Marble Bar Project

Reconnaissance and Targeted Flora Assessment

Prepared for Lithium 1 Pty. Ltd.

May 2022

Prepared by

BOTANICA CONSULTING

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Document Information

Prepared for: Lithium 1 Pty. Ltd.
Project Name: Marble Bar Project
Tenements: E45/5573
Job Reference: Reconnaissance and Targeted Flora Assessment
Job Number: 2022/032
Date: 23/05/22

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Cover Photo: Vegetation within the Marble Bar project area (12/05/2022)

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EXECUTIVE SUMMARY

Botanica Consulting Pty Ltd (Botanica) was commissioned by Lithium 1 Pty. Ltd. to undertake a reconnaissance and targeted flora/ vegetation survey of their Marble Bar project area (referred to as the 'survey area'). The survey area is approximately 9,264 ha in extent and is located approximately 13 km east of Marble Bar, Western Australia. This assessment is intended to support Program of Works approvals for the exploration programs related to the Marble Bar project.

The survey area lies within the Chichester (PIL01) subregion of the Pilbara Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

In accordance with Beard (1990) the survey area is located in the Fortescue Botanical District of the Eremaean Province. The geology consists of Archaean granite and volacnics, overlain by deposits of Proterozoic sediments (including jaspilite and dolomite) and volcanics. The landscape is mountainous, rising to 1,250 m. Soils are chiefly hard alkaline red soils on plains and pediments, with shallow and skeletal soils on the ranges. Vegetation is predominately tree- and shrub-steppe communities with Eucalyptus trees, Acacia shrubs and *Triodia wiseana* tussock grasslands, with some mulga in valleys and short-grass plains on alluvia.

The dominant land uses of the Chichester subregion include native pasture grazing, Aboriginal lands and reserves and Crown lands and reserves, with conservation areas and mining leases also present (Kendrick, 2001). The survey area is partially located within the Eginbah pastoral lease.

Prior to the field assessment a literature review was undertaken of previous flora and conducted within the local region. Documents reviewed included:

- Mattiske Consulting (2018). *A Review of Flora and Vegetation and Targeted Search for Pityrodia sp. Marble Bar-Sulphur Springs Zinc Copper Project*. Unpublished report prepared on behalf of Venturex Resources Ltd., May 2018
- Ecologia Environment (2012). *Pityrodia sp. Marble Bar Targeted Flora Survey*. Unpublished report prepared on behalf of Fortescue Metals Group Ltd., August 2012
- Bennett Environmental Consulting (2011). Flora and Vegetation of Access Road Marble Bar-Telfer Road to Kintyre. Unpublished report prepared on behalf of Cameco Australia Ltd., November 2011
- Ecologia Environment (2009). *Marillana (E47/1408) Vegetation and Flora Report (version 5)*. Unpublished report prepared on behalf of Brockman Resources Ltd., October 2009

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened and Priority Flora database (DBCA, 2022a);
- DBCA Threatened and Priority ecological communities database (DBCA, 2022b);
- NatureMap database search (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The DBCA Threatened and Priority Flora database search (Ref: 28-0522FL) and the DBCA Threatened and Priority ecological communities database search (Ref: 27-0522EC) were conducted with a 100 km buffer.

The NatureMap spatial portal search and EPBC Protected Matters search were conducted with a 20 km buffer from the survey area.

The NatureMap desktop search identified 119 vascular flora species as occurring within 20 km of the survey area, representing 69 genera from 36 families. The most diverse families were Fabaceae (93 species), followed by Poaceae and Asteraceae (nine species each). The most dominant genera were Acacia (14 species), Triodia (5 species) and Cullen, Heliotropium and Swainsona (four species each).

The desktop review identified six introduced flora (weed) species, representing five families, as potentially occurring in the vicinity of the survey area. Of these, one species, Parkinsonia aculeata, is listed as a Declared Pest on the Western Australian Organism List (WAOL) under the Biosecurity and Agriculture Management (BAM) Act 2007 and as a Weed of National Significance.

The assessment of the DBCA Threatened and Priority database search (DBCA, 2022a), Protected Matters search (DAWE, 2021a) and previous relevant literature identified 51 significant flora species recorded within a 100 km radius of the survey area. These consist of two Threatened, 19 Priority 1, three Priority 2, 22 Priority 3 and five Priority 4 taxa.

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area. The assessment identified two species as previously recorded in the survey area, consisting of two Priority 3 species. In addition, the assessment one Priority 4 taxa as likely to occur in the survey area and six taxa as possibly occurring in the survey area, consisting of two Priority 1, three Priority 3 and one Priority 4 taxa.

The Protected Matters search (DAWE, 2020a) did not identify any Threatened Ecological Community as occurring within 40 km of the survey area.

Analysis of the Priority Ecological Communities within the Pilbara region (DBCA, 2021a) did not identify any additional significant vegetation assemblages as likely or possibly occurring within the survey area.

Vegetation associations within the survey area retain >99% of their pre-European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

No Environmentally Sensitive Areas were identified within the survey area.

There are no wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) within the survey area.

There are no gazetted conservation reserves within the survey area. The nearest conservation area is a proposed reserves (LR3129/890) that is currently categorised as UCL. This area is located approximately 17 km east of the survey area. Activities within the survey area are unlikely to impact this proposed reserve.

Botanica conducted a reconnaissance flora/ vegetation from the 12th May 2022, with the area traversed on foot and by 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management).

The field survey identified 44 vascular flora taxa within the survey area. These taxa represented 141 genera across 16 families, with the most diverse families being Fabaceae (16 species), followed by Malvaceae, Myrtaceae and Poaceae (four species each). Dominant genera include *Acacia* (nine species), *Senna* (three species) and *Eucalyptus*, *Grevillea* and *Triodia* (two species each).

A total of five weed species, representing five families, were recorded within the survey area. None of these species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management* (BAM) *Act 2007* or as a Weed of National Significance.

No Threatened, Priority or otherwise significant flora species were identified within the survey area.

A total of three broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.

The survey found RP-EW3 was the most widespread community in the survey area, occupying 4,925 ha (53.2%), while DD-EW1 was the most restricted with 885 ha (9.6%). The most diverse vegetation type was DD-EW1 with 23 species (52.3%), while the least diverse was RH-EW2 with 16 species (36.4%).

No Threatened, Priority or otherwise significant ecological communities were identified within the survey area.

Native vegetation condition within the survey area was categorized as 'good' to 'completely degraded'. Impacts to vegetation within the survey area include access tracks, historical mining operations, dam construction and introduced weed species.

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act. The assessment found that the proposed vegetation clearing activities may be at variance with clearing principle (f).

1 INTRODUCTION

Botanica Consulting Pty Ltd (Botanica) was commissioned by Lithium 1 Pty. Ltd. to undertake a reconnaissance and targeted flora/ vegetation survey of their Marble Bar project area (referred to as the 'survey area'). The survey area is approximately 9,264 km in extent and is located approximately 13 km east of Marble Bar, Western Australia (Figure 1-1). This assessment is intended to support Program of Works approvals for the exploration programs related to the Marble Bar project.

1.1 Objectives

The flora assessment was conducted in accordance with the requirements of a reconnaissance flora survey as defined in *Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment – December 2016* (EPA, 2016a). The objectives of the assessment were to:

- gather background information on flora and vegetation in the target area (literature review, database and map-based searches);
- identify significant flora, vegetation and ecological communities and assess the potential sensitivity to impact;
- conduct a field survey to verify / ground truth the desktop assessment findings;
- undertake floristic community mapping to a scale appropriate for the bioregion and described according to the National Vegetation Information System (NVIS) structure and floristics;
- undertake vegetation condition mapping;
- assess the project area's plant species diversity, density, composition, structure and weed cover, using NVIS classification system for vegetation description;
- assess Matters of National Environmental Significance (MNES) and indicate whether potential impacts on MNES as protected under the EPBC Act are likely to require referral of the project to the Commonwealth DAWE; and
- determine the State legislative context of environmental aspects required for the assessment.

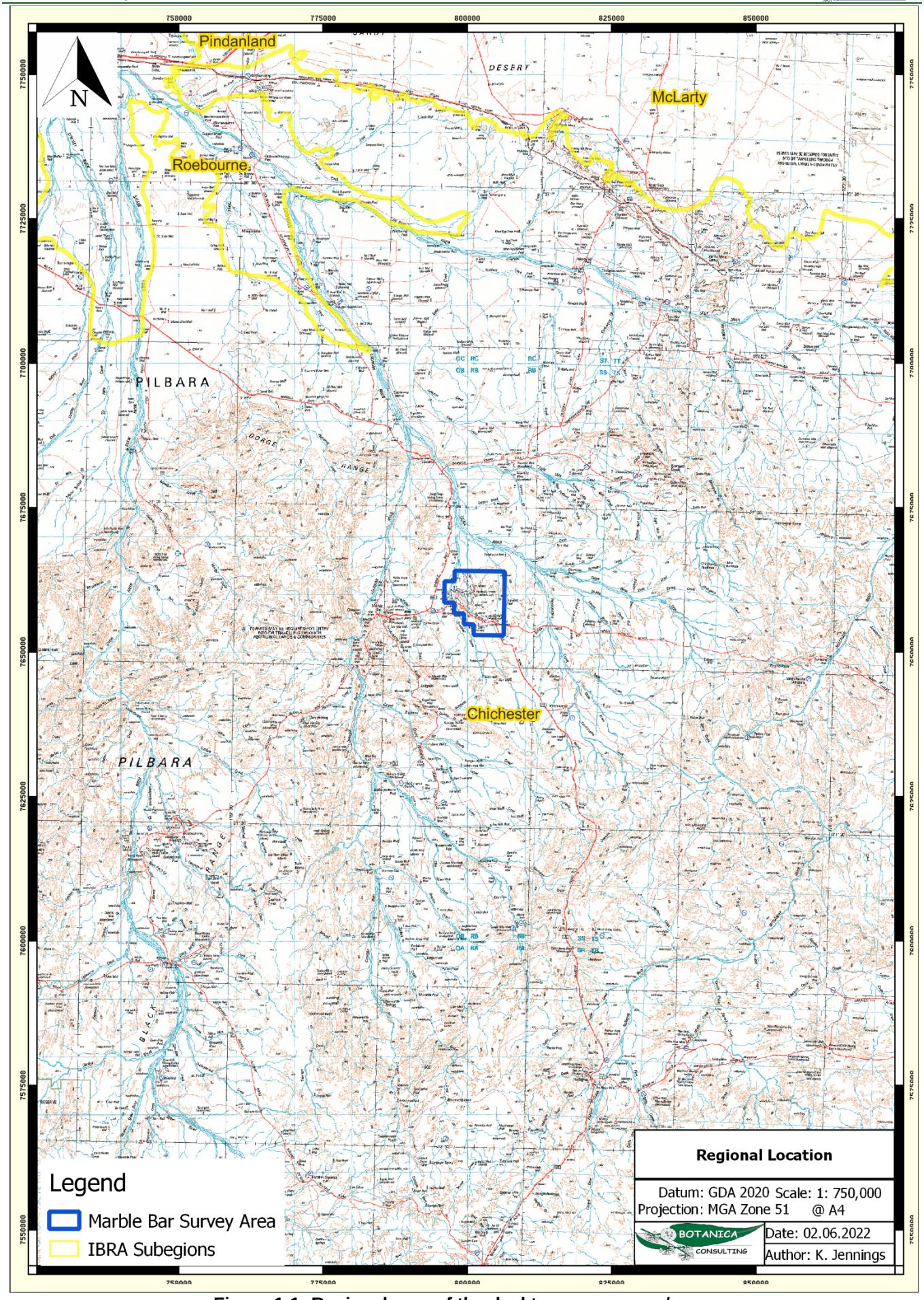

Figure 1-1: Regional map of the desktop survey area/ survey area

2 BIOPHYSICAL ENVIRONMENT

2.1 Regional Environment

The survey area lies within the Chichester (PIL01) subregion of the Pilbara Bioregion, as defined by the Interim Biogeographic Regionalisation of Australia (IBRA).

