Biota Environmental Sciences

Ministers North Detailed Flora and Vegetation Survey

Prepared for BHP

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Ministers North Detailed Flora and Vegetation Survey

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1.0 Executive Summary

BHP is evaluating the potential development of the Ministers North lease, 85 km northwest of Newman in the Pilbara region of Western Australia. Previous botanical surveys have been conducted over parts of Ministers North, however additional survey work was required to meet current Environmental Protection Authority expectations for flora and vegetation surveys for environmental impact assessment. Biota Environmental Sciences was commissioned to undertake this additional survey work in 2016.

The study comprised a desktop review followed by a two-phase botanical survey. Specifically, the objectives of the study were to:

- complete database searches and review relevant reports to consolidate existing records of conservation significant flora species from the locality;
- complete a Detailed flora and vegetation survey to describe and characterise the vegetation, including quadrat sampling;
- complete targeted searches for Threatened and Priority flora and record weed species;
- perform a PRIMER-E floristic analysis using quadrat data obtained from both the study area and the wider locality, to place the study area into appropriate context;
- produce detailed vegetation and condition mapping, which as far as practicable, remains consistent with and incorporates previous mapping of surrounding areas;
- document the above in a flora and vegetation survey report; and
- supply all data collected during the field survey in current BHP data standards.

Approximately half of the study area was burnt in December 2015, which affected the site selection of the study. During the Phase 1 survey in September 2016, 22 quadrats and 14 relevés were surveyed. Fifteen quadrats and five of the relevés were resampled, and one additional relevé was conducted, during the second phase surveys in May and July 2017.

A total of ten vegetation associations were described from the study area, covering three habitat types: a medium drainage line (Yandicoogina Creek); gullies and gorges; and stony hill crests, slopes and foothills.

The condition of the Ministers North vegetation ranged from Pristine to Completely Degraded. The vegetation of the medium drainage line, Yandicoogina Creek, was considered to be in Very Good to Good condition, with a high presence and diversity of introduced (weed) species reducing vegetation condition in some sections of the creek. The majority of the vegetation of gorges and gullies, as well as that of rocky hills and slopes, was ranked as being in Pristine condition, with only scattered weeds present. The only areas assessed as Completely Degraded were cleared exploration tracks, the rail line and drill pads.

None of the vegetation units are formally listed as Threatened Ecological Communities or Priority Ecological Communities.

A contextual floristic analysis was conducted which showed that all, but one, of the groups containing Ministers North sites also contained sites outside the study area, suggesting that the vegetation of the study area is not of particular local or regional importance. The exception was a relevé established in gorge habitat in the southwest of the study area that formed an individual floristic group in the analysis. This site represented a *Callitris* low open woodland, which is locally important as the gorge habitat has provided a refuge site for fire sensitive species.

In addition, the vegetation associated with Yandicoogina Creek, the medium drainage line in the study area, was also considered to be of elevated local importance, and comprised:

- *Eucalyptus* open woodland (ME Ev EauSop Acp) vegetation association, which occurred in the southern section of Yandicoogina Creek and supported the potentially phreatophytic (groundwater dependent) tree species *Eucalyptus victrix* (Coolibah). This association represents potentially Groundwater Dependent Vegetation.
- *Melaleuca argentea* open forest (ME MaEcr TydCyv GoroCule) vegetation association, which occurred in the northern section of Yandicoogina Creek and supported two groundwater dependent tree species - *Eucalyptus camaldulensis* subsp. *refulgens* (River Gum) and *Melaleuca argentea* (Silver Cadjeput). This association represents Groundwater Dependent Vegetation.

A total of 361 native vascular flora species have been recorded from the study area, with 311 species recorded during the current survey and 50 additional species recorded by previous surveys. In addition, 16 introduced (weed) species are known from the study area, with 13 of these recorded during the current survey and three during previous surveys. None of these weeds are listed as declared pests under the Western Australian *Biosecurity and Agriculture Management Act 2007*.

Three Priority flora species have been recorded from the study area:

- *Fimbristylis sieberiana* (Priority 3);
- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3); and
- *Acacia bromilowiana* (Priority 4).

All three species were recorded from multiple locations within suitable habitat in the study area and all are also represented within the broader locality (<40 km of the study area).

2.0 Introduction

2.1 Project Background

BHP is evaluating the potential development of the Ministers North lease, 85 km northwest of Newman in the Pilbara region of Western Australia (WA). The lease is actively being explored for iron ore deposits as part of potential future expansion of existing mining operations in the locality.

Ministers North is located 10 km southeast of BHP's Yandi operations, is 3,029 ha in size, and is hereafter referred to as 'the study area' (Figure 2.1). Although previous botanical surveys have been conducted over parts of the study area, these were completed more than five years ago and are thus no longer considered current. As a result, additional survey work was required to meet current Environmental Protection Authority (EPA) expectations for botanical surveys for environmental impact assessment (EIA).

2.2 Scope and Objectives of the Study

BHP commissioned Biota Environmental Sciences (Biota) to undertake a Detailed[1] flora and vegetation survey of the study area. The survey was conducted to inform the potential future EIA process for any proposals to develop Ministers North.

Specifically, the objectives of the current study were to:

- complete database searches and review other relevant reports to consolidate existing records of conservation significant flora from the locality;
- complete a Detailed flora and vegetation survey to describe and characterise the vegetation, including quadrat sampling;
- complete targeted searches for Threatened and Priority flora and record weed species;
- perform a PRIMER-E floristic analysis using quadrat data obtained from both the study area and the wider locality to place the study area into appropriate context;
- produce detailed vegetation and condition mapping, which, as far as practicable, remains consistent with and incorporates previous mapping of surrounding areas;
- produce a flora and vegetation survey report; and
- supply all data collected during the field survey in current BHP data standards.

The approach and methodology used for the survey was carried out with consideration of the following:

- Environmental Protection Authority (EPA) "*Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment*" (EPA 2016a);
- Environmental Protection Authority (EPA) "*Environmental Factor Guideline: Flora and Vegetation*" (EPA 2016b);
- *BHP Billiton Iron Ore Guidance for Vegetation and Flora Surveys* (0124627) (BHP Billiton Iron Ore 2016a); and
- *BHP Billiton Iron Ore Biodiversity Survey Spatial Data Requirements* (SPR-IEN-EMS-015) (BHP Billiton Iron Ore 2016b).

[1] "Detailed surveys" (EPA 2016a) have replaced "Level 2 surveys" as per the EPA Guidance Statement 51 (EPA 2004).

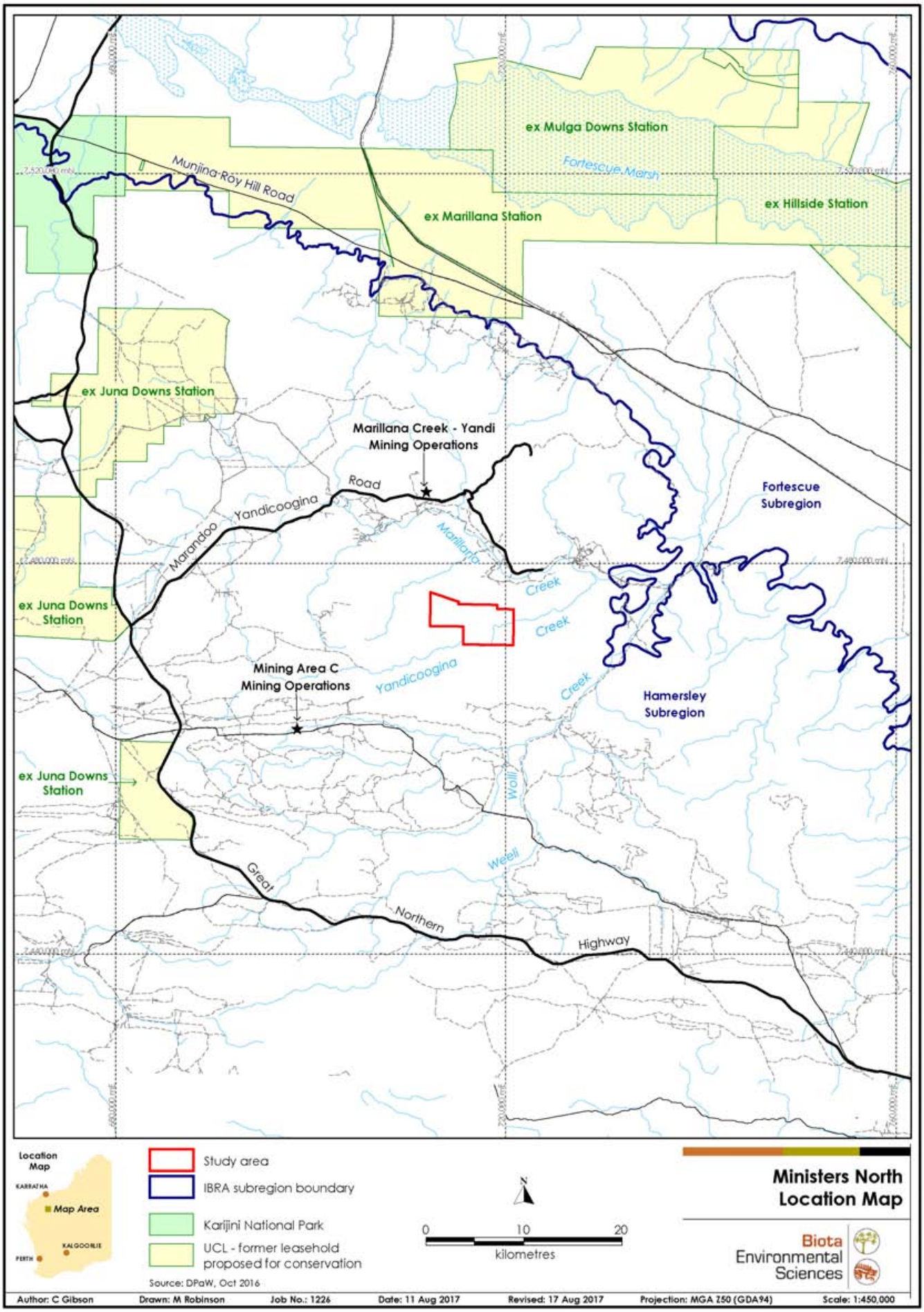

Figure 2.1: Location of the study area.

3.0 Methodology

To meet the objectives of the study and provide an assessment of the botanical values of the study area, a desktop review was completed (see Section 3.1), followed by a two-phase Detailed field survey (see Section 3.2).

3.1 Desktop Assessment

The desktop assessment was undertaken to identify features of conservation significance known from the study area (see Appendix 1 for more information regarding the framework for conservation significance ranking of communities and species in WA). This review considered regional information, previous biological surveys in the locality, and the results of various database searches, as discussed in the following sections.

3.1.1 Literature Review

Published and unpublished reports relevant to the study area were reviewed. Several regional-scale reports and data sets were examined, as well as the summary of bioregional data (Kendrick 2003), land systems mapping (van Vreeswyk et al. 2004), and vegetation descriptions and mapping by Beard (1975a, 1975b).

In addition, 21 biological surveys undertaken previously in the vicinity of the study area were reviewed (Section 4.7), and features of conservation significance recorded during these surveys (Threatened Ecological Communities (TECs), Priority Ecological Communities (PECs), Threatened flora and Priority flora were identified.

3.1.2 Database Searches

The following databases were searched for records of flora and vegetation of conservation significance[2] previously recorded from, or potentially occurring within or in the vicinity of, the study area:

1. NatureMap[3] was searched to identify flora species that had previously been recorded in the locality. This database is the most comprehensive source of information on the distribution of WA's flora and fauna, and comprises records from the Fauna Survey Returns Database, the WA Threatened and Priority Flora Database and the WA Herbarium Specimen Database (all maintained by the Department of Biodiversity, Conservation and Attractions (DBCA) (formerly the Department of Parks and Wildlife); the WA Museum Specimen Database; and BirdLife Australia's Atlas of Australian Birds.
2. The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool was used to identify flora species listed as Threatened at Commonwealth level and other relevant Matters of National Environmental Significance that may occur in the locality.
3. A specific search of the DBCA Declared Rare and Priority Flora database was also commissioned to confirm the Threatened and Priority flora species known from the area.
4. The DBCA database of TECs, PECs and Environmentally Sensitive Areas (ESAs) was searched to identify significant communities known to occur in the locality.
5. The *Biosecurity and Agriculture Management Act 2007* (BAM Act) was searched via the Western Australian Organisms List (WAOL) to provide the status of introduced species, either known to occur in, or are in close proximity to, the study area, which have been categorised under the BAM Act.

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2 The framework for conservation significance ranking of communities and species in WA is presented in Appendix 1.

3 http://naturemap.dpaw.wa.gov.au

The database searches were based on an approximate centre point of the study area (22°49'30"S, 119°06'37"E) buffered by 40 km. Results of the database searches are provided in Appendix 2.

In addition, search results from both the BHP[4] and Biota[5] internal databases of rare flora and weed records from previous surveys in the locality were reviewed.

3.1.3 Assessment of Likelihood of Occurrence in the Study Area

In order to determine which species of conservation significance had the potential to occur in the study area, the results of the database searches and previous surveys in the locality were consolidated and reviewed in light of the known habitat preferences for the species. Habitats were defined prior to the field survey according to the landforms apparent on aerial imagery, and taking into account existing information from previous surveys (see Section 4.7).

The likelihood that flora species of conservation significance would occur in the study area was assessed as part of the desktop review using a set of rankings and criteria (Table 3.1). These rankings were subsequently revised as necessary following the field survey (see Appendix 3). Throughout this report, the term "close proximity" has been defined as within 20 km of the study area, while the broader "locality" covers an area of up to 40 km from the study area.

Table 3.1: Ranking system used to assign the likelihood that a species of conservation significance would occur in the study area.

Rank	Criteria
Recorded	1. The species has been previously recorded in the study area.
Likely to occur	1. There are existing records of the species in close proximity to the study area (within 20 km); and • the species is strongly linked to a specific habitat, which is present in the study area; or • the species has more general habitat preferences, and suitable habitat is present.
May potentially occur	1. There are existing records of the species from the locality (within 40 km), however • the species is strongly linked to a specific habitat, of which only a small amount is present in the study area; or • the species has more general habitat preferences, but only some suitable habitat is present. 2. There is suitable habitat in the study area, but the species is recorded infrequently in the locality.
Unlikely to occur	1. The species is linked to a specific habitat, which is absent from the study area; or 2. Suitable habitat is present, however there are no existing records of the species from the locality despite reasonable previous search effort in suitable habitat; or 3. There is some suitable habitat in the study area, however the species is very infrequently recorded in the locality.
Would not occur	1. The species is strongly linked to a specific habitat, which is absent from the study area; and/or 2. The species' range is very restricted and would not include the study area.

[4] Records are from within a 15 km east and west buffer, and 20 km north and south buffer, of the study area boundary.

[5] Records are from within 40 km buffer of the study area boundary.

Two rankings have been provided:

1. An initial assessment was made during the desktop review (see Appendices 3 and 4). This was based on consideration of the overall distribution of the species of conservation significance, the proximity of the study area to known populations, the reliability and age of any historic records, and, if the species was known to be linked to particular habitats, whether suitable habitat appeared to be present in the study area based on inspection of aerial photography and/or existing information.
2. The likelihood rankings were subsequently revised as necessary based on the findings of the field survey (see Appendix 3). Where the initial and final likelihood rankings were different, the reason was provided.

3.2 Field Surveys

3.2.1 Survey Team and Survey Timing

A two-phase survey was conducted in the study area. The first phase was timed for spring (dry season), and the second phase timed to follow the expected period of summer rainfall in the Pilbara bioregion (wet season). The timing of the two-phase field survey was selected to provide optimal conditions for the detection of species present in the study area (see Section 3.2.2).

Both phases of the field survey were undertaken by Biota botanists or biologists, all of whom have extensive experience (a minimum of five years) in flora and vegetation surveys in the Pilbara, including large-scale Detailed surveys (see Table 3.2).

Phase 1 of the field survey was undertaken between the 20th and 29th of September 2016 by two botanists (Pierre-Louis de Kock and Chloe Flaherty[6]) and one biologist (Scott Werner). Mapping traverses, sampling of quadrats, and flora searches were completed by all personnel. A total of 20 person days were spent on the Phase 1 field survey.

Phase 2 of the field survey was undertaken over two trips[7]: 8th to 10th May and 10th to 14th July 2017. The field trips were conducted by a botanist (Pierre-Louis de Kock) and a biologist (Scott Werner). Existing quadrats were resampled and additional sites (quadrats and relevés) were established and sampled. Further traverses through the study area were conducted to target populations of conservation significant flora and weeds. A total of ten person days were spent on the combined Phase 2 field survey.

Table 3.2: Summary of personnel involved in the Ministers North vegetation and flora survey.

Name	Position	Qualification	Years of Survey Experience	Survey Role	Flora Licences[1]
Pierre-Louis de-Kock	Level 2 Botanist	BSc (Env Mgt)	10	Project Manager Vegetation mapping Site sampling (quadrats and relevés) Rare flora searches	• SL011745 (2016) • SL012031 (2017)
Chloe Flaherty	Level 2 Botanist	BSc (NRM) (Hons)	7	Vegetation mapping Site sampling (quadrats and relevés) Rare flora searches	• SL011752 (2016)
Scott Werner	Level 1 Biologist	BSc (Cons Biol & Mgt) (Hons)	6		• SL011751 (2016) • SL012032 (2017)

[1]. Permit refers to: "Licence to Take Flora for Scientific Purposes" required for the flora survey.

[6] Chloe Flaherty replaced Scott Werner on September 23rd of the Phase 1 survey in 2016.

[7] This was due to access constraints. Tracks were found to be seriously affected by wash-outs during the May 2017 field trip. They were deemed unsafe and required grading prior to the second mobilisation.

3.2.2 Survey Conditions

The weather conditions (particularly rainfall) leading up to a field survey are an important factor influencing the number and type of flora species that are recorded from an area. To characterise rainfall leading up to this survey, rainfall data for the months preceding the field surveys were sourced from the closest reliable and complete Bureau of Meteorology (BoM) weather recording station to the study area; Newman Aero (station no. 7176)[8]. Total rainfall recorded for the months preceding the Phase 1 and the Phase 2 field surveys are shown in Figure 3.1. The monthly rainfall totals were compared to the long-term monthly median rainfall (for the years 1971-2017) to provide context.

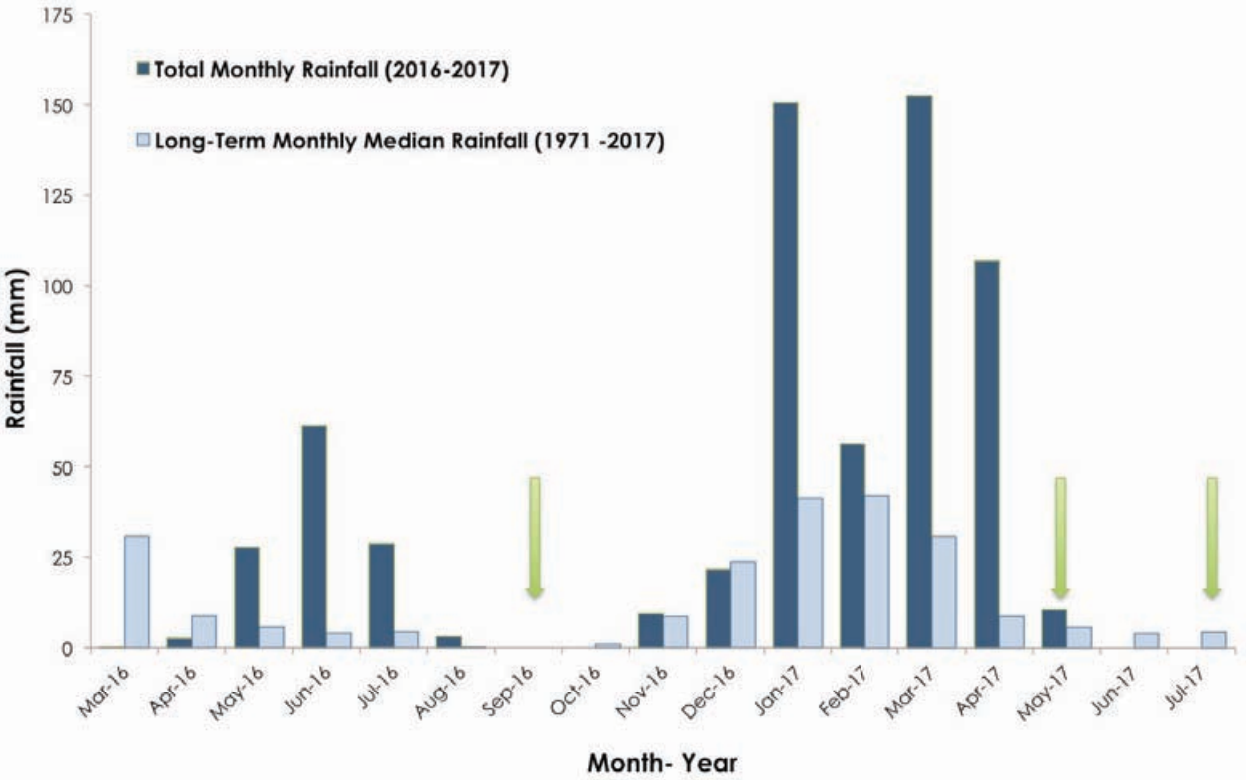

Figure 3.1: Monthly rainfall at the Newman Aero recording station for March 2016 – July 2017, compared to the long-term monthly median rainfall.
Arrows indicate timing of field surveys. Data sourced from Bureau of Meteorology recording station no. 7176 (2017).

Rainfall data for the three months preceding each of the surveys is presented in Table 3.3 along with a statement to the suitably of the conditions for the collection of flora species. These data show that above median rain fell in the three months preceding each of the field surveys. Based on the data, the timing of the Phase 1 and Phase 2 surveys was suitable for the collection of most perennial flora. However, despite the above average rainfall in June and July 2016 preceding the Phase 1 survey, it is expected that some annual and cryptic perennial species may not have been present.

[8] The BOM Newman Areo recording station is located approximately 82 km to the southeast and thus, may not represent the local conditons experienced within the study area. However, it is the closet reliable and complete weather station to the study area.

Table 3.3: Total rainfall received in the 3 months preceding the field surveys compared to long-term median for the same period recorded at the Newman Aero recording station (no. 7176). (Data sourced from the WA BoM, http://www.bom.gov.au/; accessed July 2017).

Phase (Survey Timing)	Total Rainfall 6 months preceding	Long-term median 6 months preceding (1971-2017)	Total Rainfall 3 months preceding	Long-term median 3 months preceding (1971-2017)	Conditions at Time of Survey of Collection of Flora Species
Phase 1 (20th – 29th September 2016)	123.6 mm	54.4 mm	93.2 mm	8.9 mm	Favourable for the collection of annual and cryptic perennial flora species; well above median rainfall was experienced leading up to the survey, with a majority falling between June and July (90.2 mm). No rainfall was recorded in September.
Phase 2 (8th- 10th May 2017)	497.0 mm	155.7 mm	315.4 mm	81.9 mm	Optimal for the collection of annual and cryptic perennial flora species; nearly four times the long-term median rainfall fell between March and April 2017.
Phase 2 (10th – 14th July 2017)	498.0 mm	152.7 mm	117.4 mm	18.8 mm	Favourable for the collection of annual and cryptic perennial flora species; more than double the long-term median rainfall fell between April and June 2017. However, the majority of this rain fell in April (106.8 mm) and no rainfall was recorded in June 2017.

3.2.3 December 2015 Fire

During the first week of December in 2015, a large fire burnt through the east of the Ministers North study area and surrounds (Landgate 2017). The extent of the fire in the broader locality is presented in Figure 3.2, while the fire scar within the study area can be seen on Figure 3.3. The fire occurred nine months prior to the Phase 1 survey and therefore influenced the sampling design (see Section 3.2.4).

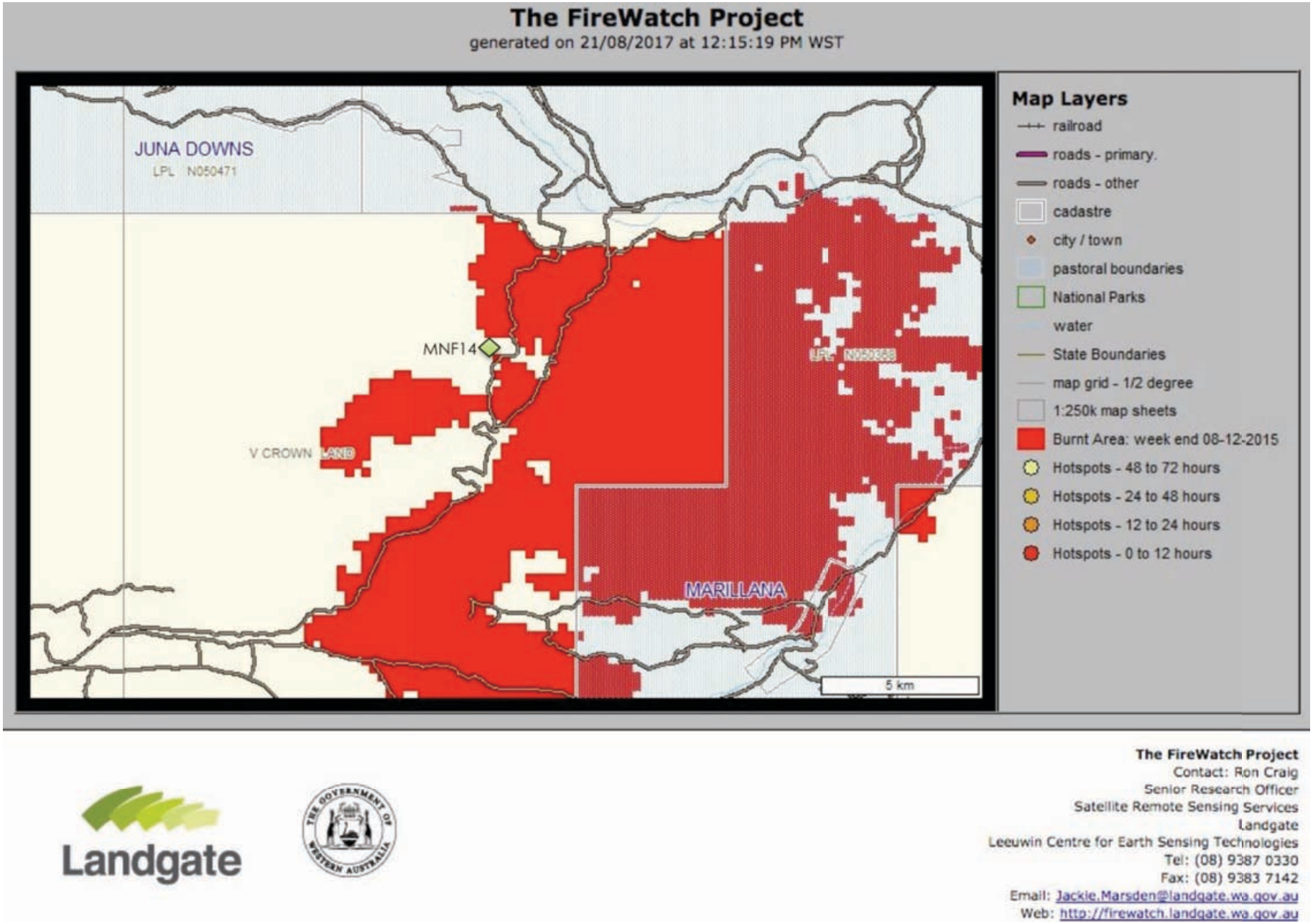

Figure 3.2: **Extent of the December 2015 fire in the vicinity of the study area (Landgate 2017).**
Approximate placement of quadrat MNF14, near the centre of the study area, added for context.

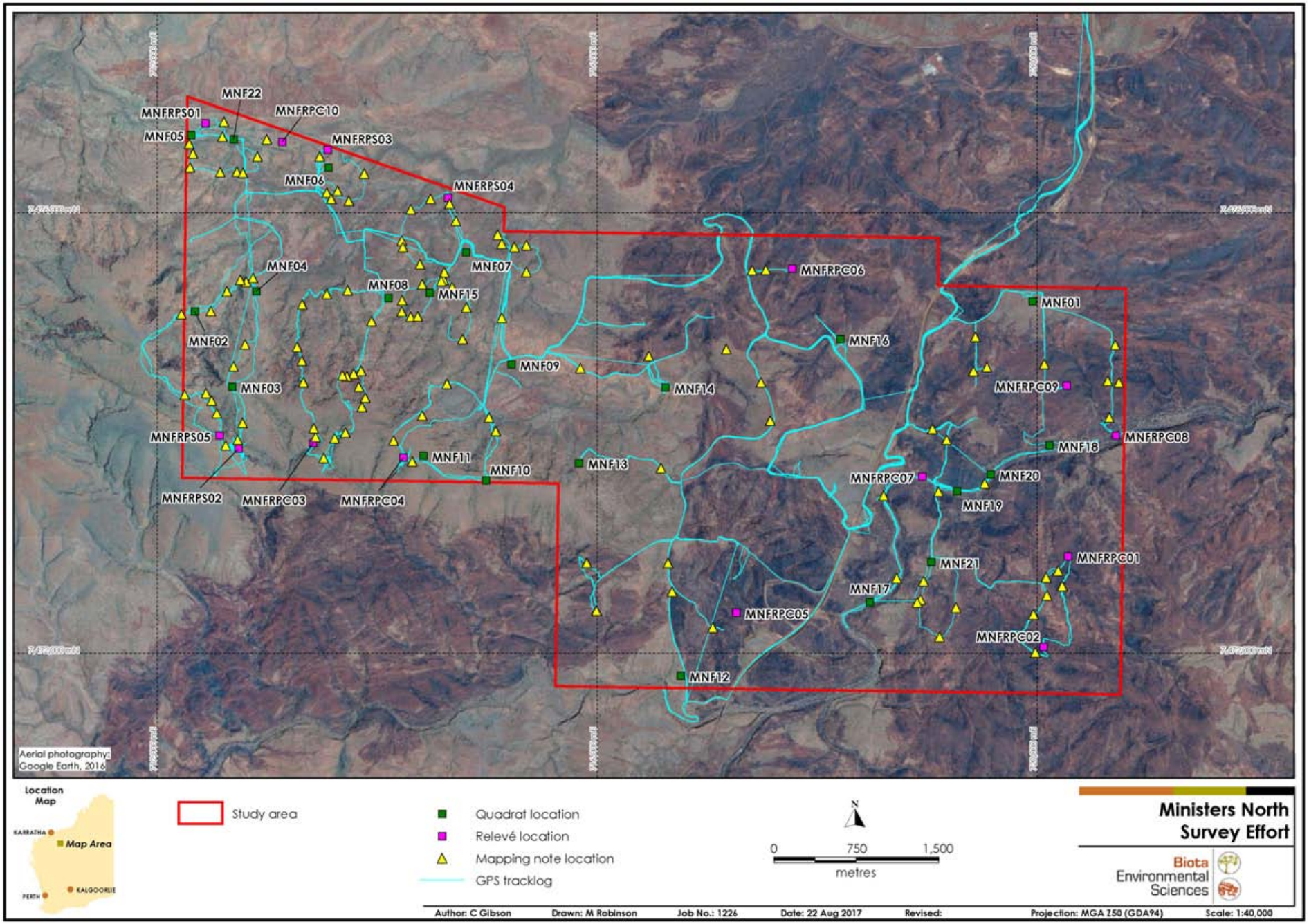

Figure 3.3: Survey effort conducted within the study area over the Phase 1 and Phase 2 surveys.

3.2.4 Establishment and Assessment of Quadrats and Relevés

Previous botanical surveys had conducted quadrat and relevé sampling in the study area (see Section 4.7). However, all of this previous work was completed longer than five years ago and is no longer considered current for EIA. In addition, the past quadrats were not pegged and therefore could not be resampled. As a result, the quadrat sampling design implemented for the current survey was independent of previous work.

Indicative quadrat and relevé locations were selected prior to the field surveys. The study area boundaries, aerial photography (displaying the fire scar, see Section 3.2.3) and the previous vegetation mapping were reviewed using Quantum Geographical Information System software (QGIS). Quadrat and relevé sites were then selected such that there was replication of sampling (a minimum of three sites) within each mapped vegetation association, taking into account the broad habitats, the fire scar and vegetation associations apparent from the aerial imagery. Permanent quadrats were located in unburnt areas only and relevés were completed in burnt areas. This reduced the number of quadrats that could be conducted within the study area, but the addition of relevés meant that the total survey effort was consistent with that required by BHP (a minimum of one quadrat per kilometre squared; BHP Billiton Iron Ore 2016a). The actual locations of the quadrats were adjusted in the field as necessary (e.g. to be placed in an area more representative of the broader vegetation association).

Permanently marked quadrats (flora sampling sites of a fixed area) were used wherever possible. Most quadrats established were 50 m x 50 m in size, or an equivalent area (2,500m^2). This area is recognised as providing an adequate sample of species presence for Pilbara vegetation and is the standard quadrat size for botanical survey work in the region (Clarke 2009). Where a square quadrat was unsuitable for sampling the vegetation unit (e.g. along narrow creeklines), a rectangular quadrat of equivalent area (e.g. 25 m x 100 m) was established instead. The quadrats were marked using steel fence droppers on at least three corners. An optical square and measuring tapes were used to accurately position the quadrat boundaries.

In cases where quadrats could not be established (e.g. due to recent fire, or to the small size or irregular shape of the habitat), these locations were instead sampled with relevés or mapping notes were taken. A relevé is an unbounded flora sampling site with a similar area to a standard quadrat; essentially the same information is recorded as for a quadrat, however the sampling of flora is typically not as thorough. Mapping notes are described in Section 3.2.5.

The following information was recorded for each quadrat and relevé:

- location coordinates (±5 m) were recorded with a hand-held Global Positioning System (GPS) using WGS84 datum (all coordinates presented in this report are in MGA Zone 50);
- personnel and date;
- a colour photograph of each site (usually taken from the northwest corner of the quadrat, looking southeast);
- habitat description, including aspect;
- broad soil type;
- fire history (approximate time since last fire, where applicable);
- vegetation description: broad floristic formation and vegetation association as per the requirements of the BHP Guidance for Vegetation and Flora Surveys (BHP Billiton Iron Ore 2016a) (see Appendix 4);
- vegetation condition ranking (Government of Western Australia 2000; Appendix 4); and
- the estimated percent foliar cover of each flora species present within the quadrat, or in the vicinity (within a ~30 m radius) of the centre point of the relevé.

A total of 22 quadrats and 14 relevés were established in the study area during the Phase 1 field survey. Fifteen of the quadrats and five of the relevés were resampled during the Phase 2 surveys. One additional relevé was also conducted during Phase 2. Table 3.4 summarises the quadrats and relevés completed in the study area and the phases they were surveyed.

Table 3.4: Quadrats and relevés sampled during the Phase 1 and Phase 2 surveys of the study area.

Site Name	Central Coordinate (WGS84)	Survey Timing	
		Phase 1	Phase 2
Quadrats			
MNF01	719958 mE, 7475196 mN	✔	✔
MNF02	712343 mE, 7475101 mN	✔	✔
MNF03	712683 mE, 7474418 mN	✔	✔
MNF04	712902 mE, 7475287 mN	✔	✔
MNF05	712311 mE, 7476707 mN	✔	✔
MNF06	713558 mE, 7476412 mN	✔	
MNF07	714808 mE, 7475643 mN	✔	
MNF08	714103 mE, 7475224 mN	✔	
MNF09	715220 mE, 7474622 mN	✔	✔
MNF10	714991 mE, 7473567 mN	✔	✔
MNF11	714421 mE, 7473791 mN	✔	
MNF12	716760 mE, 7471795 mN	✔	✔
MNF13	715836 mE, 7473725 mN	✔	
MNF14	716622 mE, 7474411 mN	✔	✔
MNF15	714479 mE, 7475272 mN	✔	
MNF16	718210 mE, 7474851 mN	✔	
MNF17	718480 mE, 7472462 mN	✔	✔
MNF18	720113 mE, 7473885 mN	✔	✔
MNF19	719271 mE, 7473470 mN	✔	✔
MNF20	719575 mE, 7473621 mN	✔	✔
MNF21	719037 mE, 7472829 mN	✔	✔
MNF22	712696 mE, 7476669 mN	✔	✔
Relevés			
MNFRPS01	712567 mE, 7473973 mN	✔	✔
MNFRPS02	712739 mE, 7473854 mN	✔	✔
MNFRPS03	713552 mE, 7476575 mN	✔	✔
MNFRPS04	714645 mE, 7476138 mN	✔	✔
MNFRPS05	712439 mE, 7476816 mE		✔
MNFRPC01	720282 mE, 7472879 mN	✔	
MNFRPC02	720060 mE, 7472058 mN	✔	
MNFRPC03	713418 mE, 7473907 mN	✔	
MNFRPC04	714239 mE, 7473774 mN	✔	✔
MNFRPC05	717266 mE, 7472367 mN	✔	
MNFRPC06	717773 mE, 7475493 mN	✔	
MNFRPC07	718955 mE, 7473600 mN	✔	
MNFRPC08	720715 mE, 7473974 mN	✔	
MNFRPC09	720269 mE, 7474430 mN	✔	
MNFRPC10	713136 mE, 7476645 mN	✔	

All raw data from the sampling sites are presented in Appendix 5. Quadrat and relevé locations are shown on Figure 3.3.

3.2.5 Vegetation Description, Condition and Mapping

Several past botanical surveys have mapped sections of the study area (see Section 4.7). However, the majority of these surveys were conducted more than five years ago and the mapping was not provided digitally. A spatial layer of regional mapping conducted by Onshore Environment (2014b) was provided by BHP, and was considered as part of this assessment. However, it was not possible to extrapolate this mapping into the broader study area, as the previously mapping was of a fine scale linear nature, which was unsuited to the broader shape of the current study area. Further explanation is provided, along with a comparison of the vegetation associations described by Onshore Environment (2014b) with those of the current survey, in Section 5.3.

Vegetation associations identified from aerial photography or existing mapping were ground-truthed during foot traverses in the study area. The boundaries of the study area were uploaded onto hand-held GPS units to ensure that the correct areas were traversed. Vegetation descriptions for each vegetation association observed in the field were recorded from quadrats and relevés (see Section 5.2), and also in a series of mapping notes. Mapping notes are sampling sites conducted over an area of smaller scale than a quadrat or relevé; these notes are typically brief, with only dominant and commonly associated species being recorded. Mapping notes are taken primarily during foot traverses of an area, with the objective of detecting boundaries and changes in vegetation associations. Typical information recorded at a mapping note location includes notes on the habitat, landscape, vegetation association and vegetation condition, usually with a representative photograph and often with opportunistic specimen collections to supplement the species list. Locations of mapping notes are presented on Figure 3.3.

Vegetation descriptions were based on the height and estimated percent cover value of dominant species using Aplin's (1979) modification of the vegetation classification of Specht (1970). Similar vegetation descriptions were grouped, based on the suite of perennial species and range of cover values, to establish the vegetation associations for the study area. Vegetation formations and associations were described in accordance with BHP's Guidance for Vegetation and Flora Surveys (BHP Billiton Iron Ore 2016a).

Each vegetation association was given a unique code, comprising:

- a two letter capital prefix to indicate the landform (ME = medium drainage lines, GG = gorges and gullies, HC = hill crests and upper hill slopes, HS = hill slopes and low undulating hills, FS = footslopes), followed by;
- a sequence of two or three letter codes to reflect the dominant plant taxa. The code comprised a capital letter representing the genus, and one or two lower case letters representing the species. Spaces between plant taxon codes reflected vegetation strata, with a maximum of three strata represented in each code.

For example, the code 'ME Ev EauSop Acp' represents the vegetation association 'Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea* subsp. *pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand in creek beds along drainage lines'.

Although some of the vegetation associations were initially defined in the field, the majority of the vegetation mapping was completed in the office after the fieldwork had been conducted. Field data and aerial imagery were reviewed to determine boundaries of vegetation associations, which were then mapped to an appropriate scale.

Once the vegetation associations were defined, they were compared against the listed descriptions of TECs and PECs to determine whether any of the vegetation associations of the study area correspond to listed community types.

Similar to mapping of vegetation associations, mapping of vegetation condition was completed in the office using field data (locations of weeds, quadrat data, mapping notes and vegetation boundaries) and aerial imagery to determine boundaries of condition, which were then mapped to an appropriate scale. Vegetation condition was ranked using the scale developed by the Government of Western Australia (2000; see Appendix 4).

The maps were created and consolidated using GIS software (QGIS and MapInfo Professional GIS), and point locations of conservation significant flora and weeds were added. All maps in this report were produced by Melissa Robinson (Biota) using MapInfo Professional GIS (version 11).

Vegetation mapping is presented in Section 5.1 and vegetation condition mapping is provided in Section 5.4.

3.2.6 Searches for Threatened Flora, Priority Flora and Weeds

Targeted searches for conservation significant flora were conducted during the extensive foot traverses that were undertaken to validate the vegetation mapping, as well as during travel between sites, and while completing quadrats and relevés during the Phase 1 and Phase 2 surveys.

