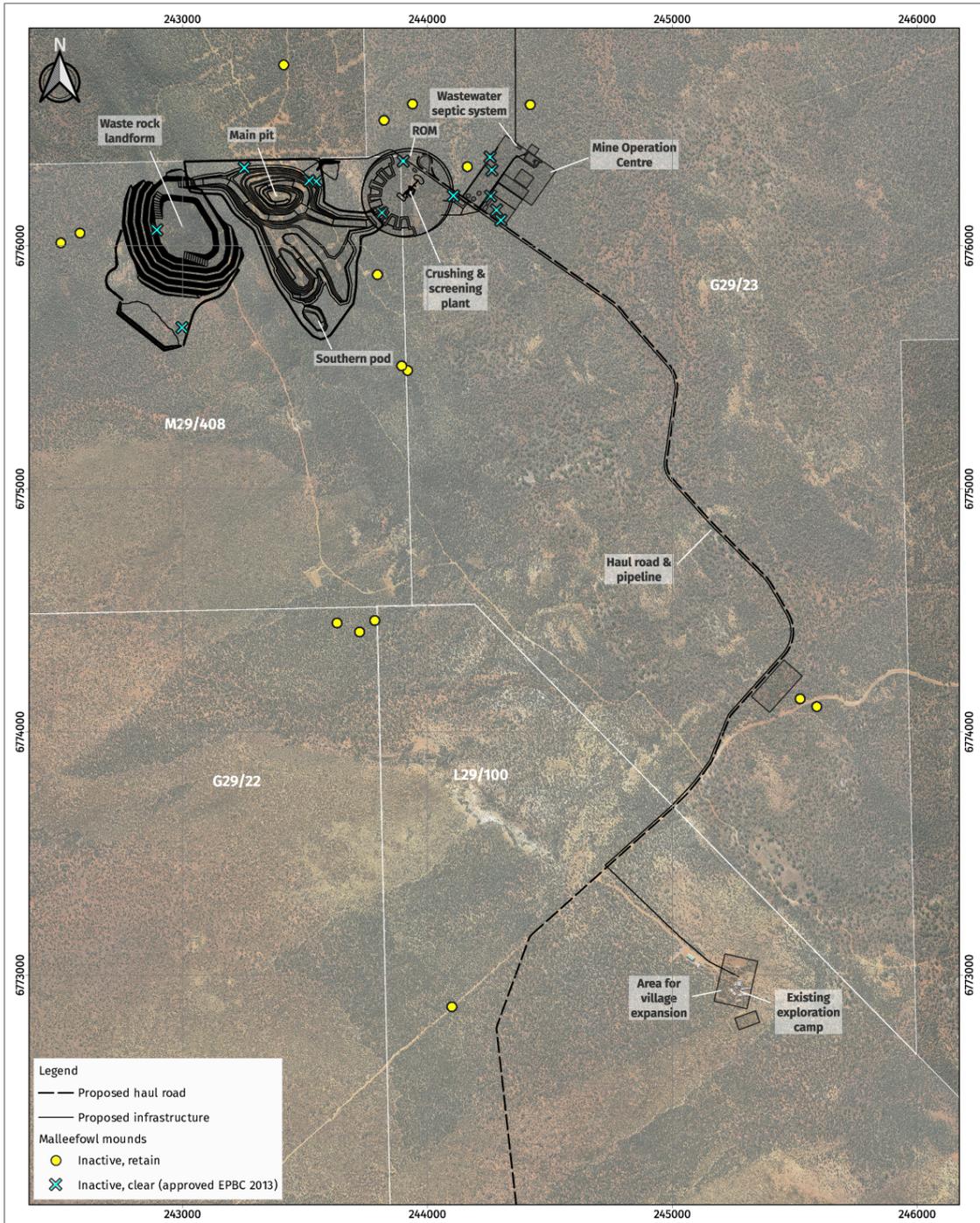


Figure 10
Malleefowl Mound Locations
Main Project Area

Figure 10: Malleefowl Mound Locations - Main Project Area