The Eastern Goldfield subregion (9,044,560 ha) lies on the northern section of the Pilbara Craton and is comprised of undulating Archaean granite and basalt plains with significant areas of basaltic ranges. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine, Shaw, Yule, Sherlock). The vegetation consists of shrub steppe of *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands on plains, with *Eucalyptus leucophloia* tree steppe on ranges (Kendrick, 2001).

In accordance with Beard (1990) the survey area is located in the Fortescue Botanical District of the Eremaean Province. The geology consists of Archaean granite and volcanics, overlain by deposits of Proterozoic sediments (including jaspilite and dolomite) and volcanics. The landscape is mountainous, rising to 1,250 m. Soils are chiefly hard alkaline red soils on plains and pediments, with shallow and skeletal soils on the ranges. Vegetation is predominately tree- and shrub-steppe communities with *Eucalyptus* trees, *Acacia* shrubs and *Triodia wiseana* tussock grasslands, with some mulga in valleys and short-grass plains on alluvia.

2.2 Land Use

The dominant land uses of the Chichester subregion include native pasture grazing, Aboriginal lands and reserves and Crown lands and reserves, with conservation areas and mining leases also present (Kendrick, 2001). The survey area is partially located within the Eginbah pastoral lease.

2.3 Soil Landscape Systems

The survey area lies within the Fortescue Province, located in the northern Pilbara, sitting to the north of the Ashburton Province, west of the Officer and Paterson-Yeneena Provinces, and south of the Canning Province. The landscape consists of hills and ranges (with stony plains and some alluvial plains and sandplains) on the volcanic, granitic and sedimentary rocks of the Pilbara Craton. Soils are predominately stony, with red loamy earths and red shallow loams (and some red/brown non-cracking clays, red deep sandy duplexes and red deep sands.

The Fortescue Province is further divided into soil-landscape zones, with the survey area located in the Abydos Hills and Plains (283) Zone. It is located in the northern Pilbara between Yandeyarra Community, Bamboo Springs Station and Marble Bar. The landscape consists of stony plains (with some hills) on granitic rocks of the Pilbara Craton. Soils include red deep sandy duplexes and red shallow loams with stony soils, red sandy earths and red loamy earths.

In accordance with soil landscape system mapping data (Government of Western Australia, 2019), the soil landscape zones are divided into soil landscape systems, with the survey areas located within three soil landscape systems, as described in Table 2-1 and shown in Figure 2-1.

Table 2-1: Soil landscape systems within the survey area

Soil Landscape System	Description	Extent within Survey Area
Granitic System	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.	3,831 ha (41.3%)
Macroy System	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex shrubby grasslands.	4,982 ha (53.8%)
River System	Narrow, seasonally active flood plains and major river channels supporting moderately close, tall shrublands or woodlands of acacias and fringing communities of eucalypts sometimes with tussock grasses or spinifex.	452 ha (4.9%)

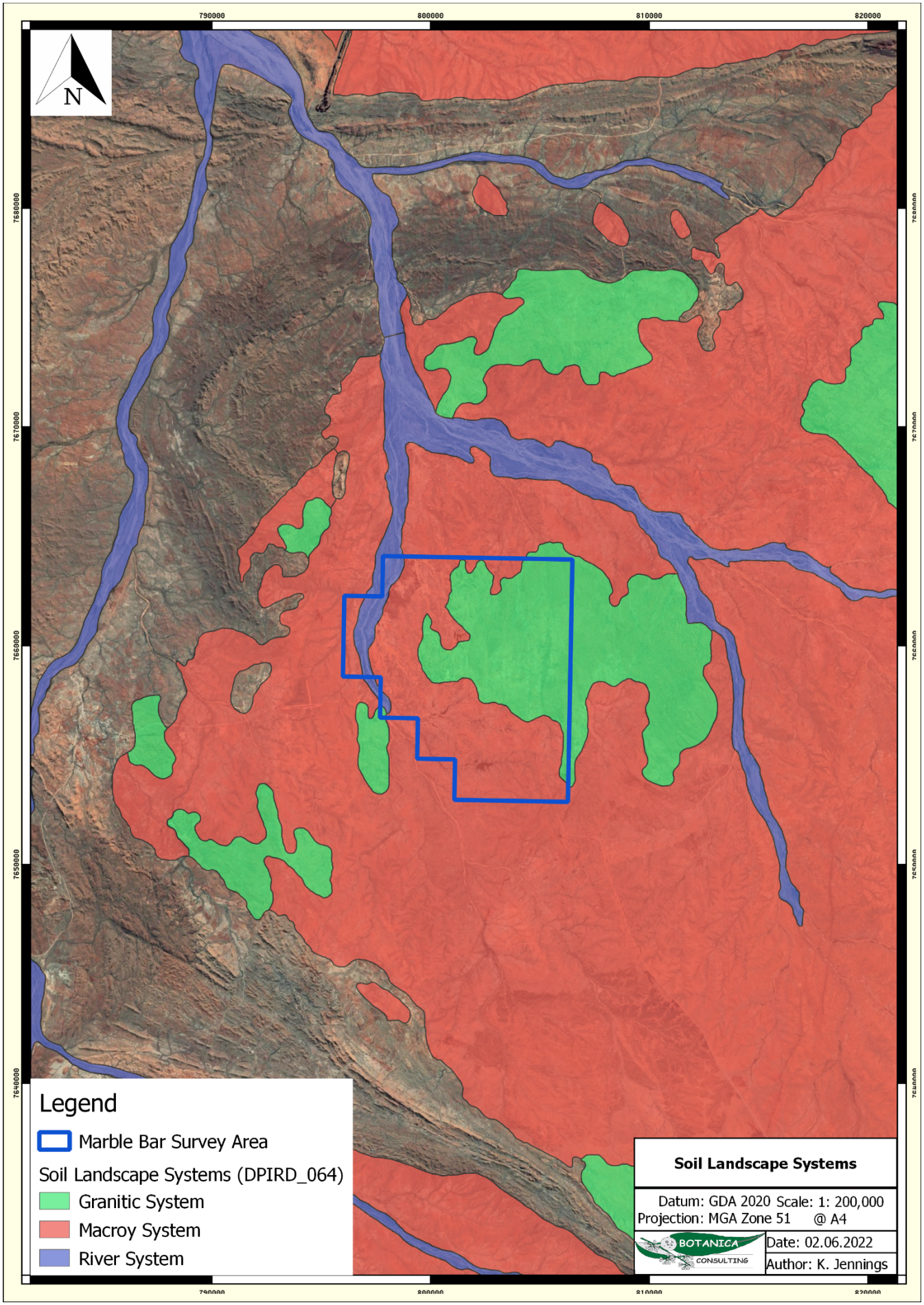

Figure 2-1: Map of soil landscape systems within the survey area

2.4 Regional Vegetation

In accordance with Tille (2006), the vegetation of the Abydos Hills and Plains Zone is described as spinifex grasslands with kanji (and some tussock grasslands).

More broadly, the vegetation of the Fortescue Province is described by Tille (2006) as typified by hard spinifex (*Triodia wiseana*) or soft spinifex (*T. pungens*) grassland with scattered emergent snappy gum (*Eucalyptus leucophloia*) and kanji (*Acacia inaequilatera*). Other spinifex which may be present include *T. basedowii*, *T. brizioides*, *T. lanigera*, *T. longiceps*, *T. epactia* and *T. plurinervata*. Hamersley bloodwood (*Corymbia hamersleyana*), *Acacia orthocarpa*, two-veined wattle (*A. bivenosa*), *A. pruinocarpa*, *A. ancistrocarpa*, *Senna glutinosa*, *Grevillea wickhamii* and *Hakea lorea* are among other tree and shrub species.
The stony plains associated with basaltic and sedimentary hills support hard and soft spinifex grasslands and low mulga (*A. aneura*) woodlands. The coastal alluvial plains have soft spinifex grasslands on the loamy soils while clay soils support tussock grasslands of Roebourne Plains grass (*Eragrostis xerophila*) with neverfail (*E. setifolia*), barley Mitchell grass (*Astrebla pectinata*), weeping grass (*Chrysopogon fallax*), swamp grass (*Eriachne benthamii*) and scattered snakewood (*Acacia xiphophylla*) and prickly wattle (*A. victoriae*). River gum (*Eucalyptus camaldulensis*) and coolabah (*E. victrix*) woodlands with soft spinifex and buffel grass (*Cenchrus ciliaris*) understorey are found on the active floodplains. The coastal sandy plains have hard and soft spinifex grasslands, while hard spinifex is found on the Fortescue sandplains. The hardpan wash plains support mulga woodlands and shrublands as well as spinifex grasslands.

2.5 Conservation Values

The Chichester subregion contains one wetland of national importance, the De Grey River, and two wetlands of subregional importance (Kendrick, 2001). Other significant assemblages in the region include hummock grassland reptile and small mammal communities and the cracking clay communities of the Chichester Range and Mungaroona Range.

No ecosystems are listed as threatened under WA State legislation occur within the subregion, but seven communities and vegetation associations are thought to be at risk for a variety of reasons. Grazing and trampling from livestock, goats and rabbits, predation from foxes, cats and other predators and impacts from mining are the main threatening processes in the region.

2.6 Climate

The climate of the Pilbara region is characterised as arid-tropical with summer rain, with an annual precipitation of 250-300 mm (Beard, 1990). Rainfall data for the Marble Bar weather station (#4106), located approximately 13 km west of the survey area, is shown in Figure 2-2. Mean monthly rainfall ranges from 108.9 mm in January to 0.7 mm in August, with a mean annual rainfall of 391.8 mm. The survey was conducted in May 2022, with significant rainfall recorded in the months prior to the survey (January/February). Climate conditions are unlikely to represent a survey constraint.