The locations of flora of conservation significance, unknown flora and introduced species (weeds) were recorded using a hand-held GPS (WGS84 datum, Zone 50). Where conservation significant flora species were encountered, estimates of the density or numbers of individuals were noted, a photo was taken and a description of the habitat and associated flora were recorded. Estimates of the density or numbers of individuals were also made for weed species.

GPS track logs showing locations of targeted searches are presented on Figure 3.3. All records of conservation significant flora and introduced flora are provided in Appendix 6 and are discussed in Sections 4.9 and 4.10 respectively.

3.3 Specimen Identification, Nomenclature and Data Entry

Flora specimen identification was conducted either in the field, or in the office following the field survey. If a plant specimen was common and well known to the survey botanist, the identification was confirmed and noted in the field. If the species was difficult to determine without microscopic examination, belonged to a recognised species complex, was poorly collected or otherwise unusual, a voucher specimen was collected. Each voucher specimen was assigned a unique internal code to facilitate tracking of data. Specimens were pressed and dried in the field, then freighted to Perth for further study and confirmation.

Specimens were identified using flora keys, consulting appropriate publications, checking voucher reference collections, and comparing the specimens to the collections held at the WA Herbarium. Biota botanists Pierre-Louis de Kock and Michi Maier identified and confirmed most specimens. Malcolm Trudgen, an expert In the Pilbara flora, was consulted to provide advice and identify some unusual plant specimens. Steve Dillon, a taxonomist with the WA Herbarium, provided confirmation for some atypical specimens collected from the study area (Chain of Custody form provided in Appendix 7). One specimen of *Imperata cylindrica* collected from the study area was discussed with Dr. Matt Barrett (a research taxonomist at the Botanic Gardens and Parks Authority), and DNA analysis to confirm its taxonomy was recommended (see Section 6.1.4).

All data were entered into a Microsoft Access Vegetation Database structure held internally at Biota. The database model employed by Biota was developed by Ted Griffin (private consultant) at the request of Malcolm Trudgen (M.E. Trudgen and Associates). Nomenclature and conservation significance rankings used in this report are in accordance with the current listing of WA flora recognised by the WA Herbarium, as listed on FloraBase[9] at the time of preparation.

A full list of vascular species recorded from the study area is presented in Appendix 8.

Where collection material was of adequate condition, voucher specimens have been lodged with the WA Herbarium for all taxa representing flora of conservation significance, range extensions, undescribed or poorly collected taxa, provided these were not already vouchered from the locality. This is in keeping with the WA Herbarium's specimen acquisition policy. Threatened and Priority Flora Report Forms will be submitted to DBCA for the Priority flora species recorded from the study area.

[9] http://florabase.dpaw.wa.gov.au

3.4 Floristic Analysis

To place the vegetation of the survey area into broader regional context, a cluster analysis was carried out using PRIMER-E v6 (Clarke and Gorley 2006). The analysis compared the floristic composition of sampling sites (quadrats and relevés) assessed in the study area with sites assessed in other surveys conducted within a 50 km radius. All sites used in the analysis therefore came from within the Hamersley, Fortescue and Chichester subregions of the Pilbara bioregion.

The combined data set totalled 536 sampling sites, comprising 525 quadrats and 11 of the 15 relevés sampled during the current survey; three relevés, MNFRPC05, MNFRPC06 and MNFRPC09, were not considered to be suitable for the analysis due to the recent fire and sampling intensity of the relevé (i.e. sampling area covered was smaller). A total of 98 of the 536 sampling sites analysed fall within the current study area (65 of which were sampled by previous surveys (ENV 2009a)). The remainder of the data set analysed comprised 438 contextual publicly available quadrats from ten other study areas in the Hamersley subregion:

- 115 quadrats from the Yandi mine area (Biota 2015);
- 103 quadrats from the Chichester, Hamersley Range and Juna Downs sections of the Hope Downs rail corridor (Biota 2004a, Biota 2004b, Biota 2006);
- 150 quadrats from various survey areas associated with Koodaideri, including the Koodaideri Lease Area, Southern Infrastructure Corridor and Northern Extension (Biota 2008, 2011, 2012a, 2012b, 2012c, 2012d, 2013a, 2013b);
- 24 quadrats from Fortescue Metal Group's Stage A rail corridor (Biota 2004b);
- 29 quadrats from BHP Billiton's Jinidi-Mindy survey and Southern Flank-Jinidi areas (Biota 2012e, Biota 2012f); and
- 17 quadrats from Rio Tinto's Baby Hope Downs survey area (Biota 2014a).

The combined species list from the ten surveys was reviewed for errors and inconsistencies in nomenclature. Where there were multiple taxa that could potentially represent the same species, these were all referred to a single taxon identification code, and this was treated as a single entity in the analysis (e.g. records of *Triodia epactia* and *T. pungens* were combined). Where a taxon name could potentially refer to more than one entity across different projects (e.g. *Euphorbia* sp.), it was excluded from the analysis. Introduced species (weeds) were removed for the analysis with the exception of **Cenchrus ciliaris* and **C. setiger*, which often had a high percent foliar cover and represented a distinct structural component of the vegetation. Parasitic plants (including *Amyema* spp.) were also excluded.

Site data from multiple phases were merged to create a single set of data for each site. Where cover values differed between phases, the highest cover value was retained.

The analysis used percent foliar cover data for both perennial and ephemeral taxa, transformed using a single square root transformation. The Bray-Curtis measure of similarity was used to produce a similarity matrix. The cluster analysis (group average method) was used to determine floristic groups, which was done manually. The similarity percentage test (SIMPER) was used to determine which species contributed most to the similarities between groups.

Due to the size of the cluster analysis and SIMPER outputs, the raw data from these tests are not presented in this document, however they are available on request.

3.5 Limitations of the Study

An assessment of the potential constraints and consequent limitations of this survey as per EPA (2016a) are summarised in Table 3.5

Table 3.5: Assessment of potential limitations to the Ministers North Detailed flora and vegetation survey.

Potential Limitation	Assessment
1. Availability of contextual information at a regional and local scale	• The Ministers North locality has been relatively well surveyed, and numerous unpublished reports were considered as part of the desktop review. Publicly available databases of rare species and communities' information were also searched, as were private company databases. The current survey added considerable new data specific to the study area. Regional and local level information is therefore not considered to be a limiting factor for this study.
2. Competency/ experience of the team carrying out the survey, including experience in the bioregion surveyed	• Sufficient time was allocated to the field survey component: 20 person days for Phase 1, and ten person days for Phase 2. The field personnel were suitably qualified to identify flora; all personnel had at least 5 years experience in the Pilbara bioregion (See Section 3.2.1). Additional assistance was sought as required from specialist external taxonomists (see Section 3.3). Not considered a limitation for this survey.
3. Proportion of flora recorded and/or collected, any identification issues	• All vascular flora encountered in the study area were recorded, and over 246 voucher specimens were collected from the current survey alone. This was in addition to voucher specimens collected during the previous survey conducted by ENV (2009a). A total of 361 vascular flora taxa have been recorded from the study area to date (see Section 6.1). • Most of the flora specimens collected during the current field surveys (approximately 99%) were of sufficient quality to be fully determined. • The recent fire within the study area is likely to have slightly reduced the diversity, or changed composition of the habitats. However, overall the suite of species recorded from the area is considered typical for the locality (see Section 6.1), and this is not considered to be a significant limitation. • Fungi and non-vascular flora (algae, mosses and liverworts) were not sampled, which is consistent with the accepted level of effort for a survey of this type and scale.
4. Appropriate area fully surveyed (effort and extent)	• A detailed survey[10] as described by the EPA (2016a) was considered appropriate to address the requirements for an EIA of the Minister North lease. • A total of 22 quadrats and 15 relevés were established, within all habitat types present in the study area, during the dry season survey in September 2016. Fifteen quadrats and five relevés were resampled during wet season surveys in May and July 2017. • Vegetation associations were described and mapped based on data collected during extensive foot traverses through the study area, in addition to data from quadrats and relevés. The mapping is considered to provide an adequate indication of the vegetation units and vegetation condition of the study area for EIA purposes. • All but one vegetation association included at least three replicated sampling sites (see Section 5.2). One relevé was conducted within the *Callitris* low open woodland association, as the amount of habitat available was too small to justify additional sampling. • Targeted searches for conservation significant flora, and opportunistic collections were completed during the field surveys. Three Priority flora taxa have been recorded from the study area (see Section 6.2.2.1). • Whist recently burnt areas of were searched, it is possible that additional Priority flora were not identifiable at the time of the surveys.

[10] "Detailed surveys" (EPA 2016a) have replaced "Level 2 surveys" as per the EPA Guidance Statement 51 (EPA 2004).

Potential Limitation	Assessment
5. Access restrictions within the survey area	• All sections of the study area could be accessed and surveyed to an appropriate level. No access issues were encountered during the Phase 1 survey in September 2016. However, track access to the study area was affected by wash-outs during the Phase 2 survey in May 2017, and time was allowed to regrade the tracks before the survey work was completed in July 2017.
6. Survey timing, rainfall, season of survey	• The survey timing of the Phase 1 and July Phase 2 surveys was considered favorable for recording annual and cryptic perennial species. The May Phase 2 survey was considered optimal for recording annual, ephemeral and cryptic perennial species (see Section 3.2.2). Therefore, survey timing was not considered a significant limitation.
7. Disturbance that may have affected the results of survey such as fire, flood or clearing	• Areas of clearing (including tracks, drill pads and the rail line) occurred in the study area. However, these areas were not extensive and are not considered to have affected the results of the assessment and therefore are not considered to be a limitation to the study. • A recent fire burnt approximately half of the study area nine months prior to the Phase 1 survey. The methodology of the survey was adjusted to address this (see Section 3.2.4). However, the fire may have affected the diversity of the flora recorded during the survey (see Section 6.1.2). Furthermore, it is possible that additional Priority species, or additional individuals of recorded Priority species may have not been identifiable within recently burnt areas (see Section 6.2.2.2).

Most potential limitations in Table 3.5 did not affect the adequacy of this survey and it meets the requirements of EPA (2016a) in providing a Detailed flora and vegetation survey adequate for EIA purposes.

4.0 Desktop Assessment

4.1 IBRA Bioregion and Subregion

The study area lies within the Pilbara bioregion, one of 89 bioregions defined by the Interim Biographic Regionalisation for Australia (IBRA) (DSEWPaC 2012). The Pilbara bioregion is divided into four subregions, with the entire study area occurring within the eastern section of the Hamersley subregion. This subregion is defined by Kendrick (2003) as:

- Hamersley subregion: "Mountainous area of Proterozoic sedimentary ranges and plateaus, dissected by gorges (basalt, shale and dolerite). Mulga low woodland over bunch grasses on fine textured soils in valley floors, and *Eucalyptus leucophloia* over *Triodia brizoides* on skeletal soils of the ranges. The climate is semi-desert tropical, average 300 mm rainfall, usually in summer cyclonic or thunderstorm events. Winter rain is not uncommon. Drainage into either the Fortescue River (to the north), the Ashburton River to the south, or the Robe River to the west."

4.2 Conservation Reserves in the Locality

The IBRA provides a national system for assessing the condition of native ecosystems and their level of protection in the National Reserve System (NRS). The NRS is Australia's network of protected areas, including national parks and other Government reserves, indigenous lands, and reserves run by non-profit conservation organisations. At the time of the regional biodiversity audit conducted by the then Department of Conservation and Land Management, the Pilbara bioregion was considered to be under-represented by the NRS, with less than 10% of the bioregion being protected (Kendrick 2003). Of the four subregions within the Pilbara bioregion, the Hamersley subregion had the highest percentage of area under some form of protection (Kendrick 2003).

Karijini National Park (Karijini) is the closest conservation reserve to the study area. The nearest boundary of Karijini is approximately 50 km west of the study area. Two areas nearer to the study area are proposed for conservation, including ex Marillana station (28.3 km north of the study area) and ex June Downs Stations (30.9 km west of the study area).

4.3 Surface Geology and Soils

The study area encompasses four geological units mapped by the Geological Survey of Western Australia (1996). These units are described in Table 4.1 and displayed in Figure 4.1.

Table 4.1: Geological units occurring within the study area (Geological Survey of Western Australia 1996).

Unit Code	Geological Description	Area (ha)	Percentage of the Study Area
Czc	Colluvium-partly consolidated quartz and rock fragments in silt and sand matrix; old valley-fill deposits	1.4	<0.1%
Czr	Hematite-goethite deposits on banded iron-formation and adjacent scree deposits	1,422.1	46.9%
PLHb	BROCKMAN IRON FORMATION: banded iron-formation, chert, and pelite	1,513.9	50.0%
PLHj	WEELI WOLLI FORMATION: banded iron-formation (commonly jaspilitic), pelite, and numerous metadolerite sills	91.9	3.0%

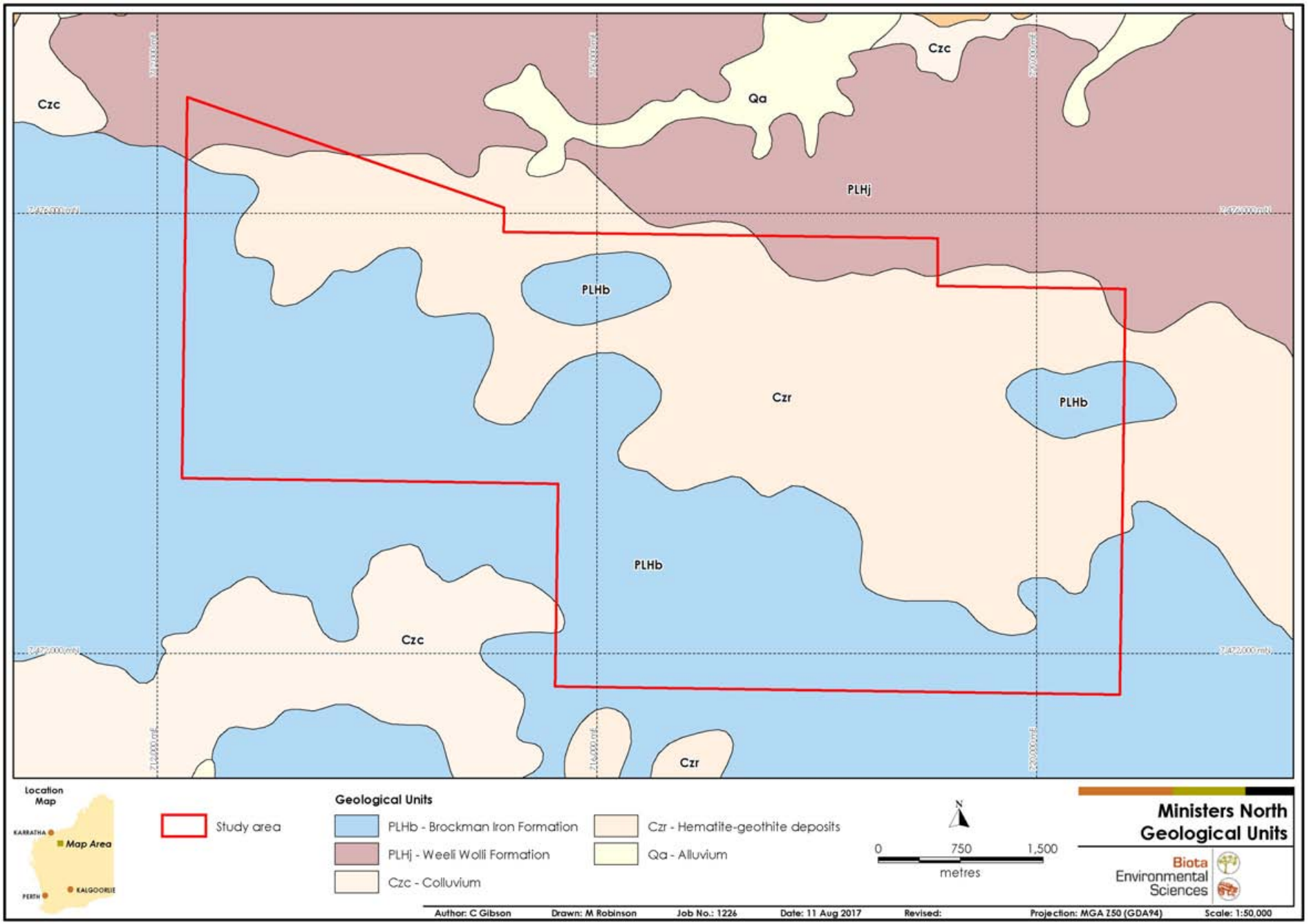

Figure 4.1: Geological units mapped within and in the vicinity of the study area (Geological Survey of Western Australia 1996).

4.4 Surface Hydrology and Landforms

The study area locality contains complex geological formations and geomorphology. The descriptions that follow are intended to provide a general description of the area only, for the purpose of providing context to the vegetation mapped in the study area.

The western section of the study area is dominated by the north-facing scarp of a range of hills. This scarp is dissected by numerous drainage lines and associated gullies. The lower slopes of the range meet with lower hills to the north, which intersect the study area in the northwest corner (see Figure 4.2). The eastern section of the study area is dominated by rolling foothills, dissected by gullies and gorges that flow into a larger creek system, Yandicoogina Creek (see Figure 4.2).

The drainage of the study area is composed of minor and major drainage lines. The major drainage through the study area, Yandicoogina Creek, is defined by an incised channel in the east of the study area and is one of the larger drainage systems in the locality (see Figure 4.2). It flows east, eventually joining Marillana and Weeli Wolli Creeks. Minor drainage lines in the study area comprise gorges and gullies. In the east, these generally flow down from the foothills into Yandicoogina Creek, while in the west they generally flow north down from the higher range (see Figure 4.2).

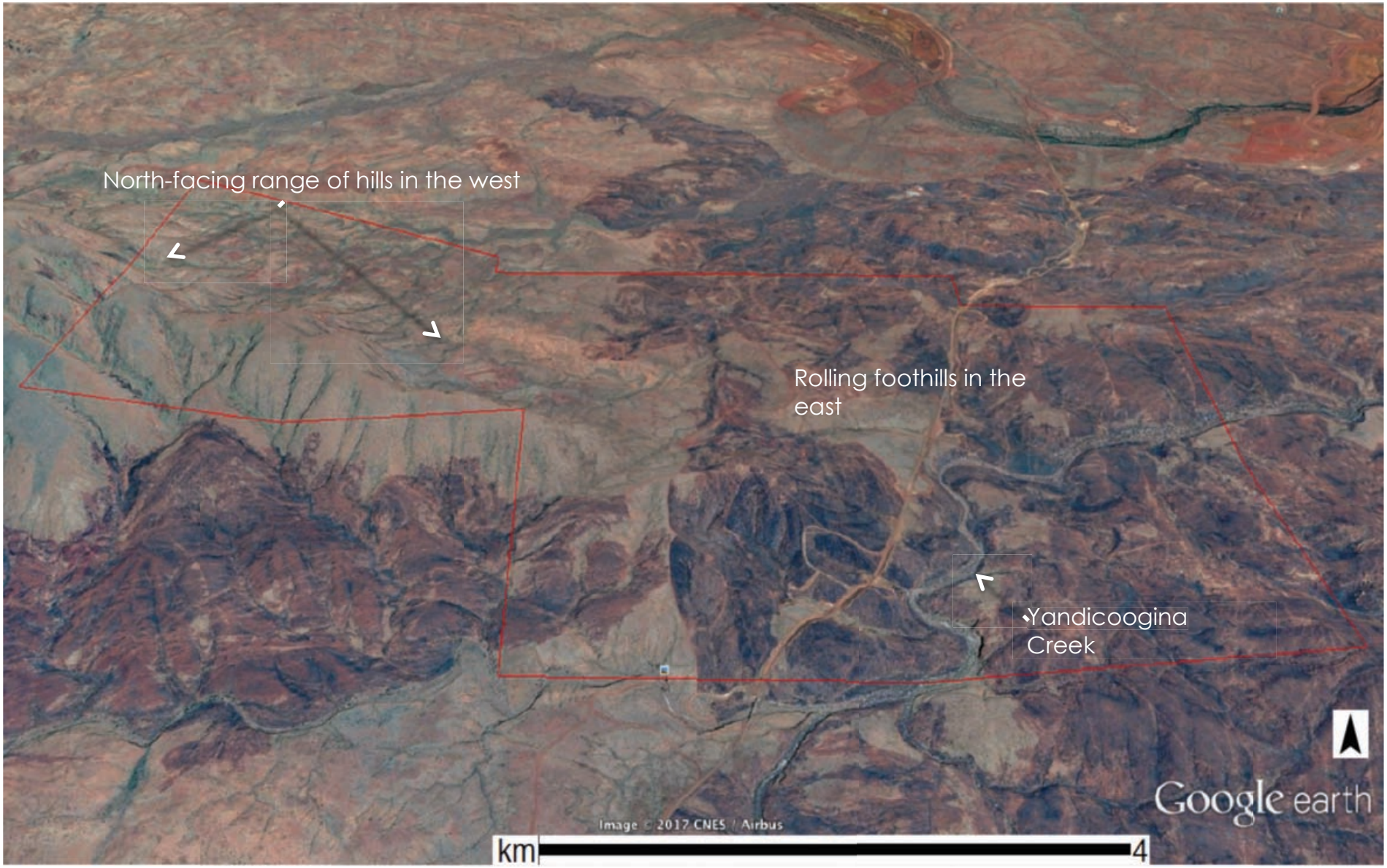

Figure 4.2: **An oblique aerial image of the landforms and hydrology of the study area, as seen looking north.**
Image sourced from Google Earth. Study area outlined in red.

4.5 Beard's Regional Vegetation Mapping

Beard (1975a, 1975b) described and mapped the vegetation of the Pilbara at a scale of 1:1,000,000. The study area is located on the Hamersley Plateau, which is within the Fortescue Botanical District of the Eremaean Botanical Province as defined by Beard. The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional eucalypts.

One vegetation unit was mapped by Beard (1975b) for the study area:

- Hamersley 82: Hummock grasslands, low tree steppe; Snappy Gum (*Eucalyptus leucophloia*) over Limestone Spinifex (*Triodia wiseana*).

This vegetation unit is widespread in the Hamersley subregion and largely uncleared (see Table 4.2). This unit is only broadly applicable to the vegetation of the study area, given the broad nature of Beard's mapping (e.g. he did not map the riparian vegetation along Yandicoogina Creek; see Section 5.2).

Table 4.2: The mapping unit of Beard (1975b) occurring in the study area and its pre-European and current extent in the Hamersley subregion (data from Government of Western Australia 2013).

Beard's Vegetation Mapping Unit	Pre-European Extent in the Hamersley Subregion	Current Extent within the Hamersley Subregion (% Remaining)	Extent within the Study Area (% of Current Mapped Extent in Hamersley Subregion)
Hamersley 82	2,177,574 ha	2,165,235 ha (99.4%)	3,029.3 ha (0.1%)

4.6 Land Systems

Western Australian Rangelands Surveys have been conducted for various parts of the State as part of a program of rangeland classification, mapping and resource evaluation (Waddell et al. 2010). These surveys have been conducted in WA since the 1950s, when they were commenced by the Commonwealth Scientific and Industrial Research Organisation (Speck et al. 1960), and more recently have been conducted as a collaboration between the Department of Agriculture and Food WA and Landgate. The land system approach to mapping different country types has been used in all of the regional rangeland surveys in WA.

The concept of land systems was first used by Christian and Stewart (1953). They defined a land system as 'an area with a recurring pattern of topography, soils and vegetation'. These recurring patterns can be mapped using 1:50,000 scale aerial photography or other remotely sensed images (Waddell et al. 2010). It is assumed that areas with a similar pattern represent the same land system. The land systems are then ground-truthed during fieldwork.

A total of 105 land systems have been identified and mapped in the Pilbara bioregion[11], with 63 land systems occurring in the Hamersley subregion. Land systems mapping covering the study area has been prepared by Van Vreeswyk et al. (2004). The study area is situated entirely within the Newman land system and is described as "rugged jaspilite plateaus, ridges and mountains supporting hard spinifex grasslands". The Newman land system is widespread and extensive in terms of the area it covers within the Hamersley subregion.

4.7 Previous Botanical Surveys in the Study Area

Previous botanical surveys, which overlap the current study area are summarised in Table 4.3, with a focus on identifying records of TECs, PECs, and flora species of conservation significance recorded during these previous studies. The findings of these surveys are summarised in Table 4.3, with the locations of the survey areas displayed in Figure 4.4. Thirteen additional surveys from the locality were also reviewed as a part of the desktop assessment. A summary of the findings of these surveys is presented in Appendix 10.

[11] This information was obtained by merging the Ashburton land system mapping (Payne et al. 1988) and Pilbara land system mapping (van Vreeswyk et al. 2004) and intersecting this with the Pilbara bioregion (Environment Australia 2000).

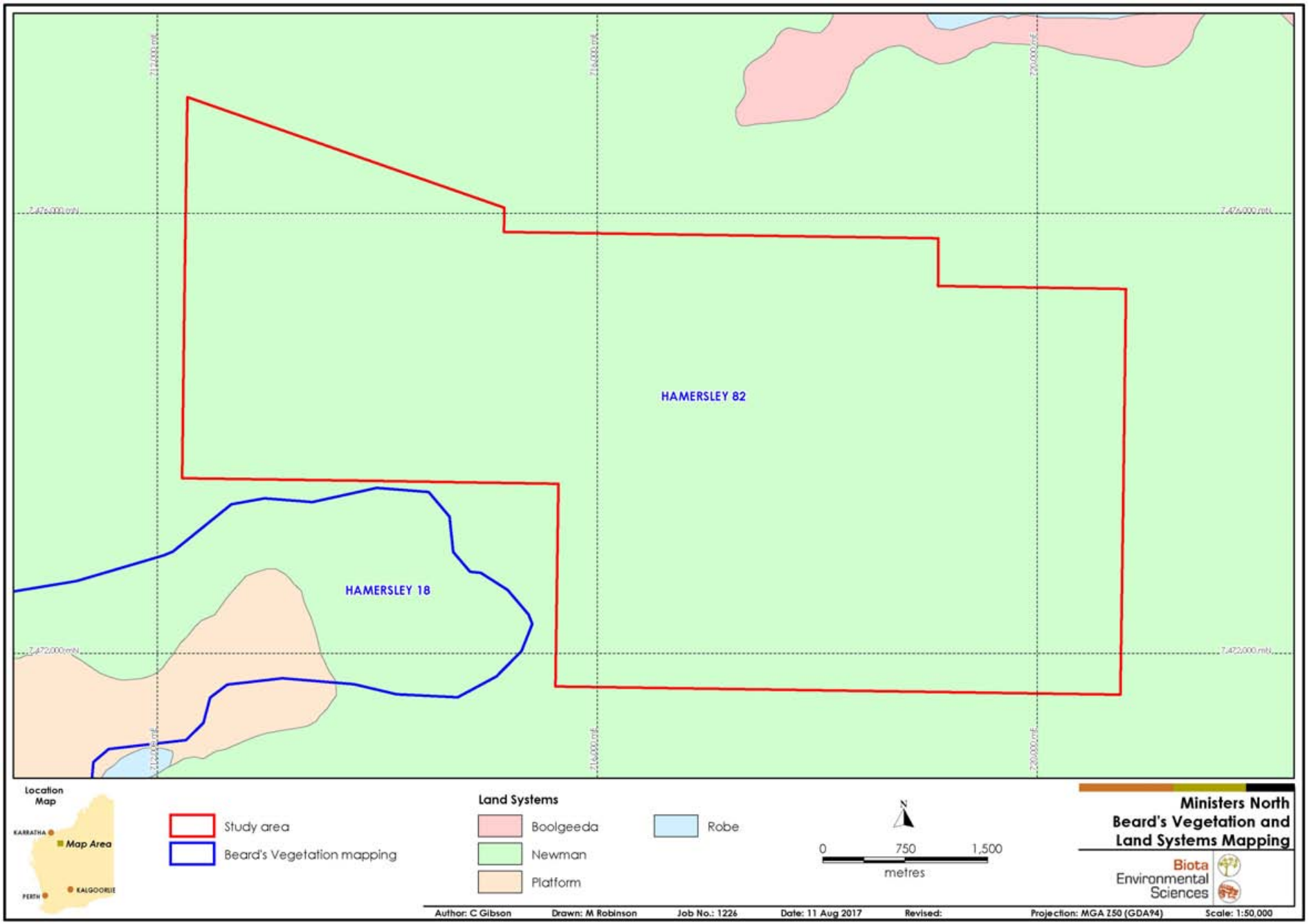

Figure 4.3: Beard's (1975b) mapping and land systems (van Vreeswyk et al. 2004) occurring within the study area.

Table 4.3: A summary of the previous botanical surveys that overlap the study area.

Project/Survey (Reference)	Survey Methodology Date of Field Survey	Size of Survey Area (ha)	Number of Sampling Sites	Seasonal Conditions (Total Rainfall in 3 Months Before Survey¥)	Species Richness †	Features of Conservation Significance: • TECs / PECs • Threatened / Priority flora species	Study Limitations and Other Comments
Area C to Yandi Flora and Vegetation Survey (Astron 2010)	Single season survey, involving vegetation mapping and rare flora searches. 6-11 September 2010	2,181 ha	50 quadrats and 7 relevés.	Poor (16.3 mm)	• 91 taxa • Zero weeds • 43 genera • 20 families	• One Priority flora species: *Acacia bromilowiana* (P4).	• Two vegetation associations analogous to 'Ecosystems at Risk' (Kendrick): Hill-top floras of the Hamersley Range and Major ephemeral watercourses. • Level 2 survey only conducted over one season.
Ministers North Flora and Vegetation Assessment (ENV 2009a)	Level 2 survey (single season), including quadrat sampling, rare flora searches, and vegetation description and mapping. 13-19 September 2007	4,500 ha – all within the current study area	65 quadrats; rare flora searches at 21 drill pads	Not reported, but likely to be poor (7.4 mm)	• 211 native taxa • 4 weeds • 96 genera • 44 families	• One Priority 3 species confirmed: *Sida* sp. Barlee Range (S. van Leeuwen 1642). • One of the recorded species (*Hibiscus* aff. *goldsworthii* (site 1260)) may represent one of the recently identified phrase name taxa in *Hibiscus*, some of which are Priority species.	• Low rainfall prior to survey. • Much of the study area had been recently burnt, including 75% of the quadrats and most of the drill pads.
Newman to Yandi Transmission Line – Flora and Vegetation Assessment (ENV 2009b)	Single phase survey including rare flora searches, quadrat sampling, and vegetation mapping. 5-15 May 2009	Approx. 2,300 ha (200 m by 115 km)	151 quadrats 29 relevés	Optimal (193.2 mm)	• 501 native taxa • 14 weeds • 172 genera • 58 families	• Two Priority flora species: *Goodenia nuda* (P4) and *Lepidium catapycnon* (P4) (revised from Threatened to Priority 4 since the survey).	• Priority 1 PEC: Weeli Wolli Spring Community occurs approximately 10 km east of the study area. A small section of the study area (2.3 km in length) lies within the buffer zone.
Ministers North Biological Survey (Ecologia 2006)	Level 1 survey (single season), including rare flora searches and vegetation descriptions. 10-14 May 2006	10,950 ha – all within the current study area	23 drill pads and two access tracks surveyed	Optimal (485.6 mm)	• 125 native taxa • 72 genera • 37 families	• No Priority flora confirmed to occur, however two of the recorded species (*Hibiscus* aff. *goldsworthii* (site 1260) and *H. haynaldii*) may represent recently identified phrase name taxa, some of which are Priority species.	• Nil

Project/Survey (Reference)	Survey Methodology Date of Field Survey	Size of Survey Area (ha)	Number of Sampling Sites	Seasonal Conditions (Total Rainfall in 3 Months Before Survey¥)	Species Richness †	Features of Conservation Significance: • TECs / PECs • Threatened / Priority flora species	Study Limitations and Other Comments
Mining Area C Rail Rare Flora Survey (Biota 2002)	Rare flora searches (two phases) 12-18 November 2001 and 21–31 March 2002	Rail corridor – 40 km.	NA – foot traverses for rare flora.	Poor (4.8 mm) & Optimal (207.5 mm)	• 426 native taxa • 6 weeds • 172 genera • 60 families	• Five Priority flora species: • *Triodia biflora* (P2), *Eriachne tenuiculmis* (P3), *Triumfetta leptacantha* (P3), *Themeda* sp. Mt Barricade (P3), and *Goodenia stellata* (P4) - however, all five are now removed from Priority flora listing.	• Survey limited to 100 m either side of rail corridor. • First phase occurred in seasonally unfavourable conditions. • Cliff faces were inaccessible. • Most areas had been recently burnt.
Mining Area C to Yandi Rail Line – Baseline Weed Survey (Ecologia 2001)	Baseline targeted weed survey 16-17 October 2001	Rail Line – approx. 38 km long.	NA – foot traverses for weed species.	Adequate (32.9 mm)	• 2 weed species.	• Nil	• Nil.
Marillana Creek Western Access Corridor (Halpern Glick Maunsell 1999)	Level 2 survey (single season), including quadrat sampling, rare flora searches, and vegetation description and mapping. 23-30 April 1999	37,715 ha – southeast 500 ha portion overlaps study area.	22 quadrats (100 x 100 m); none in study area.	Optimal (339.5 mm)	• 195 native taxa • 2 weeds • 98 genera • 40 families	• No Priority flora species: *Goodenia stellata* (P2 at the time of the survey) is now removed from Priority flora listing.	• Limited sampling given the size of the study area.
Mining Area C Biological Survey (Ecologia 1998)	Single phase biological survey including rare flora searches, quadrat and transect sampling, vegetation mapping, and fauna assessment. 16 April – 8 May 1997	103,300 ha	132 quadrats 29 transects	Optimal (516.6 mm)	• 459 native taxa • 6 weeds • 161 genera • 53 families	• One Priority flora species: *Eremophila magnifica* subsp. *magnifica* (P4). • Also recorded *Triumfetta leptacantha* (P3), *T. maconochieana* (P3), and *Brachychiton acuminata* (P4) all of which are now removed from Priority flora listing	• 47 taxa only identified to genus level. • Further 18 taxa identified with some level of uncertainty. • Lack of access to certain part of the Area C rail corridor.

¥ From Bureau of Meteorology weather recording station at Marillana (station no. 5009).

† NB. As reported in the relevant reference.

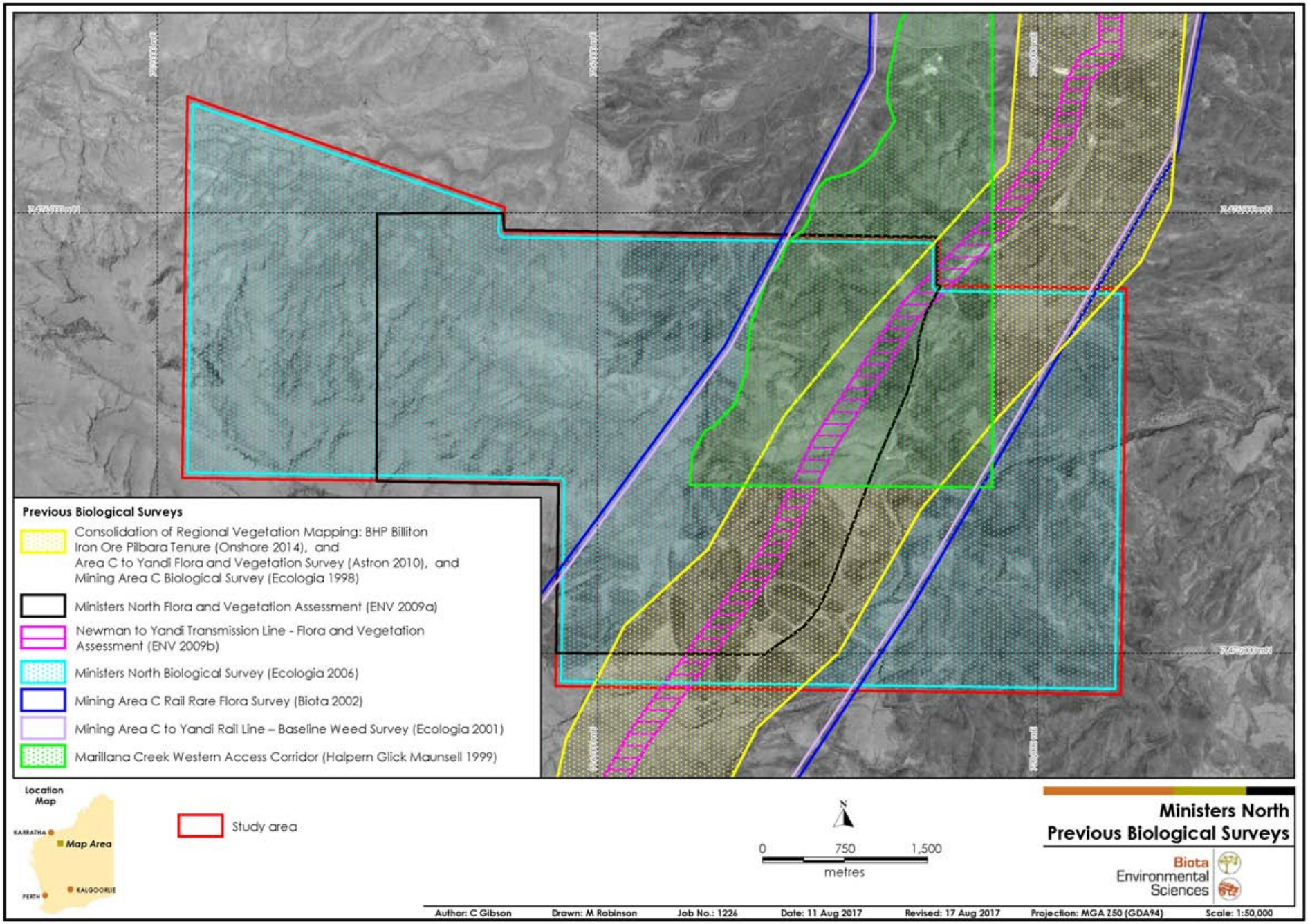

Figure 4.4: Botanical surveys previously conducted within the study area.

4.8 Communities of Conservation Significance Known from the Locality

The following section describes vegetation of conservation significance known from the Ministers North locality. The framework for ranking communities of conservation significance in WA is presented in Appendix 1.

4.8.1 Threatened Ecological Communities

TECs are described by the DBCA as "biological (flora or fauna) assemblages occurring in a particular habitat, which are under threat of modification or destruction from various processes"(Department of Biodiveristy, Conservation and Attractions 2013). TECs listed by the DBCA are significant at State level and are protected as ESAs under the WA *Environmental Protection Act 1986*. Two TECs are listed for the Pilbara bioregion: the '*Themeda* grasslands on cracking clays (Hamersley Station, Pilbara)' and the 'Ethel Gorge aquifer stygobiont community' (Department of Biodiversity, Conservation and Attractions 2016)[12].

Twenty-three of the 69 TECs listed for WA are also nationally recognised and listed under the Commonwealth EPBC Act. These do not include either of the two TECs listed for the Pilbara bioregion.

The Ethel Gorge stygobiont TEC is located approximately 89 km southeast of the study area, while the nearest area of the *Themeda* grasslands TEC is approximately 139 km to the northwest. Neither TEC is therefore relevant to the study area, with no suitable habitat expected to occur.

4.8.2 Priority Ecological Communities

PECs include possible TECs that do not meet survey criteria or are not adequately defined. These are added to the DBCA PEC list under Priorities 1 (highest priority), 2 and 3. Ecological communities that are: 1) adequately known; 2) are rare but not threatened, or meet criteria for Near Threatened; or 3) have been recently removed from the Threatened list, are placed in Priority 4. Conservation dependent ecological communities are placed in Priority 5 (see Appendix 1).

Thirty PECs are listed for the Pilbara bioregion (Department of Parks and Wildlife 2016a), none of which occur in the study area. The nearest PECs to the study area are:

- the Priority 1 'Weeli Wolli Spring Community', the buffer zone of which is situated 3.6 km to the southeast;
- three areas of the Priority 3 'Vegetation of sand dunes of the Hamersley Range/Fortescue Valley'; single dunes supporting this PEC are located 21.9 km northeast of the study area at their closest point;
- the Priority 1 'Coolibah-Lignum Flats – sub type 2', the buffer zone of which is located 26.3 km to the southwest;
- the Priority 1 'Fortescue Marsh (Marsh Land System)'. The marsh itself is located 28.5 km north of the study area, but is surrounded by fringing vegetation that extends several kilometres closer; and
- Priority 3 'Coolibah-Lignum Flats – sub-type 1' located approximately 30 km to the southwest.

[12] Department of Parks and Wildlife is now the Department of Biodiversity, Conservation and Attractions.

4.8.3 ESAs known from the Locality

Environmentally Sensitive Areas (ESAs) are defined in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* under section 51B of the WA *Environmental Protection Act 1986*. ESAs include areas that are: World Heritage sites; included on the Register of the National Estate; defined wetlands; vegetation containing Threatened flora; Threatened Ecological Communities; and Bush Forever sites.

The PECs listed in Section 4.8.2 are the only ESAs known to occur within 30 km of the study area. Of which, none occur in the study area.

4.9 Flora of Conservation Significance Known from the Locality

4.9.1 Threatened Flora

Four Threatened flora species are currently listed for the Pilbara bioregion under State and/or Commonwealth legislation: *Aluta quadrata*, *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4), *Thryptomene wittweri* and *Lepidium catapycnon*. *Aluta quadrata* and *Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4) are currently only listed as Threatened species under the WA *Wildlife Conservation Act 1950*. *Thryptomene wittweri* is listed as a Threatened species under both the WA *Wildlife Conservation Act 1950* and the Commonwealth EPBC Act. *Lepidium catapycnon* was recently reassigned to Priority 4 status in WA, however this species remains designated as a Threatened species under the EPBC Act.

Each of these species is described briefly below:

- ***Aluta quadrata*** is a perennial shrub occurring mainly in rocky gullies, although it sometimes extends down along the creeklines draining the gullies, or out onto the adjacent ridge slopes and crests. This species is currently thought to be restricted to the southern flanks of the range of hills surrounding Paraburdoo, where it occurs over an east-west range of approximately 40 km. *Aluta quadrata* has not been previously recorded within 40 km of the study area. Given the restricted distribution of this species, it would not occur in the study area.
- ***Pityrodia* sp. Marble Bar (G. Woodman & D. Coultas GWDC Opp 4)** is a shrub growing to approximately 1.5 m tall, which is described as occurring on steep hill slopes with a granite, ironstone or sandstone substrate. This species occurs in the vicinity of Marble Bar, and the six current collection locations occur over a range of less than 20 km east-west. Given the restricted distribution of this species, it would not occur in the study area.
- ***Thryptomene wittweri* (Mountain Thryptomene)** is a spreading, perennial shrub occurring in skeletal stony soils on breakaways and in drainage channels, typically high in the landscape on mountains of greater than 1,000 m elevation. All Pilbara records are restricted to the Mt Meharry area. *Thryptomene wittweri* would not occur in the study area as suitable habitat is not present, and its distribution does not include the study area.
- ***Lepidium catapycnon* (Hamersley Lepidium)** is a woody perennial herb or shrub occurring mainly on hillsides in skeletal soils, particularly in association with the Newman land system. It is widely distributed through the inland Pilbara from approximately Tom Price to Newman, hence it has recently been reassigned to Priority 4 status in WA (Department of Parks and Wildlife 2016b). This species remains listed as Threatened under the Commonwealth EPBC Act, although presumably this will be updated in future. *Lepidium catapycnon* is treated as a Priority 4 species for the purpose of this report (see Section 4.9.2).

4.9.2 Priority Flora

Based on the database searches and literature reviews conducted for this study, a total of 34 Priority flora species have been recorded within the study area locality (see Appendix 3).

Two of these Priority flora species had previously been recorded within the study area itself:

- *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3), recorded from two rocky narrow gorges in the southern half of the study area by ENV (2009a); and
- *Acacia bromilowiana* (Priority 4), recorded from a single location on an upper hill slope in the southern half of the study area by Astron (2010).

Based on the known distributions and habitat preferences of the Priority flora species, and comparison with the habitats that appeared to be present in the study area, 20 additional Priority flora taxa were identified through the desktop review as having the potential to occur in the study area. These were designated as being species that were "likely to occur" or that "may potentially occur" (based on the criteria in Table 3.1), and comprised:

- One Priority 1 species: *Synostemon hamersleyensis*.
- Five Priority 2 species: *Ipomoea racemigera, Cladium procerum, Isotropis parviflora* and *Rhodanthe frenchii.*
- Ten Priority 3 species: *Acacia subtiliformis, Aristida jerichoensis* var. *subspinulifera, Dampiera metallorum, Fimbristylis sieberiana, Grevillea saxicola, Gymnanthera cunninghamii, Indigofera gilesii* subsp. *gilesii, Rhagodia* sp. Hamersley (M. Trudgen 17794), *Rostellularia adscendens* var. *latifolia* and *Stylidium weeliwolli*.
- Four Priority 4 species: *Eremophila magnifica* subsp. *magnifica, Goodenia nuda, Lepidium catapycnon* and *Rhynchosia bungarensis.*

The 20 species listed above were considered the key target species for both phases of the field survey. The habitats present in the study area were not considered prospective for any of the other Priority flora identified as occurring in the locality (for a discussion of the reasons, see Appendix 3).

4.10 Introduced Species (Weeds) Known from the Locality

Based on the database searches and literature reviews conducted for this study, 20 Introduced flora species have been recorded within the broad locality (within a 40 km radius) of the study area (see Appendix 3). These species are listed in Table 4.4, along with their ranking according to the BAM Act.

Table 4.4: Introduced species (weeds) known from the study area locality.

Species	BAM Act Listing	
	Legal Status	Control Category for Pilbara Region
**Aerva javanica* (Kapok Bush)	Permitted – s11	Not assigned
**Argemone ochroleuca* (Mexican Poppy)	Permitted – s11	Not assigned
**Bidens bipinnata* (Bipinnate Beggartick)	Permitted – s11	Not assigned
**Cenchrus ciliaris* (Buffel Grass)	Permitted – s11	Not assigned
**Cenchrus setiger* (Birdwood Grass)	Permitted – s11	Not assigned
**Chloris virgata* (Feathertop Rhodes Grass)	Permitted – s11	Not assigned
**Conyza bonariensis* (Flaxleaf Fleabane)	Permitted – s11	Not assigned
**Cynodon dactylon* (Couch)	Permitted – s11	Not assigned
**Datura leichhardtii* (Native Thornapple)	Declared Pest – s22(2)	Not assigned
**Flaveria trinervia* (Speedy Weed)	NA	NA
**Lysimachia arvensis*	Permitted – s11	Not assigned
**Malvastrum americanum* (Spiked Malvastrum)	Permitted – s11	Not assigned

Species	BAM Act Listing	
	Legal Status	Control Category for Pilbara Region
**Rumex vesicarius* (Ruby Dock)	NA	NA
**Setaria verticillata* (Whorled Pigeon Grass)	Permitted – s11	Not assigned
**Sigesbeckia orientalis* (Indian Weed)	Permitted – s11	Not assigned
**Sisymbrium orientale* (Indian Hedge Mustard)	Permitted – s11	Not assigned
**Solanum nigrum* (Black Berry Nightshade)	Permitted – s11	Not assigned
**Sonchus oleraceus* (Common Sowthistle)	Permitted – s11	Not assigned
**Tribulus terrestris* (Caltrop)	Permitted – s11	Not assigned
**Vachellia farnesiana* (Mimosa Bush)	Permitted – s11	Not assigned

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5.0 Vegetation of the Study Area

5.1 Overview

The vegetation associations described for the study area are mapped in Figure 5.1.

These vegetation associations were associated with the following landforms:

- Medium drainage line, associated with Yandicoogina Creek.
- Rocky gullies and gorges.
- Stony hill slopes, hill crests and foothills.

Soils in the study area were generally red-brown clay loams or silty clay loams and were covered with a loose surface layer of cobbles and pebbles.

The total area of each vegetation type in the current study area is shown in Table 5.1. Disturbed areas, including drill pads and the rail line, accounted for 116 ha (3.8%) of the study area. Exploration tracks were present throughout the study area, however these were not mapped.

Table 5.1: Vegetation associations of the study area and their area of extent.

Broad Floristic Formation	Vegetation Association	Association Code	Area Mapped in Study Area (ha)	Percent of Study Area
Vegetation of Medium Drainage Lines (ME)				
Eucalyptus open woodland	Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea* subsp. *pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand in creek beds along drainage lines.	ME Ev EauSop Acp	35.2	1.2
Melaleuca argentea open forest	Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along a drainage line.	ME MaEcr TydCyv GoroCule	19.4	0.6
Vegetation of Rocky Gullies and Gorges (GG)				
Callitris low open woodland	Low open woodland of *Callitris columellaris* over high open shrubland of *Phyllanthus baccatus* over open shrubland of *Corchorus laniflorus* over scattered hummock grasses of *Triodia biflora* over scattered tussock grasses of *Aristida burbidgeae* on dark reddish brown sand and clay loam in a gorge.	GG Ccol Phba Cla TbifArb	0.7	0.02
Acacia open scrub.	Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.	GG AtpGrwhGoro ErmuTt Ch	105.4	3.5
Triodia open hummock grassland.	Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. leucophloia, *Corymbia ferriticola*, *C. hamersleyana* on dark reddish brown sandy clay loam in gullies.	GG TbifTw EllCfCh	7.7	0.3
Vegetation of Stony Hill Crests (HC), Slopes (HS) and Foothills (FH)				
Triodia hummock grassland	Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland of *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.	HC TwTp EkEll Ah	179.6	5.9
Triodia open hummock grassland	Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.	FS Ts EllCh Hc	2,169.9	71.7
Triodia open hummock grassland	Open hummock grassland of *Triodia wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.	FS Tw Ell Aha	358.3	11.8

Broad Floristic Formation	Vegetation Association	Association Code	Area Mapped in Study Area (ha)	Percent of Study Area
Triodia open hummock grassland	Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over open shrubland of *Acacia bivenosa* on dark reddish brown sandy clay loam on lower hill slopes.	HS TsTw Ell Ab	30.8	1.0
Triodia open hummock grassland.	Open hummock grassland of *Triodia wiseana* with scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* over scattered shrubs of *Acacia bivenosa* on dark reddish brown sandy clay loam on steep hill slopes.	HS Tw Ell Ab	6.2	0.2
		Disturbed:	116.1	3.8
		Total:	**3,029.3**	

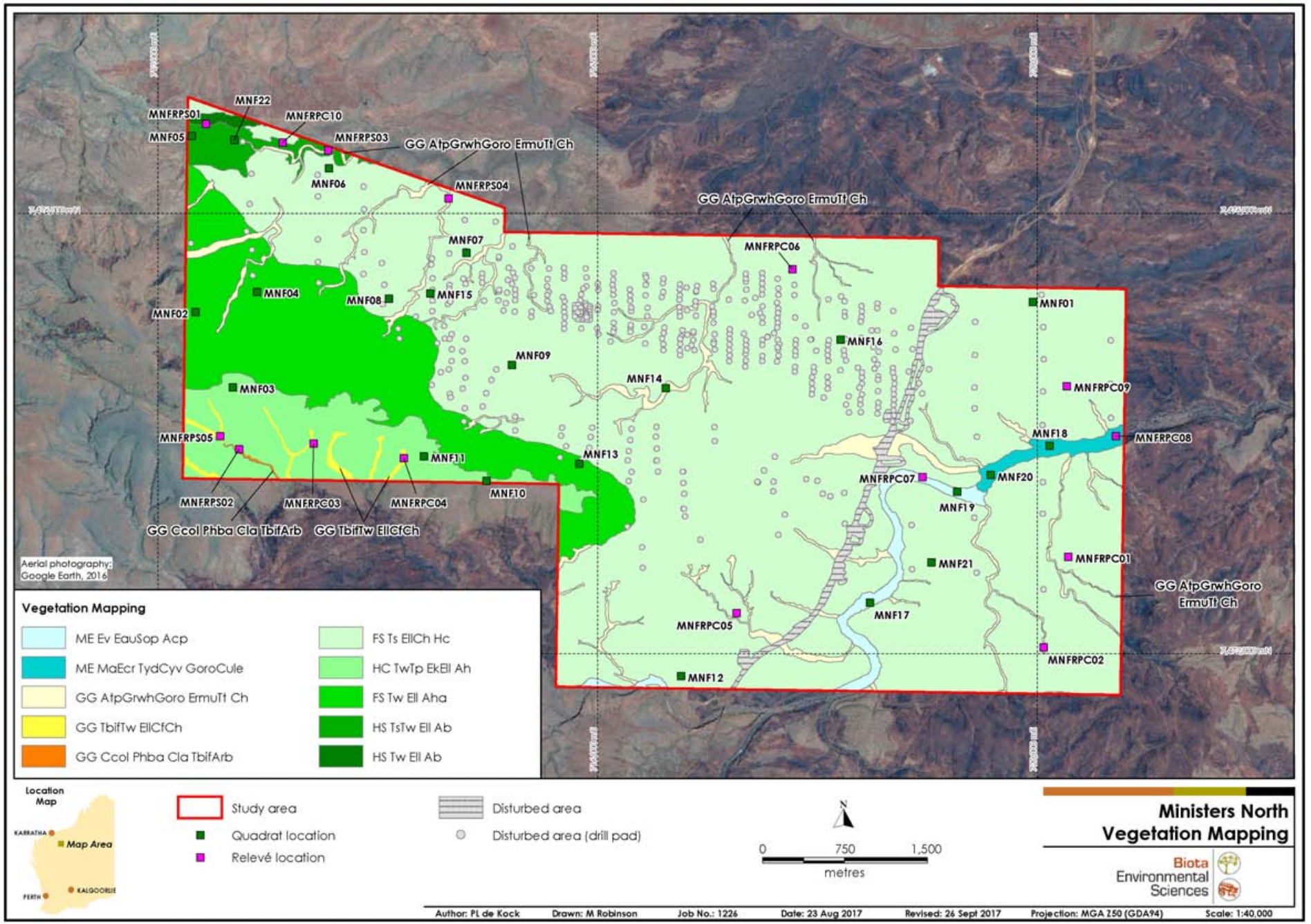

Figure 5.1: Vegetation of the study area.

5.2 Description of the Vegetation Associations

5.2.1 Vegetation of Medium Drainage Lines

Broad Floristic Formation	*Eucalyptus* open woodland
Vegetation Association	Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea* subsp. *pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.
Association Code	ME Ev EauSop Acp
Distribution and Comments	This vegetation type (Plate 5.1) was recorded in a major drainage line in the southeastern section of the study area. *Melaleuca glomerata* was occasionally found co-occuring with *Acacia coriacea* subsp. *pendens* in the tall shrub strata.
Associated Species	Trees/Tall Shrubs: *Acacia pyrifolia, A. tumida* var. *pilbarensis*, *Atalaya hemiglauca* and *Melaleuca glomerata*. Low Shrubs: *Alternanthera denticulata, Phyllanthus maderaspatensis, Pluchea dentex, P. rubelliflora.* Herbs, Grasses and Sedges: *Bergia pedicellaris, Cymbopogon ambiguus, Cyperus iria, C. vaginatus, Digitaria brownii, Eragrostis elongata, Goodenia lamprosperma, Themeda triandra and Triodia pungens*, *Wahlenbergia tumidifructa* and *Waltheria indica*.
Vegetation Condition	Very Good.
Disturbance	Presence of weeds: **Argemone ochroleuca* subsp. *ochroleuca, *Bidens bipinnata, *Cenchrus ciliaris, *Melinis repens, *Rumex vesicarius, *Setaria verticillata, *Sigesbeckia orientalis, *Sonchus oleraceus*. Presence of horse and donkey scats.
Sites in the Study Area	Two quadrats: MNF17, MNF19; one relevé: MNFRPC07.
Notes	This vegetation association transitioned abruptly downstream into ME MaEcr TydCyv GoroCule, with the occurrence of surface ponding. This association had been burnt 9 months prior to the survey. This association is considered to be potential groundwater dependant vegetation (GDV)[13]. Three individuals of *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) were recorded in this vegetation association.

Plate 5.1: Vegetation association ME Ev EauSop Acp.

[13] A potential GDV was considered a vegetation type that is dominated by *Eucalyptus victrix.*

Broad Floristic Formation	*Melaleuca argentea* open forest
Vegetation Association	Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.
Association Code	ME MaEcr TydCyv GoroCule
Distribution and Comments	This vegetation type (Plate 5.2) was recorded from one location in a drainage line in the north-eastern corner of the study area. Surface ponding was a commonly recorded along Yandicoogina Creek.
Associated Species	Trees/Tall Shrubs: *Acacia coriacea* subsp. *pendens, Atalaya hemiglauca*. Shrubs: *Abutilon amplum*, *Corchorus crozophorifolius*, *Dodonaea lanceolata*, *Indigofera monophylla*. Low Shrubs: *Melhania oblongifolia*, *Pluchea rubelliflora, Vigna lanceolata* var. *lanceolata, Waltheria indica.* Herbs, Grasses and Sedges: *Ammannia multiflora, Bergia pedicellaris, Cymbopogon procerus*, *Imperata cylindrica*, *Enteropogon ramosus*, *Eriachne tenuiculmis*, *Fimbristylis sieberiana* (Priority 3), *Eleocharis geniculata, Goodenia lamprosperma*, *Lobelia arnhemiaca* and *Wahlenbergia tumidifructa*.
Vegetation Condition	Excellent to Very Good.
Disturbance	Presence of weeds; **Argemone ochroleuca* subsp. *ochroleuca, *Bidens bipinnata, *Cenchrus ciliaris, *Flaveria trinervia, *Malvastrum americanum, *Melinis repens, *Rumex vesicarius, *Setaria verticillata, *Sonchus oleraceus, *Solanum nigrum, *Tridax procumbens, *Vachellia farnesiana.* Signs of cattle.
Sites in the Study Area	Two quadrats: MNF18, MNF20; one Relevé; MNFRC08.
Notes	Scattered sedges (e.g. *Typha domingensis*, *Eleocharis geniculata* and *Cyperus vaginatus*) occurred within this vegetation association associated with surface ponding (see Plate 5.3). This unit is considered to be GDV[14] (see Section 5.6.2). The unit quickly transitioned to vegetation unit ME Ev EauSop Acp (*Eucalyptus victrix* dominated) in the southwest, where surface ponding was no longer common. This association had been burnt 9 months prior to the survey. All records of *Fimbristylis sieberiana* (Priority 3) from the study were recorded in this vegetation association.

Plate 5.2: Vegetation association ME MaEcr TydCyv GoroCule.

Plate 5.3: Surface ponding with abundant sedges within association ME MaEcr TydCyv GoroCule.

[14] A GDV is described as vegetation dominated by *Eucalyptus camaldulensis* or *Melaleuca argentea.*

5.2.2 Vegetation of Gullies and Gorges

Broad Floristic Formation	*Callitris* low open woodland
Vegetation Association	Low open woodland of *Callitris columellaris* over high open shrubland of *Phyllanthus baccatus* over open shrubland of *Corchorus laniflorus* over scattered hummock grasses of *Triodia biflora* over scattered tussock grasses of *Aristida burbidgeae* on dark reddish brown sand and clay loam in a gorge.
Association Code	GG Ccol Phba[15] Cla TbifArb
Distribution and Comments	This vegetation type (Plate 5.4 and Plate 5.5) was recorded in a single deeply incised gorge in the southwest of the study area.
Associated Species	Trees/Tall Shrubs: *Acacia citrinoviridis, Corymbia ferriticola, Ficus brachypoda, Gossypium robinsonii.* Shrubs: *Pimelea microcephala* subsp. *microcephala.* . Low Shrubs: *Pluchea dentex, Sida* sp. Barlee Range (S. van Leeuwen 1642), *Solanum gabrielae.* Herbs and Ferns: *Cheilanthes austrotenuifolia, Lobelia heterophylla* subsp. *pilbarensis.*
Vegetation Condition	Pristine.
Disturbance	None.
Sites in the Study Area	One relevé: MNFRPS02.
Notes	Locally important due to it being a refuge for fire sensitive species (e.g. *Callitris columellaris*).

Plate 5.4: Vegetation association GG Ccol Phba Cla TbifArb

Plate 5.5: Narrow incised gorge section vegetation association GG Ccol Phba Cla TbifArb.

[15] *Phyllanthus baccatus* did not have an existing standardised code as described by BHPBIO (2010).

Broad Floristic Formation	*Acacia* open scrub.
Vegetation Association	Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.
Association Code	GG AtpGrwhGoro ErmuTt Ch
Distribution and Comments	This vegetation type (Plate 5.6) was the most widespread of the gully/ gorge units within the study area. It extended from the far east to the far west, occurring within gullies and gorges, a common habitat between the widespread low undulating hills. In many areas the gullies were too small to map individually.
Associated Species	Trees/Tall Shrubs: *Acacia hamersleyensis, Corymbia ferriticola, Ficus brachypoda, Santalum lanceolatum.* Shrubs: *Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618), *Amaranthus* aff. *undulatus* (round leaves, short tepals), *Androcalva luteiflora, Corchorus lasiocarpus* subsp. *parvus, Dodonaea lanceolata, Senna glutinosa* subsp. *glutinosa, Sida* sp. Articulation Below (A.A. Mitchell PRP 1605), *Tephrosia virens*. Low Shrubs: *Indigofera fractiflexa* subsp. *fractiflexa, Sida* sp. Barlee Range (S. van Leeuwen 1642), *Sida* sp. Excedentifolia (J.L. Egan 1925), *Triumfetta leptacantha* Herbs, Grasses: *Amaranthus undulatus, Aristida burbidgeae, Cymbopogon ambiguus, Eriachne tenuiculmis, Nicotiana benthamiana.*
Vegetation Condition	Excellent.
Disturbance	Presence of weeds: **Argemone ochroleuca* subsp. *ochroleuca *Bidens bipinnata, *Rumex vesicarius,*Sonchus oleraceus.*
Sites in the Study Area	One quadrat: MNF14; three relevés: MNFRPC02, MNFRPS03, MNFRPS04.
Notes	In some sections the gullies and gorges widened to include narrow flood banks, and therefore could be considered drainage lines (see Plate 5.7), however these areas were interspersed sporadically throughout the vegetation unit, and were at too fine a scale to be mapped separately. Most of this vegetation association had steep rocky slopes either side of the main channel. Towards the upper reaches or in narrow gorges or gullies, the vegetation comprised a sub-unit of AtpGrwhGoro ErmuTt Ch comprising *Corymbia ferriticola* and *Ficus brachypoda* scattered low trees over *Tephrosia virens* open shrubland with *Eriachne mucronata* scattered tussock grasses, however these were also too narrow to map individually. *Sida* sp. Barlee Range Barlee Range (S. van Leeuwen 1642) (Priority 3) was recorded from 11 locations in this association. *Acacia bromilowiana* (Priority 4) was recorded from two locations within this association.

Plate 5.6: Typical occurrence of vegetation association GG AtpGrwhGoro ErmuTt Ch within a gorge/gully.

Plate 5.7: Broader drainage line occurrence of GG AtpGrwhGoro ErmuTt Ch.

Broad Floristic Formation	*Triodia* open hummock grassland.
Vegetation Association	Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia ferriticola*, *C. hamersleyana* on dark reddish brown sandy clay loam in gullies.
Association Code	GG TbifTw EllCfCh
Distribution and Comments	This vegetation type (Plate 5.8) was recorded in gullies along the southern slopes (and thus shaded in winter) of the major ranges in the western section of the study area.
Associated Species	Trees/Tall Shrubs: *Astrotricha hamptonii, Dodonaea viscosa* subsp. *mucronata, Ficus brachypoda, Gossypium robinsonii* and *Grevillea wickhamii, Santalum lanceolatum.* Shrubs: *Corchorus laniflorus*, *Eremophila jucunda* subsp. *pulcherrima*, *Pimelea forrestiana*. Low Shrubs and Climbers: *Cyperus cunninghamii* subsp. *cunninghamii*, *Glycine canescens*. *Cynanchum floribundum, Indigofera fractiflexa* subsp. *fractiflexa, Pluchea dentex, Pterocaulon serrulatum* var. *velutinum, Sida* sp. Shovelanna hill (S. van Leeuwen 3842), *Solanum gabrielae, Tinospora smilacina, Triumfetta maconochieana.* Grasses and Ferns: *Cheilanthes austrotenuifolia, C. brownii, Cymbopogon ambiguus* and *Peripleura hispidula* var. *hispidula, Themeda* sp. Mt Barricade (M.E. Trudgen 2471), *Triodia pungens.*
Vegetation Condition	Pristine - Excellent.
Disturbance	Presence of a weed: **Rumex vesicarius.*
Sites in the Study Area	Three relevés: MNFRPS05, MNFRPC03, MNFRPC04.
Notes	*Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) was recorded from one location within this association.

Plate 5.8: Vegetation association GG TbifTw EllCfCh.

5.2.3 Vegetation of Stony Hill Crests, Slopes and Foothills.

Broad Floristic Formation	*Triodia* hummock grassland
Vegetation Association	Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.
Association Code	HC TwTp EkEll Ah
Distribution and Comments	This vegetation type (Plate 5.9) was restricted to the crests of the large hills located along the southern boundary of the western half of the study area. *Eucalyptus gamophylla* was sometimes found to occur as part of the mallee woodland.
Associated Species	Trees/Tall Shrubs: *Acacia pruinocarpa, A. pyrifolia, Eucalyptus gamophylla, Corymbia hamersleyana, Grevillea wickhamii* subsp. *aprica*. Shrubs: *Senna glutinosa* subsp. *glutinosa*. Low Shrubs: *Goodenia triodiophila*, *Scaevola* sp. Mt Bruce (M.E. Trudgen 1333). Grasses: *Amphipogon sericeus*, *Eriachne mucronata*, *Fimbristylis dichotoma*, *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835).
Vegetation Condition	Pristine to Excellent.
Disturbance	Scattered presence of weed: **Rumex vesicarius.*
Sites in the Study Area	Three quadrats: MNF03, MNF10, MNF11.
Notes	*Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4) were recorded within this association.

Plate 5.9: Vegetation association HC TwTp EkEll Ah

Broad Floristic Formation	*Triodia* open hummock grassland
Vegetation Association	Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.
Association Code	FS Ts EllCh Hc
Distribution and Comments	This vegetation type (Plate 5.10) was widespread throughout most of the study area, occurring on the extensive low undulating hills, in addition to one much larger hill in the south (immediately west of the rail). *Grevillea wickhamii* subsp. *hispidula* was also commonly present as scattered tall shrubs.
Associated Species	Trees/Tall Shrubs: *Acacia pruinocarpa, Grevillea wickhamii* subsp. *hispidula*. Shrubs: *Acacia adoxa* var. *adoxa*, *A. spondylophylla*, *Corchorus lasiocarpus* subsp. *parvus*, *Gompholobium oreophilum*, *Ptilotus calostachyus*, *Santalum lanceolata*, *Senna glutinosa* subsp. *glutinosa*. Low Shrubs: *Goodenia triodiophila*, *Scaevola* sp. Mt Bruce (M.E. Trudgen 1333), *Indigofera monophylla* (sensu lato). Grasses: *Amphipogon sericeus*, *Eriachne mucronata* (typical form).
Vegetation Condition	Pristine to Excellent.
Disturbance	Presence of scattered weeds: **Cenchrus setiger, *Chloris virgata, *Rumex vesicarius.*
Sites in the Study Area	Nine quadrats: MNF01, MNF06, MNF07, MNF08, MNF09, MNF12, MNF15, MNF16, MNF21; four Relevés: MNRFPC01, MNFRPC05, MNRFPC06, MNRFPC09.
Notes	Some areas had *Acacia adoxa* var. *adoxa*, and *A. spondylophylla*, occurring as low open shrublands, however not consistently enough to warrant inclusion into the vegetation description. A small section in the northeast comprised some *Corymbia deserticola* subsp. *deserticola* scattered trees, this section was too small to be mapped at this scale, in addition to having been recently burnt. The vegetation unit was heavily dissected by narrow gullies and gorges comprising vegetation unit G1, in addition to the major drainage units D1, and D2 in the southeast. Large swathes of this vegetation unit through the central section of the study area were burnt 9 months prior to the survey. *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4) were recorded within this association.

Plate 5.10: Vegetation association FS Ts EllCh Hc.

Broad Floristic Formation	*Triodia* open hummock grassland
Vegetation Association	Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.
Association Code	FS Tw Ell Aha
Distribution and Comments	This vegetation type (Plate 5.11) was restricted to the slopes and foothills of the large ranges along the southern boundary in the western half of the study area. *Eucalyptus gamophylla* occurred as a low open mallee woodland in isolated pockets. *Acacia spondylophylla* was sometimes recorded as low open shrublands.
Associated Species	Trees/Tall Shrubs: *Eucalyptus gamophylla, Grevillea wickhamii* subsp. *hispidula*, *Hakea* lorea subsp. *lorea*. Shrubs: *Acacia bromilowiana* (Priority 4), *A. hilliana*. Low Shrubs: *Acacia spondylophylla*, *Goodenia stobbsiana*. Grasses: *Amphipogon sericeus*, *Eriachne mucronata* (typical form), *E. pulchella*, *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835).
Vegetation Condition	Pristine.
Disturbance	None.
Sites in the Study Area	Three quadrats: MNF02, MNF04, MNF13.
Notes	Lower slope occurrences of this vegetation unit were interspersed with vegetation FS Ts EllCh Hc, however these were too small to map individually. Areas of breakaway were common throughout the vegetation unit, typically in the higher sections of the landscape. Vegetation here was typically comprised of *Corymbia ferriticola* and *Ficus brachypoda* scattered low trees (growing out of the free-face), with *Eriachne mucronata* tussock grasses. *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4) were recorded within this association. *Acacia bromilowiana* (Priority 4) was strongly associated with these breakaways.

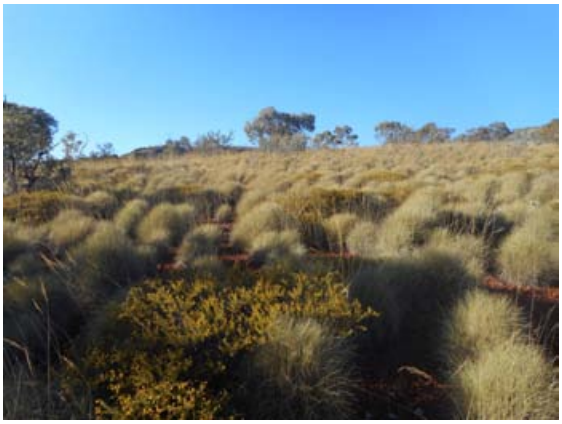

Plate 5.11: Vegetation association FS Tw Ell Aha.

Broad Floristic Formation	*Triodia* open hummock grassland
Vegetation Association	Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* on dark reddish brown sandy clay loam on lower hill slopes.
Association Code	HS TsTw Ell Ab
Distribution and Comments	This vegetation type (Plate 5.12) was recorded along lower slopes and low hills adjacent to minor flow lines in the western end of the study area.
Associated Species	Shrubs: *Acacia tenuissima*, *Capparis lasiantha*, *Dodonaea coriacea*, *Senna artemisioides* subsp. *oligophylla*, *Senna glutinosa* subsp. *glutinosa*. Low Shrubs: *Lepidium pedicellosum*. Grasses: *Eriachne mucronata* (typical form), *Paraneurachne muelleri*, *Triodia* brizoides, *T. pungens*.
Vegetation Condition	Pristine.
Disturbance	None.
Sites in the Study Area	Two quadrats: MNF05, MNF22; one relevé: MNFRPC10.
Notes	*Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4) were recorded within this association. *Acacia bromilowiana* (Priority 4) was strongly associated with these breakaways.

Plate 5.12: Vegetation assication HS TsTw Ell Ab.

Broad Floristic Formation	*Triodia* open hummock grassland.
Vegetation Association	Open hummock grassland of *Triodia wiseana* with scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* over scattered shrubs of *Acacia bivenosa* on dark reddish brown sandy clay loam on steep hill slopes.
Association Code	HS Tw Ell Ab
Distribution and Comments	This vegetation type (Plate 5.13) was recorded along a steep slope of a low hill in the northwestern corner of the study area.
Associated Species	Tall shrubs: *Grevillea wickhamii* subsp. *hispidula*. Shrubs: *Acacia tenuissima*, *Santalum lanceolatum*, *Senna glutinosa* subsp. *glutinosa*, *S. glutinosa* subsp. *pruinosa*. Grasses, herbs and ferns: *Cheilanthes brownii, Themeda* sp. Mt Barricade (M.E. Trudgen 2471) and *Goodenia muelleriana*.
Vegetation Condition	Pristine.
Distrubance	None.
Sites in the Study Area	One relevé: MNFRPS01.
Notes	Only a single site was established in this unit due to the very limited occurrence within the study area. However, it is a commonly occurring vegetation unit on steep slopes of hills and mesas, often with *Triodia brizoides* as the dominant hummock grass species (Biota 2012a, 2012d, 2012f).

Plate 5.13: Vegetation association HS Tw Ell Ab.

5.3 Comparison to Previous Vegetation Mapping

A comparison of the vegetation associations described in the current survey with those mapped by Onshore Environment (2014b) within the study area, is provided in Table 5.2 and Figure 5.2.

Onshore Environment (2014b) mapped six vegetation associations for the stony hills and drainage lines within study area. Overall, these associations share dominant species with the associations mapped by the current survey on similar landforms (e.g. medium drainage lines are dominated by open woodlands of *Eucalyptus* over open tussock grasslands, and stony hills are dominated by open hummock grasslands of *Triodia* with open shrublands of *Acacia* and open woodlands of *Eucalyptus*). However, the mapping differs between the two surveys on the boundaries of the associations and the structure of the associations. When mapping narrow corridors, as done by Onshore Environment (2014b), small areas of broader vegetation units are intersected and this can lead to more detailed mapping as a function of tighter survey scale. For example, Onshore Environment (2014b) mapped three vegetation units on stony hills, whereas, though sampling a greater number of sites within the broader unit, the current survey considers these all to be the same broader association, which extends into the northwest of the study area (Table 5.2). Similarly a greater number of minor drainage lines have been delineated by Onshore Environment (2014b) at a detailed mapping scale that was not practical or necessary for EIA requirements to extend over the much greater scale of the current study area.

Table 5.2: Comparison of vegetation associations described by current survey with those mapped by Onshore Environment (2014b).

Vegetation Description (Current Survey)	Vegetation Code (Onshore Environmental 2014b)	Vegetation Description (Onshore Environmental 2014b)
Vegetation of Medium Drainage Lines		
Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea* subsp. *pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand in creek beds along drainage lines.	MA EcrEvEx ApypAtpGoro TtEuaCyp	Low open forest of *Eucalyptus camaldulensis* subsp. *refulgens*, *Eucalyptus victrix* and *Eucalyptus xerothermica* over high shrubland of *Acacia pyrifolia* var. *pyrifolia, Acacia tumida* var. *pilbarensis* and *Gossypium robinsonii* over open tussock grassland of *Themeda triandra, Eulalia aurea,* with sedges of *Cyperus vaginatus*.
	ME TtEuaEte ApypAtpPl EvCh	Tussock grassland of *Themeda triandra, Eulalia aurea* and *Eriachne tenuiculmis* with high shrubland of *Acacia pyrifolia* var. *pyrifolia, Acacia tumida* var. *pilbarensis* and *Petalostylis labicheoides* and open woodland of *Eucalyptus victrix* and *Corymbia hamersleyana.*
Vegetation of Rocky Gullies and Gorges		
Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.	ME TpTlo ExAciCh PlApypGoro	Hummock grassland of *Triodia pungens* and *Triodia longiceps* with low woodland of *Eucalyptus xerothermica, Acacia citrinoviridis* and *Corymbia hamerselyana* over high shrubland of *Petalostylis labicheoides, Acacia pyrifolia* var. *pyrifolia* and *Gossypium robinsonii.*
	HS TbrTw Ell	Hummock grassland of *Triodia brizoides* and/or *Triodia wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. l*eucophloia*.
Vegetation of Stony Hill Slopes, Hill crests and Foothills		
Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.	ME TpTlo ExAciCh PlApypGoro	Hummock grassland of *Triodia pungens* and *Triodia longiceps* with low woodland of *Eucalyptus xerothermica, Acacia citrinoviridis* and *Corymbia hamerselyana* over high shrubland of *Petalostylis labicheoides, Acacia pyrifolia* var. *pyrifolia* and *Gossypium robinsonii.*
	FS Ts CdHc AancAiGrwh	Hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Corymbia deserticola* subsp. *deserticola* and *Hakea chordophylla* over open shrubland of *Acacia ancistrocarpa, Acacia inaequilatera* and *Grevillea wickhamii* subsp. *hispidula.*
	HS TbrTw Ell	Hummock grassland of *Triodia brizoides* and/or *Triodia wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. l*eucophloia*.
	HS TsTwTp EllCh AhiAaa	Hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over low open shrubland of *Acacia hilliana* and *Acacia adoxa* var. *adoxa.*

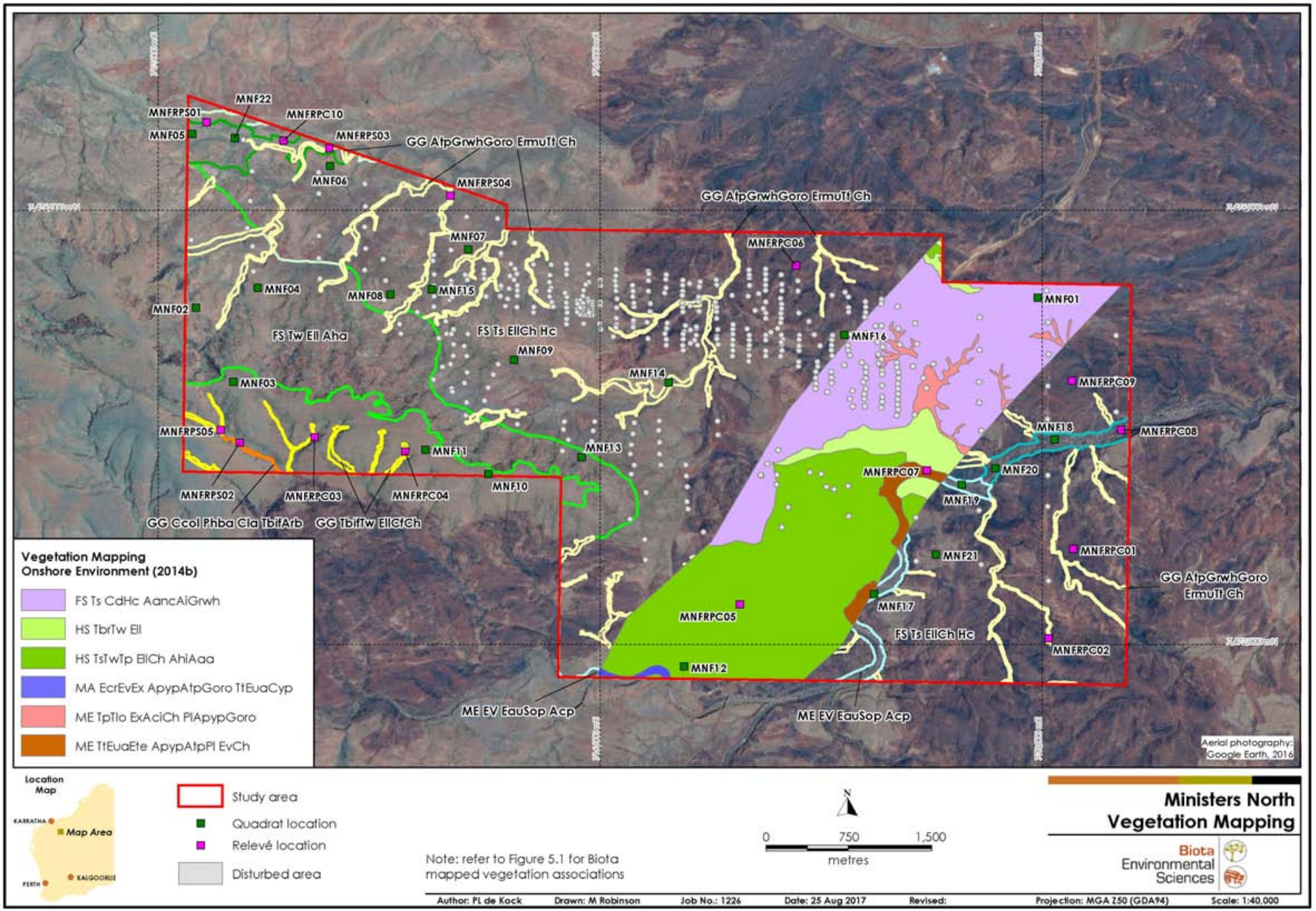

Figure 5.2: Vegetation within the study area previously mapped by Onshore Environment (2014b) compared with vegetation mapping of the current study (shown in open polygons).

5.4 Condition of the Vegetation Units

The condition of vegetation in the study area was ranked from Pristine to Very Good, with the majority of vegetation in the study area assessed as Pristine.

The study area contained some areas that had been cleared for mining exploration activities, including tracks, drill pads and a rail line. These cleared areas occurred through all sections of the study area and were considered to be Completely Degraded.

The assigned vegetation condition ranking for units in the study area generally aligned with the broad landform categories:

- Medium Drainage Lines: The vegetation of drainage lines in the study area was predominantly in Excellent to Very Good condition. Introduced species were common in Yandicoogina Creek, which reduced the vegetation condition in some sections of the creek.
- Gullies and Gorges: The vegetation of the gullies and gorges in the study area were in Pristine to Excellent condition. Introduced (weed) species occurred infrequently and where they occurred, they were present as scattered individuals.
- Hill Crests, Slopes and Foothills: The vegetation of the hills in the study area was predominately in Pristine condition. Introduced (weed) species occurred infrequently and where they occurred, they were present as scattered individuals.

The vegetation condition of the study area is mapped in Figure 5.3, along with the presence of introduced (weed) species and drill pads (disturbed areas).

It should be noted that fire is a natural part of the Pilbara landscape. While repeated fires may affect vegetation condition, according the scale used in this assessment (see Section 3.2.4 and Appendix 4), occasional naturally occurring fires do not.