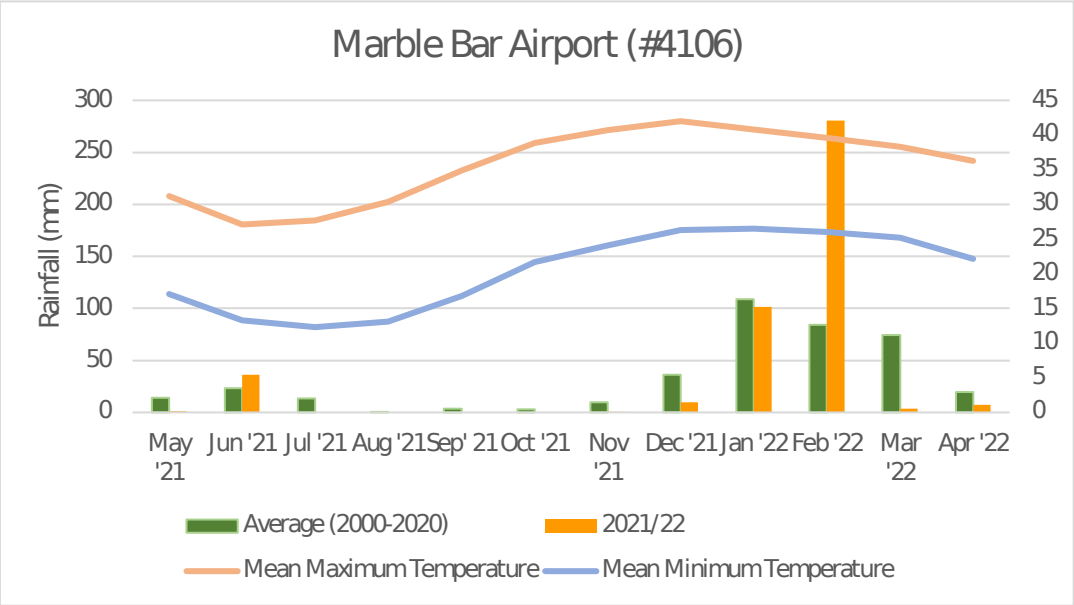

Figure 2-2: Climate data for Marble Bar (#4106) (BoM, 2022a)

2.7 Hydrology

According to the Geoscience Australia database (2015), there is one surface water body and multiple ephemeral drainage lines intersect with the survey area (Figure 2-3).

Groundwater Dependent Ecosystems (GDE) includes biological assemblages of species such as wetlands or woodlands that use groundwater either opportunistically or as their primary water source. For the purposes of this report, a GDE is defined as any vegetation community that derives part of its water budget from groundwater and must be assumed to have some degree of groundwater dependency. In accordance with the BoM *Atlas of Groundwater Dependent Ecosystems* (BoM, 2020b) database, there is one moderate-potential and one low-potential terrestrial GDE within the survey area (Figure 2-3, Table 2-2). There are three unclassified potential aquatic GDE's within the survey area, which are associated with artificial dam constructions.

Table 2-2: Potential GDE's within the survey area

Type	Geomorphology	Potential	Description	Area (ha)	Area (%)
Terrestrial	Dissected flat-topped hills of granitic, volcanic and metamorphic rocks; interspersed by stony plains on granite.	Low	Stony plains and occasional tor fields based on granite supporting hard and soft spinifex grasslands.	3,734	34.9
		Moderate	Active flood plains, major rivers and banks supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands.	452	4.2
Total				**4,186**	**39.1**

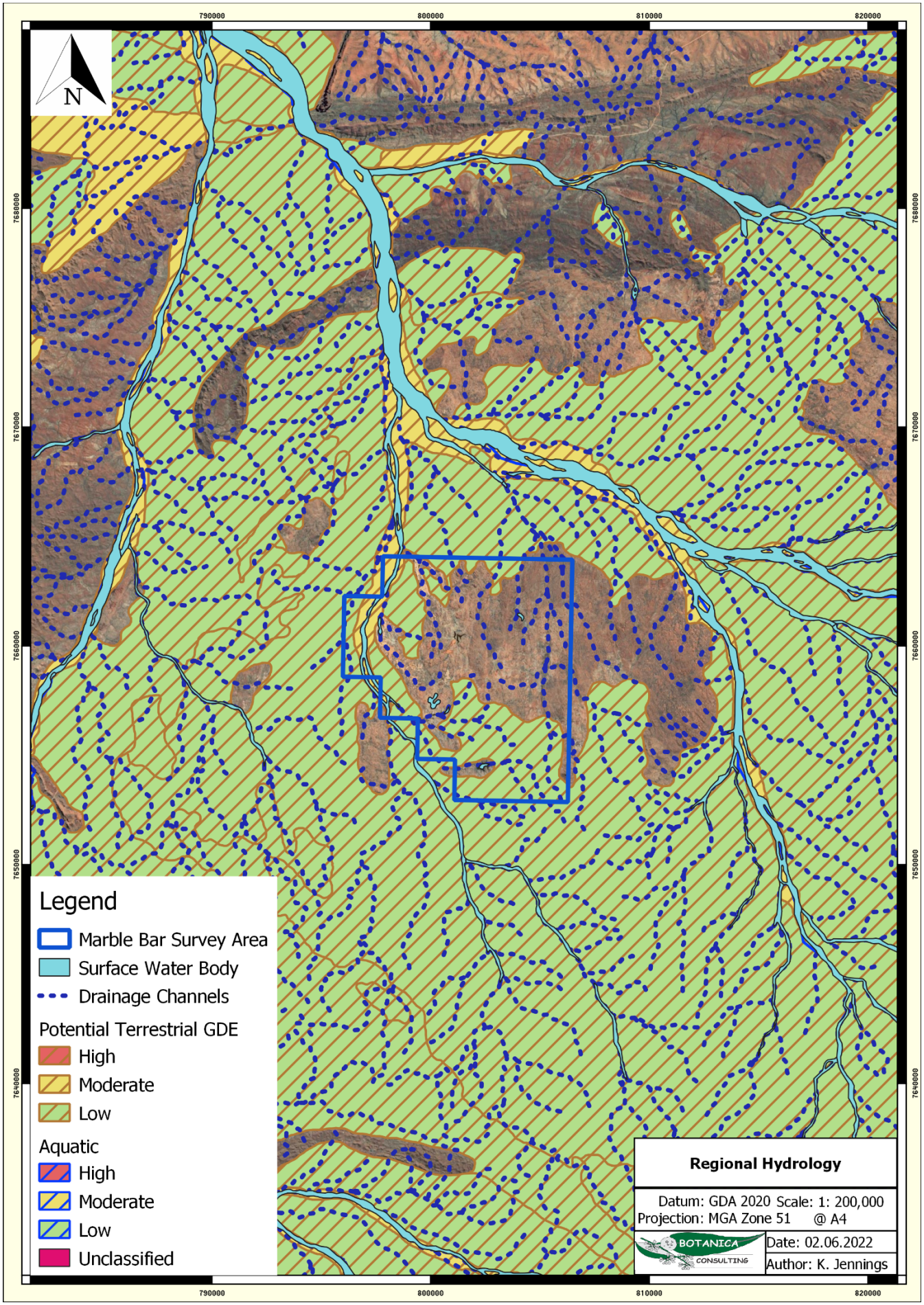

Figure 2-3: Regional hydrology of the survey area

3 SURVEY METHODOLOGY

3.1 Desktop Assessment

Prior to the field assessment a literature review was undertaken of previous flora and vegetation assessments conducted within the local region. Documents reviewed included:

- Mattiske Consulting (2018). *A Review of Flora and Vegetation and Targeted Search for Pityrodia sp. Marble Bar-Sulphur Springs Zinc Copper Project*. Unpublished report prepared on behalf of Venturex Resources Ltd., May 2018
- Ecologia Environment (2012). *Pityrodia sp. Marble Bar Targeted Flora Survey*. Unpublished report prepared on behalf of Fortescue Metals Group Ltd., August 2012
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- Ecologia Environment (2009). *Marillana (E47/1408) Vegetation and Flora Report (version 5)*. Unpublished report prepared on behalf of Brockman Resources Ltd., October 2009

In addition to the literature review, searches of the following databases were undertaken to aid in the compilation of a list of significant flora within the survey area:

- DBCA Threatened and Priority Flora database (DBCA, 2022a);
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- NatureMap database search (DBCA, 2021b); and
- EPBC Protected Matters search tool (DAWE, 2021a).

The DBCA Threatened and Priority Flora database search (Ref: 28-0522FL) and the DBCA Threatened and Priority ecological communities database search (Ref: 27-0522EC) were conducted with a 100 km buffer.

The NatureMap spatial portal search and EPBC Protected Matters search were conducted with a 20 km buffer from the survey area.

Significant flora species identified by the desktop review were assessed with regards to their population extent and distribution and preferred habitat to determine their likelihood of occurrence within the survey area.

The assessment categorised flora species as follows:

- Unlikely- Suitable habitat is not expected to occur and/or the survey area is outside the known range of the species.
- Possible- Suitable habitat may be present, and the area is within the known range of the species. This option is also used when there is insufficient information to determine the preferred habitat of a species.
- Likely- Suitable habitat is expected to occur and there are records within 10 km of the survey area.
- Previously Recorded- A record for this species is located within the survey area. Field survey will ground-truth currently occurring individuals and populations.

It should be noted that these lists are based on observations from a broader area than the assessment area (40 km radius) and therefore may include taxa not present. The databases also often include very old records that may be incorrect or in some cases the taxa in question have become locally or

regionally extinct. Information from these sources should therefore be taken as indicative only and local knowledge and information also needs to be taken into consideration when determining what actual species may be present within the specific area being investigated.

The conservation significance of flora taxa was assessed using data from the following sources:

- *Environment Protection and Biodiversity and Conservation* (EPBC) *Act 1999*. Administered by the Australian Government (DAWE);
- *Biodiversity Conservation* (BC) *Act 2016*. Administered by the WA Government (DBCA);
- Red List produced by the Species Survival Commission (SSC) of the World Conservation Union (also known as the IUCN Red List – the acronym derived from its former name of the International Union for Conservation of Nature and Natural Resources). The Red List has no legislative power in Australia but is used as a framework for State and Commonwealth categories and criteria; and
- Priority Flora list. A non-legislative list maintained by DBCA for management purposes (released December 2018).

Descriptions of conservation significant species and communities are provided in Appendix A.

3.2 Flora and Vegetation Field Assessment

Botanica conducted a reconnaissance flora and vegetation and a targeted flora survey on the 12th May 2022, with the area traversed on foot and by 4WD by Jim Williams (Director/Principal Botanist, Diploma of Horticulture) and Jennifer Jackson (Senior Botanist, BSc (Honours) Environmental Management). The GPS track log of the survey effort is shown in Figure 3-1.