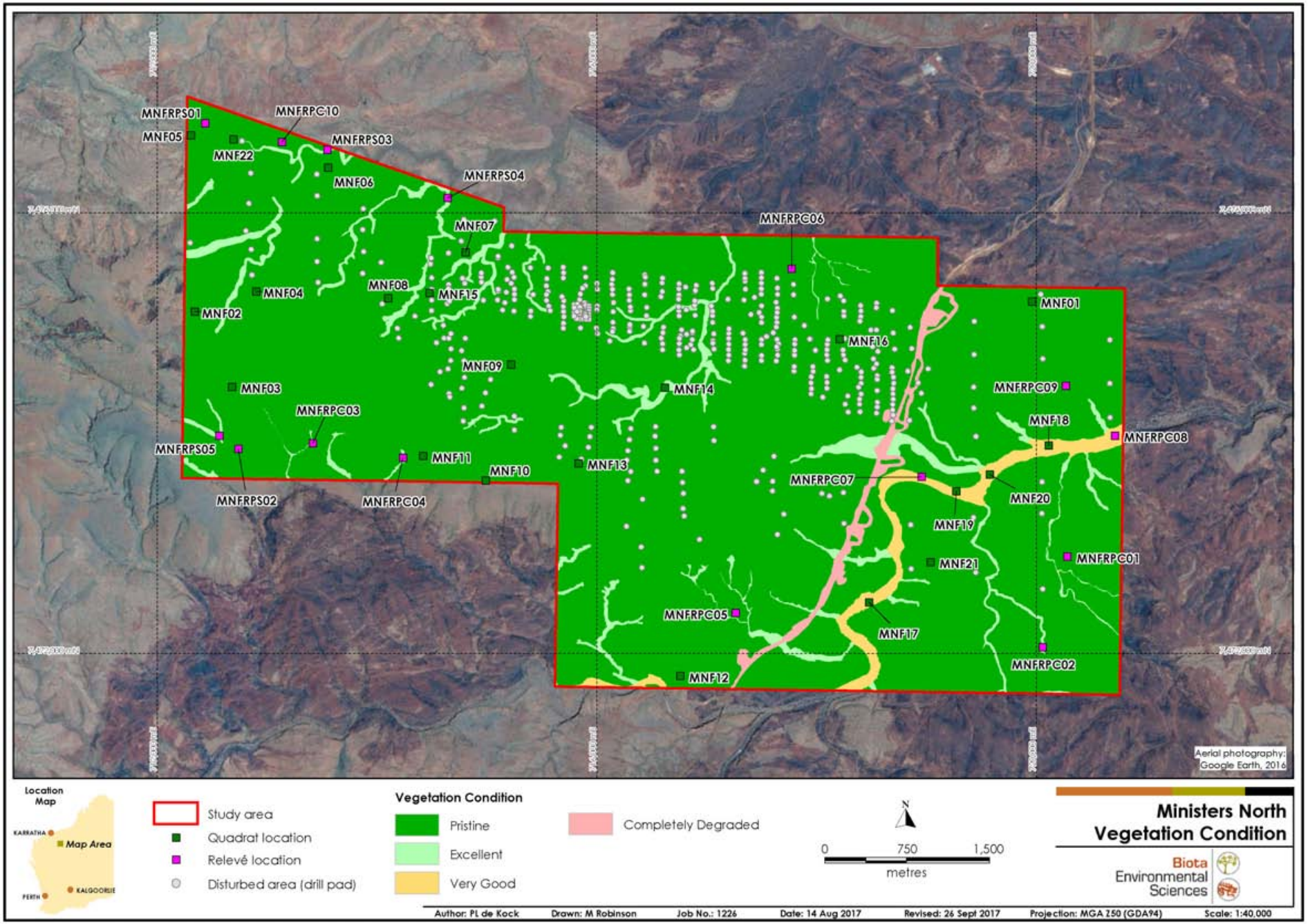

Figure 5.3: Vegetation condition and disturbed areas (drill pads and rail line only) in the study area.

5.5 Floristic Analysis

Clustering analysis, in conjunction with non-metric multidimensional scaling (NMDS), was used to determine any apparent geographic restriction of vegetation in the study area based on the floristic composition of the quadrats. The data set for the analysis contained data from 536 sampling sites with 98 sites from the study area (see Section 3.4).

A total of 53 floristic groups were determined from the cluster analysis with sites from the study area falling into 15 of these. Seven groups were composed of sites from within the study area only (Groups 20, 21, 23, 24, 25, 26, 27; Appendix 9). The sites that made up six of these groups were recently burnt (between one and five years ago) or had been affected by the close proximity of the recent burn (presence of fire ephemerals), and therefore none these groups were considered to be significant but rather were separated by the analysis due to their early seral stage post-fire (Appendix 9). Group 23 was represented by a single relevé, MNFRPS02, which was situated in a gorge, and provides a refuge to fire sensitive species such as *Callitris columellaris* (see Section 5.6.2), and is therefore considered to represent a locally important vegetation unit. Although this group was distinct in the analysis, the cluster diagram indicates that it is related to Group 22 at a lower level of similarity. This group is comprised of other gorge sites from the study area and rocky sites from the regional data set.

The NMDS plot (Figure 5.4) indicates that there is a large amount of overlap in floristic composition between the majority of the quadrats and, based on floristic composition, quadrats from the study area do not form any distinct groupings separate from other quadrats in the locality. Therefore, none of the sites sampled are considered to be geographically restricted to the study area.

A summary of the floristic groups is presented in Appendix 9, including their characteristics (i.e. habitat, fire age and associated species, as determined by the SIMPER analysis).

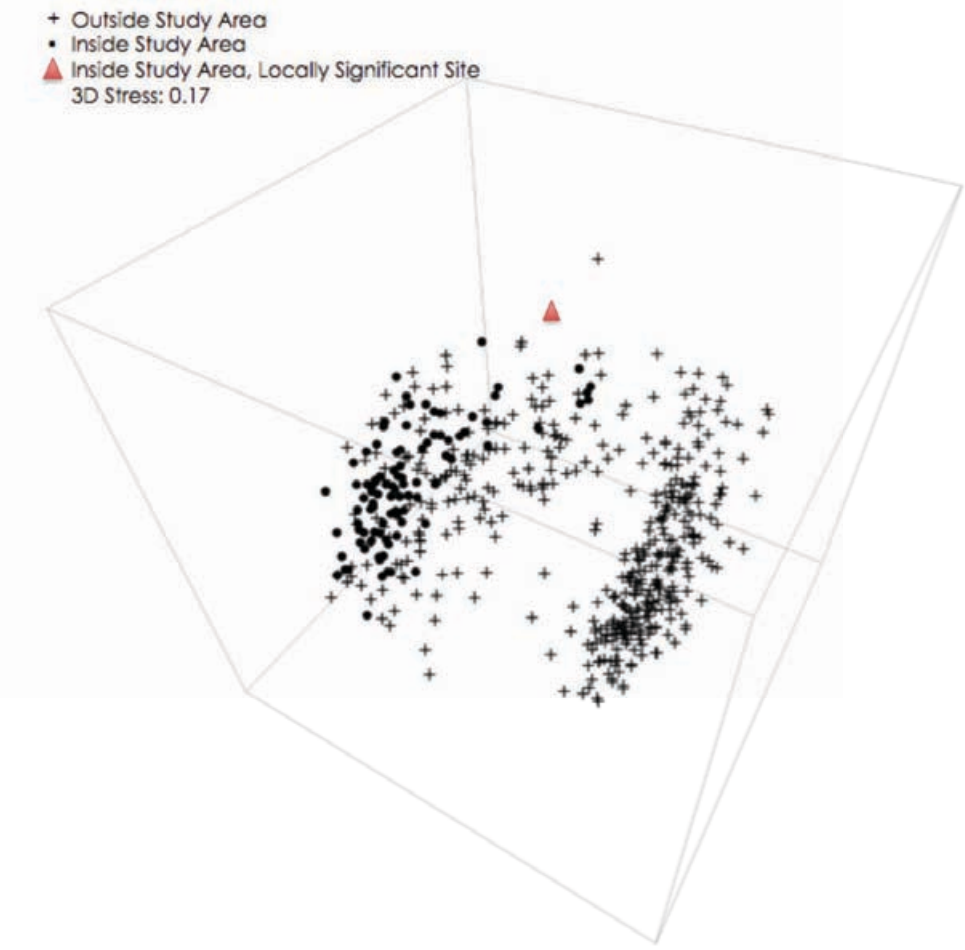

Figure 5.4: NMDS plot of quadrats sampled both inside the study area and within 50 km of the study area.

5.6 Vegetation of Conservation Significance

5.6.1 Threatened and Priority Ecological Communities

None of the vegetation associations identified for the study area comprise TECs or PECs.

5.6.2 Communities of Local Importance

Three vegetation associations are considerd tobe of local importance, comprising:

- *Callitris* low open woodland (GG Ccol Phba16 Cla TbifArb);
- *Eucalyptus* open woodland (ME Ev EauSop Acp); and
- *Melaleuca argentea* open forest (ME MaEcr TydCyv GoroCule).

Further discussion is provided in Sections 5.5 and 7.2.

[16] *Phyllanthus baccatus* did not have an existing standardised code as described by BHPBIO (2010).

6.0 Flora of the Study Area

6.1 Overview

6.1.1 Flora Taxa Recorded from the Study Area

A total of 361 native vascular flora species from 142 genera and 53 families have been recorded from the study area, including 311 recorded across both phases of the current survey and an additional 50 native species recorded previously within the study area by ENV (2009a) (see Appendix 7).

Three Priority species (*Fimbristylis sieberiana* (Priority 3), *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4)) were recorded during the current survey (see Section 4.9.2).

The dominant native plant families and genera recorded from the study area are presented in Table 6.1. These families and genera are typically represented in species lists from this region.

Table 6.1: Dominant families and genera recorded from the study area.

Family	No. of Native Species	Genus	No. of Native Species
Fabaceae	64	*Acacia*	28
Poaceae	49	*Senna*	14
Malvaceae	42	*Ptilotus*	12
Amaranthaceae	21	*Sida*	11

In addition to the above, 16 introduced flora species (weeds) have been recorded from the study area (see Section 6.3).

6.1.2 Species Richness – Regional Context

To place the number of native vascular flora species recorded from the study area into regional context, the number of flora species recorded from the current study was compared to the number of flora species recorded from eleven other surveys completed in the locality.

Figure 6.1 plots the number of native vascular flora species recorded against the size of each survey area, fitted with a log curve. The current survey is situated slightly below the log curve, indicating that it appears to have a slightly lower level of species richness than expected for a study area of this size when compared to other study areas in the locality. However, the species richness recorded in the study area is considered to be fair, given the following factors:

- A fire in 2015 burnt approximately half the study area (see Section 3.2.3). This may have reduced the diversity recorded, as some species may have been unidentifiable, or no longer present, and fire ephemeral taxa dominated some habitats (see Plates 6.1 and 6.2).
- The fire also influenced the methodology of the current survey, with only relevés being conducted in burnt areas. As relevés are not permanently marked and are difficult to resample, this may have also reduced the number of species recorded.
- Several surveys used in the comparison comprised linear study areas, which result in both a reduced survey area and, typically, a higher number of species due to the diversity of habitats intersected during corridor surveys. In particular, the Newman to Yandi Transmission Line survey (ENV 2009b) and the Southern Flank to Jindi survey (Biota 2012f) appear to have strongly influenced the log curve (see Figure 6.1).

Plate 6.1: **Recently burnt section of Yandicoogina Creek, with an increased presence of *Senna notabilis* (fire ephemeral).**

Plate 6.2: **Recently burnt foothill in the east of the study area, with a reduction in perennial species.**

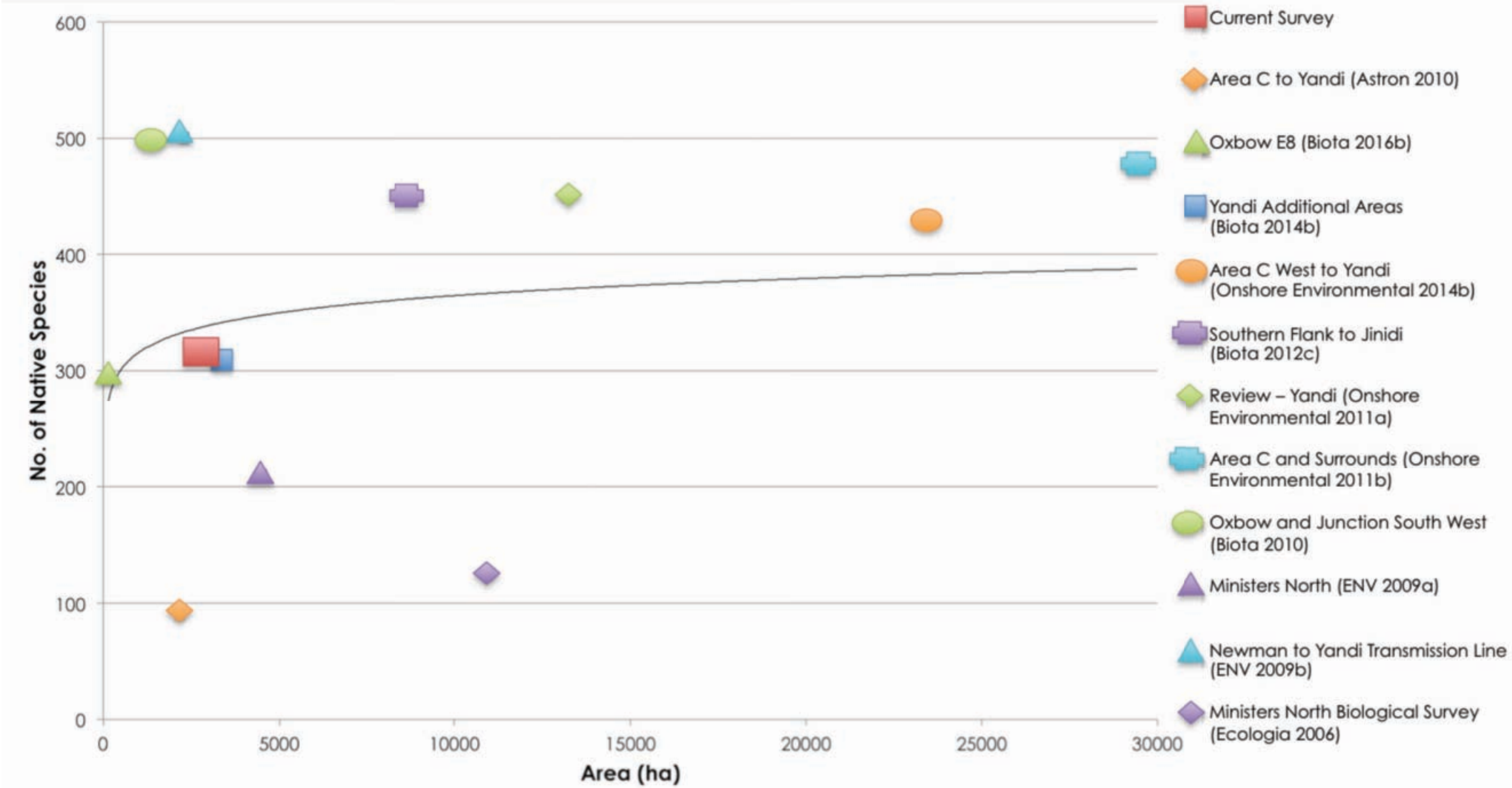

Figure 6.1: The number of native vascular flora species recorded from the current study and 10 other surveys in comparison to the size of the study area.

6.1.3 Undescribed or Unresolved Taxa and Apparent Variation within Taxonomic Entities

Some specimens collected from the study area belong to undescribed taxa, or to taxa that cannot be fully determined due to a lack of taxonomic resolution in the particular group (Section 6.1.3.1). Other specimens belong to forms of species that have been recognised by various specialists, but that have not yet been formally assigned a phrase-name (Section 6.1.3.2). All of these taxa are widespread through the Pilbara, and none are considered to be of significance.

6.1.3.1 Undescribed or Unresolved Taxa

Three undescribed or unresolved taxa were recorded within the study area. Further work (including genetic analysis) would be required to determine the taxonomic status of these entities, so in most cases they have not been allocated a separate name in the species list in Appendix 8.

- ***Cymbopogon procerus/ambiguus***
  Cymbopogon procerus is no longer considered to occur in the Pilbara, and is known only from the Kimberley region of WA (Department of Biodiversity, Conservation and Attractions 2017). However, a form of *Cymbopogon* that keys to *C. procerus* on the basis of its tall habit, many-noded inflorescence and the length of glume of sessile spikelet (Simon and Alfonso 2012) continues to be collected from the Pilbara. Biota has noted this form as being distinct, however until further information comes to light it has been determined as a form *of C. ambiguus.*

- ***Eulalia* sp. (Three Rivers Station, B. Forsyth AQ6789133)**
  Eulalia sp. (Three Rivers Station B. Forsyth AQ6789133) differs from *E. aurea* (the more common *Eulalia* species in the Pilbara) by its broader leaves, elongated rhizomes and the inflorescences remaining closed at maturity (Simon and Alfonso 2012). This *Eulalia* taxon was first collected in 2008 by Dr. Ken Tinley on Three Rivers Homestead in the Gascoyne region of WA, and the phrase name *Eulalia* sp. (Three Rivers Station B. Forsyth AQ6789133) was applied (Bryan Simon, Queensland Herbarium, pers. comm. 2012). This phrase name is not yet recognised on FloraBase or Australia's Virtual Herbarium. A formal description of *Eulalia* sp. (Three Rivers Station B. Forsyth AQ6789133) is currently being progressed by the Pilbara bioregion flora expert Malcolm Trudgen (M.E Trudgen and Associates) and Rachel Butler (previously from Biota).

  This taxon was recorded from one location in the study area, in a drainage line with clayey soil.

  Once recognised on FloraBase, it is possible that as a poorly known taxon, *Eulalia* sp. (Three Rivers Station B. Forsyth AQ6789133) may be assigned a Priority status. However, given that a number of collections have been made throughout the Pilbara bioregion, it is unlikely that this taxon is truly rare. It is more probable that it has been under-collected due to its similarity to the common species *E. aurea*.

- ***Amaranthus* aff. *undulatus* (round leaves, short tepals)**
  An unusual form of *Amaranthus*, designated *Amaranthus* aff. *undulatus* (round leaves, short tepals), was recorded from a deep gorge system in the study area. This form differs from typical *Amaranthus undulatus* in having very short tepals, round leaves and decumbent, often pink, stems. Four records of the entity were recorded from rocky gorge habitats in the study area. Biota has collected this entity from several sites in the locality, where it appears to be confined to gorge habitats. Pierre-Louis de Kock (Biota) plans a taxonomic study of this entity, including an investigation into the ornamentation of the pollen. The significance of this entity cannot be established until the completion of the study.

6.1.3.2 Taxonomic Forms

Seven species recorded from the study area have distinct forms that are not currently recognised by the WA Herbarium, as indicated by the nomenclature designated on FloraBase. These species and their forms are described below:

- ***Eriachne mucronata***
  Two forms of *Eriachne mucronata* were present in the study area: the 'typical form' (culms with sparse hairs) and one designated as 'arid form' (which has white woolly hairs on the culms). Both forms are widespread in the Pilbara bioregion.

- ***Fimbristylis dichotoma***
  Fimbristylis dichotoma is a variable species that occupies a wide range of habitats, from hill crests to moist soils along drainage lines. Discussions with, Malcolm Trudgen indicate that this species complex may yield a number of distinct taxa, which are yet to be formally described. A number of collections from the study area had wholly ciliate styles (documented to be glabrous on the undivided portion in Flora of the Kimberley Region (Wheeler 1992)). However, the species complex is widespread and it is unlikely that any of its forms would be of conservation significance.

- ***Glycine canescens***
  Glycine canescens is a species complex that comprises a wide array of different forms. One particular form collected from the current study had very narrow leaflets. This form has been collected once previously in the broader Yandi area and at that time was determined to be a *G.* aff. *arenaria*, which would comprise a considerable range extension from the Northern Kimberley. Collections from this study were taken to Steve Dillon, who regarded it as within the *G. canescens* complex. Further work on the *G. canescens* complex would be required to revise the taxonomic boundaries of its different forms and to establish if any warrant being assigned conservation significance.

- ***Gossypium australe* forms**
  Two forms of *Gossypium australe* have been collected from the study area, designated *Gossypium australe* (Burrup Peninsula form) and *G. australe* (Whim Creek form). These forms have been identified by Malcolm Trudgen, who is currently working with Dr Shadila Venkatasamy (previously from Biota) to progress formal naming of these taxa. Both entities are widespread in the Pilbara: the Burrup Peninsula form is more common, occurring in drainage areas and on plains, while the Whim Creek form occurs mainly on hillslopes and rocky areas. The latter form can be distinguished by the more dense, felty indumentum on the leaves, as well as differences in calyx characters.

- ***Senna artemisioides* subsp. *oligophylla* (form with thinly sericeous leaves)**
  A form of *Senna artemisioides* subsp. *oligophylla* collected from the study area has been recognised as a separate entity for some time by Malcolm Trudgen. The leaf indumentum of this form consists of closely appressed fine hairs, which give the leaf surface a silvery look, in addition to the leaf shape usually being elliptic. According to McCarthy (1998), *Senna artemisioides* subsp. *oligophylla* is noted for having only a sparse indumentum of appressed hairs and ovate to obovate leaves. Both *S. artemisioides* subsp. *oligophylla* (form with thinly sericeous leaves) and *S. artemisioides* subsp. *oligophylla* are distributed widely throughout the Pilbara bioregion, where they often co-occur.

6.1.4 Range Extensions

One native flora species recorded in the study area represents a range extension (i.e. an enlargement of the recognised area of occupancy of the species):

- ***Imperata cylindrica***

Imperata cylindrica is a rhizomatous, tufted perennial grass, with white flowers between May and September (Department of Biodiversity, Conservation and Attractions 2017). This species occurs in swampy areas and creeklines on clay or sandy clay, in the Kimberley region (Department of Biodiversity, Conservation and Attractions 2017). *Imperata cylindrica* is uncommonly recorded in the Pilbara, with only one vouchered record for the region (Department of Biodiversity, Conservation and Attractions 2017), approximately 49 km northwest of the study area. There is only one previous record of this species from the Pilbara on the Biota database, recorded from silty mud at Albert Gorge near the Yandi mining operations. The specimen collected from the study area was examined by Dr. Matt Barrett (research taxonomist at the Botanic Gardens and Parks Authority) for DNA analysis who confirmed its taxonomy.

One other species recorded from the study area, appears to be a range extension according to florabase[17]:

- ***Peripleura hispidula* var. *hispidula***
  Peripleura hispidula is a small annual daisy with erect stems. The variety *hispidula* is distinguished by the covering of minute gland-tipped hairs on the outer faces of the involucre bracts; coarser erect septate hairs are usually absent, although a few may be present (Burbidge 1982). Although this particular variety is not currently vouchered from the Pilbara, it is commonly recorded from Queensland and New South Wales. Specimens collected by Biota at Yandi, West Angelas and Eliwana have recently been confirmed as this taxon by the WA Herbarium. It is likely that this taxon is more widespread in the Pilbara than current records suggest, as other specimens may have been determined to variety solely based on geographical location.

6.2 Flora of Conservation Significance

6.2.1 Threatened Flora

No species listed as Threatened flora under either State or Commonwealth legislation have been recorded in the study area and none are considered likely to occur (Section 4.9.1 and Appendix 3).

Of the four Threatened flora species known from the Pilbara bioregion, only *Lepidium catapycnon* has been recorded within 40 km of the study area. It should again be noted that this species is no longer listed as a Threatened species under the WA *Wildlife Conservation Act 1950*, but remains for the moment listed as Threatened under the Commonwealth EPBC Act *Lepidium catapycnon* is a perennial shrub and has distinctive "zigzag" stems (recognisable even when in poor condition). This species was not recorded in the study area, however large areas of the study area had been recently burnt nine months prior to the field surveys. It is considered that this species "may potentially occur" in the study area (see Section 6.2.2.2).

6.2.2 Priority Flora

6.2.2.1 Priority Flora Recorded from the Study Area

Three Priority flora taxa were recorded during the current survey. A summary of the records for these three taxa within the study area is presented in Table 6.2, including records from previous surveys (see also Figure 6.2 and Appendix 6). The abundance of *Sida* sp. Barlee Range (S. van Leeuwen 1642) and *Acacia bromilowiana* within the study area suggests that additional locations of these species may have been present pre-fire in the recently burnt areas.

Table 6.2: Summary of Priority flora recorded within the study area.

Species	Survey	No. of locations	Approximate No. of individuals
Priority 3			
Fimbristylis sieberiana	Current Survey	3	3
Sida sp. Barlee Range (S. van Leeuwen 1642)	Current Survey	30	169
	ENV (2009a)	2	2
Priority 4			
Acacia bromilowiana	Current Survey	37	391
	Astron (2010)	1	1

[17] https://florabase.dpaw.wa.gov.au

A brief description of the taxa follows:

- ***Fimbristylis sieberiana*** **Priority 3**

Fimbristylis sieberiana is a shortly rhizomatous, tufted perennial grass, that grows to 60 cm in height and displays brown flowers between May and June (Department of Biodiversity, Conservation and Attractions 2017) (Plate 6.3). It is commonly recorded from the edges of pools, or sandstone cliffs (Department of Biodiversity, Conservation and Attractions 2017). Three individuals of *Fimbristylis sieberiana* were recorded from three separate locations along Yandicoogina Creek in the east of the study area during the current surveys (see Table 6.2 and Figure 6.2). This species has previously been recorded in the locality (see Appendix 3).

- ***Sida* sp. Barlee Range (S. van Leeuwen 1642)** **Priority 3**

Sida sp. Barlee Range (S. van Leeuwen 1642) is a spreading shrub, which grows to 0.5 m and typically occurs in pockets of red soil on steep rocky slopes and along the base of free rock faces (Department of Biodiversity, Conservation and Attractions 2017) (Plate 6.2). Approximately 169 individuals of this species were recorded from 30 locations throughout the study area during the current survey (see Table 6.2 and Figure 6.2). Two additional records of this species were previously recorded by ENV (2009a) within the study area (see Table 6.2). These records were predominantly from gullies and gorges or on rocky hillcrests and slopes (Figure 6.2). One individual of this species was recorded from Yandicoogina Creek, which is atypical habitat. This species has a broad distribution, extending 370 km east-west from Barlee Range Nature Reserve to near Newman. It is well known from the vicinity of the study area (see Appendix 3).

Plate 6.3: The Priority 3 species *Fimbristylis sieberiana* (image from FloraBase[18]).

Plate 6.4: The Priority 3 species, *Sida* sp. Barlee Range (S. van Leeuwen 1642).

- ***Acacia bromilowiana*** **Priority 4**

Acacia bromilowiana is a large shrub or tree that can grow up to 12 m in height. It has dark grey, fibrous bark and displays yellow flowers in July and August (Plate 6.5 and Plate 6.4). It often has a characteristically divided peduncle (Department of Biodiversity, Conservation and Attractions 2017). The species commonly occurs on skeletal stony loams on rocky hills, slopes, in gorges or creek beds (Department of Biodiversity, Conservation and Attractions 2017). During the current survey, approximately 391 individuals of *Acacia bromilowiana* were recorded from 37 locations, largely on the upper slopes and crest of hills in the west of the study area (see Table 6.2 and Figure 6.2). This species had previously been recorded at one location in the study area by Astron (2010) (Table 6.2). *A. bromilowiana* has a broad east-west distribution in the southern Pilbara, over an extent of approximately 400 km (Department of Biodiversity, Conservation and Attractions 2017), and is well known from the locality (see Appendix 3).

[18] https://florabase.dpaw.wa.gov.au

Plate 6.5: ***Acacia bromilowiana*** **(Priority 4) growing on rocky hill slopes in the study area.**

Plate 6.6: ***Acacia bromilowiana*** **(Priority 4) in flower during the current surveys.**

6.2.2.2 Other Priority Flora Potentially Occurring in the Study Area

In addition to the species discussed in Section 6.2.2, a total of 18 other Priority flora taxa have been recorded within 40 km of the study area, and were considered "likely to occur" or that "may potentially occur" (based on the criteria in Table 3.1) (see Section 4.9.2 and Appendix 3).

Following the field survey, no further species were considered 'likely to occur'. However, it was considered that nine species "may potentially occur" in the study area (Appendix 3):

- two Priority 2 species: *Ipomoea racemigera* and *Isotropis parviflora;*
- three Priority 3 species: *Grevillea saxicola, Gymnanthera cunninghamii* and *Rostellularia adscendens* var. *latifolia; and*
- four Priority 4 species: *Eremophila magnifica* subsp. *magnifica, Goodenia nuda, Lepidium catapycnon* and *Rhynchosia bungarensis.*

While not recorded during the current survey, these species may have occurred within the recently burnt sections of the study area, and may regenerate or persist in the soil seed bank.

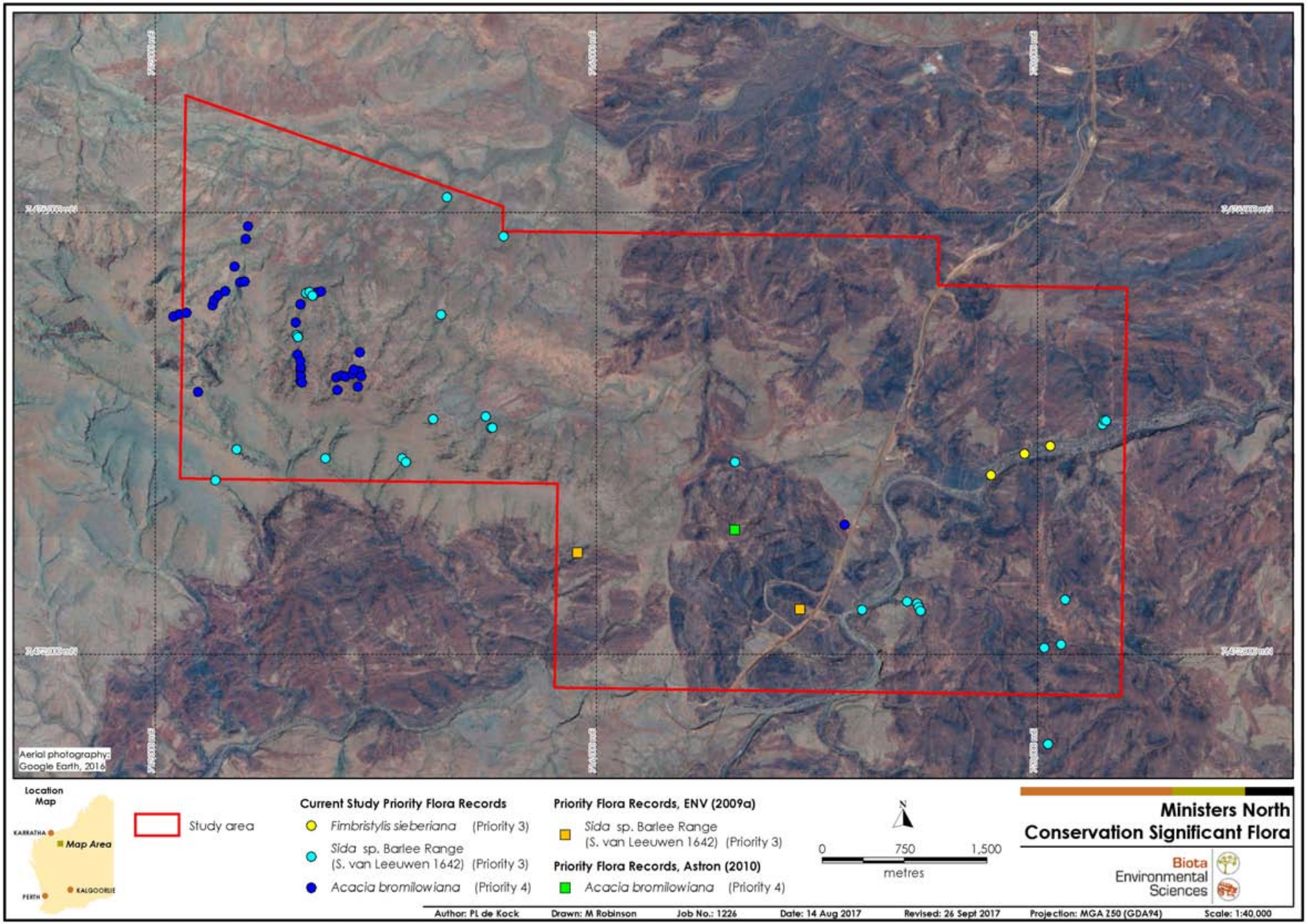

Figure 6.2: Conservation significant flora recorded in the study area.

6.3 Introduced Flora (Weeds)

Thirteen introduced flora (weed) species were recorded within the study area during the current survey, with an additional three species recorded during previous surveys (ENV 2009a, 2009b, Astron 2010; BHP database). A summary of the records within the study area is presented in Table 6.3, while all records are shown on Figure 6.3, and provided in Appendix 6.

The occurrence and diversity of introduced species noted from the study area during the current surveys was much greater than previously recorded (ENV 2009a, 2009b, Astron 2010; unknown). In particular, several species occurred in very large numbers, including: **Argemone ochroleuca* subsp. *ochroleuca*, **Melinis repens, *Rumex vesicarius, *Sigesbeckia orientalis* and **Sonchus oleraceus* (see Table 6.3). These species largely occurred along Yandicoogina Creek in the east of the study area (see Figure 5.3), and were sometimes associated with pooled water. The higher than median rainfall over recent years (see Section 3.2.2) is considered likely to have facilitated the movement of these species through the creekline and allowed for increased recruitment. **Rumex vesicarius* was also recorded in higher numbers along the rail line (see Figure 6.3).

Table 6.3: Introduced flora recorded from the study area, along with their ranking.

Species	Survey	Number of locations	Approx. Number of individuals	WPP – Weed Species Ranking¥
**Aerva javanica*	BHP database	1	1	Low
**Argemone ochroleuca* subsp. *ochroleuca*	Current survey	16	11,179	Low
**Bidens bipinnata*	Current survey	7	440	Low
**Cenchrus ciliaris*	Current survey	11	3,385	Low
**Cenchrus setiger*	ENV (2009a)	1	1	Low
**Chloris virgata*	ENV (2009a)	1	1	High
**Flaveria trinervia*	Current survey	2	4	-
**Malvastrum americanum*	Current survey	5	26	Low
**Melinis repens*	Current survey	6	325	-[19]
*Rumex vesicarius	Current Survey	37	874	Medium
	BHP database	19	19	
	ENV (2009b)	1	1	
**Setaria verticillata*	Current survey	10	75	Low
**Sigesbeckia orientalis*	Current survey	6	584	Low
**Solanum nigrum*	Current survey	3	7	Low
*Sonchus oleraceus	Current survey	13	177	Negligible
	ENV (2009a)	2	2	
**Tridax procumbens*	Current survey	2	3	-
**Vachellia farnesiana*	Current survey	3	5	Low

WPP= Department of Parks and Wildlife's Weed Prioritisation Process (Department of Parks and Wildlife 2013a).

¥ WPP Weed Species Ranking:

- High (objective is eradication or control to reduce),
- Medium (objective is control to reduce or containment),
- Low (objective is containment at key sites only),
- Negligible (no action to be undertaken but may include monitoring only).

[19] Not commonly recorded in the Pilbara, however, considered a weed of high ecological impact (DEC 2011).

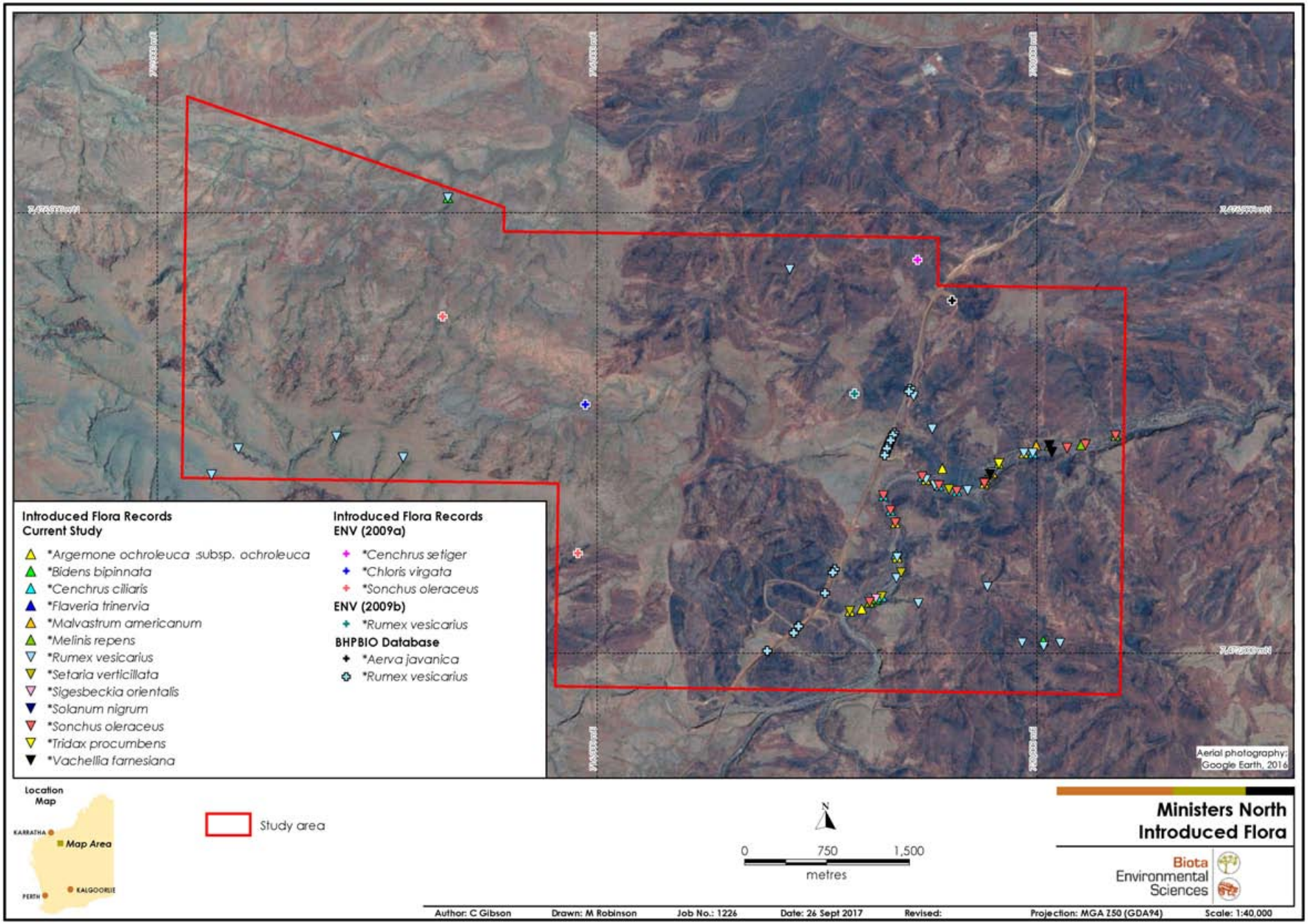

Figure 6.3: Introduced flora recorded within the study area.

None of these species are listed as Weeds of National Significance (Thorp and Lynch 2000)[20], or declared plants for the Pilbara region under the WA BAM Act. However, Buffel Grass (**Cenchrus ciliaris*), Birdwood Grass (**C. setiger*), Mimosa Bush (**Vachellia farnesiana*), Natal Redtop (**Melinis repens*) and Ruby Dock (**Rumex vesicaria*) are all considered to be serious environmental weeds in WA (CALM 1999).

The Department of Parks and Wildlife (now DBCA) (2013b) Weed Species Ranking, which is derived from the Department's Weed Prioritisation Process (WPP) (Department of Parks and Wildlife 2013a), takes into account the potential distribution, current distribution, ecological impact, invasiveness and feasibility of control to derive a final broad qualitative weed species ranking corresponding to specific management actions (see Table 6.3). Most weed species recorded from the study area had a ranking of Low through this process, however **Chloris virgata* was ranked as High and **R. vesicarius* was listed as Medium (Department of Parks and Wildlife 2013b). Three species (**Flaveria trinervia, *Melinis repens* and **Tridax procumbens*) have not been classified. One of these, **Melinis repens,* is considered a weed of high ecological impact (DEC 2011).

It should be noted that the Weed Species Ranking of Low for species such as **Cenchrus ciliaris* and **C. setiger* is a reflection of the low feasibility of control for these species, rather than an indication of their perceived invasiveness or potential for ecological impact. Several species (**Aerva javanica, *Cenchrus ciliaris, *C. setiger, *Chloris virgata, *Malvastrum americanum, *Rumex vesicarius, *Setaria verticillata* and **Vachellia farnesiana*) are ranked by the Department of Parks and Wildlife (2013a) as priority widespread weeds. These comprise weed species that are considered to have the potential for high ecological impact and are rapidly invasive, but which are already too widespread in the region to be feasible to control at the species level. Management of these species is targeted at the protection of specific assets or high conservation areas.

A brief description of each of the weed species is provided below:

- ****Aerva javanica* (Kapok Bush)** is an erect perennial herb, which often occurs on sandy soils. This species was originally introduced to assist with the revegetation of disturbed bushland and is now widespread from Carnarvon to the Kimberley (Hussey et al. 1997). Kapok Bush was previously recorded from one location along the rail line in the north of the study area (Astron 2010).
- ****Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy)** is a prickly, robust annual herb with deeply divided leaves and cream flowers during February to March and July to November (Department of Biodiversity, Conservation and Attractions 2017) (see Plate 6.7). This garden escapee is now widespread in major rivers in the arid region of Western Australia (Hussey et al. 1997). Infestations of Mexican Poppy were observed along Yandicoogina Creek and approximately 11,179 individual were recorded at 16 locations (Plate 6.8).

Plate 6.7: ****Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy) in flower.**

Plate 6.8: **Infestations of **Argemone ochroleuca* subsp. *ochroleuca* (Mexican Poppy) in the bare creek bed of Yandicoogina Creek.**

[20] For the current listing of Weeds of National Significance, go to http://www.weeds.org.au/WoNS/

- ***Bidens bipinnata* (Bipinnate Beggartick)** is an annual daisy, which grows to 90 cm tall and produces yellow flowers between March and September (Department of Biodiversity, Conservation and Attractions 2017). This species is commonly observed in association with Mulga vegetation and creeklines in the Pilbara. **Bidens bipinnata* may occur in high densities within suitable habitats and given appropriate conditions, but on its own does not appear to cause exclusion of native flora species. This species was recorded from five locations along Yandicoogina Creek and two in gorges (Plate 6.9).
- ***Cenchrus ciliaris* (Buffel Grass)** was introduced by pastoralists as a fodder species. It is widespread throughout WA and is commonly found in association with drainage lines, floodplains, sandy coastal areas and disturbed sites (Department of Biodiversity, Conservation and Attractions 2017). This perennial grass forms dense tussock grasslands, particularly along creeklines, floodplains and in sandy areas. **Cenchrus ciliaris* grows to 1 m tall and flowers for most of the year (Plate 6.10). This species has demonstrated allelopathic capacities, whereby it releases chemicals that inhibit the growth of other plants, and it competes aggressively and effectively with native flora species (Cheam 1984a, 1984b). It reproduces by seed and short rhizomes and is thought to be dispersed primarily by wind and water, but can also be spread through the movement of mammals, birds and vehicles (Hussey et al. 1997). Approximately 3,385 individuals of Buffel Grass were recorded from 11 locations along Yandicoogina Creek in the study area.

Plate 6.9: *Bidens bipinnata* (Bipinnate Beggartick).

Plate 6.10: *Cenchrus ciliaris* (Buffel Grass).

- ***Cenchrus setiger* (Birdwood Grass)** is closely related to Buffel Grass; it grows in similar habitats, but is usually less common. This species was also introduced as a fodder species in pastoral areas and has since become a common weed in watercourses from Carnarvon to the Kimberley (Hussey et al. 1997). Birdwood Grass is an erect tussocky perennial grass that produces cream or purple flowers between April and May (Department of Biodiversity, Conservation and Attractions 2017). This species was previously recorded from one location on a footslope in the north of the study area (ENV 2009a). This habitat is uncommon for this species and it may represent a misidentification.
- ***Chloris virgata* (Feathertop Rhodes Grass)** is an annual grass, with green-purple flowers in April to May, that is common from clay and sand (Department of Biodiversity, Conservation and Attractions 2017). It is widespread from the Kimberley through to Esperance and inhabits clay or sandy substrates. This species was previously recorded from one location on a footslope in the north of the study area (ENV 2009a).
- ***Flaveria trinervia* (Speedy Weed)** is an annual daisy, which is common in the Pilbara and occurs in a variety of habitats, including drainage and disturbed areas (Department of Biodiversity, Conservation and Attractions 2017)(Plate 6.11). This species was recorded from two locations along Yandicoogina Creek.
- ***Malvastrum americanum* (Spiked Malvastrum)** typically occurs in Mulga vegetation, drainage lines and on floodplains, and can also be recorded on steep hill slopes and rockpiles (Plate 6.12). It is an erect, perennial herb or shrub to 1.3 m tall, with yellow or orange flowers from April to July (Department of Biodiversity, Conservation and Attractions 2017). Spiked Malvastrum was recorded from five locations along Yandicoogina Creek in the study area.

Plate 6.11: ***Flaveria trinervia* (Speedy Weed).**

Plate 6.12: ***Malvastrum americanum* (Spiked Malvastrum).**

- ***Melinis repens* (Natal Red Top)** is a tufted grass, which grows to 1.2 m in height and produces red-purple flowers between July and December or January to April (Department of Biodiversity, Conservation and Attractions 2017). This species was introduced from South Africa (Hussey et al. 1997), and has been recorded from the Kimberley to the South-west of WA. In the Pilbara, this species is currently known from a limited number of populations, with only two vouchered records (Department of Biodiversity, Conservation and Attractions 2017). Natal Red Top is considered to be a weed of high ecological impact, due to its highly invasive nature (DEC 2011). A number of the populations along roadways appear to have been introduced and/or spread by road maintenance equipment, however some populations have now been found a considerable distance from disturbed areas in creeklines, suggesting that the seed may be spread by water or stock (Michi Maier, Principal Botanist Biota, pers. obs.). Approximately 325 individuals of Natal Red Top were recorded from six locations along Yandicoogina Creek (Plate 6.13).
- ***Rumex vesicarius* (Ruby Dock)** is a stout, fleshy annual herb that produces densely clustered red-pink fruit between July and September (Department of Biodiversity, Conservation and Attractions 2017). This species is common within disturbed areas in the arid zone from the Pilbara to the Nullarbor (Hussey et al. 1997). Approximately 894 individuals (including 874 recorded during the current surveys) of Ruby Dock have been recorded from 55 locations throughout all habitats present in the study area (ENV 2009a, Astron 2010) (Plate 6.14).

Plate 6.13: ***Melinis repens* (Natal Red Top).**

Plate 6.14: ***Rumex vesicarius* (Ruby Dock).**

- ***Setaria verticillata* (Whorled Pigeon Grass)** is a loosely tufted annual grass that grows to 1.3 m tall (Department of Biodiversity, Conservation and Attractions 2017). This species commonly occurs in disturbed areas, on the edges of rivers and creeks and in shrublands from the Kimberley to the Pilbara (Hussey et al. 1997). Approximately 75 individuals of Whorled Pigeon Grass were recorded from 10 locations along Yandicoogina Creek (Plate 6.15).
- ***Sigesbeckia orientalis* (Indian Weed)** is an annual daisy to 1 m tall, which is known from the Pilbara and South-West regions of Western Australia (Department of Biodiversity, Conservation and Attractions 2017). Approximately 584 individuals of this species were recorded from six locations along Yandicoogina Creek (Plate 6.16).

Plate 6.15: *Setaria verticillata* (Whorled Pigeon Grass).

Plate 6.16: *Sigesbeckia orientalis* (Indian Weed).

- ***Solanum nigrum* (Black Berry Nightshade)** typically occurs in Mulga vegetation, drainage lines and on floodplains, and can also be recorded on steep hill slopes and rockpiles. It is an erect, perennial herb or shrub to 1.3 m tall, with yellow or orange flowers from April to July (Department of Biodiversity, Conservation and Attractions 2017) (Plate 6.17). Black Berry Nightshade was recorded from three locations along Yandicoogina Creek.
- ***Sonchus oleraceus* (Common Sowthistle)** is a short-lived annual herb that grows to 1.5 m tall (Department of Biodiversity, Conservation and Attractions 2017). This species is common and widespread in disturbed areas from Wittenoom to the Nullarbor in Western Australia (Hussey et al. 1997). Approximately 177 individuals of this species were recorded during the current survey from 15 locations along Yandicoogina Creek (Plate 6.18). In addition, this species was also previously recorded from two gorge habitats in the study area (ENV 2009a).

Plate 6.17: *Solanum nigrum* (Black Berry Nightshade) (image from FloraBase[21]).

Plate 6.18: *Sonchus oleraceus* (Common Sowthistle).

[21] https://florabase.dpaw.wa.gov.au

- ***Tridax procumbens* (Tridax)** is a prostrate to erect perennial daisy that grows to 40 cm in height and produces small yellow and white flowers all year (Department of Biodiversity, Conservation and Attractions 2017). This species is common from disturbed areas and wet ground. Tridax was recorded from two locations along Yandicoogina Creek during the current survey (Plate 6.19).
- ****Vachellia farnesiana* (Mimosa Bush)** is a spreading, thorny shrub to 4 m high, with dark grey bark, pinnate leaves, and yellow flowers in winter (Department of Biodiversity, Conservation and Attractions 2017) (Plate 6.20). This species is widespread from the Kimberley to near Perth, typically occurring along drainage systems and in adjacent low-lying areas (Hussy et al. 1997). Mimosa Bush was recorded from three locations along Yandicoogina Creek during the current survey.

Plate 6.19: ***Tridax procumbens* (Tridax)**

Plate 6.20: ***Vachellia farnesiana* (Mimosa Bush)**

7.0 Discussion

7.1 Flora

Most of the native flora taxa recorded from the study area are well known from the locality. One taxon represents a range extension: *Imperata cylindrica*.

The native flora diversity recorded from the study area was slightly lower when compared to other studies in the locality. However, several factors were considered to have influenced this, including the recent fire and the linear nature of several of the comparative studies (see Section 6.1.2). Overall, the species diversity recorded within the study area is within the range expected for the size of the survey area and range of habitats present, and the suite of species recorded is typical of similar habitats in the Pilbara region.

The three Priority flora species recorded from the study area are also relatively common in the locality and the range of habitats represented. Two of these species had previously been recorded from the study area: *Sida* sp. Barlee Range (S. van Leeuwen 1642) (Priority 3) and *Acacia bromilowiana* (Priority 4). Targeted searches conducted during the current surveys significantly increased the number of records of these species. *Fimbristylis sieberiana* (Priority 3) had not been previously recorded from the study area. However, this species is known from the locality and was identified during the desktop review completed for this survey as potentially occurring. It is possible that additional Priority species occur in the study area and were not detected or identifiable at the time of the surveys as a result of the recent fire.

Of the 16 introduced species recorded from the study area, all but one are well known in the locality and are within their known distributions. Natal Red Top (**Melinis repens*) is not commonly recorded in the Pilbara, and its presence within Yandicoogina Creek suggests its seeds may be spreading via waterways in the broader locality.

7.2 Vegetation

A total of ten vegetation types were recorded from the study area, none of which comprise TECs or PECs. The condition of the vegetation ranged from Pristine to Completely Degraded, with a majority of the vegetation assessed as being in Pristine to Excellent condition.

Three vegetation associations were identified as being of elevated local importance. Two of these occurred within Yandicoogina Creek:

- *Eucalyptus* open woodland (ME Ev EauSop Acp) vegetation association occurred in the southern section of Yandicoogina Creek within the study area and supported the potentially phreatophytic (groundwater dependent) tree species, *Eucalyptus victrix* (Coolibah). This association is of importance as it is considered potential GDV.
- *Melaleuca argentea* open forest (ME MaEcr TydCyv GoroCule) vegetation association occurred in the northern section of Yandicoogina Creek within the study area and supported the groundwater dependent tree species': *Eucalyptus camaldulensis* subsp. *refulgens* (River Gum) and *Melaleuca argentea* (Silver Cadjeput). This association is of importance as it is considered GDV.

The third vegetation association of elevated local importance comprised the *Callitris* low open woodland (GG Ccol Phba Cla TbifArb). This association includes fire sentive species (e.g. *Callitris columellaris*) that been provided refuge in the gorge habitat.

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8.0 Glossary and Acronyms

*	Used prior to a species name to denote an introduced (weed) species.
aff.	Abbreviation of *affinis* (Latin); 'with affinities to'.
Annual (plant)	A plant that lives for only one year.
CALM	Former WA Department of Conservation and Land Managament, now operating as the Department of Biodiversity, Conservation and Attractions.
Conservation significant	A plant, community or habitat that has a formally assigned conservation ranking, usually because it is recognised to be rare, unusual, new or poorly sampled (see Appendix 1) for more on the conservation framework).
Cryptic	Plants that die back to a perennial root-stock under dry conditions; considered cryptic (meaning hidden) because although they are consistently present, it is difficult to tell unless suitable conditions prevail.
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	The former WA Department of Environment and Conservation, now operating as the Department of Biodiversity, Conservation and Attractions.
Dominant species	The species that occur most abundantly in an area or vegetation stratum.
EPA	Environmental Protection Authority of Western Australia.
EPBC Act	The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.
Ephemeral	A plant that lives a very short time; less than one year or, usually, less than six months.
Flora keys	Botanical publications containing a series of questions (regarding the plant's characteristics) aiding in the identification of a taxon.
Foot traverse	Consists of walking through an area to confirm or note the vegetation and/or species presence (usually sampling a narrow corridor/cross section of vegetation).
Ground-truth	The on-ground/site study of an area to confirm vegetation patterns suggested by aerial photography.
GDV	Groundwater dependant vegetation is dominated by *Eucalyptus camaldulensis* or *Melaleuca argentea*. Potential GDV is vegetation that is dominated by *Eucalyptus victrix*.
IBRA	Interim Biogeographical Regionalisation for Australia.
Indumentum	A layer of hairs on the leaves, stems or other parts of a plant.
MNES	A Matter of National Environmental Significance listed under the Commonwealth EPBC Act.
NRS	National Reserve System.
Opportunistic	A plant species collected from outside the formal quadrat sites; sometimes abbreviated to "Opp."
PEC	Priority Ecological Community (see Appendix 9 for more on the WA conservation framework).
Perennial	A plant that lives for more than two growing seasons.
Priority flora	Flora listed by the Department of Parks and Wildlife as requiring additional information to properly evaluate their conservation significance or requiring ongoing monitoring; see Appendix 9 for more on the WA conservation framework.
Quadrat	A bounded sample area of uniform vegetation in which all species present are recorded; the standard quadrat size for the Pilbara is 50 m by 50 m, or an equivalent area (2,500 m^2).

Relevé	An unbounded flora sampling site, with a similar area to a quadrat, in which most species present are recorded.
sens. lat.	Abbreviation of *sensu lato* (Latin), meaning "in the broad sense".
Sericeous	Silky, with long, soft, slender, somewhat appressed hairs.
sp. (plural: spp.)	Abbreviation of 'species'.
Stratum (plural: strata)	A horizontal level of vegetation defined by growth habit (and sometimes height); e.g. low trees, tall trees, tussock grasses, hummock grasses).
subsp. (plural: subspp.)	Abbreviation of 'subspecies'.
Taxon (plural: taxa)	A taxonomic entity; typically at species level or below.
TEC	Threatened Ecological Community (see Appendix 9 for more on the WA conservation framework).
Tepal	A segment of a perianth that is not differentiated into calyx and corolla; a sepal or petal.
Threatened Flora	Flora protected by legislation, either listed under the Commonwealth EPBC Act or the WA *Wildlife Conservation Act 1950* (species known as Declared Rare Flora); see Appendix 9 for more on the WA conservation framework.
var.	Abbreviation of 'variety'.

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Appendix 1

Framework for Conservation Significance Ranking of Communities and Species in WA

A. Definitions, Categories and Criteria for Threatened and Priority Ecological Communities

Species and Communities Branch, Department of Environment and Conservation, December 2010.

1. General Definitions

Ecological Community
A naturally occurring biological assemblage that occurs in a particular type of habitat.

Note: The scale at which biological communities are defined will often depend on the level of detail in the information source, therefore no particular scale is specified.

A **threatened ecological community** (TEC) is one which is found to fit into one of the following categories; "presumed totally destroyed", "critically endangered", "endangered" or "vulnerable".

Possible threatened ecological communities that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological Communities that are adequately known, are rare but not threatened, or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

An **assemblage** is a defined group of biological entities.

Habitat is defined as the areas in which an organism and/or assemblage of organisms lives. It includes the abiotic factors (e.g. substrate and topography), and the biotic factors.

Occurrence: a discrete example of an ecological community, separated from other examples of the same community by more than 20 metres of a different ecological community, an artificial surface or a totally destroyed community.

By ensuring that every discrete occurrence is recognised and recorded future changes in status can be readily monitored.

Adequately Surveyed is defined as follows:
"An ecological community that has been searched for thoroughly in most likely habitats, by relevant experts."

Community structure is defined as follows:
"The spatial organisation, construction and arrangement of the biological elements comprising a biological assemblage" (e.g. *Eucalyptus salmonophloia* woodland over scattered small shrubs over dense herbs; structure in a faunal assemblage could refer to trophic structure, e.g. dominance by feeders on detritus as distinct from feeders on live plants).

Definitions of **Modification** and **Destruction** of an ecological community:

Modification: "changes to some or all of ecological processes (including abiotic processes such as hydrology), species composition and community structure as a direct or indirect result of human activities. The level of damage involved could be ameliorated naturally or by human intervention."

Destruction: "modification such that reestablishment of ecological processes, species composition and community structure within the range of variability exhibited by the original community is unlikely within the foreseeable future even with positive human intervention."

Note: Modification and destruction are difficult concepts to quantify, and their application will be determined by scientific judgement. Examples of modification and total destruction are cited below:

Modification of ecological processes: The hydrology of Toolibin Lake has been altered by clearing of the catchment such that death of some of the original flora has occurred due to dependence on fresh water. The system may be bought back to a semblance of the original state by redirecting saline runoff and pumping waters of the rising underground watertable away to restore the hydrological balance. Total destruction of downstream lakes has occurred due to hydrology being altered to the point that few of the original flora or fauna species are able to tolerate the level of salinity and/or water logging.

Modification of structure: The understorey of a plant community may be altered by weed invasion due to nutrient enrichment by addition of fertiliser. Should the additional nutrients be removed from the system the balance may be restored, and the original plant species better able to compete. Total destruction may occur if additional nutrients continue to be added to the system causing the understorey to be completely replaced by weed species, and death of overstorey species due to inability to tolerate high nutrient levels.

Modification of species composition: Pollution may cause alteration of the invertebrate species present in a freshwater lake. Removal of pollutants may allow the return of the original inhabitant species. Addition of residual highly toxic substances may cause permanent changes to water quality, and total destruction of the community.

Threatening processes are defined as follows:
"Any process or activity that threatens to destroy or significantly modify the ecological community and/or affect the continuing evolutionary processes within any ecological community."

Examples of some of the continuing threatening processes in Western Australia include: general pollution; competition, predation and change induced in ecological communities as a result of introduced animals; competition and displacement of native plants by introduced species; hydrological changes; inappropriate fire regimes; diseases resulting from introduced micro-organisms; direct human exploitation and disturbance of ecological communities.

Restoration is defined as returning an ecological community to its pre-disturbance or natural state in terms of abiotic conditions, community structure and species composition.

Rehabilitation is defined as the re-establishment of ecological attributes in a damaged ecological community although the community will remain modified.

2. Definitions and Criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities

ECOLOGICAL COMMUNITIES

Presumed Totally Destroyed (PD)
An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.

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 (A or B):

A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or

B) All occurrences recorded within the last 50 years have since been destroyed

Critically Endangered (CR)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.

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. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):

A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):

   i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);

   ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

   i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);

ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;

iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.

C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).

Endangered (EN)
An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.

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. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):

A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):

i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);

ii) modification throughout its range is continuing such that in the short term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.

B) Current distribution is limited, and one or more of the following apply (i, ii or iii):

i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);

ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;

iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.

C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

Vulnerable (VU)
An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

3. Definitions and Criteria for Priority Ecological Communities

PRIORITY ECOLOGICAL COMMUNITY LIST
Possible threatened ecological communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. These three categories are ranked in order of priority for survey and/or definition of the community, and evaluation of conservation status, so that consideration can be given to their declaration as threatened ecological communities. Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5.

Priority One: 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. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.

Priority Two: 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, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.

Priority Three: Poorly known ecological communities

(i) 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:

(ii) 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;

(iii) 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 by domestic and/or feral stock, and inappropriate fire regimes.

Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.

Priority Four: 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.

(a) Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands.

(b) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable.

(c) Ecological communities that have been removed from the list of threatened communities during the past five years.

Priority Five: 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.

B. Conservation Significant Flora and Fauna – Formal Framework

In Western Australia, all native flora and fauna species are protected under the *Wildlife Conservation Act 1950,* making it an offence to take these without approval. The definition of 'take' is broad, and encompasses killing, capturing or disturbing fauna, and destroying, gathering, cutting or injuring flora. In addition to this basic level of statutory protection, a number of species are assigned an additional level of conservation significance based on the fact that there are a limited number of known populations, some of which may be under threat.

Such species are classified within a framework of 11 categories. Species of the highest conservation significance are designated as Threatened within four categories (Critically Endangered: CR, Endangered: EN, Vulnerable: V, and Presumed Extinct: EX). These represent those species listed in Schedules 1 to 4 of the annual Wildlife Conservation (Specially Protected Fauna) Notice and Wildlife Conservation (Rare Flora) Notice. Migratory birds that are protected under various international agreements are assigned to a separate category (IA). Conservation dependent fauna (species listed under Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice) and other specially protected fauna (those listed in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice) comprise two additional categories (Conservation Dependent: CD, and Other Specially Protected: OS). Species that appear to be rare or threatened, but for which there is insufficient information to properly evaluate their conservation significance, are assigned to one of three Priority categories (Priority 1 to Priority 3), while species that are adequately known but require regular monitoring are assigned to Priority 4. The 11 categories are explained in more detail on the following pages.

Note that of the above classifications, only the 'Threatened' categories have statutory standing. The Priority flora and fauna classifications are employed by the WA Department of Parks and Wildlife to manage and classify their database of species considered potentially rare or at risk, but these categories have no legislative status. Note also that proposals that appear likely to affect Threatened flora require formal written approval from the Minister for the Environment under Section 23(f) of the *Wildlife Conservation Act 1950,* in addition to the requirements of the *Environmental Protection (Native Vegetation Clearing) Regulations 2004*.

Many of the species that are specially protected at State level are also listed as Threatened species at the Federal level, as one of the Matters of National Environmental Significance (MNES) identified under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). In addition, numerous Migratory species are listed as MNES under the EPBC Act (some of which are also listed as Threatened). The national List of Migratory Species consists of those species listed under the following International Conventions:

- Japan-Australia Migratory Bird Agreement;
- China-Australia Migratory Bird Agreement; and
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Under the terms of the EPBC Act, an action (e.g. a project or development) is required to be referred to the Australian Government Environment Minister for approval if it has, will have, or is likely to have, a significant impact on an MNES. The term 'action' includes projects and developments subsequent to commencement of the Act, however there are a number of exemptions (e.g. projects in Commonwealth areas). According to Department of the Environment (2013), a 'significant impact' is an impact which is important, notable, or of consequence, having regard to its context or intensity. Whether or not an action is likely to have a significant impact depends upon the sensitivity, value, and quality of the environment which is impacted, and upon the intensity, duration, magnitude and geographic extent of the impacts.

References:

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Department of Parks and Wildlife

CONSERVATION CODES

For Western Australian Flora and Fauna

Specially protected fauna or flora are species* which have been adequately searched for and are deemed to be, in the wild, either rare, at risk of extinction, or otherwise in need of special protection, and have been gazetted as such.

Categories of specially protected fauna and flora are:

T **Threatened species**

Published as Specially Protected under the *Wildlife Conservation Act 1950,* and listed under Schedules 1 to 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora (which may also be referred to as Declared Rare Flora).

Threatened fauna is that subset of 'Specially Protected Fauna' declared to be 'likely to become extinct' pursuant to section 14(4) of the Wildlife Conservation Act.

Threatened flora is flora that has been declared to be 'likely to become extinct or is rare, or otherwise in need of special protection', pursuant to section 23F(2) of the Wildlife Conservation Act.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

CR **Critically endangered species**

Threatened species considered to be facing an extremely high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EN **Endangered species**

Threatened species considered to be facing a very high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

VU **Vulnerable species**

Threatened species considered to be facing a high risk of extinction in the wild. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice for Threatened Fauna and Wildlife Conservation (Rare Flora) Notice for Threatened Flora.

EX **Presumed extinct species**

Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.

IA **Migratory birds protected under an international agreement**

Birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and the Bonn Convention, relating to the protection of migratory birds. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice.

CD **Conservation dependent fauna**

Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice.

OS **Other specially protected fauna**

Fauna otherwise in need of special protection to ensure their conservation. Published as Specially Protected under the *Wildlife Conservation Act 1950,* in Schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice.

P **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 flora or fauna.

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.

1 **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.

2 **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.

3 **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.

4 **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.

*Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Last updated 11 November 2015

Appendix 2

NatureMap and EPBC Act Database Searches

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 09/09/2016

Kingdom	Plantae
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	119° 06' 37" E,22° 49' 30" S
Buffer	20km
Group By	Family

Family	Species	Records
Acanthaceae	3	12
Aizoaceae	1	2
Amaranthaceae	12	19
Apocynaceae	3	3
Araliaceae	3	9
Asteraceae	28	45
Bignoniaceae	1	1
Boraginaceae	6	10
Brassicaceae	3	10
Campanulaceae	3	9
Capparaceae	1	1
Caryophyllaceae	2	2
Celastraceae	2	3
Chenopodiaceae	8	13
Cleomaceae	1	2
Convolvulaceae	9	13
Cucurbitaceae	1	1
Cyperaceae	11	20
Dilleniaceae	1	5
Elatinaceae	1	1
Euphorbiaceae	6	7
Fabaceae	67	129
Gentianaceae	1	1
Goodeniaceae	14	56
Haloragaceae	2	2
Lamiaceae	6	13
Loranthaceae	4	4
Lythraceae	1	1
Malvaceae	36	71
Molluginaceae	1	2
Moraceae	2	4
Myrtaceae	14	23
Nyctaginaceae	2	2
Oleaceae	2	2
Papaveraceae	1	2
Phyllanthaceae	3	3
Plantaginaceae	1	1
Plumbaginaceae	1	1
Poaceae	50	65
Polygalaceae	1	1
Polygonaceae	1	2
Portulacaceae	1	1
Proteaceae	6	8
Pteridaceae	4	4
Ricciaceae	1	1
Rubiaceae	3	3
Santalaceae	2	3
Sapindaceae	7	8
Scrophulariaceae	10	23
Solanaceae	10	23
Stylidiaceae	2	8
Surianaceae	1	5
Thymelaeaceae	1	2
Violaceae	1	1
Zygophyllaceae	4	5
TOTAL	**369**	**668**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthaceae					
1.	7164	*Dicladanthera forrestii*			
2.	11320	*Dipteracanthus australasicus subsp. australasicus*			
3.	11556	*Rostellularia adscendens var. latifolia*		P3	
Aizoaceae					
4.	44305	*Trianthema pilosum*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amaranthaceae					
5.	2646	*Aerva javanica (Kapok Bush)*	Y		
6.	18363	*Gomphrena canescens subsp. canescens*			
7.	2680	*Gomphrena cunninghamii*			
8.	2690	*Ptilotus aervoides*			
9.	2696	*Ptilotus astrolasius*			
10.	2698	*Ptilotus auriculifolius*			
11.	2704	*Ptilotus calostachyus (Weeping Mulla Mulla)*			
12.	2725	*Ptilotus fusiformis*			
13.	2731	*Ptilotus helipteroides (Hairy Mulla Mulla)*			
14.	2746	*Ptilotus nobilis (Tall Mulla Mulla)*			
15.	2747	*Ptilotus obovatus (Cotton Bush)*			
16.	2755	*Ptilotus rotundifolius (Royal Mulla Mulla)*			
Apocynaceae					
17.	6584	*Cynanchum floribundum (Dumara Bush, Tjipa)*			
18.	12832	*Gymnanthera cunninghamii*		P3	
19.	6599	*Rhyncharrhena linearis (Bush Bean, Wintjulanypa)*			
Araliaceae					
20.	6202	*Astrotricha hamptonii (Ironplant)*			
21.	6278	*Trachymene oleracea*			
22.	19043	*Trachymene oleracea subsp. oleracea*			
Asteraceae					
23.	7854	*Bidens bipinnata (Bipinnate Beggartick)*	Y		
24.	7891	*Calocephalus francisii (Fine-leaf Beauty-heads)*			
25.	7895	*Calocephalus multiflorus (Yellow-top)*			
26.	7905	*Calotis multicaulis (Many-stemmed Burr-daisy)*			
27.	7906	*Calotis plumulifera*			
28.	19762	*Centipeda minima subsp. macrocephala*			
29.	12612	*Chrysocephalum apiculatum*			
30.	7939	*Conyza bonariensis (Flaxleaf Fleabane)*	Y		
31.	35558	*Flaveria trinervia (Speedy Weed)*	Y		
32.	8088	*Ixiochlamys cuneifolia*			
33.	8096	*Lactuca serriola (Prickly Lettuce)*	Y		
34.	12635	*Olearia fluvialis*			
35.	42160	*Pentalepis trichodesmoides subsp. trichodesmoides*			
36.	34997	*Peripleura arida*			
37.	17816	*Pluchea ferdinandi-muelleri*			
38.	45239	*Podolepis eremaea*			
39.	8192	*Pterocaulon sphacelatum (Apple Bush)*			
40.	8193	*Pterocaulon sphaeranthoides*			
41.	13301	*Rhodanthe floribunda*			
42.	13310	*Rhodanthe margarethae*			
43.	13303	*Rhodanthe sterilescens*			
44.	45148	*Roebuckiella ciliocarpa*			
45.	8213	*Senecio magnificus (Showy Groundsel)*			
46.	8223	*Sigesbeckia orientalis (Indian Weed)*	Y		
47.	8235	*Streptoglossa bubakii*			
48.	8237	*Streptoglossa decurrens*			
49.		*Vittadinia sp.*			
50.		*Wedelia sp.*			
Bignoniaceae					
51.	7117	*Pandorea pandorana*			
Boraginaceae					
52.	6687	*Halgania cyanea (Rough Halgania)*			
53.	29840	*Halgania cyanea var. Allambi Stn (B.W. Strong 676)*			
54.	6706	*Heliotropium cunninghamii*			
55.	6712	*Heliotropium heteranthum*			
56.	17309	*Heliotropium pachyphyllum*			
57.	6727	*Trichodesma zeylanicum (Camel Bush, Kumbalin)*			
Brassicaceae					
58.	3022	*Lepidium catapycnon (Hamersley Lepidium)*		P4	
59.	3025	*Lepidium echinatum*			
60.	3032	*Lepidium muelleri-ferdinandii*			
Campanulaceae					
61.	37480	*Lobelia arnhemiaca*			
62.	36880	*Lobelia heterophylla subsp. pilbarensis*			
63.	7393	*Wahlenbergia tumidifructa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Capparaceae					
64.	2981	*Capparis spinosa*			
Caryophyllaceae					
65.	2901	*Polycarpaea holtzei*			
66.	2903	*Polycarpaea longiflora*			
Celastraceae					
67.	19500	*Maytenus sp. Mt Windell (S. van Leeuwen 846)*			
68.		*Stackhousia sp.*			
Chenopodiaceae					
69.	2502	*Dysphania kalpari (Rat's Tail, Kalpari)*			
70.	33479	*Dysphania melanocarpa (Black Crumbweed)*			
71.	33596	*Dysphania melanocarpa forma leucocarpa*			
72.	2506	*Dysphania rhadinostachya*			
73.	2511	*Enchylaena tomentosa (Barrier Saltbush)*			
74.	2556	*Maireana planifolia (Low Bluebush)*			
75.	30434	*Salsola australis*			
76.	2603	*Sclerolaena cornishiana (Cartwheel Burr)*			
Cleomaceae					
77.	2988	*Cleome viscosa (Tickweed, Tjinduwadhu)*			
Convolvulaceae					
78.	11167	*Bonamia erecta*			
79.	44782	*Bonamia pilbarensis*			
80.	31274	*Duperreya commixta*			
81.	6617	*Evolvulus alsinoides (Tropical Speedwell)*			
82.	11200	*Evolvulus alsinoides var. villosicalyx*			
83.	6633	*Ipomoea muelleri (Poison Morning Glory, Yumbu)*			
84.	6653	*Polymeria ambigua (Morning Glory)*			
85.	9232	*Polymeria distigma*		P3	
86.	17513	*Polymeria lanata*			
Cucurbitaceae					
87.	41721	*Cucumis variabilis*			
Cyperaceae					
88.	786	*Cyperus cunninghamii*			
89.	12811	*Cyperus cunninghamii subsp. cunninghamii*			
90.	799	*Cyperus ixiocarpus*			
91.	818	*Cyperus vaginatus (Stiffleaf Sedge)*			
92.	827	*Eleocharis geniculata*			
93.	842	*Fimbristylis cardiocarpa*			
94.	851	*Fimbristylis dichotoma (Eight Day Grass)*			
95.	862	*Fimbristylis microcarya*			
96.	882	*Fimbristylis sieberiana*		P3	
97.		*Fimbristylis sp.*			
98.	16257	*Schoenoplectus subulatus*			
Dilleniaceae					
99.	5128	*Hibbertia glaberrima*			
Elatinaceae					
100.	5186	*Bergia trimera*			
Euphorbiaceae					
101.	17422	*Adriana tomentosa var. tomentosa*			
102.	4617	*Euphorbia australis (Namana)*			
103.	35303	*Euphorbia australis var. subtomentosa*			
104.	4620	*Euphorbia boophthona (Gascoyne Spurge)*			
105.	4623	*Euphorbia coghlanii (Namana)*			
106.	13281	*Euphorbia vaccaria*			
Fabaceae					
107.	11215	*Acacia adoxa var. adoxa*			
108.	3205	*Acacia adsurgens*			
109.	44579	*Acacia adsurgens x rhodophloia*			
110.	3214	*Acacia ancistrocarpa (Fitzroy Wattle)*			
111.	37260	*Acacia aptaneura*			
112.	3241	*Acacia bivenosa*			
113.	29571	*Acacia bromilowiana*		P4	
114.	3260	*Acacia citrinoviridis*			
115.	13502	*Acacia coriacea subsp. pendens*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
116.	3272	*Acacia cowleana (Halls Creek Wattle)*			
117.	3300	*Acacia dictyophleba (Sandhill Wattle, Ngarkalya)*			
118.	16174	*Acacia elachantha*			
119.	3360	*Acacia hamersleyensis*			
120.	3370	*Acacia hilliana*			
121.	3377	*Acacia inaequilatera (Baderi)*			
122.	3434	*Acacia maitlandii (Maitland's Wattle)*			
123.	3447	*Acacia monticola (Gawar, Lilwardi)*			
124.	3475	*Acacia pachyacra*			
125.	3500	*Acacia pruinocarpa (Gidgee)*			
126.	29015	*Acacia pyrifolia var. pyrifolia*			
127.	13078	*Acacia sclerosperma subsp. sclerosperma*			
128.	8949	*Acacia sibirica (Bastard Mulga)*			
129.	3553	*Acacia spondylophylla*			
130.	23526	*Acacia steedmanii subsp. borealis*			
131.	23528	*Acacia subtiliformis*		P3	
132.	13070	*Acacia synchronicia*			
133.	3573	*Acacia tenuissima*			
134.	3577	*Acacia tetragonophylla (Kurara, Wakalpuka)*			
135.	20319	*Acacia tumida var. pilbarensis*			
136.	3592	*Acacia validinervia*			
137.	3783	*Crotalaria medicaginea*			
138.	20179	*Crotalaria medicaginea var. neglecta*			
139.	3785	*Crotalaria novae-hollandiae (New Holland Rattlepod)*			
140.	11231	*Crotalaria novae-hollandiae subsp. novae-hollandiae*			
141.	17119	*Cullen leucochaites*			
142.	17116	*Cullen martinii*			
143.	17120	*Cullen pogonocarpum*			
144.	3903	*Gastrolobium grandiflorum (Wallflower Poison)*			
145.	41245	*Gompholobium oreophilum*			
146.	45473	*Indigofera fractiflexa subsp. fractiflexa*			
147.	3980	*Indigofera linifolia*			
148.	3982	*Indigofera monophylla*			
149.	3989	*Isotropis atropurpurea (Poison Sage)*			
150.	17790	*Isotropis parviflora*		P2	
151.		*Lotus sp.*			
152.	4105	*Mirbelia viminalis*			
153.	3675	*Petalostylis labicheoides (Slender Petalostylis)*			
154.	4190	*Rhynchosia australis (Rhynchosia)*			
155.	17645	*Senna artemisioides*			
156.	12279	*Senna artemisioides subsp. helmsii*			
157.	12280	*Senna artemisioides subsp. oligophylla*			
158.	12307	*Senna glutinosa subsp. glutinosa*			
159.	12309	*Senna glutinosa subsp. pruinosa*			
160.	12312	*Senna notabilis*			
161.	19347	*Senna sericea*			
162.	18445	*Senna stricta*			
163.	12319	*Senna venusta*			
164.	4196	*Sesbania cannabina (Sesbania Pea)*			
165.	4223	*Swainsona decurrens*			
166.	12356	*Swainsona formosa*			
167.	41986	*Tephrosia oxalidea*			
168.	41825	*Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)*			
169.	17768	*Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)*			
170.	42442	*Tephrosia sp. NW Eremaean (S. van Leeuwen et al. PBS 0356)*			
171.	42225	*Tephrosia sp. Newman (A.A. Mitchell PRP 29)*			
172.	30716	*Vachellia farnesiana (Mimosa Bush)*	Y		
173.	4323	*Vigna lanceolata (Maloga Vigna, Wega)*			
Gentianaceae					
174.	41660	*Schenkia australis*			
Goodeniaceae					
175.	7413	*Brunonia australis (Native Cornflower)*			
176.	7424	*Dampiera candicans*			
177.	20378	*Dampiera metallorum*		P3	
178.	7526	*Goodenia microptera*			
179.	12552	*Goodenia muelleriana*			
180.	7530	*Goodenia nuda*		P4	
181.		*Goodenia sp.*			
182.	29381	*Goodenia sp. East Pilbara (A.A. Mitchell PRP 727) (O'Meara's Goodenia)*		P3	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
183.	7550	*Goodenia stellata*			
184.	10982	*Goodenia stobbsiana*			
185.	12723	*Scaevola amblyanthera*			
186.	7633	*Scaevola parvifolia (Camel Weed)*			
187.	13172	*Scaevola parvifolia subsp. pilbarae*			
188.		*Scaevola sp.*			
Haloragaceae					
189.	6174	*Haloragis gossei*			
190.	23465	*Haloragis gossei var. gossei*			
Lamiaceae					
191.	13692	*Clerodendrum floribundum var. angustifolium*			
192.	13689	*Clerodendrum tomentosum var. lanceolatum*			
193.	6754	*Dicrastylis cordifolia*			
194.		*Newcastelia sp.*			
195.	20252	*Newcastelia sp. Hamersley Range (S. van Leeuwen 4264)*			
196.	12707	*Prostanthera albiflora*			
Loranthaceae					
197.	11614	*Amyema gibberula var. gibberula*			
198.	2374	*Amyema hilliana*			
199.	2383	*Amyema preissii (Wireleaf Mistletoe)*			
200.	11874	*Amyema sanguinea var. sanguinea*			
Lythraceae					
201.	5277	*Ammannia baccifera*			
Malvaceae					
202.	9080	*Abutilon cunninghamii*			
203.		*Abutilon sp.*			
204.	42920	*Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)*			
205.		*Abutilon sp. Dioicum (A.A.Mitchell PRP 1618)*			
206.	14113	*Abutilon sp. Pilbara (W.R. Barker 2025)*			
207.	40910	*Androcalva luteiflora (Yellow-flowered Rulingia)*			
208.	12716	*Brachychiton acuminatus*			
209.	13560	*Corchorus crozophorifolius*			
210.	18408	*Corchorus lasiocarpus subsp. parvus*			
211.		*Corchorus sp.*			
212.	4910	*Gossypium australe (Native Cotton)*			
213.	4918	*Gossypium robinsonii (Wild Cotton)*			
214.	11559	*Gossypium sturtianum var. sturtianum*			
215.	4925	*Hibiscus coatesii*			
216.	4933	*Hibiscus leptocladus*			
217.		*Hibiscus sp.*			
218.	40640	*Hibiscus sp. Mt Robinson (G. Byrne 3537)*			
219.	11651	*Hibiscus sturtii var. campylochlamys*			
220.	11477	*Hibiscus sturtii var. platychlamys*			
221.	19636	*Keraudrenia velutina subsp. elliptica*			
222.	4962	*Malvastrum americanum (Spiked Malvastrum)*	Y		
223.	5051	*Melhania oblongifolia*			
224.		*Melhania sp.*			
225.	4966	*Sida arenicola*			
226.	4970	*Sida calyxhymenia (Tall Sida)*			
227.	4971	*Sida cardiophylla*			
228.	4977	*Sida fibulifera (Silver Sida)*			
229.	4988	*Sida rohlenae*			
230.		*Sida sp.*			
231.	31859	*Sida sp. Articulation below (A.A. Mitchell PRP 1605)*			
232.		*Sida sp. Bond Springs (D.J.Nelson 2538)*			
233.	16617	*Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)*			
234.	16948	*Sida sp. verrucose glands (F.H. Mollemans 2423)*			
235.	4879	*Triumfetta leptacantha*			
236.	14942	*Triumfetta maconochieana*			
237.	5106	*Waltheria indica*			
Molluginaceae					
238.	29851	*Mollugo molluginea*			
Moraceae					
239.	19648	*Ficus brachypoda*			
240.	1753	*Ficus platypoda (Native Fig, Makartu)*			
Myrtaceae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
241.	5446	*Calytrix carinata*			
242.	16783	*Corymbia candida*			
243.	17093	*Corymbia hamersleyana*			
244.	35345	*Eucalyptus camaldulensis subsp. obtusa (Blunt-budded River Red Gum)*			
245.	5641	*Eucalyptus ewartiana (Ewart's Mallee)*			
246.	5655	*Eucalyptus gamophylla (Twin-leaf Mallee, Warilu)*			
247.	13529	*Eucalyptus kingsmillii subsp. alatissima*			
248.	13528	*Eucalyptus kingsmillii subsp. kingsmillii*			
249.		*Eucalyptus sp.*			
250.	18219	*Eucalyptus tephrodes*			
251.	14548	*Eucalyptus victrix*			
252.	5846	*Lamarchea sulcata*			
253.	5875	*Melaleuca argentea (Silver Cadjeput, Bandaran)*			
254.	5915	*Melaleuca glomerata*			
Nyctaginaceae					
255.	2770	*Boerhavia coccinea (Tar Vine, Wituka)*			
256.	2774	*Boerhavia repleta*			
Oleaceae					
257.	6501	*Jasminum didymum*			
258.	12059	*Jasminum didymum subsp. lineare (Desert Jasmine)*			
Papaveraceae					
259.	2961	*Argemone ochroleuca (Mexican Poppy)*	Y		
Phyllanthaceae					
260.	9056	*Phyllanthus baccatus*			
261.	4680	*Phyllanthus maderaspatensis*			
262.	45744	*Phyllanthus rhytidospermus*			
Plantaginaceae					
263.	7098	*Stemodia grossa (Marsh Stemodia, Mindjaara)*			
Plumbaginaceae					
264.	6491	*Plumbago zeylanica (Native Plumbago)*			
Poaceae					
265.	19835	*Amphipogon sericeus*			
266.	204	*Aristida burbidgeae*			
267.	207	*Aristida contorta (Bunched Kerosene Grass)*			
268.	12063	*Aristida holathera var. holathera*			
269.	216	*Aristida lazaridis*		P2	
270.	240	*Bothriochloa ewartiana (Desert Bluegrass)*			
271.	258	*Cenchrus ciliaris (Buffel Grass)*	Y		
272.	266	*Chloris barbata (Purpletop Chloris)*	Y		
273.	269	*Chloris pectinata (Comb Chloris)*			
274.	273	*Chrysopogon fallax (Golden Beard Grass)*			
275.	279	*Cymbopogon ambiguus (Scentgrass)*			
276.	281	*Cymbopogon obtectus (Silkyheads)*			
277.		*Cymbopogon sp.*			
278.	290	*Dactyloctenium radulans (Button Grass)*			
279.	311	*Digitaria ciliaris (Summer Grass)*	Y		
280.	360	*Enneapogon lindleyanus (Wiry Nineawn, Purple-head Nineawn)*			
281.	375	*Eragrostis cumingii (Cuming's Love Grass)*			
282.	377	*Eragrostis desertorum (Desert Lovegrass)*			
283.	380	*Eragrostis eriopoda (Woollybutt Grass, Wangurnu)*			
284.	17608	*Eragrostis olida*			
285.	392	*Eragrostis pergracilis*			
286.	398	*Eragrostis tenellula (Delicate Lovegrass)*			
287.	400	*Eriachne aristidea*			
288.	403	*Eriachne benthamii (Swamp Wanderrie)*			
289.	13660	*Eriachne lanata*			
290.	413	*Eriachne mucronata (Mountain Wanderrie Grass)*			
291.	16486	*Eriachne pulchella subsp. pulchella*			
292.	421	*Eriachne tenuiculmis*			
293.	11011	*Eulalia aurea*			
294.	505	*Panicum laevinode*			
295.	10975	*Paspalidium basicladum*			
296.	521	*Paspalidium gracile (Slender Panic)*			
297.	523	*Paspalidium rarum (Rare Paspalidium)*			
298.	524	*Paspalidium reflexum*			
299.	527	*Paspalum dilatatum*	Y		
300.	546	*Perotis rara (Comet Grass)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
301.	613	*Setaria verticillata (Whorled Pigeon Grass)*	Y		
302.	17820	*Themeda sp. Hamersley Station (M.E. Trudgen 11431)*		P3	
303.	17819	*Themeda sp. Mt Barricade (M.E. Trudgen 2471)*			
304.	673	*Themeda triandra*			
305.	678	*Tragus australianus (Small Burrgrass)*			
306.	680	*Triodia basedowii (Lobed Spinifex)*			
307.	17886	*Triodia biflora*			
308.	689	*Triodia lanigera*			
309.	690	*Triodia longiceps (Giant Grey Spinifex)*			
310.	696	*Triodia pungens (Soft Spinifex)*			
311.	17873	*Triodia schinzii*			
312.	704	*Triodia wiseana (Limestone Spinifex)*			
313.	706	*Triraphis mollis (Needle Grass)*			
314.	732	*Yakirra australiensis*			
Polygalaceae					
315.	41365	*Polygala glaucifolia*			
Polygonaceae					
316.	17739	*Acetosa vesicaria*	Y		
Portulacaceae					
317.	2884	*Portulaca oleracea (Purslane, Wakati)*			
Proteaceae					
318.	2079	*Grevillea pyramidalis (Caustic Bush, Tjungu)*			
319.	19570	*Grevillea pyramidalis subsp. leucadendron*			
320.	2121	*Grevillea wickhamii (Wickham's Grevillea)*			
321.	19478	*Grevillea wickhamii subsp. hispidula*			
322.	2138	*Hakea chordophylla*			
323.	2177	*Hakea lorea (Witinti)*			
Pteridaceae					
324.	31	*Cheilanthes austrotenuifolia*			
325.	33	*Cheilanthes contigua*			
326.	37	*Cheilanthes lasiophylla (Woolly Cloak Fern)*			
327.	12815	*Cheilanthes sieberi subsp. pseudovellea*			
Ricciaceae					
328.		*Riccia crinita*			
Rubiaceae					
329.	7338	*Oldenlandia crouchiana*			
330.	12964	*Pomax rupestris*			
331.	18154	*Psydrax latifolia*			
Santalaceae					
332.	2333	*Anthobolus leptomerioides*			
333.	2357	*Santalum lanceolatum (Northern Sandalwood, Yarnguli)*			
Sapindaceae					
334.	4739	*Alectryon oleifolius*			
335.	4740	*Atalaya hemiglauca (Whitewood)*			
336.	4759	*Dodonaea coriacea*			
337.	4767	*Dodonaea lanceolata (Pirrungu)*			
338.	11406	*Dodonaea lanceolata var. lanceolata*			
339.	4772	*Dodonaea pachyneura*			
340.	4782	*Dodonaea viscosa (Sticky Hopbush)*			
Scrophulariaceae					
341.	7192	*Eremophila cuneifolia (Pinyuru, T'iranju)*			
342.	15052	*Eremophila forrestii subsp. forrestii*			
343.	7209	*Eremophila fraseri (Burra)*			
344.	16696	*Eremophila fraseri subsp. fraseri*			
345.	17519	*Eremophila jucunda subsp. pulcherrima*			
346.	16940	*Eremophila lanceolata*			
347.	7230	*Eremophila latrobei (Warty Fuchsia Bush, Mintjingka)*			
348.	7234	*Eremophila longifolia (Berrigan, Tulypurpa)*			
349.		*Eremophila sp.*			
350.	23997	*Eremophila tietkensii*			
Solanaceae					
351.	6962	*Datura leichhardtii (Native Thornapple)*	Y		
352.	11331	*Nicotiana occidentalis subsp. obliqua*			
353.	6997	*Solanum chippendalei*			
354.	42544	*Solanum elatius*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
355.	7009	*Solanum gabrielae*			
356.	7014	*Solanum horridum*			
357.	7018	*Solanum lasiophyllum (Flannel Bush, Mindjulu)*			
358.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
359.	7029	*Solanum phlomoides*			
360.	7036	*Solanum sturtianum (Thargomindah Nightshade)*			
Stylidiaceae					
361.	7700	*Stylidium ceratophorum*			
362.	18123	*Stylidium weeliwolli*		P2	
Surianaceae					
363.	3182	*Stylobasium spathulatum (Pebble Bush)*			
Thymelaeaceae					
364.	5245	*Pimelea forrestiana*			
Violaceae					
365.	5215	*Hybanthus aurantiacus*			
Zygophyllaceae					
366.	4376	*Tribulus forrestii*			
367.	4377	*Tribulus hirsutus*			
368.	4379	*Tribulus macrocarpus*			
369.	18072	*Tribulus suberosus*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government