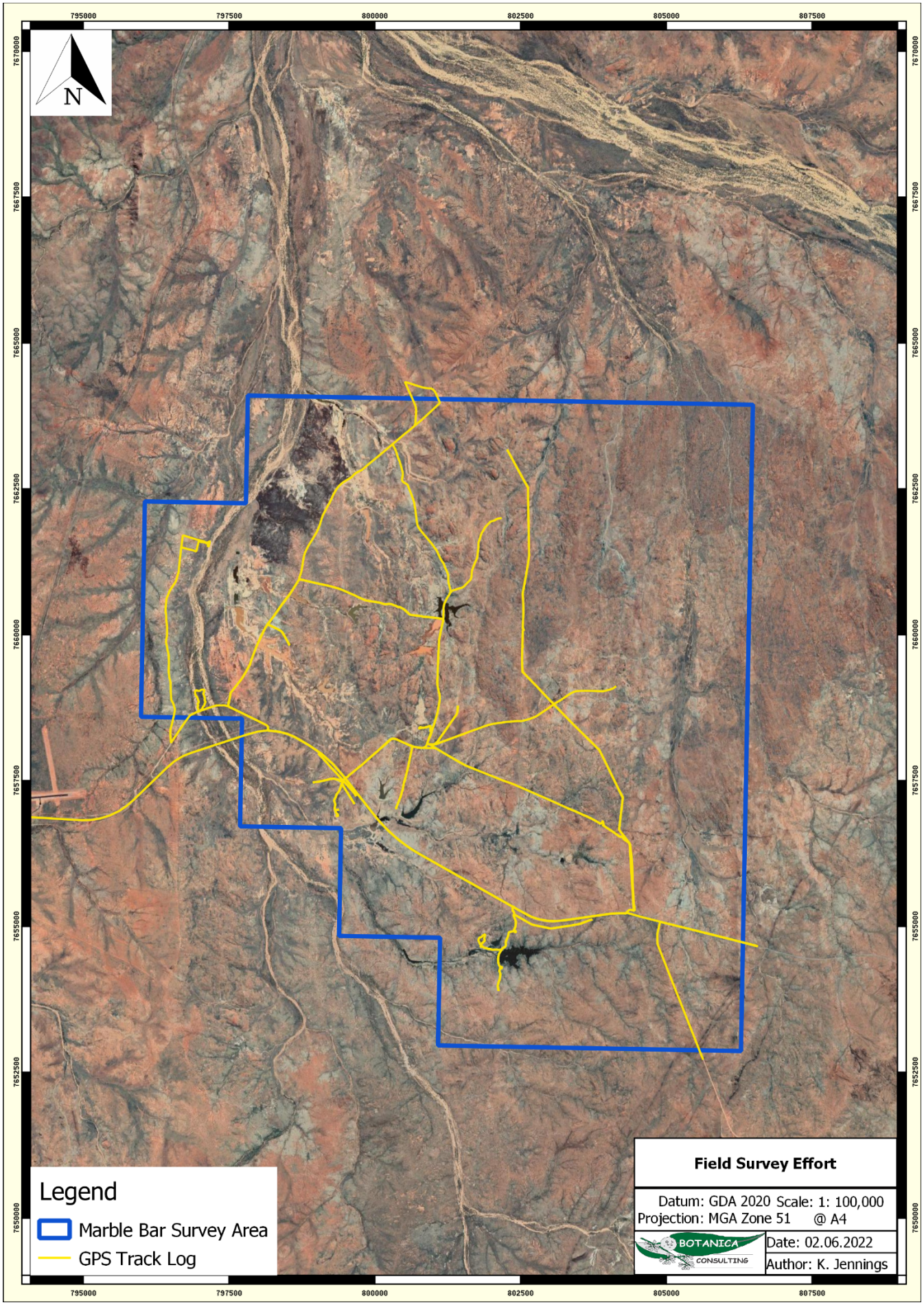

Figure 3-1: GPS track log of the survey effort

3.2.1 Flora Assessment

Prior to the commencement of field work, aerial photography was inspected and obvious differences in the vegetation assemblages were identified. The different vegetation communities identified were then inspected during the field survey to assess their validity. A handheld GPS unit was used to record the coordinates of the boundaries between existing vegetation communities. At each sample point, the following information was recorded:

- GPS location;
- Photograph of vegetation;
- Dominant taxa for each stratum;
- All vascular taxa (including annual taxa);
- Landform classification;
- Vegetation condition rating;
- Collection and documentation of unknown plant specimens; and
- GPS location, photograph and collection of flora of conservation significance if encountered.

Unknown specimens collected during the survey were identified with the aid of samples housed at the Botanica Herbarium and Western Australian Herbarium. Vegetation was classified in accordance with NVIS classifications.

3.3 Data Analysis Tools

Following field assessments, vegetation types and condition were mapped using the GIS program QGIS, and the hectare area/ percentage area of each vegetation type and condition within the survey area was calculated. Spatial maps illustrating the location of vegetation types and any significant flora and/or vegetation were generated using QGIS.

3.4 Scientific Licences

Table 3-1: Scientific Licenses of Botanica Staff coordinating the survey

Licensed Staff	Permit Number	Date of Expiry
Jim Williams	FB62000108 (licence to take flora for scientific purposes)	27/05/2022
Jennifer Jackson	FB62000309 (Licence to take flora for scientific purposes)	11/01/2024

3.5 Survey Limitations and Constraints

It is important to note that flora surveys will entail limitations notwithstanding careful planning and design. Potential limitations are listed in Table 3-2.

The conclusions presented in this report are based upon field data and environmental assessments and/or testing carried out over a limited period of time and are therefore merely indicative of the environmental condition of the site at the time of the field assessments. Also, it should be recognised that site conditions can change with time. Information not available at the time of this assessment which may subsequently become available may alter the conclusions presented.

Some species are reported as potentially occurring based on there being suitable habitat (quality and extent) within the survey area or immediately adjacent. The habitat requirements and ecology of many of the species known to occur in the wider area are however often not well understood or documented. It can therefore be difficult to exclude species from the potential list based on a lack of a specific habitats or microhabitats within the survey area. As a consequence of this limitation, the potential species list produced is most likely an overestimation of those species that actually utilise the survey area for some purpose.

In recognition of survey limitations, a precautionary approach has been adopted for this assessment. Any flora species that would possibly occur within the survey area (or immediately adjacent), as identified through ecological databases, publications, discussions with local experts/residents and the habitat knowledge of the author, has been listed as having the potential to occur.

Table 3-2: Limitations and constraints associated with the flora and vegetation survey

Variable	Potential Impact on Survey	Details
Access problems	Minor Constraint	The survey was conducted via 4WD and on foot. The survey area was extensive with few tracks and roads, therefore vegetation mapping is generalistic and ground-truthing surveys were limited in scope.
Competency/ Experience	Not a constraint	The Botanica personnel that conducted the survey were regarded as suitably qualified and experienced. **Coordinating Staff**: Jim Williams (Botanist), Jennifer Jackson (Botanist) **Data Interpretation**: Jim Williams (Botanist), and Kelby Jennings (Senior Environmental Consultant).
Timing of survey, weather & season	Not a constraint	Fieldwork was undertaken during the EPA's recommended primary survey time period for the Eremaean Province (i.e., 6-8 post wet season March-June). Significant rainfall was recorded in the region in the months prior to the survey.
Area disturbance	Minor constraint	The majority of native vegetation survey area was in good to degraded condition. Historical impacts from mining operations and other human disturbance have significantly affected vegetation composition and structure within the survey area
Survey Effort/ Extent	Minor constraint	Survey intensity was restricted for the size/significance of the area with a reconnaissance and targeted flora survey completed to identify vegetation types and significant flora and vegetation. Constraints were due to the extent of the survey area and limited access and time constraints.
Availability of contextual information at a regional and local scale	Not a constraint	DBCA desktop searches for significant flora and ecological communities were used to inform the survey effort and identify the location of significant environmental values. BoM, DWER, DPIRD, DBCA and DAWE databases were reviewed to obtain appropriate regional desktop information on the biophysical environment of the local region. Results of previous assessments in the local area were reviewed to provide context on the local environment.
Completeness	Minor constraint	In the opinion of Botanica, the survey area was covered sufficiently in order to identify broad-scale vegetation assemblages. However, further ground-truthing may be required to further refine vegetation communities within the survey area. All observed flora individuals were able to be identified to species level. Fieldwork was undertaken during the EPA's recommended primary survey time period for the Eremaean Province. The vegetation associations for this study were based on visual descriptions of locations in the field. The distribution of these vegetation associations outside the survey area is not known, however vegetation associations identified were categorised via comparison to vegetation distributions throughout WA given on NVIS (DotEE, 2017).

4 RESULTS

4.1 Desktop Assessment

4.1.1.1 Flora

The NatureMap desktop search identified 119 vascular flora species as occurring within 20 km of the survey area, representing 69 genera from 36 families. The most diverse families were Fabaceae (93 species), followed by Poaceae and Asteraceae (nine species each). The most dominant genera were *Acacia* (14 species), *Triodia* (5 species) and *Cullen*, *Heliotropium* and *Swainsona* (four species each).

4.1.1.2 Introduced Flora

The desktop review identified six introduced flora (weed) species, representing five families, as potentially occurring in the vicinity of the survey area. Of these, one species, *Parkinsonia aculeata*, is listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management* (BAM) *Act 2007* and as a Weed of National Significance.

The full list of potential weed species is contained in Appendix B.

4.1.1.3 Significant Flora

The assessment of the DBCA Threatened and Priority database search (DBCA, 2022a), Protected Matters search (DAWE, 2022a) and previous relevant literature identified 51 significant flora species recorded within a 100 km radius of the survey area. These consist of two Threatened, 19 Priority 1, three Priority 2, 22 Priority 3 and five Priority 4 taxa (Appendix C).

These taxa were assessed for distribution and known habitat to determine their likelihood of occurrence within the survey area. The assessment identified two species as previously recorded in the survey area, consisting of two Priority 3 species. In addition, the assessment one Priority 4 taxa as likely to occur in the survey area and six taxa as possibly occurring in the survey area, consisting of two Priority 1, three Priority 3 and one Priority 4 taxa (Table 4-1). The full flora likelihood assessment is listed in Appendix C. The locations of the DBCA database records are illustrated spatially in Figure 4-1.