Department of the Environment

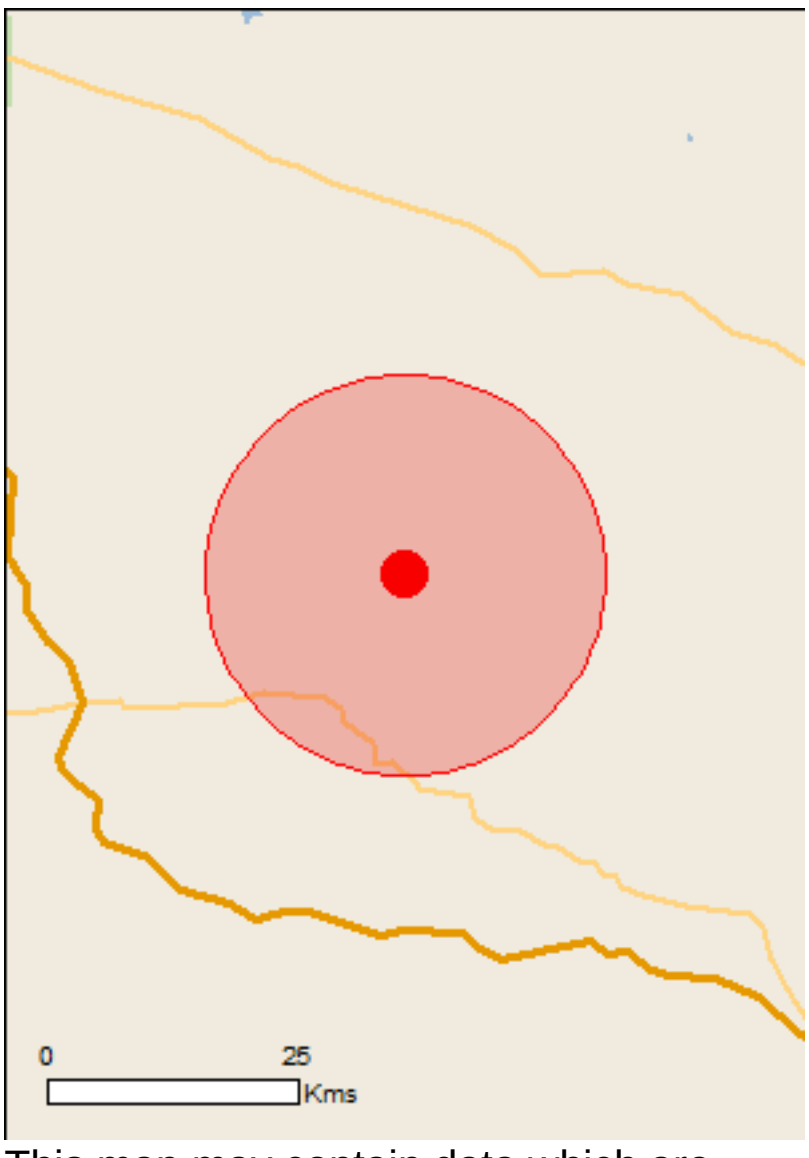
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

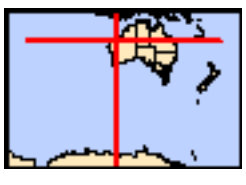
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 09/09/16 11:45:28



Coordinates

Buffer: 20.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	9
Listed Migratory Species:	6

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Commonwealth Reserves Marine:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	None
Regional Forest Agreements:	None
Invasive Species:	9
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat likely to occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus hallucatus Northern Quoll, Digul [331]	Endangered	Species or species habitat known to occur within area
Macroderma gigas Ghost Bat [174]	Vulnerable	Species or species habitat likely to occur within area
Macrotis lagotis Greater Bilby [282]	Vulnerable	Species or species habitat may occur within area
Rhinonicteris aurantia (Pilbara form) Pilbara Leaf-nosed Bat [82790]	Vulnerable	Species or species habitat known to occur within area
Plants		
Lepidium catapycnon Hamersley Lepidium, Hamersley Catapycnon [9397]	Vulnerable	Species or species habitat known to occur within area
Reptiles		
Liasis olivaceus barroni Olive Python (Pilbara subspecies) [66699]	Vulnerable	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Migratory Marine Birds		
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		

Name	Threatened	Type of Presence
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.		
Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat likely to occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area
Charadrius veredus		
Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Hirundo rustica		
Barn Swallow [662]		Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Endangered*	Species or species habitat may occur within area

Extra Information

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Camelus dromedarius Dromedary, Camel [7]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Equus asinus Donkey, Ass [4]		Species or species habitat likely to occur within area
Equus caballus Horse [5]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-22.825 119.11028

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales
-Department of Environment and Primary Industries, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment, Water and Natural Resources, South Australia
-Parks and Wildlife Commission NT, Northern Territory Government
-Department of Environmental and Heritage Protection, Queensland
-Department of Parks and Wildlife, Western Australia
-Environment and Planning Directorate, ACT
-Birdlife Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-South Australian Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
Forestry Corporation, NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix 3

Conservation Significant Flora Species Recorded within 40 km of the Study Area and their Likelihood of Occurring in the Study Area

Species	Habit	Habitat	Database Searches				Previous Surveys *f*				Likelihood of Occurrence Within the Study Area	
			NatureMap	WA Herbarium	TPFL	EPBC Protected Matters	BHPBIO Database	Biota [a]	Rio Tinto[b]	Other[c]	**Initial Ranking Based on Desktop Review** (NR: distance to nearest record)	**Final Ranking Including Results of the Current Surveys**
Priority 1												
Eremophila spongiocarpa	Compact low shrub.	Weakly sub-saline alluvial plains.		✓	✓						Would not occur: suitable habitat not present; recorded infrequently within the locality (NR <40 km).	Would not occur.
Synostemon hamersleyensis	Shrub.	Breakaway formations and rock outcrops either side of incised gully systems and upper slopes on ridges.		✓					✓		May potentially occur: small amount of suitable habitat may be present and recorded in close proximity to the study area (NR <20 km).	Unlikely to occur.
Priority 2												
Aristida lazaridis	Tufted perennial grass.	Red clayey sand of floodplains and ephemeral lakes.	✓	✓			✓				May potentially occur: minimal suitable habitat may be present; recorded in close proximity (NR <20 km).	Unlikely to occur.
Cladium procerum	Tufted perennial sedge.	Perennial pools.								✓	May potentially occur: small amount of suitable habitat may be present, and recorded in close proximity (NR <20 km).	Unlikely to occur: infrequently recorded in close proximity.
Euphorbia australis var. *glabra*	Annual herb.	Moderately drained, red clay loam. Sub-saline flats.		✓						✓	Unlikely to occur: some suitable habitat present, recorded very infrequently within the locality (NR <40 km).	Unlikely to occur.
Ipomoea racemigera	Creeping annual herb.	Drainage lines, creek beds.					✓				Likely to occur: suitable habitat present; recorded in close proximity (NR <20 km).	May potentially occur:
Isotropis parviflora	Perennial compact shrub.	Ironstone plains, hill slopes, valley slopes of ironstone plateaus.	✓	✓			✓				May potentially occur: suitable habitat present and recorded in close proximity (NR <20 km).	May potentially occur.
Oxalis sp. Pilbara (M.E. Trudgen 12725)	Annual herb.	Loamy soil with stony mantle. Hill slopes.		✓							Unlikely to occur: some suitable habitat present; recorded very infrequently within the locality (NR <40 km).	Unlikely to occur.
Rhodanthe frenchii	Upright annual, herb, to 30 cm.	Stony hills, rocky river banks and outcrops.							✓		May potentially occur: suitable habitat may be present; infrequently recorded in close proximity (NR <20 km).	Unlikely to occur: infrequently recorded in close proximity.
Priority 3												
Acacia subtiliformis	Erect shrub.	Restricted to rocky calcrete platforms.	✓	✓			✓	✓	✓	✓	May potentially occur: suitable habitat may be present; recorded in close proximity (NR <20 km).	Unlikely to occur: no suitable habitat.

Species	Habit	Habitat	Database Searches				Previous Surveys *f*				Likelihood of Occurrence Within the Study Area	
			NatureMap	WA Herbarium	TPFL	EPBC Protected Matters	BHPBIO Database	Biota [a]	Rio Tinto[b]	Other[c]	**Initial Ranking Based on Desktop Review** (NR: distance to nearest record)	**Final Ranking Including Results of the Current Surveys**
Amaranthus centralis	Herb.	Riverbanks, alluvial sand plains, and Mulga woodland.					✓				Unlikely to occur: little suitable habitat may be present; very infrequently recorded in close proximity (NR <20 km).	Unlikely to occur.
Aristida jerichoensis var. *subspinulifera*	Tufted perennial grass.	Hardpan plains.		✓			✓				May potentially occur: suitable habitat may be present; recorded in close proximity (NR <20 km).	Unlikely to occur: no suitable habitat.
Dampiera metallorum	Sub-shrub.	Steep slopes and summits of tall hills. Skeletal gravelly soil over banded ironstone.	✓	✓			✓				May potentially occur: suitable habitat may be present; recorded in close proximity (NR <20 km).	Unlikely to occur: no suitable habitat present.
Glycine falcata	Prostrate perennial herb.	Clay along drainage depressions in crabhole plains and on river floodplains.		✓							Unlikely to occur: recorded in the locality (NR <40 km) but suitable habitat is unlikely to be present.	Would not occur; no suitable habitat.
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	Annual or biennial herb.	Red-brown clay soil on low undulating plains, usually on calcrete.	✓	✓			✓	✓	✓	✓	Unlikely to occur: recorded in close proximity (NR <20 km) but no suitable habitat present.	Unlikely to occur.
Grevillea saxicola	Tall shrub or tree.	Skeletal sandy loam. Steep slopes, rocky hills, ridges.		✓			✓				May potentially occur: suitable habitat present; recorded in close proximity (NR <20 km).	May potentially occur.
Gymnanthera cunninghamii	Erect shrub.	Sandy soils along creeklines.	✓	✓			✓	✓			May potentially occur: suitable habitat present; infrequently recorded but known from close proximity (NR <20 km).	May potentially occur.
Fimbristylis sieberiana	Perennial sedge.	Pool edges, sandstone cliffs, flood zones.	✓	✓			✓	✓			Likely to occur: suitable habitat present; recorded in close proximity (NR <20 km).	Recorded.
Indigofera gilesii	Erect shrub.	Skeletal loam clay. Rocky slopes, gorges, creeklines.		✓	✓				✓		May potentially occur: some suitable habitat present and recorded within the locality (NR <40 km).	Unlikely to occur: infrequently recorded in close proximity.
Oldenlandia sp. Hamersley Station (A.A. Mitchell PRP 1479)	Spreading annual herb.	Cracking clay on undulating plains, crab-holed plains.							✓		Would not occur: recorded in close proximity (NR <20 km) but no suitable habitat present.	Would not occur.

Species	Habit	Habitat	Database Searches				Previous Surveys *f*				Likelihood of Occurrence Within the Study Area	
			NatureMap	WA Herbarium	TPFL	EPBC Protected Matters	BHPBIO Database	Biota [a]	Rio Tinto[b]	Other[c]	**Initial Ranking Based on Desktop Review** (NR: distance to nearest record)	**Final Ranking Including Results of the Current Surveys**
Polymeria distigma	Prostrate perennial trailing herb.	Sandy soils.	✓	✓							Unlikely to occur: minimal suitable habitat may be present; very infrequently recorded (NR <20 km)	Unlikely to occur.
Rhagodia sp. Hamersley (M. Trudgen 17794)	Shrub.	Red sandy loam or clay, loam on plains, floodplains and creeklines; usually with Mulga.		✓			✓	✓		✓	May potentially occur: suitable habitat may be present; recorded in close proximity (NR <20 km).	Unlikely to occur; no suitable habitat.
Rostellularia adscendens var. *latifolia*	Annual or short-lived perennial herb.	Red-brown loam on ironstone; usually along drainage lines, occasionally on rocky hills.	✓	✓			✓	✓	✓	✓	May potentially occur: suitable habitat present; recorded in close proximity (NR <20 km).	May potentially occur.
Sida sp. Barlee Range (S. van Leeuwen 1642)	Low spreading shrub.	Skeletal red-brown soil. Steep hillslopes, gullies.		✓			✓	✓	✓	✓	Previously recorded in the study area.	Recorded.
Stackhousia clementii	Perennial herb/shrub.	Sandy plains and occasionally inundated saline areas.							✓		Unlikely to occur: suitable habitat may be present and recorded very infrequently within the locality (NR <40 km).	Unlikely to occur.
Stylidium weeliwolli	Annual herb.	Sand, sandy clay. Edge of watercourses.	✓	✓				✓	✓	✓	May potentially occur: suitable habitat present; recorded in close proximity (NR <20 km).	Unlikely to occur: no suitable habitat.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	Tussocky perennial grass.	Red cracking clay on clay plains.	✓	✓				✓	✓		Unlikely to occur: suitable habitat unlikely to be present; recorded in close proximity (NR <20 km).	Unlikely to occur.
Priority 4												
Acacia bromilowiana	Tree or shrub.	Red skeletal stony loam, on rocky hills, breakaways, scree slopes, gorges and creek beds.	✓	✓			✓	✓	✓	✓	Previously recorded in the study area.	Recorded.
Eremophila magnifica subsp. *magnifica*	Shrub.	Skeletal soils over ironstone on rocky hillslopes.		✓			✓		✓		May potentially occur: recorded in close proximity to the study area (NR <20 km) and some suitable habitat present.	May potentially occur.
Eremophila youngii subsp. *lepidota*	Dense spreading shrub.	Clay loam on drainage and floodplains, semi-saline clay flats near Fortescue Marsh.							✓		Unlikely to occur: some suitable habitat may be present; recorded infrequently within the locality (NR <40 km).	Unlikely to occur.

Species	Habit	Habitat	Database Searches				Previous Surveys *f*				Likelihood of Occurrence Within the Study Area	
			NatureMap	WA Herbarium	TPFL	EPBC Protected Matters	BHPBIO Database	Biota [a]	Rio Tinto[b]	Other[c]	**Initial Ranking Based on Desktop Review** (NR: distance to nearest record)	**Final Ranking Including Results of the Current Surveys**
Goodenia nuda	Erect to ascending herb.	Clay or loam along creeklines, wet areas.	✓	✓			✓	✓			May potentially occur: suitable habitat present and recorded in close proximity (NR <20 km).	May potentially occur.
Lepidium catapycnon[22]	Low perennial herb or shrub.	Skeletal soils on hills, particularly in the Newman land system.	✓	✓		✓	✓	✓	✓	✓	May potentially occur: some suitable habitat present and recorded in close proximity (NR <20 km).	May potentially occur.
Ptilotus mollis	Low perennial shrub.	Stony hills, scree slopes.		✓					✓		Unlikely to occur: some suitable habitat present, recorded infrequently within the locality (NR <40 km).	Unlikely to occur.
Rhynchosia bungarensis	Perennial bushy herb.	Creeklines and associated floodplains; coarse sand amongst boulders.		✓					✓	✓	May potentially occur: suitable habitat present; recorded in close proximity (NR <20 km).	May potentially occur.

[22] This species is no longer listed as a Threatened species under the WA *Wildlife Conservation Act 1950*, but remains for the moment listed as Threatened under the Commonwealth EPBC Act.

Appendix 4

Vegetation Structural Classes and Condition Scale

Vegetation Structural Classes*

Stratum	Canopy Cover (%)				
	70-100%	30-70%	10-30%	2-10%	<2%
Trees over 30 m	High Closed Forest	High Open forest	Tall Woodland	Tall Open Woodland	Scattered Tall Trees
Trees 10-30 m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees under 10 m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Mallee	Closed Mallee	Mallee	Open Mallee	Very Open Mallee	Scattered Mallees
Shrubs over 2 m	Closed Scrub	Open Scrub	High Shrubland	High Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2 m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs under 1 m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Hummock Grasses	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Very Open Hummock Grassland	Scattered Hummock Grasses
Tussock Grasses	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Very Open Tussock Grassland	Scattered Tussock Grasses
Bunch Grasses	Closed Bunch Grassland	Bunch Grassland	Open Bunch Grassland	Very Open Bunch Grassland	Scattered Bunch Grasses
Sedges	Closed Sedges	Sedges	Open Sedges	Very Open Sedges	Scattered Sedges
Herbs	Closed Herbs	Herbs	Open Herbs	Very Open Herbs	Scattered Herbs
Grasses, Sedges, Herbs	Closed Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Open Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Very Open Tussock Grassland / Bunch Grassland / Sedgeland / Herbland	Scattered Tussock Grasses / Bunch Grasses / Sedges / Herbs

* As per 'Guidance for Vegetation and Flora Surveys' (BHP 2016), which is based on Muir (1977), and Aplin's (1979) modification of the vegetation classification system of Specht (1970): Aplin T.E.H. (1979). The Flora. Chapter 3 *In* O'Brien, B.J. (ed.) (1979). *Environment and Science.* University of Western Australia Press; Muir B.G. (1977). Biological Survey of the Western Australian Wheatbelt. Part II: Vegetation and habitat of Bendering Reserve. *Records of the Western Australian Museum, Suppl*. No. 3; Specht R.L. (1970). Vegetation. *In The Australian Environment.* 4th edn (Ed. G.W. Leeper). Melbourne.

Vegetation Condition Scale*

Pristine Pristine or nearly so; no obvious signs of disturbance.
Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
Very Good Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded Basic vegetation structure severely impacted by disturbance. Scope for regenerative but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded Basic vegetation structure severely impacted by disturbance. Scope for regenerative but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing

* Developed by Keighery (1994) and as summarised in Bush Forever (Government of Western Australia 2000).

Appendix 5

Raw Data from Field Sampling Sites

Ministers North L2 Veg & Flora **Site** MNF01

Described by PLSW **Date** 20-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 719946 **mE** 7475231 **mN**

Habitat South-facing upper gentle slope of low-medium undulating hills.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone pebbles and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	1	50	
Acacia ancistrocarpa	0.1	110	
Acacia bivenosa	0.1	110	
Acacia hilliana	3	60	
Acacia tenuissima	0.1	110	MNF01-05
Calytrix carinata	0.1	90	MNF01-02
Corymbia deserticola subsp. *deserticola*	2	500	
Gompholobium oreophilum	1	50	
Goodenia stobbsiana	0.1	35	
Goodenia triodiophila	0.1	40	MNF01-04
Grevillea wickhamii subsp. *hispidula*	3	220	MNF01-01
Hakea chordophylla	1.5	450	
Indigofera monophylla	0.1	40	
Ptilotus calostachyus	0.1	90	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	MNF01-06
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	43	40	MNF01-03

Ministers North L2 Veg & Flora **Site** MNF02

Described by PLSW **Date** 21-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 712338 **mE** 7475067 **mN**

Habitat False slope crest. NW aspect.

Soil Dark reddish brown sandy loam.

Rock Type Ironstone cobbles, pebbles and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FS Tw Ell Aha

Vegetation Association Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.

Veg Condition Pristine

Fire Age Burnt 3-5 years ago.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia hamersleyensis	2	110	MNF02-01
Amphipogon sericeus	0.1	10	
Cymbopogon ambiguus	0.1	80	MNF02-04
Eriachne pulchella	0.1	10	
Eucalyptus gamophylla	3	340	
Eucalyptus kingsmillii subsp. *kingsmillii*	0.1	180	
Eucalyptus leucophloia subsp. *leucophloia*	2	280	
Goodenia stobbsiana	0.1	40	
Peripleura virgata	0.1	30	MNF02-03
Petalostylis labicheoides	2	230	
Ptilotus calostachyus	0.1	80	
Ptilotus obovatus var. *obovatus*	0.1	60	
Senna glutinosa subsp. *glutinosa*	0.1	170	
Triodia wiseana	20	110	
Tylophora flexuosa	0.1	10	MNF02-02

Ministers North L2 Veg & Flora **Site** MNF03

Described by PLSW **Date** 21-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 712648 **mE** 7474428 **mN**

Habitat Hilltop of major range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation Triodia hummock grassland

Vegetation Code HC TwTp EkEll Ah

Vegetation Association Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia hamersleyensis	3	300	
Acacia pyrifolia	0.1	180	
Amphipogon sericeus	0.1	35	
Corymbia hamersleyana	0.1	290	
Eriachne mucronata	0.1	40	
Eucalyptus gamophylla	5	500	
Eucalyptus kingsmillii subsp. *kingsmillii*	4	190	
Eucalyptus leucophloia subsp. *leucophloia*	1	600	
Goodenia triodiophila	0.1	40	
Ptilotus obovatus var. *obovatus*	0.1	60	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	MNF03-02
Triodia pungens	5	60	MNF03-01
Triodia wiseana	20	60	

Ministers North L2 Veg & Flora **Site** MNF04

Described by PLSW **Date** 21-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 712879 **mE** 7475315 **mN**

Habitat Mid-slope of large range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FS Tw Ell Aha

Vegetation Association Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Notes Probably part of hilltop vegetation unit, and not lower area of ElHcTsps.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia hamersleyensis	0.5	200	
Acacia hilliana	1	220	
Acacia spondylophylla	2	70	
Corymbia hamersleyana	0.5	550	
Eucalyptus leucophloia subsp. *leucophloia*	4	450	
Grevillea wickhamii subsp. *hispidula*	1	300	MNF04-01
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.5	40	
Triodia wiseana	12	70	

Ministers North L2 Veg & Flora **Site** MNF05

Described by PLSW **Date** 22-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 712323 **mE** 7476676 **mN**

Habitat Low rise/crest of very low hill in an undulating section of low hills and lower lying plains.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS TsTw Ell Ab

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* over on dark reddish brown sandy clay loam on lower hill slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm) (cm)	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	55		
Acacia bivenosa	5	160		
Acacia tenuissima	0.1	60	MNF05-01	
Dodonaea coriacea	0.1	25		
Eucalyptus leucophloia subsp. *leucophloia*	3	500		
Goodenia triodiophila	0.1	45		
Grevillea wickhamii	0.1	150		Sterile; ISM
Hakea lorea subsp. *lorea*	0.1	25		
Lepidium pedicellosum	0.1	40	MNF05-02	
Ptilotus calostachyus	0.1	60		
Senna artemisioides subsp. *helmsii*	0.1	45		
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	110		
Senna glutinosa subsp. x *luerssenii*	0.1	150		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	4	50		
Triodia wiseana	18	110		

Ministers North L2 Veg & Flora **Site** MNF06

Described by SW **Date** 22-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 713524 **mE** 7476403 **mN**

Habitat South-southeast facing slope below low rise continuing onto undulating

Soil Dark reddish brown sandy loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs ElICh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia adoxa var. *adoxa*	0.5	45	
Acacia hilliana	8	75	
Acacia inaequilatera	1	190	
Cassytha capillaris	0.1	60	
Eucalyptus leucophloia subsp. *leucophloia*	0.5	180	
Gompholobium oreophilum	0.1	45	
Hakea chordophylla	0.1	260	
Ptilotus calostachyus	0.1	75	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	27	60	
Triodia wiseana	2	100	

Ministers North L2 Veg & Flora **Site** MNF07

Described by SW **Date** 22-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 714773 **mE** 7475651 **mN**

Habitat North-northeast facing gentle hillslope just below the crest of low hill.

Soil Dark reddish brown sandy loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm) (cm)	Specimen	Notes
Acacia hilliana	7	55		
Acacia spondylophylla	0.1	50		
Calytrix carinata	0.1	80		
Corymbia hamersleyana	1	600		
Eucalyptus leucophloia subsp. *leucophloia*	1	600		
Gompholobium oreophilum	0.1	45		
Grevillea wickhamii	2	220		Sterile; ISM
Hakea chordophylla	0.1	110		
Petalostylis labicheoides	0.1	220		
Ptilotus calostachyus	0.1	54		
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	45	MNF07-01	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20	50		
Triodia wiseana	0.1	65		

Ministers North L2 Veg & Flora **Site** MNF08

Described by PLSW **Date** 22-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 714072 **mE** 7475206 **mN**

Habitat Hillcrest and upper slope of large hill on footslopes of major range to the

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm) (cm)	Specimen	Notes
Acacia hilliana	12	50		
Acacia monticola	0.1	140		
Acacia pruinocarpa	0.1	100		
Acacia spondylophylla	0.1	45		
Aristida holathera var. *holathera*	0.1	40		
Corymbia hamersleyana	1	400		
Eucalyptus leucophloia subsp. *leucophloia*	1	650		
Gompholobium oreophilum	0.1	50		
Grevillea wickhamii	0.1	130		Sterile; ISM
Hakea chordophylla	0.1	220		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	20	35		
Triodia wiseana	0.1	80		

Ministers North L2 Veg & Flora **Site** MNF09
Described by CEFPL **Date** 24-Sep-16 **Type** Quadrat 50 x 50 m
MGA Zone 50 715189 **mE** 7474644 **mN**
Habitat Low hill crest/slope in broad valley of undulating low hills.
Soil Dark reddish brown sandy clay loam.
Rock Type Ironstone cobbles, pebbles, and gravel.
Broad Floristic Formation *Triodia* open hummock grassland
Vegetation Code FSTs EllCh Hc
Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.
Veg Condition Pristine
Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia hilliana	11	50	
Acacia monticola	0.1	70	
Acacia pruinocarpa	0.1	190	
Acacia spondylophylla	1	40	
Aristida contorta	0.1	15	
Aristida holathera var. *holathera*	0.1	30	
Calytrix carinata	0.1	45	
Codonocarpus cotinifolius	0.1	130	
Corchorus lasiocarpus subsp. *parvus*	0.1	50	
Corymbia hamersleyana	1.5	550	
Dampiera candicans	0.1	50	
Diplatia grandibractea	0.1	120	
Eriachne lanata	0.1	30	
Eucalyptus leucophloia subsp. *leucophloia*	1	500	
Fimbristylis dichotoma	0.1	10	
Gompholobium oreophilum	0.1	50	
Goodenia stobbsiana	0.1	40	
Goodenia triodiophila	0.1	30	
Grevillea berryana	0.1	170	
Grevillea wickhamii	0.1	220	Sterile; ISM
Hakea chordophylla	0.1	190	
Indigofera monophylla	0.1	40	
Jasminum didymum subsp. *lineare*	0.1	60	
Ptilotus calostachyus	0.1	40	
Santalum lanceolatum	0.1	150	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	MNF09-02
Triodia pungens	0.1	60	MNF09-01
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	15	30	
Triodia wiseana	1	60	

Ministers North L2 Veg & Flora **Site** MNF10

Described by CEFPL **Date** 25-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 714975 **mE** 7473599 **mN**

Habitat Hill crest of major range running east-west.

Soil Dark reddish brown sandy caly loam.

Rock Type Irosntone boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* hummock grassland

Vegetation Code HC TwTp EkEll Ah

Vegetation Association Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm) (cm)	Specimen
Acacia hamersleyensis	0.1	240	
Acacia pruinocarpa	0.1	220	
Cassytha capillaris	0.1	30	
Eriachne mucronata	0.1	40	
Eucalyptus gamophylla	2	250	
Eucalyptus kingsmillii subsp. *kingsmillii*	0.1	200	
Eucalyptus leucophloia subsp. *leucophloia*	2	500	
Fimbristylis dichotoma	0.1	15	
Goodenia stobbsiana	0.1	15	
Goodenia triodiophila	0.1	15	
Hakea chordophylla	0.1	180	
Paraneurachne muelleri	0.1	20	
Senna glutinosa subsp. *glutinosa*	0.1	130	
Triodia wiseana	15	80	

Ministers North L2 Veg & Flora **Site** MNF11

Described by CEFPL **Date** 25-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 714427 **mE** 7473825 **mN**

Habitat Hill crest and upper slope of major range running east-west.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* hummock grassland

Vegetation Code HC TwTp EkEll Ah

Vegetation Association Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia hamersleyensis	2	420	
Cymbopogon obtectus	0.1	60	
Eriachne mucronata	0.1	20	
Eucalyptus kingsmillii subsp. *kingsmillii*	4	210	
Eucalyptus leucophloia subsp. *leucophloia*	0.5	300	
Fimbristylis dichotoma	0.1	15	
Grevillea wickhamii subsp. *aprica*	0.1	190	MNF11-01
Jasminum didymum subsp. *lineare*	0.1	60	
Solanum phlomoides	0.1	40	
Triodia pungens	4	40	MNF11-02
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	1	30	
Triodia wiseana	13	80	

Ministers North L2 Veg & Flora **Site** MNF12

Described by CEFPL **Date** 25-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 716768 **mE** 7471830 **mN**

Habitat Low hilltop and south-facing slope within a range of undulating low hills.

Soil Dark reddish brown sandy clay loam

Rock Type Ironstone

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.1	40	
Acacia hilliana	9	45	
Acacia pruinocarpa	0.1	160	
Clerodendrum floribundum var. *angustifolium*	0.1	220	
Corchorus lasiocarpus subsp. *parvus*	0.1	55	MNF12-01
Corymbia hamersleyana	0.1	450	
Eucalyptus leucophloia subsp. *leucophloia*	2.5	420	
Fimbristylis dichotoma	0.1	10	
Gompholobium oreophilum	0.1	50	
Goodenia triodiophila	0.1	15	
Grevillea wickhamii subsp. *hispidula*	0.1	240	MNF12-03
Hakea chordophylla	0.1	210	
Indigofera monophylla	0.1	30	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	140	
Senna artemisioides subsp. *helmsii*	0.1	50	
Senna glutinosa subsp. *glutinosa*	0.1	180	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	40	MNF12-02
Solanum phlomoides	0.1	50	
Triodia pungens	0.1	50	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	22	40	
Triodia wiseana	0.1	55	

Ministers North L2 Veg & Flora **Site** MNF13

Described by CEFPL **Date** 26-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 715827 **mE** 7473755 **mN**

Habitat Midslope of range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone outcropping, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FS Tw Ell Aha

Vegetation Association Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia hamersleyensis	0.1	220	
Acacia pruinocarpa	0.1	60	
Acacia spondylophylla	1	50	
Calytrix carinata	0.1	60	
Corymbia ferriticola	0.1	350	
Corymbia hamersleyana	0.1	190	
Cymbopogon ambiguus	0.1	50	
Eriachne mucronata	0.1	30	
Eucalyptus leucophloia subsp. *leucophloia*	4	600	
Goodenia muelleriana	0.1	30	
Goodenia stobbsiana	0.1	40	
Hakea lorea subsp. *lorea*	0.1	60	
Senna glutinosa subsp. *glutinosa*	0.1	170	
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.1	30	
Solanum horridum	1	10	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	11	30	
Triodia wiseana	10	60	

Ministers North L2 Veg & Flora **Site** MNF14

Described by CEFPL **Date** 26-Sep-16 **Type** Quadrat 27.5 x 90 m

MGA Zone 50 716629 **mE** 7474459 **mN**

Habitat Drainage line (gully) wiithin low to medium sized hills surrounded by steep-sided, rocky free faces.

Soil Dark reddish brown sandy clay loam

Rock Type Ironstone

Broad Floristic Formation *Acacia* open scrub.

Vegetation Code GG AtpGrwhGoro ErmuTt Ch

Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.

Veg Condition Pristine

Fire Age No sign of recent fire

Name	Cover (%)	Height (cm)	Specimen
Acacia bivenosa	0.1	210	
Acacia pyrifolia	0.1	130	
Acacia tumida var. *pilbarensis*	4	300	
Androcalva luteiflora	4	160	
Aristida holathera var. *holathera*	0.1	40	
Corymbia hamersleyana	3	450	
Cymbopogon ambiguus	0.1	45	
Cymbopogon obtectus	0.1	60	
Dodonaea lanceolata var. *lanceolata*	0.1	100	
Duperreya commixta	0.1	100	
Eriachne mucronata	0.1	30	
Eriachne tenuiculmis	5	30	
Eucalyptus leucophloia subsp. *leucophloia*	0.1	400	
Euphorbia australis var. *subtomentosa*	0.1	5	MNF14-05
Goodenia cusackiana	0.1	15	
Gossypium robinsonii	1	400	
Grevillea wickhamii subsp. *hispidula*	2	300	MNF14-04
Hakea chordophylla	0.1	100	
Hybanthus aurantiacus	0.1	30	
Indigofera monophylla	0.1	30	
Jasminum didymum subsp. *lineare*	0.1	120	
Paraneurachne muelleri	0.1	20	
Peripleura hispidula var. *hispidula*	0.1	10	MNF14-06
Petalostylis labicheoides	0.1	200	
Rhynchosia minima	0.1	20	
Santalum lanceolatum	0.1	300	
Senna artemisioides subsp. *oligophylla*	0.1	130	MNF14-01
Senna glutinosa subsp. *glutinosa*	0.1	160	
Senna glutinosa subsp. *pruinosa*	0.1	140	
Seringia elliptica	0.1	50	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	40	
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	10	MNF14-02
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	3	120	MNF14-03
Trichodesma zeylanicum var. *zeylanicum*	0.1	40	
Triodia pungens	20	70	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.1	30	

Ministers North L2 Veg & Flora **Site** MNF15

Described by CEFPL **Date** 26-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 714465 **mE** 7475303 **mN**

Habitat Midslope of lower footslope of major range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone outcropping, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age Burnt 3-5 years ago.