Table 4-1: Significant flora potentially occurring within the survey area

Taxon	Status			Habitat	Assessment	Likelihood
	EPBC	BC Act	DBCA			
Acacia cyperophylla var. *omearana*	-	-	P1	Stony & gritty alluvium. Along drainage lines.	Within known range, habitat may be present	Possible
Corchorus sp. Yarrie (J. Bull & D. Roberts CAL 01.05)	-	-	P1	Brown clay soils. Slopes	At extreme of known range	Possible
Eragrostis crateriformis	-	-	P3	Clayey loam or clay. Creek banks, depressions.	Within known range, habitat may be present	Possible
Euphorbia clementii	-	-	P3	Gravelly hillsides, stony grounds.	Within known range, habitat likely to be present.	Previously Recorded
Euploca mutica	-	-	P3	-	Outside usual range of species, records may be incorrect.	Previously Recorded
Heliotropium murinum	-	-	P3	Red sand. Plains.	Within known range, habitat may be present	Possible
Rostellularia adscendens var. *latifolia*	-	-	P3	Ironstone soils. Near creeks, rocky hills.	Within known range, habitat may be present	Possible
Bulbostylis burbidgeae	-	-	P4	Granitic soils. Granite outcrops, cliff bases.	Within known range, habitat likely to be present.	Likely
Ptilotus mollis	-	-	P4	Stony hills and screes.	Within known range, habitat may be present	Possible

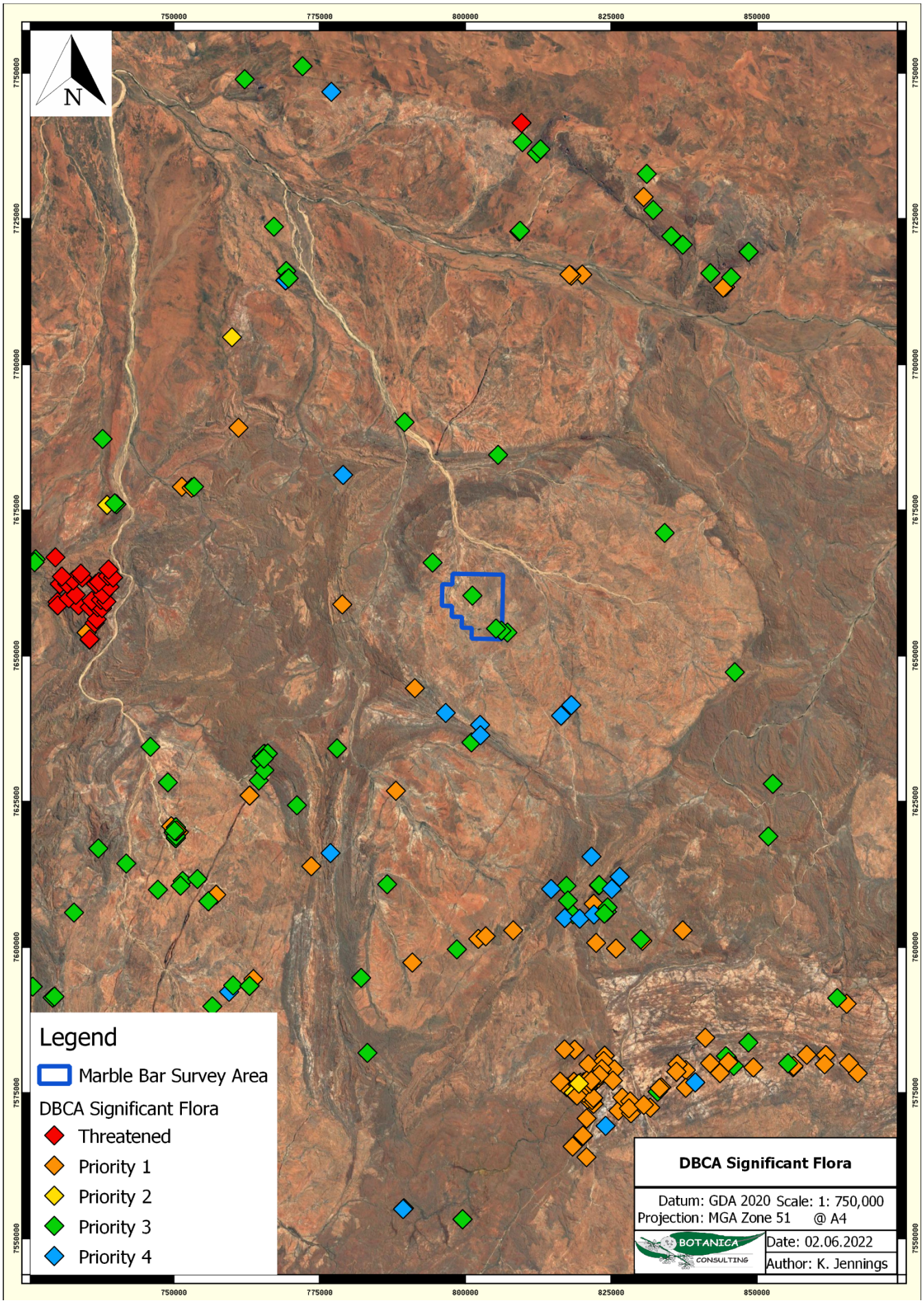

Figure 4-1: Significant flora within the desktop search area

4.1.1.4 Vegetation and Ecological Communities

4.1.1.5 Vegetation Associations

The Pre-European vegetation association spatial mapping dataset (DPIRD, 2018) identified two vegetation associations as occurring within the survey area (Figure 4-2). The association descriptions and their remaining extent, as specified in the 2018 Statewide Vegetation Statistics (DBCA, 2019b) are provided in Table 4-2. Areas retaining less than 30% of their pre-European vegetation extent generally experience exponentially accelerated species loss, while areas with less than 10% are considered "endangered" (EPA, 2000). Both vegetation associations retain >99% of their pre-European extent, and development within the survey area will not significantly reduce the current extent of these vegetation associations.

Table 4-2: Pre-European vegetation associations within the survey area

Vegetation Association	Current Extent (ha)	Pre-European extent remaining	% Protected for Conservation	Floristic Description	Extent within Survey Area
Abydos Plain 93	414,171	99.94	-	Hummock grasslands, shrub steppe; kanji over soft spinifex	9,206 ha (99.4%)
Abydos Plain 619	10,485	100	-	Medium woodland; river gum (*Eucalyptus camaldulensis*)	58 ha (0.6%)

4.1.1.6 Significant Ecological Communities

The Protected Matters search (DAWE, 2022a) did not identify any Threatened Ecological Community as occurring within 40 km of the survey area.

Analysis of the Priority Ecological Communities within the Pilbara region (DBCA, 2021a) did not identify any additional significant vegetation assemblages as likely or possibly occurring within the survey area.

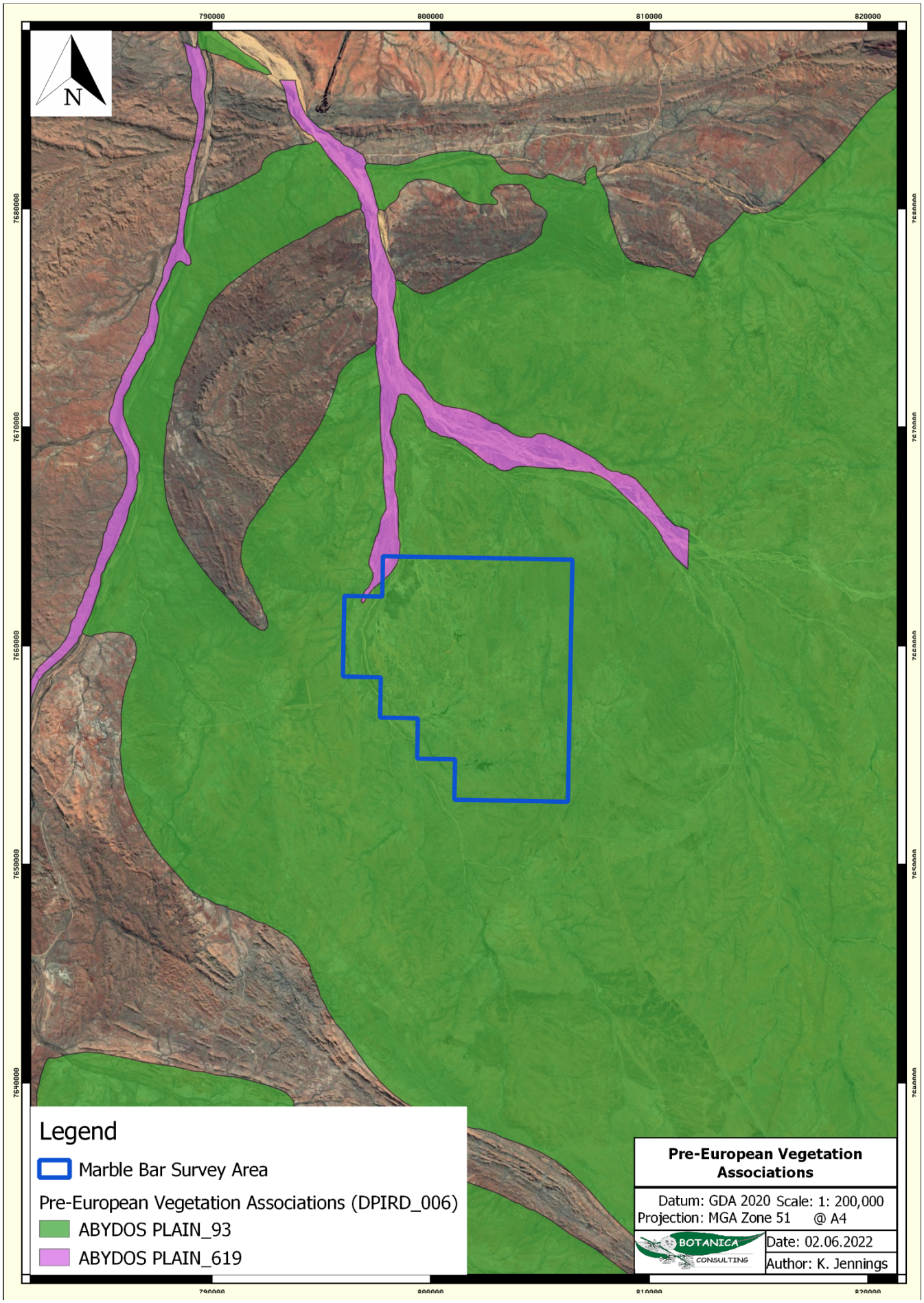

Figure 4-2: Pre-European vegetation systems within the survey area

4.2 Field Assessment

4.2.1 Flora

The field survey identified 44 vascular flora taxa within the survey area. These taxa represented 141 genera across 16 families, with the most diverse families being Fabaceae (16 species), followed by Malvaceae, Myrtaceae and Poaceae (four species each). Dominant genera include *Acacia* (nine species), Senna (three species) and *Eucalyptus*, *Grevillea* and *Triodia* (two species each). Of these, five taxa (11.4%) were introduced (weed) species. The full field species inventory is listed in Appendix E.

4.2.1.1 Introduced Flora

A total of five weed species, representing five families, were recorded within the survey area. None of these species are listed as a Declared Pest on the Western Australian Organism List (WAOL) under the *Biosecurity and Agriculture Management* (BAM) *Act 2007* or as a Weed of National Significance.

Family	Taxon	Common Name	WAOL Status	Control Category	WONS
Asteraceae	*Bidens bipinnata*	Bipinnate Beggartick	Permitted - s11	No Control Category	No
Curcurbitaceae	*Cucumis myriocarpus*	Paddy Melon	Permitted - s11	No Control Category	No
Fabaceae	*Vachellia farnesiana*	Mimosa Bush	Permitted - s11	No Control Category	No
Papaveraceae	*Argemone ochroleuca*	Mexican Poppy	Permitted - s11	No Control Category	No
Poaceae	*Cenchrus ciliaris*	Buffel Grass	Permitted - s11	No Control Category	No

4.2.1.2 Significant Flora

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant flora includes:

- flora being identified as threatened or priority species;
- locally endemic flora or flora associated with a restricted habitat type (e.g. surface water or groundwater dependent ecosystems);
- new species or anomalous features that indicate a potential new species;
- flora representative of the range of a species (particularly, at the extremes of range, recently discovered range extensions, or isolated outliers of the main range);
- unusual species, including restricted subspecies, varieties or naturally occurring hybrids; and
- flora with relictual status, being representative of taxonomic groups that no longer occur widely in the broader landscape.

No Threatened, Priority or otherwise significant flora species were identified within the survey area.

4.2.2 Vegetation Communities

A total of three broad-scale vegetation communities were identified within the survey area. Vegetation community descriptions and extent are listed below in Table 4-3 and illustrated spatially in Figure 4-3. Vegetation community descriptions and extents were determined from field survey results, aerial imagery interpretation and extrapolation of the communities.

The survey found RP-EW3 was the most widespread community in the survey area, occupying 4,925 ha (53.2%), while DD-EW1 was the most restricted with 885 ha (9.6%). The most diverse vegetation type was DD-EW1 with 23 species (52.3%), while the least diverse was RH-EW2 with 16 species (36.4%).

Table 4-3: Summary of vegetation types within the survey area

Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Landform	Image
DD-EW1 885 ha (9.6%)	*Eucalyptus* open woodland	*Eucalyptus camaldulensis* open woodland over *Grevillea pyramidalis, Melaleuca glomerata* and *Androcalva luteiflora* open shrubland over *Pluchea rubelliflora, Stemodia grossa* and *Polycarpaea longiflora* sparse herbland	Drainage Depression	
RH-EW2 975 ha (10.5%)	*Eucalyptus* low sparse woodland	*Eucalyptus leucophloia* subsp. *Leucophloia* low sparse woodland over *Acacia orthocarpa, A. inaequilatera* and *A. pyrifolia* var. *pyrifolia* open shrubland over *Ptilotus polystachyus, Solanum lasiophyllum* and *Triodia wiseana* low sparse shrubland/tussock grassland	Rocky Hillslopes	

Vegetation Community	Broad Floristic Formation (NVIS III)	Vegetation Description (NVIS V)	Landform	Image
RP-EW3 4,925 ha (53.2%)	*Eucalyptus* sparse woodland	*Corymbia hamersleyana* sparse woodland over *Acacia pyrifolia* var. *pyrifolia, Acacia bivenosa* and *Acacia stellaticeps* open shrubland over *Triodia longiceps* and *Aristida contorta* tussock grassland	Rocky Plain	

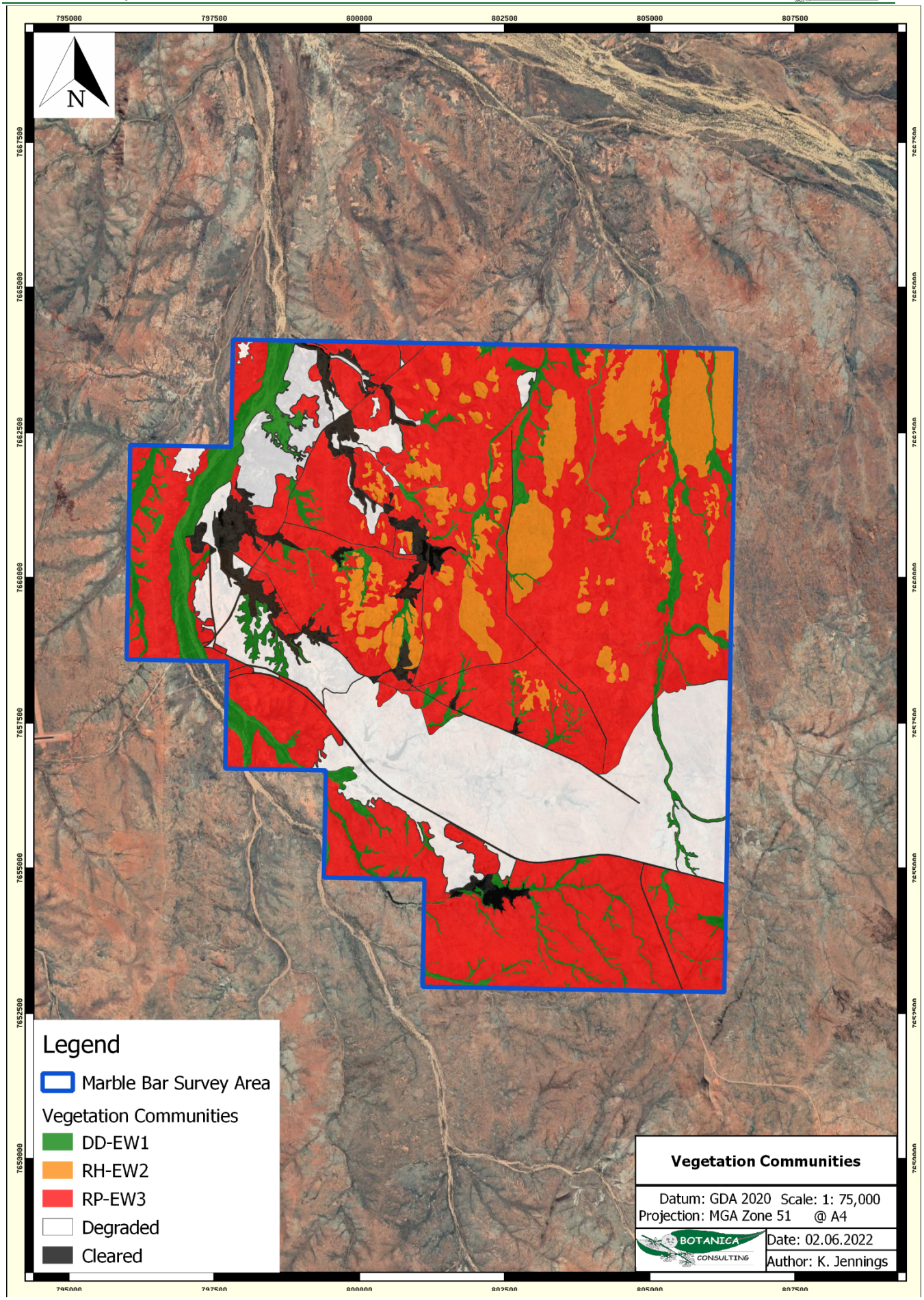

Figure 4-3: Vegetation types within the survey area

4.2.3 Vegetation Condition

Based on the vegetation condition rating scale adapted from Keighery (1994) and Trudgen, (1988), native vegetation within the survey area was categorized as 'good' to 'completely degraded'. (Table 4-4, Figure 4-4). Vegetation condition rating descriptions are listed in Appendix F. Impacts to vegetation within the survey area include access tracks, historical mining operations, dam construction and introduced weed species.

Table 4-4: Vegetation condition rating within the survey area

Condition rating	Description	Area (ha)	Area (%)
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.	6,785	73.3
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.	2,078	22.4
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.	401	4.3
TOTAL		**9,264**	**100**

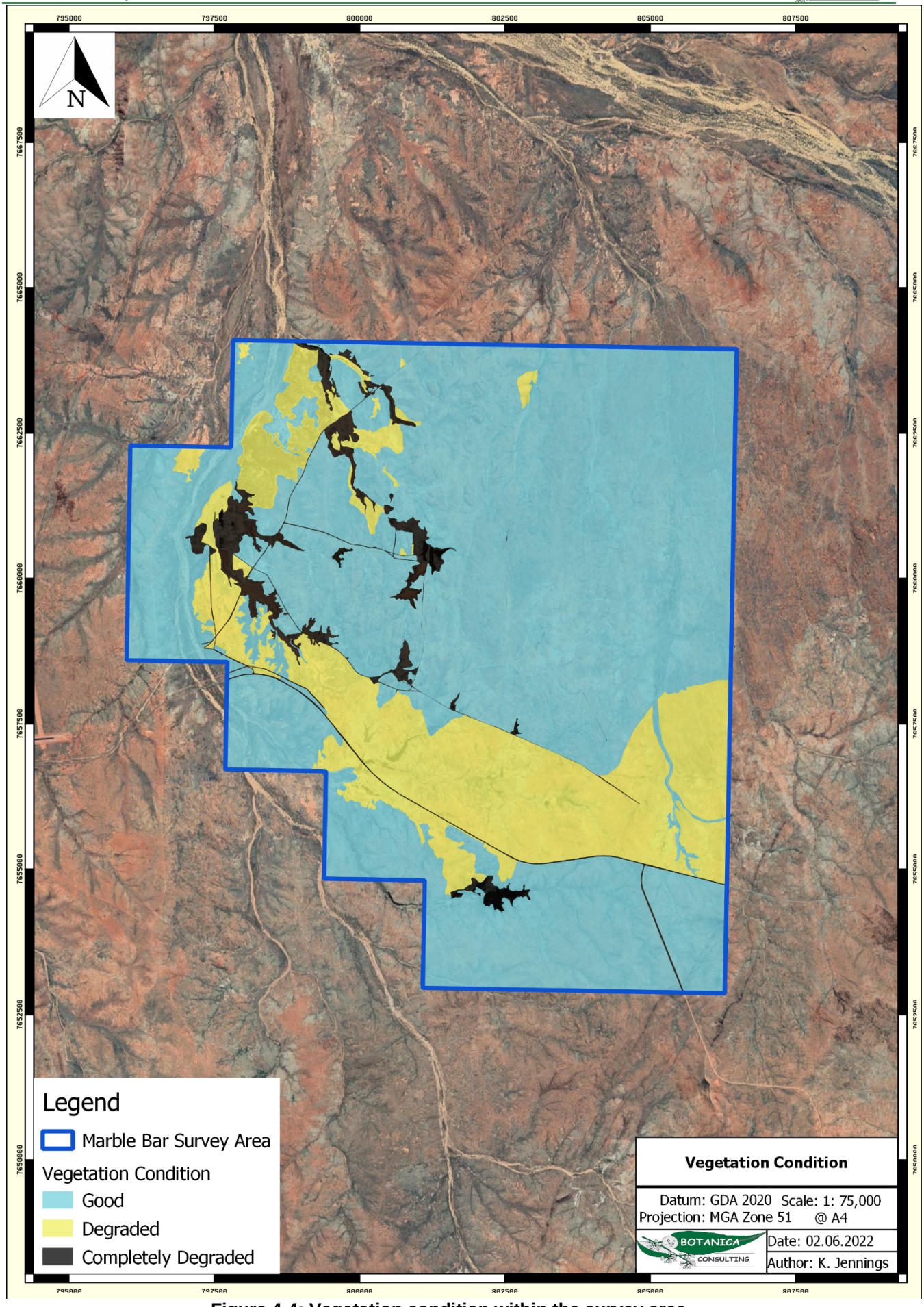

Figure 4-4: Vegetation condition within the survey area

4.2.4 Significant Vegetation

According to the EPA *Environmental Factor Guideline for Flora and Vegetation* (EPA, 2016b) significant vegetation includes:

- vegetation being identified as threatened or priority ecological communities;
- vegetation with restricted distribution;
- vegetation subject to a high degree of historical impact from threatening processes;
- vegetation which provides a role as a refuge; and
- vegetation providing an important function required to maintain ecological integrity of a significant ecosystem.