Name	Cover (%)	Height (cm)	Specimen
Acacia hilliana	32	50	
Acacia pruinocarpa	0.1	100	
Acacia spondylophylla	0.1	60	
Corymbia hamersleyana	3	500	
Eriachne lanata	0.1	30	
Eriachne mucronata	0.1	30	
Eucalyptus leucophloia subsp. *leucophloia*	1.5	550	
Gompholobium oreophilum	0.1	70	
Goodenia triodiophila	0.1	30	
Grevillea wickhamii subsp. *hispidula*	3	400	MNF15-01
Indigofera monophylla	0.1	35	
Jasminum didymum subsp. *lineare*	0.1	200	
Petalostylis labicheoides	0.1	300	
Ptilotus calostachyus	0.1	50	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	30	
Senna ferraria	0.1	60	
Senna glutinosa subsp. *glutinosa*	0.1	220	
Solanum lasiophyllum	0.1	70	
Triodia pungens	0.1	40	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	25	35	
Triodia wiseana	1	70	

Ministers North L2 Veg & Flora **Site** MNF16

Described by CEFPL **Date** 26-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 718179 **mE** 7474866 **mN**

Habitat Slope of low hill.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone pebbles and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.1	50	
Acacia hilliana	5	60	
Acacia inaequilatera	0.5	320	
Acacia pruinocarpa	1	230	
Acacia spondylophylla	3	70	
Codonocarpus cotinifolius	0.1	200	
Corymbia hamersleyana	2	450	
Cymbopogon obtectus	0.1	90	
Eucalyptus gamophylla	1	400	
Grevillea wickhamii	5	350	Sterile; ISM
Hakea chordophylla	0.1	200	
Indigofera monophylla	0.1	45	
Jasminum didymum subsp. *lineare*	0.1	100	
Petalostylis labicheoides	0.1	300	
Ptilotus astrolasius	0.1	40	
Ptilotus calostachyus	0.1	90	
Santalum lanceolatum	0.1	350	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	15	35	
Triodia wiseana	2	70	

Ministers North L2 Veg & Flora **Site** MNF17

Described by CEFPL **Date** 27-Sep-16 **Type** Quadrat 38 x 66 m

MGA Zone 50 718502 **mE** 7472493 **mN**

Habitat Creek bed of major drainage line surrounded by steep cliff free faces.

Soil Dark reddish brown riversand

Rock Type Riverstone

Broad Floristic Formation *Eucalyptus* open woodland

Vegetation Code ME Ev EauSop Acp

Vegetation Association Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea subsp. pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.

Veg Condition Very Good; Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Melinis repens, *Rumex vesicarius, *Setaria verticillata, *Sonchus oleraceus*).

Fire Age No sign of recent fire

Notes Many weed species, however under story structural integrity still intact

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia coriacea subsp. *pendens*	3	450		
Acacia pyrifolia	0.1	120	MNFR17-03	
Acacia tumida var. *pilbarensis*	0.1	130		
Achyranthes aspera	0.1	20		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	40		NI=10
Bergia pedicellaris	0.1	15		
Boerhavia coccinea	0.1	40		
Cleome viscosa	0.1	15		
Cymbopogon ambiguus	0.1	130		
Cyperus iria	0.1	45		
Cyperus vaginatus	0.1	80		
Digitaria brownii	0.1	30		
Enneapogon sp.	0.1	40		
Eragrostis cumingii	0.1	15		
Eragrostis elongata	0.1	40		
Eragrostis tenellula	0.1	10		
Eriachne tenuiculmis	0.1	30		
Eucalyptus victrix	4	900		
Eulalia aurea	12	70		
Euphorbia biconvexa	0.1	60	MNF17-01	
Evolvulus alsinoides var. *decumbens*	0.1	20		
Fimbristylis microcarya	0.1	20	MNF17-05	
Gomphrena cunninghamii	0.1	5		
Goodenia lamprosperma	0.1	10		
Gossypium robinsonii	0.1	20		
Heliotropium cunninghamii	0.1	35	MNF17-02	
Hybanthus aurantiacus	0.1	40		
Melaleuca glomerata	15	400		
**Melinis repens*	0.1	35		NI =200
Phyllanthus maderaspatensis	0.1	40		
Pluchea dentex	0.1	40		
Pluchea rubelliflora	0.5	35		
Polycarpaea longiflora	0.1	25		
Pterocaulon sphacelatum	0.1	10		
Ptilotus auriculifolius	0.1	50		
Rhynchosia minima	0.1	40		
**Rumex vesicarius*	0.1	30		NI =5
**Setaria verticillata*	0.1	30		NI =4
**Sonchus oleraceus*	0.1	15		NI =1
Sorghum plumosum var. *plumosum*	1	130		
Stemodia grossa	0.1	50		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	1	40		

Name	Cover (%)	Height (cm)	Specimen	Notes
Themeda triandra	0.1	80		
Trachymene oleracea subsp. *oleracea*	0.1	70		
Trichodesma zeylanicum var. *zeylanicum*	0.1	40		
Triodia pungens	0.1	30		
Wahlenbergia tumidifructa	0.1	15		
Waltheria indica	0.1	30		

Ministers North L2 Veg & Flora **Site** MNF18

Described by CEFPL **Date** 27-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 720089 **mE** 7473905 **mN**

Habitat Major drainage in broad area of undulating low hills heavily dissected with gullies.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Melaleuca argentea open forest*

Vegetation Code ME MaEcr TydCyv GoroCule

Vegetation Association Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.

Veg Condition Very Good: Weeds (**Cenchrus ciliaris, *Flaveria trinervia, *Malvastrum americanum, *Melinis repens, *Rumex vesicarius, *Sonchus oleraceus, *Vachellia farnesiana*), signs of cattle.

Fire Age Burnt 1-2 years ago.

Notes Pre-fire vegetation estimated to be open forest.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia bivenosa	0.1	50		
Acacia pyrifolia	0.1	50		
Acacia tumida var. *pilbarensis*	0.1	130		
Adriana tomentosa var. *tomentosa*	0.1	20		
Amaranthus cuspidifolius	0.1	95		
Amaranthus undulatus	0.1	40	MNF18-02	
Ammannia multiflora	0.1	40		
Androcalva luteiflora	0.1	60		
Atalaya hemiglauca	0.1	50		
Bergia pedicellaris	0.1	15		
Cajanus cinereus	0.1	50		
Calocephalus beardii	0.1	20	MNF18-13	
**Cenchrus ciliaris*	0.1	45		NI =15
Centipeda minima subsp. *macrocephala*	0.1	10		
Cleome viscosa	0.1	45		
Clerodendrum floribundum var. *angustifolium*	0.1	10		
Corchorus crozophorifolius	0.1	30		
Corchorus laniflorus	0.1	40		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	50	MNF18-09	
Crotalaria medicaginea var. *neglecta*	0.1	40		
Cucumis variabilis	0.1	40		
Cullen leucanthum	2	180		
Cymbopogon ambiguus	0.1	140		
Cyperus difformis	1	110		
Cyperus vaginatus	3	170		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	30	MNF18-11	
Eleocharis geniculata	0.1	10		
Enteropogon ramosus	0.1	60		
Eragrostis elongata	0.1	35		
Eragrostis tenellula	0.1	40		
Eriachne tenuiculmis	0.1	50		
Eucalyptus camaldulensis subsp. *refulgens*	0.1	1700		
Eulalia aurea	6	120	MNF18-05	
Euphorbia trigonosperma	0.1	40	MNF18-04	
Fimbristylis sieberiana (Priority 3)	0.1	50	MNF18-06	
**Flaveria trinervia*	0.1	50		NI =2
Glycine canescens	0.1	20		
Goodenia muelleriana	0.1	10	MNF18-12	
Gossypium robinsonii	4	220		
Indigofera monophylla	0.1	45		NI =8

Name	Cover (%)	Height (cm)	Specimen	Notes
Ipomoea muelleri	0.1	10		
Isotropis forrestii	0.1	60		
Lobelia arnhemiaca	0.1	5	MNF18-15	
Lobelia heterophylla subsp. *pilbarensis*	0.1	20		
**Malvastrum americanum*	0.1	40		NI =2
Melaleuca argentea	20	2000		
Melhania oblongifolia	0.1	20		
**Melinis repens*	0.1	40		NI =45
Nicotiana benthamiana	0.1	20		
Paspalidium clementii	0.1	20		
Paspalidium sp.	0.1	20	MNF18-07	Sterile; ISM
Phyllanthus maderaspatensis	0.1	50		
Pluchea dentex	0.1	60		
Pluchea rubelliflora	0.1	30		
Polymeria ambigua	0.1	10		
Pterocaulon sphacelatum	0.1	90		
Pterocaulon sphaeranthoides x *sphacelatum*	0.1	40	MNF18-03	
Ptilotus nobilis subsp. *nobilis*	*0.1*	*60*		
Rhodanthe margarethae	0.1	40		
**Rumex vesicarius*	0.1	70		NI =20
Rutidosis helichrysoides subsp. *helichrysoides*	0.1	25		
Senna notabilis	0.1	40		
Senna venusta	0.1	30		
**Setaria verticillata*	0.1	50		NI =40
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	100		
**Solanum nigrum*	0.1	40		NI =2
Solanum phlomoides	0.1	60		
**Sonchus oleraceus*	0.1	20		NI =30
Sorghum plumosum var. *plumosum*	1	130	MNF18-01	
Stemodia grossa	0.1	60		
Streptoglossa decurrens	0.1	20	MNF18-10	
Stylobasium spathulatum	0.1	130		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	50		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	60	MNF18-08	
Themeda triandra	0.1	100		
Trachymene oleracea subsp. *oleracea*	0.1	130		
Trichodesma zeylanicum var. *zeylanicum*	0.1	130		
Typha domingensis	11	230		
**Vachellia farnesiana*	0.1	160		NI =1
Vigna lanceolata var. *lanceolata*	0.1	20		
Wahlenbergia tumidifructa	0.1	50		
Waltheria indica	0.1	50		

Ministers North L2 Veg & Flora **Site** MNF19
Described by CEFPL **Date** 27-Sep-16 **Type** Quadrat 50 x 50 m
MGA Zone 50 719250 **mE** 7473499 **mN**
Habitat Creek bed of major drainage line
Soil Dark reddish brown sand
Rock Type Riverstone
Broad Floristic Formation *Eucalyptus* open woodland
Vegetation Code ME Ev EauSop Acp
Vegetation Association Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea subsp. pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.
Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Cenchrus ciliaris, *Rumex vesicarius, *Sigesbeckia orientalis, *Sonchus oleraceus*), horse scats, donkey scats.
Fire Age 3-5 years ago.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon amplum	0.1	20		
Acacia coriacea subsp. *pendens*	0.5	500		
Acacia pyrifolia	0.1	10		
Acacia tumida var. *pilbarensis*	0.1	90		
Achyranthes aspera	0.1	30		
Alternanthera denticulata	0.1	10		
Amaranthus cuspidifolius	0.1	30		
Androcalva luteiflora	0.1	40		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	20		NI =40
Atalaya hemiglauca	0.1	50		
Bergia pedicellaris	0.1	5		
**Cenchrus ciliaris*	0.1	15		NI =1
Cleome viscosa	0.1	15		
Corchorus crozophorifolius	0.1	90		
Corchorus laniflorus	0.1	10		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	40	MNF19-06	
Corchorus lasiocarpus subsp. *parvus*	0.1	20		
Crotalaria medicaginea var. *neglecta*	0.1	10		
Cymbopogon ambiguus	1	140		
Cyperus vaginatus	0.1	60		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	10	=PC6-03	
Enneapogon robustissimus	0.1	45		
Eragrostis elongata	0.1	15		
Eragrostis tenellula	0.1	10		
Eriachne tenuiculmis	5	35		
Eucalyptus victrix	6	1400		
Eulalia aurea	3	110		
Euphorbia australis var. *subtomentosa*	0.1	5	MNF19-03	
Euphorbia tannensis subsp. *eremophila*	0.1	45		
Euphorbia trigonosperma	0.1	40	MNF19-04	
Gomphrena cunninghamii	0.1	5		
Goodenia lamprosperma	0.1	15		
Goodenia muelleriana	0.1	20	=MNF18-12	
Gossypium australe	0.1	10		
Gossypium robinsonii	0.1	50		Juvenile
Grevillea wickhamii	0.1	10		Seedling
Haloragis gossei var. *gossei*	0.1	40		
Heliotropium cunninghamii	0.1	30	MNF19-05	
Hibiscus sturtii var. *campylochlamys*	0.1	30	MNF19-07	
Indigofera monophylla	0.1	30	=PC08-02	
Ipomoea muelleri	0.1	10		
Jasminum didymum subsp. *lineare*	0.1	100		
Lobelia heterophylla subsp. *pilbarensis*	0.1	5		

Name	Cover (%)	Height (cm)	Specimen	Notes
Melaleuca glomerata	0.1	180		
Melhania oblongifolia	0.1	15		
Phyllanthus erwinii	0.1	10		
Phyllanthus maderaspatensis	0.1	30		
Pluchea dentex	0.1	3		
Pluchea rubelliflora	0.1	15		
Polycarpaea longiflora	0.1	15		
Polymeria ambigua	0.1	5		
Pterocaulon sphacelatum	0.1	25		
Ptilotus auriculifolius	0.1	5		
Ptilotus fusiformis	0.1	30		
Ptilotus nobilis subsp. *nobilis*	0.1	15		
**Rumex vesicarius*	0.1	30		NI = 40
Salsola australis	0.1	20		
Senna notabilis	0.1	25		
Senna venusta	0.1	40		
Sida echinocarpa	0.1	40		
Sida fibulifera	0.1	10		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	30		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	50		
**Sigesbeckia orientalis*	0.1	15		NI =1
Solanum lasiophyllum	0.1	10		
**Sonchus oleraceus*	0.1	5		NI= 11
Sorghum plumosum var. *plumosum*	0.5	50	=MNF18-	
Stemodia grossa	0.1	10		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	4	70		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	110	MNF19-01	
Themeda triandra	0.1	60		
Trachymene oleracea subsp. *oleracea*	0.1	10		
Tribulus hirsutus	0.1	10		
Trichodesma zeylanicum var. *zeylanicum*	0.1	90		
Triodia pungens	0.1	30		

Ministers North L2 Veg & Flora **Site** MNF20

Described by CEFPL **Date** 28-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 719571 **mE** 7473656 **mN**

Habitat Major drainage surrounded by steep cliffs, flowing to the northeast.

Soil Dark reddish brown clay loam to loam in areas.

Rock Type Ironstone outcropping, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Melaleuca argentea open forest*

Vegetation Code ME MaEcr TydCyv GoroCule

Vegetation Association Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.

Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Cenchrus ciliaris, *Flaveria trinervia, *Malvastrum americanum, *Rumex vesicarius, *Setaria verticillata, *Solanum nigrum, *Sonchus oleraceus, *Tridax procumbens*), signs of cattle.

Fire Age Burnt 1-2 years ago.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon amplum	0.1	150		
Abutilon otocarpum	0.1	50		
Acacia bivenosa	0.1	100		
Acacia colei	0.1	170	MNF20-08	NI =12; Sterile
Acacia pyrifolia	0.1	40		
Acacia tumida var. *pilbarensis*	0.1	60		
Achyranthes aspera	0.1	70		
Amaranthus cuspidifolius	0.1	70		
Ammannia multiflora	0.1	40	MNF20-01	
Androcalva luteiflora	0.1	160		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	180		NI =60
Atalaya hemiglauca	0.1	100		
Bergia pedicellaris	0.1	25		
Capparis spinosa subsp. *nummularia*	0.1	20		
**Cenchrus ciliaris*	0.1	50		NI =30
Centipeda minima subsp. *macrocephala*	0.1	10	MNF20-09	
Chrysopogon fallax	0.1	60		
Cleome viscosa	0.1	40		
Corchorus laniflorus	0.1	40		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	60	MNF18-09	
Crotalaria medicaginea var. *neglecta*	0.1	45		
Cullen leucanthum	1	180		
Cymbopogon ambiguus	0.1	150		
Cyperus vaginatus	6	120		
Dodonaea lanceolata var. *lanceolata*	0.1	50		
Eleocharis geniculata	0.1	15	MNF20-07	
Enneapogon lindleyanus	0.1	45	MNF20-05	
Enteropogon ramosus	0.1	70		
Eragrostis cumingii	0.1	30		
Eragrostis elongata	0.1	25		
Eragrostis tenellula	0.1	40		
Eriachne tenuiculmis	0.1	40		
Eucalyptus camaldulensis subsp. *refulgens*	9	1700		
Eulalia aurea	5	70		
Euphorbia biconvexa	0.1	40	MNF20-06	
Fimbristylis sieberiana (Priority 3)	0.1	140	MNF18-06	
**Flaveria trinervia*	0.1	40		NI =2
Goodenia lamprosperma	0.1	20		
Gossypium robinsonii	1	150		
Grevillea wickhamii	0.1	10		Sterile; ISM
Helichrysum luteoalbum	0.1	10	MNF20-02	
Ipomoea muelleri	0.1	10		

Name	Cover (%)	Height (cm)	Specimen	Notes
Isotropis forrestii	0.1	45		
Lobelia arnhemiaca	0.1	10		
**Malvastrum americanum*	0.1	30		NI =1
Melaleuca argentea	43	1800		
Nicotiana benthamiana	0.1	140		
Nicotiana occidentalis subsp. *obliqua*	0.1	35		
Paspalidium basicladum	0.1	20	MNF20-10	
Phyllanthus maderaspatensis	0.1	40		
Pluchea dentex	0.1	40		
Pluchea rubelliflora	0.1	50		
Polycarpaea longiflora	0.1	25		
Pterocaulon sphacelatum	0.1	55		
Pterocaulon sphaeranthoides x *sphacelatum*	0.1	50	MNF18-03	
Ptilotus nobilis subsp. nobilis	*0.1*	*70*		
Rhodanthe margarethae	0.1	15		
Rhynchosia minima	0.1	150		
**Rumex vesicarius*	0.1	30		NI =2
Schenkia clementii	0.1	70	MNF-PL51	
Senna notabilis	0.1	40		
Senna venusta	0.1	70		
Setaria surgens	0.1	40	MNF20-03	
Setaria verticillata	0.1	50		NI =1
Sida fibulifera	0.1	20		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	120		
**Solanum nigrum*	0.1	30		NI =1
Solanum phlomoides	0.1	110		
**Sonchus oleraceus*	0.1	160		NI =70
Sorghum plumosum var. *plumosum*	0.5	140	MNF18-01	
Stemodia grossa	1	80		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	60		
Themeda triandra	0.1	80	MNF20-04	
Trachymene oleracea subsp. *oleracea*	0.1	30		
Trichodesma zeylanicum var. *zeylanicum*	0.1	90		
**Tridax procumbens*	0.1	20		NI =1
Triumfetta leptacantha	0.1	40		
Typha domingensis	8	230		
Vigna lanceolata var. *lanceolata*	0.1	30		
Wahlenbergia tumidifructa	0.1	50		
Waltheria indica	0.1	40		

Ministers North L2 Veg & Flora **Site** MNF21

Described by CEFPL **Date** 28-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 719011 **mE** 7472853 **mN**

Habitat Hillslope of medium hill in area of undulating hills. Just to the east of major drainage.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.1	40	
Acacia hilliana	25	50	
Acacia inaequilatera	0.5	180	
Acacia tumida var. *pilbarensis*	0.1	140	
Amphipogon sericeus	0.1	30	
Corchorus lasiocarpus subsp. *parvus*	0.1	60	=MNFRPC09
Corymbia hamersleyana	0.5	600	
Gompholobium oreophilum	0.1	60	
Hakea chordophylla	3	350	
Indigofera monophylla	0.1	50	
Ptilotus calostachyus	0.1	90	
Senna artemisioides subsp. *oligophylla*	0.1	40	MNF21-01
Senna glutinosa subsp. *pruinosa*	0.1	130	
Solanum phlomoides	0.1	15	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	25	40	

Ministers North L2 Veg & Flora **Site** MNF22

Described by CEFPL **Date** 29-Sep-16 **Type** Quadrat 50 x 50 m

MGA Zone 50 712700 **mE** 7476703 **mN**

Habitat Low rocky rise in area of drainages and low hills.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone and quartz outcropping, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS TsTw Ell Ab

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* over on dark reddish brown sandy clay loam on lower hill slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia bivenosa	6	150	
Acacia dictyophleba	0.1	100	
Capparis lasiantha	0.1	50	
Eriachne mucronata	0.1	40	
Eucalyptus leucophloia subsp. *leucophloia*	4	550	
Jasminum didymum subsp. *lineare*	0.1	45	
Lepidium pedicellosum	0.1	40	
Paraneurachne muelleri	0.1	15	
Ptilotus nobilis subsp. *nobilis*	0.1	15	
Salsola australis	0.1	25	
Senna artemisioides subsp. *oligophylla*	0.1	70	
Senna artemisioides subsp. *oligophylla* x subsp. *helmsii*	0.1	40	
Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	0.1	16	
Triodia pungens	0.1	60	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	29	35	
Triodia wiseana	6	60	

Ministers North L2 Veg & Flora **Site** MNFRPC01
Described by CEFPL **Date** 23-Sep-16 **Type** Relevé 50 x 50 m
MGA Zone 50 720282 **mE** 7472879 **mN**
Habitat Crest of low hill.
Soil Dark reddish brown Sandy clay loam
Rock Type Ironstone
Broad Floristic Formation *Triodia* open hummock grassland
Vegetation Code FSTs EllCh Hc
Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.
Veg Condition Pristine
Fire Age Burnt <1 year ago

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	10		
Acacia hilliana	0.1	10		
Acacia inaequilatera	0.1	400		
Amphipogon sericeus	0.1	30		
Aristida holathera var. *holathera*	0.1	30		
Bonamia pilbarensis	0.1	5		
Corchorus lasiocarpus subsp. *parvus*	0.1	20		
Dampiera candicans	0.1	40		
Eriachne lanata	0.1	40		
Eriachne pulchella	0.1	10		
Eucalyptus leucophloia subsp. *leucophloia*	0.5	450		
Fimbristylis dichotoma	0.1	20		
Gompholobium oreophilum	0.5	45		
Goodenia stobbsiana	0.1	5		
Goodenia triodiophila	0.1	10		
Grevillea wickhamii	0.1	60		Sterile; ISM
Hakea chordophylla	0.1	100		
Heliotropium glabellum	0.1	10	MNFRPC01-3	
Hibiscus coatesii	0.1	10		
Indigofera monophylla	0.1	15		
Ptilotus calostachyus	0.1	40		
Ptilotus nobilis subsp. *nobilis*	0.1	5		
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	MNFRPC01-2	
Senna glutinosa subsp. *glutinosa*	0.1	20		
Senna notabilis	0.1	10		
Sida arenicola	0.1	10		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	20		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	35	MNFRPC01-1	
Solanum phlomoides	0.1	35		
Tephrosia oxalidea	0.1	5		
Trachymene oleracea subsp. *oleracea*	0.1	15		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	2	10		

Ministers North L2 Veg & Flora **Site** MNFRPC02
Described by CEFPL **Date** 23-Sep-16 **Type** Relevé
MGA Zone 50 720059 **mE** 7472095 **mN**
Habitat Rocky narrow gorge.
Soil Dark reddish brown sandy clay loam.
Rock Type Ironstone
Broad Floristic Formation *Acacia* open scrub.
Vegetation Code GG AtpGrwhGoro ErmuTt Ch
Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.
Veg Condition Excellent: **Rumex vesicarius*.
Fire Age Burnt <1 year ago

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon lepidum	0.1	100		
Abutilon macrum	0.1	20		
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	250		
Acacia adoxa var. *adoxa*	0.1	30		
Acacia inaequilatera	0.1	200		
Acacia monticola	0.1	50		
Acacia tumida var. *pilbarensis*	0.1	40		
Amaranthus cuspidifolius	0.1	30		
Aristida holathera var. *holathera*	0.1	40		
Atalaya hemiglauca	0.1	120		
Corchorus lasiocarpus subsp. *parvus*	0.1	40		
Corymbia hamersleyana	0.5	30		
Crotalaria novae-hollandiae subsp. *novae-hollandiae*	0.1	10	MNFRPC02-3	
Cucumis variabilis	0.1	300		
Cymbopogon ambiguus	0.1	90	MNFRPC2-1	
Duperreya commixta	0.1	50		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	40		
Enneapogon lindleyanus	0.1	50		
Eriachne aristidea	0.1	20		
Eriachne mucronata	1	40		
Eriachne tenuiculmis	0.1	40		
Euphorbia boophthona	0.1	40		
Euphorbia trigonosperma	0.1	5	MNFRPC02-4	
Evolvulus alsinoides var. *villosicalyx*	0.1	30		
Ficus brachypoda	1	300		
Gomphrena cunninghamii	0.1	10		
Gossypium robinsonii	0.1	60		
Grevillea wickhamii	0.1	60		Sterile; ISM
Hibiscus coatesii	0.1	70		
Hibiscus sturtii var. *campylochlamys*	0.1	40		
Hybanthus aurantiacus	0.1	30		
Indigofera monophylla	0.1	30		
Isotropis atropurpurea	0.1	30		
Jasminum didymum subsp. *lineare*	0.1	100		
Lobelia heterophylla subsp. *pilbarensis*	0.1	15		
Nicotiana benthamiana	0.1	20		
Nicotiana occidentalis subsp. *obliqua*	0.1	15		
Oldenlandia crouchiana	0.1	20		
Paraneurachne muelleri	0.1	40		
Paspalidium clementii	0.1	25		
Polycarpaea longiflora	0.1	40		
Ptilotus auriculifolius	0.1	20		

Name	Cover (%)	Height (cm)	Specimen	Notes
Ptilotus fusiformis	0.1	50		
Ptilotus obovatus var. *obovatus*	0.1	60		
Rhynchosia minima	0.1	10		
*Rumex vesicarius**	0.1	30		NI=1
Senna glutinosa subsp. *glutinosa*	0.1	120		
Senna venusta	0.1	80		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	40		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	5		NI=2
Solanum horridum	0.1	10		
Solanum phlomoides	0.1	50		
Tephrosia virens	5	60		
Themeda triandra	1	60		
Tinospora smilacina	0.1	50		
Trachymene oleracea subsp. *oleracea*	0.1	40		
Trichodesma zeylanicum var. *zeylanicum*	0.1	130		
Triumfetta leptacantha	0.1	30	MNFRPC02-2	

Ministers North L2 Veg & Flora **Site** MNFRPC03

Described by CEFPL **Date** 23-Sep-16 **Type** Relevé

MGA Zone 50 713448 **mE** 7473917 **mN**

Habitat Gully/gorge in wider area of large ranges. Heavily dissected with narrow gullies and gorges with sharp wide slopes.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone large boulders, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland.

Vegetation Code GG TbifTw EllCfCh

Vegetation Association Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. leucophloia, *Corymbia ferriticola*, C. hamersleyana on dark reddish brown sandy clay loam in gullies.

Veg Condition Pristine

Fire Age No sign of recent fire.

Notes Gully units variable.

Name	Cover (%)	Height (cm)	Specimen
Acacia hamersleyensis	0.1	220	
Acacia pyrifolia	0.1	150	
Astrotricha hamptonii	0.1	140	
Capparis spinosa subsp. *nummularia*	0.1	120	
Corymbia ferriticola	0.1	400	
Corymbia hamersleyana	0.1	700	
Cymbopogon ambiguus	0.1	50	
Cyperus cunninghamii subsp. *cunninghamii*	0.1	20	
Diplatia grandibractea	*0.1*	*130*	MNFRPC03-4
Dodonaea viscosa subsp. *mucronata*	0.1	190	
Eriachne mucronata	0.1	25	
Eucalyptus leucophloia subsp. *leucophloia*	*5*	600	
Euphorbia trigonosperma	0.1	25	MNFRPC03-5
Ficus brachypoda	0.1	100	MNFRPC03-3
Glycine canescens	*0.1*	*90*	MNFRPC03-2
Gossypium robinsonii	*0.1*	*300*	
Jasminum didymum subsp. lineare	*0.1*	*110*	
Peripleura hispidula var. *hispidula*	0.1	30	
Pimelea forrestiana	0.1	130	
Pterocaulon serrulatum var. *velutinum*	0.1	30	
Ptilotus fusiformis	0.1	40	
Ptilotus obovatus var. *obovatus*	0.1	70	
Rhodanthe margarethae	0.1	30	
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.1	30	
Solanum gabrielae	0.1	30	
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	60	
Tinospora smilacina	0.1	40	
Trichodesma zeylanicum var. *zeylanicum*	0.1	160	
Triodia biflora	*65*	70	MNFRPC03-1

Ministers North L2 Veg & Flora **Site** MNFRPC04
Described by CEFPL **Date** 25-Sep-16 **Type** Relevé
MGA Zone 50 714243 **mE** 7473741 **mN**
Habitat Rocky gully within slope of large hill, with free-face edges and waterfalls.
Soil Dark reddish brown skeletal sandy clay loam.
Rock Type Ironstone cobbles, pebbles, and gravel.
Broad Floristic Formation *Triodia* open hummock grassland.
Vegetation Code GG TbifTw EllCfCh
Vegetation Association Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. leucophloia, *Corymbia ferriticola*, C. hamersleyana on dark reddish brown sandy clay loam in gullies.
Veg Condition Excellent: **Rumex vesicarius*.
Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia hamersleyensis	0.1	200		
Acacia pruinocarpa	0.1	90		
Acacia pyrifolia	0.1	250		
Aristida burbidgeae	0.1	45		
Astrotricha hamptonii	0.1	130		
Cheilanthes austrotenuifolia	0.1	10		
Cheilanthes brownii	0.1	10		
Clerodendrum floribundum var. *angustifolium*	0.1	140		
Corymbia ferriticola	1	150		
Corymbia hamersleyana	0.1	400		
Cucumis variabilis	0.1	50		
Cymbopogon ambiguus	1	70		
Cynanchum floribundum	0.1	10		
Duperreya commixta	0.1	40		
Eremophila jucunda subsp. *pulcherrima*	0.1	50		
Eriachne mucronata	0.1	35		
Eucalyptus leucophloia subsp. *leucophloia*	4	450		
Euphorbia trigonosperma	0.1	10	MNFRPC04-5	
Ficus brachypoda	0.1	400	MNFRPC04-4	
Glycine canescens	0.1	30	MNFRPC04-1	
Gossypium robinsonii	0.1	210		
Indigofera fractiflexa subsp. *fractiflexa*	0.1	60		
Jasminum didymum subsp. *lineare*	0.1	100		
Lobelia heterophylla subsp. *pilbarensis*	0.1	20		
Phyllanthus erwinii	0.1	5	MNFRPC04-2	
Pluchea dentex	0.1	20		
Pterocaulon serrulatum var. *velutinum*	0.1	10		
Pterocaulon sphacelatum	0.1	45	MNFRPC04-3	
Ptilotus obovatus var. *obovatus*	0.1	45		
Rhodanthe margarethae	0.1	15		
**Rumex vesicarius*	0.1	25		NI=100
Santalum lanceolatum	0.1	180		
Senna glutinosa subsp. *glutinosa*	0.1	100		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	30		NI=5
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	50		
Triodia biflora	45	70		
Triodia pungens	0.1	40		

Ministers North L2 Veg & Flora **Site** MNFRPC05

Described by CEFPL **Date** 25-Sep-16 **Type** Relevé 50 x 50 m

MGA Zone 50 717266 **mE** 7472367 **mN**

Habitat Hilltop and upper slope of large hill.

Soil Dark reddish brown sandy clay loam

Rock Type Ironstone

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age Burnt <1 year ago

Notes Elevation approx. 750 m.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon amplum	0.1	50		
Acacia adoxa var. *adoxa*	0.1	30		
Acacia hilliana	0.1	30		
Acacia pyrifolia	0.1	20		
Amphipogon sericeus	0.1	40		
Cymbopogon obtectus	0.1	55		
Eucalyptus gamophylla	0.1	70		
Eucalyptus leucophloia subsp. *leucophloia*	3	500		
Fimbristylis dichotoma	0.1	10		
Gompholobium oreophilum	0.1	35		
Goodenia stobbsiana	0.1	5		
Goodenia triodiophila	0.1	20		
Grevillea wickhamii	0.1	180		Sterile; ISM
Hibiscus coatesii	0.1	20		
Indigofera monophylla	0.1	30		
Oldenlandia crouchiana	0.1	20		
Paspalidium clementii	0.1	10		
Ptilotus calostachyus	0.1	100		
Senna glutinosa subsp. *glutinosa*	0.1	160		
Senna glutinosa subsp. x *luerssenii*	0.1	60		
Senna notabilis	0.1	30		
Sida sp. Excedentifolia (J.L. Egan 1925)	0.1	20		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	20		
Solanum lasiophyllum	0.1	40		
Solanum phlomoides	0.1	50		
Tephrosia oxalidea	0.1	5		
Tribulus hirsutus	0.1	10		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	3	30		

Ministers North L2 Veg & Flora **Site** MNFRPC06
Described by CEFPL **Date** 26-Sep-16 **Type** Relevé
MGA Zone 50 717736 **mE** 7475463 **mN**
Habitat Minor rocky drainage line (gully), within a range of rocky low hills.
Soil Dark reddish brown sandy clay loam
Rock Type Ironstone
Broad Floristic Formation *Triodia* open hummock grassland
Vegetation Code FSTs EllCh Hc
Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.
Veg Condition Pristine
Fire Age Burnt <1 year ago

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	20		
Acacia monticola	0.1	30		
Acacia tumida var. *pilbarensis*	2	30		
Androcalva luteiflora	0.1	100		
Aristida holathera var. *holathera*	0.1	40		
Bulbostylis barbata	0.1	10		
Cheilanthes sp.	0.1	10		Sterile; ISM
Clerodendrum floribundum var. *angustifolium*	0.1	45		
Corymbia ferriticola	0.1	15		
Crotalaria novae-hollandiae subsp. *novae- hollandiae*	0.1	30		
Cucumis variabilis	0.1	100		NI =2
Cymbopogon ambiguus	0.1	50		
Dampiera candicans	0.1	25		
Duperreya commixta	0.1	50		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	15	MNFRPC06-3	
Enneapogon robustissimus	0.1	60		
Eriachne lanata	0.1	40		
Eriachne mucronata	2	30		
Eriachne tenuiculmis	0.1	50		
Ficus brachypoda	0.1	350	MNFRPC06-4	Sterile; ISM
Gompholobium oreophilum	0.1	10		
Gomphrena cunninghamii	0.1	10		
Goodenia stobbsiana	0.1	10		
Gossypium robinsonii	0.1	25		
Grevillea wickhamii	0.1	10		Sterile; ISM
Nicotiana benthamiana	0.1	20		
Nicotiana occidentalis subsp. *obliqua*	0.1	20		
Paraneurachne muelleri	0.1	30		
Paspalidium clementii	0.1	30		
Petalostylis labicheoides	5	120		
Polycarpaea longiflora	0.1	20		
Ptilotus auriculifolius	0.1	5		
Ptilotus fusiformis	0.1	40		
Senna glutinosa subsp. *glutinosa*	0.1	100		
Senna venusta	0.1	10		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	10		
Solanum phlomoides	0.1	10		
Tephrosia virens	1	35	MNFRPC06-2	
Themeda triandra	0.1	45	MNFRPC06-1	
Trachymene oleracea subsp. *oleracea*	0.1	15		
Triodia wiseana	0.1	20		

Name	Cover (%)	Height (cm)	Specimen	Notes
Triumfetta maconochieana	0.1	10		

Ministers North L2 Veg & Flora **Site** MNFRPC07
Described by CEFPL **Date** 28-Sep-16 **Type** Relevé
MGA Zone 50 718955 **mE** 7473600 **mN**
Habitat Broad creek bed of major creekline surrounded by steep, rocky free faces.
Soil Dark reddish brown sand
Rock Type Riverstone
Broad Floristic Formation *Eucalyptus* open woodland
Vegetation Code ME Ev EauSop Acp
Vegetation Association Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea subsp. pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.

Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Cenchrus ciliaris, *Rumex vesicarius, *Setaria verticillata, *Sigesbeckia orientalis, *Sonchus oleraceus*).
Fire Age No sign of recent fire
Notes Several weed species

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon amplum	0.1	60	MNFRPC7-1	
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	170		
Acacia coriacea subsp. *pendens*	0.5	350		
Acacia pyrifolia	0.1	130		
Acacia tumida var. *pilbarensis*	0.1	170		
Achyranthes aspera	0.1	100		
Alternanthera denticulata	0.1	30		
Amaranthus cuspidifolius	0.1	50		
Amaranthus undulatus	0.1	15	MNFRPC7-2	
Ammannia multiflora	*0.1*	*30*		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	100		NI=1000
Bergia pedicellaris	0.1	20		
**Cenchrus ciliaris*	0.1	15		NI =6
Centipeda minima subsp. *macrocephala*	0.1	25		
Cleome viscosa	0.1	30		
Cucumis variabilis	0.1	50		
Cymbopogon ambiguus	0.1	120		
Cyperus vaginatus	0.1	90		
Elytrophorus spicatus	0.1	15		
Enneapogon lindleyanus	0.1	40		
Eragrostis elongata	0.1	20		
Eragrostis tenellula	0.1	25		
Eriachne tenuiculmis	0.1	50		
Eucalyptus victrix	15	1400		
Eulalia aurea	2	120		
Gomphrena cunninghamii	0.1	5		
Goodenia lamprosperma	0.1	40		
Gossypium robinsonii	0.1	15		
Lobelia heterophylla subsp. *pilbarensis*	0.1	25		
Marsilea hirsuta	0.1	10	MNFRPC7-3	
Melaleuca glomerata	2	400		
Nicotiana benthamiana	0.1	50		
Phyllanthus maderaspatensis	0.1	40		
Pluchea dentex	0.1	20		
Pluchea rubelliflora	2	20		
Polycarpaea longiflora	0.1	30		
Ptilotus auriculifolius	0.1	40		
Ptilotus nobilis subsp. *nobilis*	0.1	40		
Rhodanthe margarethae	0.1	30		
Rhynchosia minima	0.1	30		
**Rumex vesicarius*	0.1	15		NI=1

Name	Cover (%)	Height (cm)	Specimen	Notes
Senna glutinosa subsp. *glutinosa*	0.1	100		
**Setaria verticillata*	0.1	50		NI=15
Sida sp. verrucose glands (F.H. Mollemans 2423)	0.1	50		
**Sigesbeckia orientalis*	0.1	100		NI=20
**Sonchus oleraceus*	0.1	40		NI=20
Sorghum plumosum var. *plumosum*	0.1	120	=MNF18-01	
Stemodia grossa	0.1	30		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	2	60		
Themeda triandra	0.1	80		
Trachymene oleracea subsp. *oleracea*	0.1	100		
Trichodesma zeylanicum var. *zeylanicum*	0.1	120		
Wahlenbergia tumidifructa	0.1	40		

Ministers North L2 Veg & Flora **Site** MNFRPC08
Described by CEFPL **Date** 28-Sep-16 **Type** Relevé 40 x 62.5 m
MGA Zone 50 720715 **mE** 7473974 **mN**
Habitat Major drainage line with steep sided cliffs on either side. Flowing east.
Soil Dark reddish brown sandy clay loam, loam in inundated areas.
Rock Type Ironstone
Broad Floristic Formation *Melaleuca argentea open forest*
Vegetation Code ME MaEcr TydCyv GoroCule
Vegetation Association Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.
Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Melinis repens, *Rumex vesicarius, Setaria verticillata*, Sonchus oleraceus**), cattle tracks.
Fire Age Burnt 1-2 yrs ago

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia coriacea subsp. *pendens*	0.1	120		
Acacia pyrifolia	0.1	150		
Acacia tumida var. *pilbarensis*	0.1	40		
Ammannia multiflora	0.1	50		
Androcalva luteiflora	0.1	130		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	25		NI=5
Atalaya hemiglauca	0.1	100		
Cajanus cinereus	0.1	50	MNFRPC8-1	
Centipeda minima subsp. *macrocephala*	0.1	20		Sterile; ISM
Clerodendrum floribundum var. *angustifolium*	0.1	210		
Corchorus lasiocarpus subsp. *parvus*	0.1	35	MNFRPC8-3	
Crotalaria medicaginea var. *neglecta*	0.1	10		
Crotalaria novae-hollandiae subsp. *novae-hollandiae*	0.1	30		
Cullen leucanthum	*0.5*	*3000*		
Cymbopogon ambiguus	1	110		
Cyperus vaginatus	1	130		
Eleocharis geniculata	0.1	25	=MNF20-7	
Eragrostis tenellula	0.1	30		
Eriachne tenuiculmis	0.1	40		
Eucalyptus camaldulensis subsp. *refulgens*	12	1800		
Eulalia aurea	2	90		
Evolvulus alsinoides var. *decumbens*	0.1	25		
Gossypium robinsonii	1	150		
Grevillea wickhamii	0.1	90		Sterile. ISM
Indigofera monophylla	0.1	40	MNFRPC8-2	NI= 40
Lobelia arnhemiaca	0.1	10		
Lobelia heterophylla subsp. *pilbarensis*	0.1	20		
Melaleuca argentea	*40*	*2100*		
**Melinis repens*	0.1	40		NI=20
Phyllanthus maderaspatensis	0.1	40		
Pluchea rubelliflora	0.1	40		
Pterocaulon sphacelatum	0.1	50		
Ptilotus auriculifolius	0.1	40		
Ptilotus fusiformis	0.1	40		
Ptilotus nobilis subsp. *nobilis*	0.1	40		
Rhynchosia minima	0.1	10		
**Rumex vesicarius*	0.1	20		NI=1
Schenkia clementii	0.1	30	=MNF-PL51	
Schoenoplectus subulatus	0.01	110	=MNF-PL47	
Senna notabilis	0.1	20		
**Setaria verticillata*	0.1	15		

Name	Cover (%)	Height (cm)	Specimen	Notes
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	140		
**Sonchus oleraceus*	0.1	15		
Sorghum plumosum var. *plumosum*	1	130	=MNF18-01	
Stemodia grossa	0.1	50		
Themeda triandra	0.1	90		
Trachymene oleracea subsp. *oleracea*	0.1	50		
Trichodesma zeylanicum var. *zeylanicum*	0.1	160		
Typha domingensis	30	250		
Vigna lanceolata var. *lanceolata*	0.1	20		
Waltheria indica	0.1	50		

Ministers North L2 Veg & Flora **Site** MNFRPC09
Described by CEFPL **Date** 28-Sep-16 **Type** Relevé
MGA Zone 50 720269 **mE** 7474430 **mN**
Habitat Hilltop of moderate sized rolling hills.
Soil Dark reddish brown silty clay loam.
Rock Type Ironstone cobbles, pebbles, and gravel.
Broad Floristic Formation *Triodia* open hummock grassland
Vegetation Code FSTs EllCh Hc
Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.
Veg Condition Pristine
Fire Age Burnt <1 year ago.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	20		
Acacia hilliana	0.1	15		
Acacia inaequilatera	1	260		
Aristida holathera var. *holathera*	0.1	40		
Bonamia pilbarensis	0.1	5		
Calocephalus beardii	0.1	8	MNFRPC09-2	
Corchorus lasiocarpus subsp. *parvus*	0.1	20	MNFRPC09-1	
Duperreya commixta	0.1	40		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	10		
Eriachne aristidea	0.1	15		
Eriachne pulchella	0.1	10		
Eucalyptus leucophloia subsp. *leucophloia*	2	450		
Fimbristylis dichotoma	0.1	20		
Gompholobium oreophilum	0.1	45		
Goodenia stobbsiana	0.1	10		
Goodenia triodiophila	0.1	40		
Grevillea wickhamii	0.5	60		Sterile; ISM
Heliotropium glabellum	0.1	15		
Heliotropium pachyphyllum	0.1	40		
Hibiscus sturtii var. *campylochlamys*	0.1	10		
Indigofera monophylla	0.1	30	MNFRPC09-3	
Ptilotus calostachyus	0.1	60		
Ptilotus fusiformis	0.1	30		
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	30		
Senna glutinosa subsp. *glutinosa*	0.1	30		
Senna notabilis	0.1	40		
Sida arenicola	0.1	70		
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	40	MNFRPC09-4	
Solanum phlomoides	0.1	40		
Synaptantha tillaeacea var. *tillaeacea*	0.1	5		
Tephrosia oxalidea	0.1	10		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.5	5		
Triodia wiseana	0.1	10		

Ministers North L2 Veg & Flora **Site** MNFRPC10

Described by CEFPL **Date** 29-Sep-16 **Type** Relevé

MGA Zone 50 713136 **mE** 7476645 **mN**

Habitat South facing bench slope within a range of low rocky hills.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS TsTw Ell Ab

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* over on dark reddish brown sandy clay loam on lower hill slopes.