No Threatened, Priority or otherwise significant ecological communities were identified within the survey area.

4.3 Matters of National Environmental Significance

4.3.1 Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act protects matters of national environmental significance and is used by the Commonwealth DAWE to list threatened taxa and ecological communities into categories based on the criteria set out in the Act (www.environment.gov.au/epbc/index.html). The Act provides a national environmental assessment and approval system for proposed developments and enforces strict penalties for unauthorised actions that may affect matters of national environmental significance. Matters of national environmental significance as defined by the Commonwealth EPBC Act include:

- Nationally threatened flora species;
- World heritage properties;
- National heritage places;
- Wetlands of international importance (often called 'Ramsar' wetlands after the international treaty under which such wetlands are listed);
- Nationally threatened ecological communities;
- Commonwealth marine area;
- The Great Barrier Reef Marine Park; and
- Nuclear actions (including uranium mining) a water resource, in relation to coal seam gas development and large coal mining development.

No Matters of National Environmental Significance were identified within the survey area.

4.4 Matters of State Environmental Significance

4.4.1 *Environmental Protection Act WA 1986*

The EP Act provides for the prevention, control and abatement of pollution and environmental harm, for the conservation, preservation, protection, enhancement and management of the environment. The Act is administered by The Department of Water and Environment Regulation (DWER), which is the State Government's environmental regulatory agency.

Under Section 51C of the EP Act and the *Environmental Protection (Clearing of Native Vegetation) Regulations (Regulations) WA 2004* any clearing of native vegetation in Western Australia that is not eligible for exemption under Schedule 6 of the *EP Act 1986* or under the Regulations 2004 requires a clearing permit from the DWER or DMIRS. Under Section 51A of the *EP Act 1986* native vegetation includes aquatic and terrestrial vegetation indigenous to Western Australia, and intentionally planted vegetation declared by regulation to be native vegetation, but not vegetation planted in a plantation or planted with commercial intent. Section 51A of the *EP Act 1986* defines clearing as "the killing or destruction of; the removal of; the severing or ringbarking of trunks or stems of; or the doing of substantial damage to some or all of the native vegetation in an area, including the flooding of land, the burning of vegetation, the grazing of stock or an act or activity that results in the above". Exemptions under Schedule 6 of the EP Act and the EP Regulations do not apply in ESAs as declared under Section 51B of the EP Act or TEC listed under State and Commonwealth legislation.

No Matters of State Environmental Significance were identified within the survey area.

4.4.2 *Biodiversity Conservation Act 2016*

This Act is used by the Western Australian DBCA for the conservation and protection of biodiversity and biodiversity components in Western Australia and to promote the ecologically sustainable use of biodiversity components in the State. Taxa are classified as 'Threatened" when their populations are geographically restricted or are threatened by local processes (see following sections for Threatened definitions). Under this Act all native flora are protected throughout the State. Financial penalties are enforced under this Act if threatened species are collected without an appropriate license.

Under Section 54(1) of the BC Act, habitat is eligible for listing as critical habitat if:

a) it is critical to the survival of a threatened species or a threatened ecological community; and
b) its listing is otherwise in accordance with the ministerial guidelines.

No threatened species or critical habitat listed under the BC Act were recorded within the survey area.

4.5 Other Areas of Conservation Significance

The DBCA lists 'Priority' species and communities which are under consideration for declaration as 'Threatened' under the BC Act. These Priority species/ communities have no formal legal protection until they are endorsed by the Minister as being Threatened.

No Priority species or PEC as listed by the DBCA were identified within the survey area.

No Environmentally Sensitive Areas were identified within the survey area.

There are no wetlands of international importance (Ramsar Wetlands) or national importance (Australian Nature Conservation Agency Wetlands) within the survey area.

There are no gazetted or proposed conservation reserves within the survey area.

The nearest conservation area is a proposed reserves (LR3129/890) that is currently categorised as UCL. This area is located approximately 17 km east of the survey area. Activities within the survey area are unlikely to impact this proposed reserve.

Both proposed and gazetted conservation reserves are managed by DBCA, with gazetted conservation reserves vested with the Conservation and Parks Commission of Western Australia. The Conservation and Parks Commission is an independent statutory authority that was established under the Conservation and Land Management (CALM) Act 1984 in November 2000 and is the controlling body in which the State's conservation estate, including national parks, conservation parks, nature reserves, state forests and timber reserves, are vested. The Conservation and Parks Commission develops policies and provides independent advice to the Minister for Environment with respect to conservation, the management of ecological biodiversity and the application of ecologically sustainable forest management. The DBCA manages land on behalf of the Conservation and Parks Commission.

The location of proposed and gazetted conservation reserves, ESA's and Nationally Important Wetlands in relation to the survey area is provided in Figure 4 3.

Figure 4-5: Areas of conservation significance

4.6 Native Vegetation Clearing Principles

Based on the outcomes from the survey undertaken, Botanica assessed the results of the desktop and field survey with regards to the native vegetation clearing principles listed under Schedule 5 of the EP Act (Table 4-5). The assessment found that the proposed vegetation clearing activities may be at variance with clearing principle (f).

Table 4-5: Assessment against native vegetation clearing principles

Letter	Principle Native vegetation should not be cleared if it:	Assessment	Outcome
(a)	comprises a high level of biological diversity.	Vegetation within the survey area is considered to be of low biological diversity and is well represented outside the survey area. No Threatened, Priority or otherwise significant flora or ecological communities were identified within the survey area.	Clearing is unlikely to be at variance with this principle
(b)	comprises the whole or part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to WA.	No evidence for the presence of significant fauna or habitat within the survey area was observed during the field survey.	Clearing is unlikely to be at variance with this principle
(c)	includes, or is necessary for the continued existence of rare flora.	No Threatened Flora taxa, pursuant to the BC Act and the EPBC Act were identified within the survey area.	Clearing is unlikely to be at variance with this principle
(d)	comprises the whole or part of or is necessary for the maintenance of a threatened ecological community (TEC).	No Threatened Ecological Communities were identified as potentially occurring within the survey area.	Clearing is unlikely to be at variance with this principle
(e)	is significant as a remnant of native vegetation in an area that has been extensively cleared	All vegetation associations retain over 99% of their Pre-European extent.	Clearing is unlikely to be at variance with this principle
(f)	is growing, in, or in association with, an environment associated with a watercourse or wetland	Several artificial surface water bodies and multiple ephemeral drainage lines were identified within the survey area.	Clearing may be at variance with this principle
(g)	Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	The survey area and surrounding region has not been extensively cleared. Clearing within the survey area is not considered likely to lead to land degradation issues such as salinity, water logging or acidic soils.	Clearing is unlikely to be at variance with this 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.	Clearing within the survey area is unlikely to impact any conservation areas.	Clearing is unlikely to be at variance with this 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.	Several surface water bodies and multiple drainage lines were identified within the survey area. Potential aquatic GDE's were identified within the survey area. Clearing activities are unlikely to impact hydrological systems.	Clearing is unlikely to be at variance with this principle
(j)	Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence of flooding	Pilbara region is characterised as arid-tropical with summer rain, with an annual precipitation of 250-300 mm. Ground-disturbance activities are unlikely to impact surface water flow or increase the probability of flooding events.	Clearing is unlikely to be at variance with this principle

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APPENDIX A: CONSERVATION RATINGS BC ACT AND EPBC ACT

Definitions of Conservation Significant Species

Code	Category
State categories of Threatened and Priority species	
Threatened Species (T) Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as Threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).	
CR	**Critically Endangered** Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
EN	**Endangered** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
VU	**Vulnerable** Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.
Extinct species Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.	
EX	**Extinct** Species where *"there is no reasonable doubt that the last member of the species has died"*, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for extinct fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for extinct flora.
EW	**Extinct in the Wild** Species that *"is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form"*, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no Threatened fauna or Threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Priority species Possibly Threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of Priority for survey and evaluation of conservation status so that consideration can be given to their declaration as Threatened Fauna or Flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.	

Code	Category
P1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
Commonwealth categories of Threatened species	
EX	**Extinct** Taxa where there is no reasonable doubt that the last member of the species has died.
EW	**Extinct in the Wild** Taxa where it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
CR	**Critically Endangered** Taxa that are facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
EN	**Endangered** Taxa which are not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
VU	**Vulnerable** Taxa which are not critically endangered or endangered and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
CD	**Conservation Dependent** Taxa which are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish; (ii) the species is the focus of a plan of management that provides for actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised; (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory; (iv) cessation of the plan of management would adversely affect the conservation status of the species.

Definitions of conservation significant communities

Category Code	Category
State categories of Threatened Ecological Communities (TEC)	
PD	**Presumed Totally Destroyed**
	An ecological community will be listed as Presumed Totally Destroyed if there are no recent records of the community being extant and either of the following applies:
	• records within the last 50 years have not been confirmed despite thorough searches or known likely habitats or;
	• all occurrences recorded within the last 50 years have since been destroyed.
CR	**Critically Endangered**
	An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future, meeting any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 90% and is either continuing to decline with total destruction imminent, or is unlikely to be substantially rehabilitated in the immediate future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the immediate future.
EN	**Endangered**
	An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. The ecological community must meet any one of the following criteria:
	The estimated geographic range and distribution has been reduced by at least 70% and is either continuing to decline with total destruction imminent in the short-term future, or is unlikely to be substantially rehabilitated in the short-term future due to modification;
	The current distribution is limited i.e. highly restricted, having very few small or isolated occurrences, or covering a small area;
	The ecological community is highly modified with potential of being rehabilitated in the short-term future.
VU	**Vulnerable**
	An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing high risk of total destruction in the medium to long term future. The ecological community must meet any one of the following criteria:
	The ecological community exists largely as modified occurrences that are likely to be able to be substantially restored or rehabilitated;
	The ecological community may already be modified and would be vulnerable to threatening process, and restricted in range or distribution;
	The ecological community may be widespread but has potential to move to a higher threat category due to existing or impending threatening processes.
Commonwealth categories of Threatened Ecological Communities (TEC)	
CE	**Critically Endangered** If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
EN	**Endangered** If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
VU	**Vulnerable** If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).
Priority Ecological Communities	
P1	**Poorly-known ecological communities**
	Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist.

Category Code	Category
P2	**Poorly-known ecological communities**
	Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, State forest, un-allocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation.
P3	**Poorly known ecological communities**
	Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or:
	Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or;
	Communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing and inappropriate fire regimes.
P4	**Ecological communities that are adequately known, rare but not threatened** or meet criteria for near threatened, or that have been recently removed from the threatened list. These communities require regular monitoring.
P5	**Conservation Dependent ecological communities**
	Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

APPENDIX B: POTENTIALLY OCCURRING INTRODUCED (WEED) FLORA SPECIES

Family	Taxon	Common Name	WAOL Status	Control Category	WONS
Amaranthaceae	*Aerva javanica*	Kapok Bush	Permitted - s11	No Control Category	No
Asphodelaceae	*Aloe vera var. officinalis*	Aloe vera	Permitted - s11	No Control Category	No
Fabaceae	*Leucaena leucocephala*	Leucaena	Permitted - s11	No Control Category	No
Fabaceae	*Parkinsonia aculeata*	Parkinsonia	Declared Pest - s22(2)	C3 Management, Whole of State	Yes
Papaveraceae	*Argemone ochroleuca*	Mexican Poppy	Permitted - s11	No Control Category	No
Poaceae	*Cenchrus ciliaris*	Buffel Grass	Permitted - s11	No Control Category	No

APPENDIX C: SIGNIFICANT FLORA LIKELIHOOD ASSESSMENT

Taxon	Status			Habitat	Assessment	Likelihood
	EPBC	BC Act	DBCA			
Quoya zonalis	EN	EN	-	-	Outside known range of species.	Unlikely
Seringia exastia	-	CR	-	-	Outside known range of species.	Unlikely
Acacia aphanoclada	-	-	P1	Skeletal stony soils. Rocky hills, ridges & rises.	Outside known range of species.	Unlikely
Acacia cyperophylla var. *omearana*	-	-	P1	Stony & gritty alluvium. Along drainage lines.	Within known range, habitat may be present	Possible
Acacia fecunda	-	-	P1	Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills, road verges.	Outside known range of species.	Unlikely
Acacia leeuweniana	-	-	P1	Gritty, skeletal red-grey sandy loam, light orange-brown gravelly sand, granite. In rock fissures in outcrops, among boulders.	Outside known range of species.	Unlikely
Acacia sp. Marble Bar (J .G. & M.H. Simmons 3499)	-	-	P1	-	Outside known range of species.	Unlikely
Acacia sp. Nullagine (B.R. Maslin 4955)	-	-	P1	Rocky clay. Low-lying areas between rocky hills.	Outside known range of species.	Unlikely
Atriplex spinulosa	-	-	P1	-	Outside known range of species.	Unlikely
Cochlospermum macnamarae	-	-	P1	-	Outside known range of species.	Unlikely
Corchorus sp. Yarrie (J . Bull & D. Roberts CAL 01.05)	-	-	P1	Brown clay soils. Slopes	At extreme of known range	Possible
Eremophila maculata subsp. *filifolia*	-	-	P1	On spinifex plains.	Outside known range of species.	Unlikely
Fimbristylis sp. Shay Gap (K.R. Newbey 10293)	-	-	P1	Sandy soil. Drainage line.	Outside known range of species.	Unlikely
Euploca parviantrum	-	-	P1	-	Outside known range of species.	Unlikely
Ptilotus wilsonii	-	-	P1	Stony gravelly soils. Rocky hills.	Outside known range of species.	Unlikely
Schoenus coultasii	-	-	P1	Marshy areas	Outside known range of species.	Unlikely
Solanum sp. Mosquito Creek (A.A. Mitchell et al. AAM 10795)	-	-	P1	-	Outside known range of species.	Unlikely
Stemodia sp. Battle Hill (A.L. Payne 1006)	-	-	P1	Cracking clay. Floodplain.	Outside known range of species.	Unlikely
Tephrosia rosea var. Port Hedland (A.S. George 1114)	-	-	P1	-	Outside known range of species.	Unlikely
Themeda sp. Panorama (J . Nelson et al. NS 102)	-	-	P1	-	Outside known range of species.	Unlikely
Tribulus minutus	-	-	P1	-	Outside known range of species.	Unlikely
Euphorbia inappendiculata var. *inappendiculata*	-	-	P2	-	Outside known range of species.	Unlikely
Goodenia hartiana	-	-	P2	Sand. Sand dune swales, sandhills.	Outside known range of species.	Unlikely
Indigofera ixocarpa	-	-	P2	Skeletal red soils over massive ironstone.	Outside known range of species.	Unlikely
Acacia levata	-	-	P3	Sand or sandy loam over granite. Hillslopes.	Outside known range of species.	Unlikely
Croton aridus	-	-	P3	Deep red sand, pindan soil. Sandplains or ridges, spinifex sandplains.	Outside known range of species.	Unlikely
Dolichocarpa sp. Hamersley Station (A.A. Mitchell PRP 1479)	-	-	P3	-	Outside known range of species.	Unlikely
Eragrostis crateriformis	-	-	P3	Clayey loam or clay. Creek banks, depressions.	Within known range, habitat may be present	Possible

Taxon	Status			Habitat	Assessment	Likelihood
	EPBC	BC Act	DBCA			
Eucalyptus rowleyi	-	-	P3	-	Outside known range of species.	Unlikely
Euphorbia australis var. *glabra*	-	-	P3	-	Outside known range of species.	Unlikely
Euphorbia clementii	-	-	P3	Gravelly hillsides, stony grounds.	Within known range, habitat likely to be present.	Previously Recorded
Gomphrena leptophylla	-	-	P3	Sand, sandy to clayey loam, granite, quartzite. Open flats, sandy creek beds, edges salt pans & marshes, stony hillsides.	Outside known range of species.	Unlikely
Gymnanthera cunninghamii	-	-	P3	Sandy soils, creeklines.	Outside known range of species.	Unlikely
Heliotropium murinum	-	-	P3	Red sand. Plains.	Within known range, habitat may be present	Possible
Euploca mutica	-	-	P3	-	Outside usual range of species, records my be incorrect.	Previously Recorded
Indigofera ammobia	-	-	P3	Red sand. Sand dunes.	Outside known range of species.	Unlikely
Nicotiana umbratica	-	-	P3	Shallow soils. Rocky outcrops.	Outside known range of species.	Unlikely
Phyllanthus hebecarpus	-	-	P3	-	Outside known range of species.	Unlikely
Pterocaulon xenicum	-	-	P3	-	Outside known range of species.	Unlikely
Rostellularia adscendens var. *latifolia*	-	-	P3	Ironstone soils. Near creeks, rocky hills.	Within known range, habitat may be present	Possible
Rothia indica subsp. *australis*	-	-	P3	Sandy soils. Sandhills and sandy flats.	Outside known range of species.	Unlikely
Stylidium weeliwolli	-	-	P3	Gritty sand soil, sandy clay. Edge of watercourses.	Outside known range of species.	Unlikely
Swainsona thompsoniana	-	-	P3	-	Outside known range of species.	Unlikely
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	-	-	P3	Red clay. Clay pan, grass plain.	Outside known range of species.	Unlikely
Triodia basitricha	-	-	P3	-	Outside known range of species.	Unlikely
Triodia chichesterensis	-	-	P3	-	Outside known range of species.	Unlikely
Bulbostylis burbidgeae	-	-	P4	Granitic soils. Granite outcrops, cliff bases.	Within known range, habitat likely to be present.	Likely
Goodenia nuda	-	-	P4	-	Outside known range of species.	Unlikely
Lepidium catapycnon	-	-	P4	Skeletal soils. Hillsides.	Outside known range of species.	Unlikely
Ptilotus mollis	-	-	P4	Stony hills and screes.	Within known range, habitat may be present	Possible
Rhynchosia bungarensis	-	-	P4	Pebbly, shingly coarse sand amongst boulders. Banks of flow line in the mouth of a gully in a valley wall.	Outside known range of species.	Unlikely

APPENDIX D: LIST OF SPECIES IDENTIFIED WITHIN THE SURVEY AREA

(W) denotes introduced (weed) species; (A) denotes ephemeral (annual) species; (P) denotes Priority species

Family	Taxon	RP-EW3	DD-EW*	RH-EW2
Amaranthaceae	*Gomphrena canescens*			
Amaranthaceae	*Ptilotus polystachyus*			*
Asteraceae	*Bidens bipinnata (W)*		*	
Asteraceae	*Pluchea rubelliflora*		*	
Caryophyllaceae	*Polycarpaea longiflora*		*	
Cleomaceae	*Arivela viscida*		*	
Convolvulaceae	*Ipomoea muelleri*		*	
Cucurbitaceae	*Cucumis myriocarpus (W)*		*	
Euphorbiaceae	*Euphorbia biconvexa*		*	
Fabaceae	*Acacia bivenosa*	*		*
Fabaceae	*Acacia inaequilatera*			*
Fabaceae	*Acacia maitlandii*	*	*	*
Fabaceae	*Acacia orthocarpa*			*
Fabaceae	*Acacia pyrifolia* subsp. *pyrifolia*	*	*	*
Fabaceae	*Acacia stellaticeps*	*		
Fabaceae	*Acacia trachycarpa*	*		
Fabaceae	*Acacia tumida var. pilbarensis*	*		*
Fabaceae	*Acacia victoriae*	*		
Fabaceae	*Indigofera monophylla*	*		
Fabaceae	*Senna artemisioides* subsp. *helmsii*	*		*
Fabaceae	*Senna glutinosa*	*		*
Fabaceae	*Senna helmsii*	*		
Fabaceae	*Swainsona formosa*		*	
Fabaceae	*Tephrosia rosea var. clementii*		*	
Fabaceae	*Vachellia farnesiana (W)*		*	
Malvaceae	*Androcalva luteiflora*		*	
Malvaceae	*Corchorus parviflorus*		*	
Malvaceae	*Hibiscus leptocladus*	*	*	
Malvaceae	*Waltheria virgata*	*	*	
Myrtaceae	*Corymbia hamersleyana*	*		
Myrtaceae	*Eucalyptus camaldulensis*		*	
Myrtaceae	*Eucalyptus leucophloia* subsp. *leucophloia*			*
Myrtaceae	*Melaleuca glomerata*		*	
Papaveraceae	*Argemone ochroleuca (W)*		*	
Plantaginaceae	*Stemodia grossa*		*	
Poaceae	*Aristida contorta*	*		
Poaceae	*Cenchrus ciliaris (W)*		*	*
Poaceae	*Triodia longiceps*	*		*
Poaceae	*Triodia wiseana*			*
Proteaceae	*Grevillea pyramidalis*		*	*
Proteaceae	*Grevillea wickhamii*			*
Proteaceae	*Hakea lorea* subsp. *lorea*			
Solanaceae	*Solanum lasiophyllum*	*		*
Violaceae	*Afrohybanthus aurantiacus*	*	*	

APPENDIX E: VEGETATION CONDITION RATING

Vegetation Condition Rating	South West and Interzone Botanical Provinces	Eremaean and Northern Botanical Provinces
Pristine	Pristine or nearly so, no obvious signs of disturbance or damage caused by human activities since European settlement.	
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. Damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle tracks.	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement.
Very Good	Vegetation structure altered, obvious signs of disturbance. Disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.	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	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate it. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor		Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. Disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds at high density, partial clearing, dieback and grazing.	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	The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees and shrubs.	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.

APPENDIX F: NATUREMAP DATABASE SEARCH (20 KM)

APPENDIX G: EPBC PROTECTED MATTERS SEARCH (20 KM BUFFER)