Veg Condition Pristine

Fire Age No sign of recent fire

Name	Cover (%)	Height (cm)	Specimen
Acacia bivenosa	3	140	
Cymbopogon ambiguus	0.1	50	
Eremophila latrobei subsp. *latrobei*	0.1	150	
Eriachne mucronata	0.1	30	
Eucalyptus leucophloia subsp. *leucophloia*	5	450	
Lepidium pedicellosum	0.1	40	
Paraneurachne muelleri	0.1	40	
Ptilotus nobilis subsp. *nobilis*	0.1	25	
Senna glutinosa subsp. *pruinosa*	0.1	50	
Senna glutinosa subsp. x *luerssenii*	0.1	45	
Solanum lasiophyllum	0.1	50	
Triodia brizoides	45	40	
Triodia wiseana	0.1	45	

Ministers North L2 Veg & Flora **Site** MNFRPS01

Described by PLSW **Date** 21-Sep-16 **Type** Relevé

MGA Zone 50 712439 **mE** 7476816 **mN**

Habitat Open flat gully surrounded by tall cliffs, with minor incised gullies dissecting/flowing into.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone large boulders, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS Tw Ell Ab

Vegetation Association Open hummock grassland of *Triodia wiseana* with scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* over scattered shrubs of *Acacia bivenosa* on dark reddish brown sandy clay loam on steep hill slopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia arida	0.1	110		
Acacia monticola	0.1	310		
Acacia pruinocarpa	0.1	180		
Acacia pyrifolia	0.1	65		
Corchorus laniflorus	0.1	120		
Corymbia hamersleyana	1	400		
Cymbopogon ambiguus	0.1	110		
Dodonaea viscosa subsp. *mucronata*	0.1	160	MNFRPS1-2	
Eucalyptus leucophloia subsp. *leucophloia*	1	400		
Eucalyptus xerothermica	1	410		
Gossypium robinsonii	0.1	350		
Grevillea wickhamii	0.1	250		Sterile; ISM
Indigofera fractiflexa subsp. *fractiflexa*	0.1	45	MNFRPS1-1	
Senna glutinosa subsp. *glutinosa*	0.1	120		
Trichodesma zeylanicum var. *zeylanicum*	0.1	75		
Triodia biflora	35	80		
Triodia wiseana	25	80		
Triumfetta maconochieana	0.1	40		

Ministers North L2 Veg & Flora **Site** MNFRPS02

Described by PLSW **Date** 21-Sep-16 **Type** Relevé

MGA Zone 50 712691 **mE** 7473894 **mN**

Habitat Gorge with steep freeface (~40m) sides. Base is 10 m at its widest and 2 m at its narrowest. Running west-east.

Soil Dark reddish brown sandy loam.

Rock Type Ironstone large boulders, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Callitris* low open woodland

Vegetation Code GG Ccol Phba Cla TbifArb

Vegetation Association Low open woodland of *Callitris columellaris* over high open shrubland of *Phyllanthus baccatus* over open shrubland of *Corchorus laniflorus* over scattered hummock grasses of *Triodia biflora* over scattered tussock grasses of *Aristida burbidgeae* on dark reddish brown sand and clay loam in a gorge.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia citrinoviridis	0.1	600		
Acacia pyrifolia	0.1	110		
Aristida burbidgeae	0.5	50		
Callitris columellaris	3	200	MNFRPS02-3	NI=8
Capparis umbonata	0.1	110		
Cheilanthes austrotenuifolia	0.1	10		
Corchorus laniflorus	2	85	MNFRPS02-7	
Corymbia ferriticola	0.1	300		
Cucumis variabilis	0.1	10		
Cymbopogon ambiguus	0.1	60		
Cyperus cunninghamii subsp. *cunninghamii*	0.1	25		
Dodonaea pachyneura	*0.1*	*60*		
Enneapogon lindleyanus	0.1	40		
Eriachne mucronata	0.1	25		
Eucalyptus xerothermica	0.1	450		
Euphorbia trigonosperma	0.1	10	MNFRPS02-2	
Ficus brachypoda	0.1	480	MNFRPS02-5	
Glycine canescens	0.1	25		
Gossypium robinsonii	0.1	250		
Lobelia heterophylla subsp. *pilbarensis*	0.1	10		
Phyllanthus baccatus	3	240		
Pimelea microcephala subsp. *microcephala*	0.1	210	MNFRPS02-6	
Pluchea dentex	0.1	40		
Polycarpaea longiflora	0.1	10		
Pterocaulon sphacelatum	0.1	10		
Ptilotus obovatus var. *obovatus*	0.1	65		
Rhodanthe margarethae	0.1	25		
Rhynchosia minima	0.1	25		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	40	MNFRPS02-4	NI=1
Solanum gabrielae	0.1	50		
Teucrium disjunctum	0.1	25		
Triodia biflora	0.5	2		
Tylophora flexuosa	0.1	25	MNFRPS02-1	

Ministers North L2 Veg & Flora **Site** MNFRPS03
Described by PLDK **Date** 22-Sep-16 **Type** Relevé
MGA Zone 50 713492 **mE** 7476566 **mN**
Habitat Moderate drainage in wide flood channel of ElAbTw.
Soil Dark reddish brown sand and clay loam.
Rock Type Riverstone and ironstone large boulders, boulders, cobbles, pebbles, gravel.
Broad Floristic Formation *Acacia* open scrub.
Vegetation Code GG AtpGrwhGoro ErmuTt Ch
Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.
Veg Condition Pristine
Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia maitlandii	0.1	190		
Acacia pyrifolia	0.1	50		
Acacia tumida var. *pilbarensis*	3	450		
Androcalva luteiflora	1	220		
Cleome viscosa	0.1	20		
Corymbia hamersleyana	0.5	500		
Duperreya commixta	0.1	140		
Eriachne mucronata	0.5	35		
Eriachne tenuiculmis	0.5	45		
Eucalyptus leucophloia subsp. *leucophloia*	0.5	600		
Gossypium robinsonii	0.1	150		
Grevillea wickhamii	2	400		Sterile; ISM
Hybanthus aurantiacus	0.1	60		
Paraneurachne muelleri	0.1	50		
Petalostylis labicheoides	1	400		
Phyllanthus maderaspatensis	0.1	50		
Ptilotus nobilis subsp. *nobilis*	0.1	60		
Senna glutinosa subsp. *glutinosa*	0.1	165		
Themeda triandra	0.5	100		
Triodia pungens	20	80		

Ministers North L2 Veg & Flora **Site** MNFRPS04
Described by PLDK **Date** 22-Sep-16 **Type** Relevé
MGA Zone 50 714642 **mE** 7476088 **mN**
Habitat Moderate drainage in area of low-moderate undulating hills.
Soil Dark reddish brown sandy clay loam.
Rock Type Ironstone, boulders, cobbles, pebbles, and gravel.
Broad Floristic Formation *Acacia* open scrub.
Vegetation Code GG AtpGrwhGoro ErmuTt Ch
Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.
Veg Condition Pristine
Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon amplum	0.1	40	MNFRPS4-2	
Abutilon lepidum	0.1	70		
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	220		
Acacia hamersleyensis	0.1	250		
Acacia monticola	0.1	280		
Acacia pyrifolia	0.1	60		
Acacia tumida var. *pilbarensis*	5	500		
Androcalva luteiflora	2	230		
Aristida burbidgeae	0.1	45		
Atalaya hemiglauca	0.1	330		
Clerodendrum floribundum var. *angustifolium*	0.1	100		
Corymbia ferriticola	0.1	500		
Corymbia hamersleyana	0.5	700		
Cucumis variabilis	0.1	50		
Cymbopogon ambiguus	0.5	100	MNFRPS4-1	
Duperreya commixta	0.1	220		
Dysphania rhadinostachya	0.1	15		
Enneapogon lindleyanus	0.1	45		
Eriachne mucronata	0.5	40		
Euphorbia trigonosperma	0.1	10	MNFRPS4-7	
Evolvulus alsinoides var. *villosicalyx*	0.1	15		
Gossypium robinsonii	1	300		
Grevillea wickhamii subsp. *hispidula*	6	600	MNFRPS4-8	
Jasminum didymum subsp. *lineare*	0.1	110		
Nicotiana occidentalis subsp. *obliqua*	0.1	20	MNFRPS4-6	
Paraneurachne muelleri	0.1	45		
Polycarpaea longiflora	0.1	35		
Pterocaulon sphaeranthoides	0.1	50	MNFRPS4-3	
Ptilotus obovatus var. *obovatus*	0.1	110		
Rhodanthe margarethae	0.1	40		
Santalum lanceolatum	0.1	220		
Senna glutinosa subsp. *glutinosa*	0.1	160		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	50		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	50	MNFRPS4-4	NI=6
Solanum gabrielae	0.1	40	MNFRPS4-5	
Stylobasium spathulatum	0.1	40		
Themeda triandra	4	90		
Tinospora smilacina	0.1	60		
Trachymene oleracea subsp. *oleracea*	0.1	40		
Trichodesma zeylanicum var. *zeylanicum*	0.1	90		
Triodia pungens	12	70		
Triumfetta maconochieana	0.1	40		

Ministers North Phase 2 **Site** MNFR01

Described by PLSW **Date** 10-May-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 719946 **mE** 7475231 **mN**

Habitat South-facing upper gentle slope of low-medium undulating hills.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone pebbles and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia, Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	1	50	
Acacia ancistrocarpa	0.1	110	
Acacia bivenosa	0.1	100	
Acacia hilliana	3	60	
Acacia tenuissima	0.1	110	
Amphipogon sericeus	0.1	30	
Amyema gibberula var. *gibberula*	0.1	40	MNFR01-01
Bulbostylis barbata	0.1	10	
Calytrix carinata	0.1	90	
Corymbia deserticola subsp. *deserticola*	1	580	
Eriachne pulchella	0.1	10	
Fimbristylis simulans	0.1	10	
Gompholobium oreophilum	1	70	
Goodenia stobbsiana	0.1	40	
Goodenia triodiophila	0.1	20	
Grevillea wickhamii subsp. *hispidula*	3	380	
Hakea chordophylla	1.5	400	
Indigofera monophylla	0.1	50	
Polycarpaea corymbosa var. *corymbosa*	0.1	15	
Polycarpaea holtzei	0.1	2	
Ptilotus astrolasius	0.1	30	
Ptilotus calostachyus	0.1	30	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	60	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	40	35	

Ministers North Phase 2 **Site** MNFR02

Described by PLSW **Date** 12-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 712338 **mE** 7475067 **mN**

Habitat False slope crest. NW aspect.

Soil Dark reddish brown sandy loam.

Rock Type Ironstone cobbles, pebbles and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FS Tw Ell Aha

Vegetation Association Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.

Veg Condition Pristine

Fire Age Burnt 3-5 years ago.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia hamersleyensis	2	140		
Amphipogon sericeus	0.1	35		
Bulbostylis barbata	0.1	20		
Cleome viscosa	0.1	20		
Corymbia hamersleyana	0.1	350		
Cymbopogon ambiguus	0.1	110		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	25	MNFR02-01	
Eriachne mucronata	0.1	40		
Eriachne pulchella	0.1	20		
Eucalyptus gamophylla	3	340		
Eucalyptus leucophloia subsp. *leucophloia*	2	280		
Goodenia stobbsiana	0.1	40		
Grevillea wickhamii	0.1	5		Seedling
Peripleura virgata	0.1	25		
Petalostylis labicheoides	2	230		
Polycarpaea holtzei	0.1	5		
Pterocaulon sphacelatum	0.1	5		
Ptilotus calostachyus	0.1	70		
Ptilotus nobilis subsp. *nobilis*	0.1	30		
Ptilotus obovatus var. *obovatus*	0.1	60		
Senna artemisioides subsp. *oligophylla*	0.1	40		
Senna glutinosa subsp. *glutinosa*	0.1	170		
Triodia wiseana	20	50		

Ministers North Phase 2 **Site** MNFR03

Described by PLSW **Date** 12-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 712648 **mE** 7474428 **mN**

Habitat Hilltop of major range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* hummock grassland

Vegetation Code HC TwTp EkEll Ah

Vegetation Association Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia hamersleyensis	3	300	
Acacia pyrifolia	0.1	180	
Amphipogon sericeus	0.1	50	
Corymbia hamersleyana	0.1	290	
Eriachne mucronata	0.1	45	
Eriachne pulchella	0.1	10	
Eucalyptus gamophylla	5	500	
Eucalyptus kingsmillii subsp. *kingsmillii*	4	190	
Eucalyptus leucophloia subsp. *leucophloia*	1	600	
Fimbristylis dichotoma	0.1	25	
Goodenia triodiophila	0.1	40	
Polycarpaea holtzei	0.1	10	
Ptilotus obovatus var. *obovatus*	0.1	60	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	25	MNF03-01
Triodia pungens	4	60	
Triodia wiseana	22	60	

Ministers North Phase 2 **Site** MNFR04

Described by PLSW **Date** 12-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 712879 **mE** 7475315 **mN**

Habitat Mid-slope of large range.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FS Tw Ell Aha

Vegetation Association Open hummock grassland of *Triodia wiseana with* low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia over* scattered tall shrubs of *Acacia hamersleyensis* on dark reddish brown sandy loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia hamersleyensis	0.5	200	
Acacia hilliana	1	80	
Acacia spondylophylla	2	80	
Bulbostylis barbata	0.1	15	
Corymbia hamersleyana	0.5	550	
Eriachne pulchella	0.1	20	
Eucalyptus leucophloia subsp. *leucophloia*	4	450	
Grevillea wickhamii subsp. *hispidula*	1.5	300	
Hakea chordophylla	0.1	10	
Polycarpaea corymbosa var. *corymbosa*	0.1	15	
Polycarpaea holtzei	0.1	5	
Polygala glaucifolia	0.1	5	
Ptilotus calostachyus	0.1	10	
Schizachyrium fragile	0.1	25	
Senna notabilis	0.1	5	
Trachymene oleracea subsp. *oleracea*	0.1	40	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	1	30	
Triodia wiseana	12	50	

Ministers North Phase 2 **Site** MNFR05

Described by PLSW **Date** 13-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 712323 **mE** 7476676 **mN**

Habitat Low rise/crest of very low hill in an undulating section of low hills and lower lying plains.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS TsTw Ell Ab

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* over on dark reddish brown sandy clay loam on lower hill slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.5	50	
Acacia bivenosa	6	160	
Acacia hilliana	0.1	40	
Acacia tenuissima	0.1	150	
Amphipogon sericeus	0.1	40	
Bulbostylis barbata	0.1	10	
Dodonaea coriacea	0.1	50	
Eriachne pulchella	0.1	15	
Eucalyptus leucophloia subsp. *leucophloia*	3	500	
Gossypium australe	0.1	40	
Grevillea wickhamii subsp. *hispidula*	0.1	190	MNFR05-02
Hakea lorea subsp. *lorea*	0.1	40	
Lepidium pedicellosum	0.1	40	
Polycarpaea holtzei	0.1	8	
Polygala glaucifolia	0.1	8	
Ptilotus calostachyus	0.1	100	
Senna glutinosa subsp. *pruinosa*	0.1	180	
Senna sericea	0.1	30	MNFR05-01
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	4	35	
Triodia wiseana	18	40	

Ministers North Phase 2 **Site** MNFR09

Described by PLSW **Date** 12-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 715189 **mE** 7474644 **mN**

Habitat Low hill crest/slope in broad valley of undulating low hills.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia hilliana	14	50	
Acacia monticola	0.1	75	
Acacia pruinocarpa	0.5	190	
Acacia spondylophylla	2	65	
Aristida holathera var. *holathera*	0.1	30	
Bulbostylis barbata	0.1	20	
Calytrix carinata	0.1	50	
Codonocarpus cotinifolius	0.1	210	
Corchorus lasiocarpus subsp. *parvus*	0.1	50	
Corymbia hamersleyana	1	550	
Dampiera candicans	0.1	40	
Diplatia grandibractea	0.1	200	
Eriachne lanata	0.1	30	
Eriachne mucronata	0.1	40	
Eriachne pulchella	0.1	10	
Eucalyptus leucophloia subsp. *leucophloia*	1	550	
Fimbristylis dichotoma	0.1	15	
Gompholobium oreophilum	0.1	45	
Goodenia stobbsiana	0.1	5	
Goodenia triodiophila	0.1	30	
Grevillea berryana	0.1	180	
Grevillea wickhamii subsp. *hispidula*	0.1	75	MNFR09-01
Hakea chordophylla	0.1	190	
Indigofera monophylla	0.1	40	
Jasminum didymum subsp. *lineare*	0.1	60	
Polycarpaea holtzei	0.1	5	
Polycarpaea longiflora	0.1	20	
Ptilotus calostachyus	0.1	65	
Ptilotus nobilis subsp. *nobilis*	0.1	60	
Santalum lanceolatum	0.1	40	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	45	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	15	40	
Triodia wiseana	1	45	

Ministers North Phase 2 **Site** MNFR10

Described by PLSW **Date** 13-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 714975 **mE** 7473599 **mN**

Habitat Hill crest of major range running east-west.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* hummock grassland

Vegetation Code HC TwTp EkEll Ah

Vegetation Association Open hummock grassland of *Triodia wiseana* (*T. pungens*) with low open mallee woodland *Eucalyptus kingsmillii* with scattered tall shrubs of *Acacia hamersleyensis* and scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* on dark reddish brown sandy clay loam on upper hill crests and slopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia hamersleyensis	0.1	240		
Acacia pruinocarpa	0.1	220		
Acacia pyrifolia	0.1	160		
Aristida holathera var. *holathera*	0.1	20		
Bulbostylis barbata	0.1	20		
Cassytha capillaris	0.1	80		
Cymbopogon ambiguus	0.1	80		
Dysphania rhadinostachya	0.1	10	MNFR10-01	Sterile; ISM
Eriachne aristidea	0.1	10		
Eriachne mucronata	0.1	40		
Eriachne pulchella	0.1	15		
Eucalyptus gamophylla	2	250		
Eucalyptus kingsmillii subsp. *kingsmillii*	0.5	160		
Eucalyptus leucophloia subsp. *leucophloia*	2	500		
Fimbristylis dichotoma	0.1	30		
Gomphrena cunninghamii	0.1	15		
Goodenia stobbsiana	0.1	30		
Goodenia triodiophila	0.1	40		
Hakea chordophylla	0.1	180		
Oldenlandia crouchiana	0.1	8		
Peripleura virgata	0.1	25		
Polycarpaea corymbosa var. *corymbosa*	0.1	15		
Polycarpaea holtzei	0.1	8		
Polycarpaea longiflora	0.1	20		
Polygala glaucifolia	0.1	8		
Ptilotus nobilis subsp. *nobilis*	0.1	10		
Schizachyrium fragile	0.1	20		
Senna glutinosa subsp. *glutinosa*	0.1	130		
Synaptantha tillaeacea var. *tillaeacea*	0.1	8		
Trachymene oleracea subsp. *oleracea*	0.1	50		
Triodia wiseana	18	70		

Ministers North Phase 2 **Site** MNFR12

Described by PLSW **Date** 10-May-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 716768 **mE** 7471830 **mN**

Habitat Low hilltop and south-facing slope within a range of undulating low hills.

Soil Dark reddish brown sandy clay loam

Rock Type Ironstone

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.1	50	
Acacia hilliana	8	50	
Acacia pruinocarpa	0.1	170	
Bulbostylis barbata	0.1	15	
Corchorus lasiocarpus subsp. *parvus*	0.1	80	
Corymbia hamersleyana	0.1	550	
Eriachne pulchella	0.1	15	
Eucalyptus leucophloia subsp. *leucophloia*	2.5	550	
Fimbristylis dichotoma	0.1	25	
Gompholobium oreophilum	0.1	50	
Goodenia triodiophila	0.1	40	
Grevillea wickhamii subsp. *hispidula*	0.1	320	
Hakea chordophylla	0.1	300	
Indigofera monophylla	0.1	40	
Polycarpaea corymbosa var. *corymbosa*	0.1	10	
Polycarpaea holtzei	0.1	8	
Ptilotus nobilis subsp. *nobilis*	0.1	10	
Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	0.1	40	
Schizachyrium fragile	0.1	15	
Senna artemisioides subsp. *oligophylla* x	0.1	40	MNFR12-01
Senna glutinosa subsp. *glutinosa*	0.1	130	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	40	
Solanum phlomoides	0.1	40	
Triodia pungens	0.1	50	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	26	30	
Triodia wiseana	0.1	50	

Ministers North Phase 2 **Site** MNFR14

Described by PLSW **Date** 13-Jul-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 716629 **mE** 7474459 **mN**

Habitat Drainage line (gully) within low to medium sized hills surrounded by steep-sided, rocky free faces.

Soil Dark reddish brown sandy clay loam

Rock Type Ironstone

Broad Floristic Formation *Acacia* open scrub

Vegetation Code GG AtpGrwhGoro ErmuTt Ch

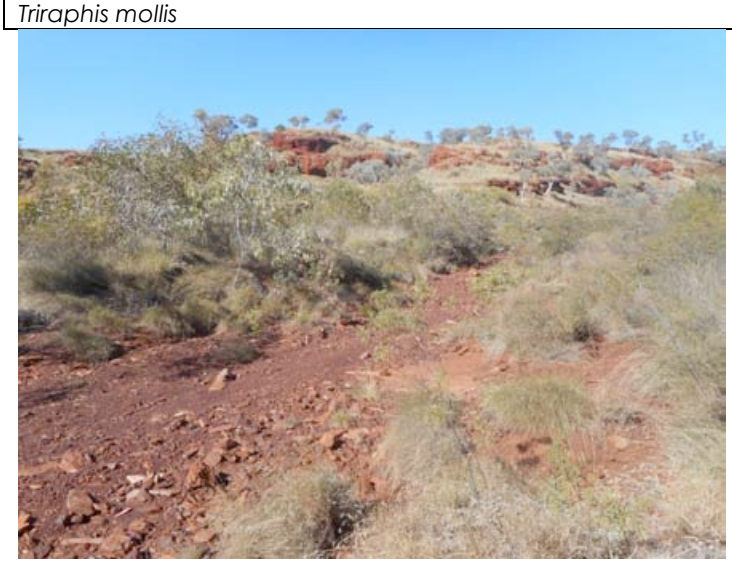
Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.

Veg Condition Pristine

Fire Age No sign of recent fire

Name	Cover (%)	Height (cm)	Specimen
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	20	
Acacia bivenosa	1	180	
Acacia pyrifolia	0.1	220	
Acacia tumida var. *pilbarensis*	4	300	
Androcalva luteiflora	4	160	
Bulbostylis barbata	0.1	20	
Cleome viscosa	0.1	25	
Corchorus lasiocarpus subsp. *parvus*	0.1	50	
Corymbia hamersleyana	3	450	
Cucumis variabilis	0.1	70	
Cymbopogon ambiguus	0.1	90	
Cymbopogon obtectus	0.1	90	
Dodonaea lanceolata var. *lanceolata*	0.1	170	
Duperreya commixta	0.1	80	
Enneapogon polyphyllus	0.1	40	
Eriachne tenuiculmis	5	30	
Eucalyptus leucophloia subsp. *leucophloia*	0.1	400	
Euphorbia australis var. *subtomentosa*	0.1	10	
Euphorbia boophthona	0.1	30	
Euphorbia sp. (biconvexa/coghlanii/trigonosperma; sterile)	0.1	35	MNFR14-01
Evolvulus alsinoides var. *villosicalyx*	0.1	25	
Goodenia cusackiana	0.1	30	
Goodenia muelleriana	0.1	30	
Gossypium robinsonii	1	400	
Grevillea wickhamii subsp. *hispidula*	2	420	
Hakea chordophylla	0.1	100	
Hibiscus sturtii var. *campylochlamys*	0.1	30	
Hybanthus aurantiacus	0.1	45	
Indigofera monophylla	0.1	40	
Jasminum didymum subsp. *lineare*	0.1	140	
Oldenlandia crouchiana	0.1	25	
Paraneurachne muelleri	0.1	40	
Peripleura hispidula var. *hispidula*	0.1	30	
Petalostylis labicheoides	0.1	320	
Polycarpaea corymbosa var. *corymbosa*	0.1	25	
Polycarpaea holtzei	0.1	3	
Polycarpaea longiflora	0.1	25	
Pterocaulon sphaeranthoides	0.1	40	
Ptilotus astrolasius	0.1	30	
Ptilotus fusiformis	0.1	40	
Rhynchosia minima	0.1	80	
Santalum lanceolatum	0.1	250	
Senna artemisioides subsp. *oligophylla*	0.1	100	

Name	Cover (%)	Height (cm)	Specimen
Senna glutinosa subsp. *glutinosa*	0.1	170	
Senna glutinosa subsp. *pruinosa*	0.1	170	
Senna notabilis	0.1	8	
Seringia elliptica	0.1	50	
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	20	
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	110	
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	3	120	
Trachymene oleracea subsp. *oleracea*	0.1	70	
Trichodesma zeylanicum var. *zeylanicum*	0.1	70	
Triodia pungens	27	70	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	0.1	30	
Triodia wiseana	0.1	50	
Triraphis mollis	0.1	40	



Ministers North Phase 2 **Site** MNFR17

Described by PLSW **Date** 09-May-17 **Type** Quadrat 38 x 66 m

MGA Zone 50 718502 **mE** 7472493 **mN**

Habitat Creek bed of major drainage line surrounded by steep cliff free faces.

Soil Dark reddish brown riversand

Rock Type Riverstone

Broad Floristic Formation *Eucalyptus* open woodland

Vegetation Code ME Ev EauSop Acp

Vegetation Association Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea subsp. pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.

Veg Condition Very Good; Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Melinis repens, *Rumex vesicarius, *Setaria verticillata, Sigesbeckia orientalis*, *Sonchus oleraceus*).

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia coriacea subsp. *pendens*	3	700		
Acacia pyrifolia	0.1	100		
Acacia tumida var. *pilbarensis*	0.1	180		
Achyranthes aspera	0.1	40		
Alternanthera denticulata	0.1	25		
Alternanthera nana	0.1	30	MNFR17-03	
Amaranthus undulatus	0.1	65	MNFR17-04	
Ammannia baccifera	0.1	10		
Ammannia multiflora	1	15		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	10		NI =5.
Bergia pedicellaris	0.1	10		
**Bidens bipinnata*	0.1	40		NI =300.
Centipeda minima subsp. *macrocephala*	0.1	20		
Cleome viscosa	0.1	25		
Corchorus tridens	0.1	25	MNFR17-05	
Crotalaria medicaginea var. *neglecta*	0.1	30		
Cucumis variabilis	0.1	60		
Cymbopogon ambiguus	0.1	60		
Cyperus dactylotes	0.1	10	MNFR17-07	
Cyperus difformis	0.1	60		
Cyperus vaginatus	0.1	80		
Digitaria ctenantha	0.1	40	MNFR17-09	
Eleocharis geniculata	0.1	10	MNFR17-06	
Enneapogon caerulescens	0.1	40		
Enneapogon robustissimus	0.1	50		
Enteropogon ramosus	0.1	60		
Eragrostis cumingii	0.1	35		
Eragrostis elongata	0.1	30	MNFR17-02	
Eragrostis tenellula	0.1	20		
Eriachne tenuiculmis	0.1	75		
Eucalyptus victrix	4	960		
Eulalia aurea	13	75		
Euphorbia biconvexa	0.1	60		
Evolvulus alsinoides var. *decumbens*	0.1	15		
Fimbristylis microcarya	0.1	30		
Glycine canescens	0.1	150		
Gomphrena cunninghamii	0.1	15		
Goodenia lamprosperma	0.1	50		
Gossypium robinsonii	0.1	150		
Grevillea wickhamii subsp. *hispidula*	0.1	160	MNFR17-08	
Ipomoea muelleri	0.1	40		
Ipomoea plebeia	0.1	30	MNFR17-01	
Marsilea hirsuta	0.1	10	MNFR17-11	

Name	Cover (%)	Height (cm)	Specimen	Notes
Melaleuca glomerata	15	420		
**Melinis repens*	0.1	10		
Mimulus gracilis	0.1	10	MNFR17-10	
Phyllanthus maderaspatensis	0.1	30		
Pluchea dentex	0.1	30		
Pluchea rubelliflora	0.5	30		
Polycarpaea longiflora	0.1	20		
Pterocaulon sphacelatum	0.1	40		
Rhynchosia minima	0.1	40		
**Rumex vesicarius*	0.1	80		NI =35.
**Setaria verticillata*	0.1	80		NI =30.
**Sigesbeckia orientalis*	1	60		NI =400.
**Sonchus oleraceus*	0.1	40		NI =40.
Sorghum plumosum var. *plumosum*	2	100		
Stemodia grossa	0.1	20		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	1	60		
Themeda triandra	0.1	80		
Trichodesma zeylanicum var. *zeylanicum*	0.1	50		
Triodia pungens	0.1	60		
Vigna lanceolata var. *lanceolata*	0.1	20		
Wahlenbergia tumidifructa	0.1	15		
Waltheria indica	0.1	40		

Ministers North Phase 2 **Site** MNFR18

Described by PLSW **Date** 09-May-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 720089 **mE** 7473905 **mN**

Habitat Major drainage in broad area of undulating low hills heavily dissected with gullies.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Melaleuca argentea open forest*

Vegetation Code ME MaEcr TydCyv GoroCule

Vegetation Association Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.

Veg Condition Very Good: Weeds (**Cenchrus ciliaris, *Malvastrum americanum, *Melinis repens, *Rumex vesicarius, *Sonchus oleraceus, *Vachellia farnesiana*).

Fire Age Burnt 1-2 years ago.

Notes Quadrat has had heavy flow after rainfall and is inundated with water.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia bivenosa	0.1	100		
Acacia pyrifolia	0.1	60		
Acacia tumida var. *pilbarensis*	0.1	110		
Achyranthes aspera	0.1	40		
Adriana tomentosa var. *tomentosa*	0.1	110		
Alternanthera nana	0.1	20		
Amaranthus cuspidifolius	0.1	60		
Ammannia multiflora	0.1	10		
Androcalva luteiflora	0.1	110		
Atalaya hemiglauca	0.1	100		
Bergia pedicellaris	0.1	10		
**Bidens bipinnata*	0.1	20		NI =20.
Cajanus cinereus	0.1	65		
**Cenchrus ciliaris*	0.1	40		
Centipeda minima subsp. *macrocephala*	0.1	10		
Cleome viscosa	0.1	45		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	60		
Cullen leucanthum	1	170		
Cymbopogon ambiguus	0.1	170		
Cyperus difformis	0.1	70		
Cyperus vaginatus	3	85		
Digitaria brownii	0.1	40	MNFR18-03	
Eleocharis geniculata	0.1	15		
Enteropogon ramosus	0.1	80		
Eragrostis elongata	0.1	45		
Eragrostis tenellula	0.1	20		
Eriachne tenuiculmis	0.1	60		
Eucalyptus camaldulensis subsp. *refulgens*	8	1700		
Eulalia aurea	4	70		
Evolvulus alsinoides var. *villosicalyx*	0.1	10		
Fimbristylis microcarya	0.1	25		
Fimbristylis sieberiana	*0.5*	*20*	*MNFR18-02*	
Glycine canescens	0.1	20		
Goodenia stobbsiana	0.1	20		
Gossypium robinsonii	3	240		
Imperata cylindrica	1	110	MNFR18-01	
Indigofera monophylla	0.1	40		
Ipomoea muelleri	0.1	20		
Ipomoea plebeia	0.1	10		
Isotropis forrestii	0.1	80		
Lobelia arnhemiaca	0.1	10		

Name	Cover (%)	Height (cm)	Specimen	Notes
**Malvastrum americanum*	0.1	40		
Melaleuca argentea	20	2000		
Melhania oblongifolia	0.1	50		
**Melinis repens*	0.1	25		
Paspalidium constrictum	0.1	90	MNFR18-04	
Petalostylis labicheoides	0.1	180		
Phyllanthus maderaspatensis	0.1	25		
Pluchea dentex	0.1	20		
Pluchea rubelliflora	0.1	20		
Polycarpaea longiflora	0.1	15		
Pterocaulon sphacelatum	0.1	25		
Rhynchosia minima	0.1	40		
**Rumex vesicarius*	0.1	70		NI =10.
Senna notabilis	0.1	20		
Senna venusta	0.1	70		
Setaria surgens	0.1	30		
Setaria verticillata	0.1	80		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	100		
Sigesbeckia orientalis	0.1	40		NI =3.
Solanum nigrum	0.1	40		NI =2.
**Sonchus oleraceus*	0.1	150		
Sorghum plumosum var. *plumosum*	2	70		
Stemodia grossa	0.1	20		
Stylobasium spathulatum	0.1	210		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	60		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	40		
Themeda triandra	0.1	60		
Trichodesma zeylanicum var. *zeylanicum*	0.1	60		
Typha domingensis	18	170		
**Vachellia farnesiana*	0.1	60		N=1.
Vigna lanceolata var. *lanceolata*	0.1	100		
Wahlenbergia tumidifructa	0.1	25		
Waltheria indica	0.1	40		

Ministers North Phase 2 **Site** MNFR19
Described by PLSW **Date** 08-May-17 **Type** Quadrat 50 x 50 m
MGA Zone 50 719250 **mE** 7473499 **mN**
Habitat Creek bed of major drainage line
Soil Dark reddish brown sand
Rock Type Riverstone
Broad Floristic Formation *Eucalyptus* open woodland
Vegetation Code ME Ev EauSop Acp
Vegetation Association Open woodland of *Eucalyptus victrix* over open tussock grassland of *Eulalia aurea* (*Sorghum plumosum* var. *plumosum*) with scattered tall shrubs of *Acacia coriacea subsp. pendens* over scattered low shrubs of *Tephrosia rosea* var. Fortescue Creeks (M.I.H. Brooker 2186) on dark reddish brown sand along drainage lines.
Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Cenchrus ciliaris, *Rumex vesicarius, *Sigesbeckia orientalis)*, horse scats, donkey scats.
Fire Age 3-5 years ago.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	190		
Abutilon sp. Pilbara (W.R. Barker 2025)	0.1	30		
Acacia coriacea subsp. *pendens*	0.5	550		
Acacia pyrifolia	0.1	150		
Acacia tumida var. *pilbarensis*	0.1	90		
Achyranthes aspera	0.1	30		
Alternanthera denticulata	0.1	25		
Amaranthus undulatus	0.1	40	MNFR19-01	
Ammannia multiflora	0.1	30		
Androcalva luteiflora	0.1	90		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	25		NI =4.
Atalaya hemiglauca	0.1	110		
Bergia pedicellaris	0.1	15		
Bidens bipinnata	0.1	35		NI =5.
Boerhavia coccinea	0.1	40		
Bulbostylis barbata	0.1	15		
**Cenchrus ciliaris*	0.1	50		NI=1.
Centipeda minima subsp. *macrocephala*	0.1	10		
Cleome viscosa	0.1	40		
Corchorus lasiocarpus subsp. *lasiocarpus*	0.1	80		
Corchorus lasiocarpus subsp. *parvus*	0.1	70		
Crotalaria medicaginea var. *neglecta*	0.1	90		
Cucumis variabilis	0.1	60		
Cymbopogon ambiguus	1	160		
Cyperus vaginatus	0.1	70		
Diplatia grandibractea	0.1	110		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	30		
Enneapogon lindleyanus	0.1	40		
Enneapogon robustissimus	0.1	70		
Eragrostis tenellula	0.1	30		
Eriachne tenuiculmis	5	50		
Eucalyptus victrix	9	1400		
Eulalia aurea	3	100		
Euphorbia australis var. *subtomentosa*	0.1	3	MNRF19-02	
Euphorbia tannensis subsp. *eremophila*	0.1	70		
Euphorbia trigonosperma	0.1	60		
Fimbristylis microcarya	0.1	20		
Gomphrena cunninghamii	0.1	15		
Goodenia lamprosperma	0.1	30		
Goodenia muelleriana	0.1	25		
Goodenia stobbsiana	0.1	30		
Gossypium robinsonii	0.1	210		
Grevillea wickhamii	0.1	8		Sterile, Seedling.

Name	Cover (%)	Height (cm)	Specimen	Notes
Ipomoea muelleri	0.1	30		
Jasminum didymum subsp. *lineare*	0.1	130		
Melaleuca glomerata	0.1	160		
Phyllanthus maderaspatensis	0.1	40		
Pluchea dentex	0.1	30		
Pluchea rubelliflora	0.1	40		
Polycarpaea longiflora	0.1	35		
Polymeria ambigua	0.1	8		
Pterocaulon sphacelatum	0.1	30		
Ptilotus nobilis subsp. *nobilis*	0.1	80		
Rhynchosia minima	0.1	30		
**Rumex vesicarius*	0.1	70		NI =42
Salsola australis	0.1	80		
Senna glutinosa subsp. *glutinosa*	0.1	90		
Senna notabilis	0.1	20		
Senna venusta	0.1	140		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	180		
**Sigesbeckia orientalis*	0.1	30		NI =15
Sorghum plumosum var. *plumosum*	2	170		
Stemodia grossa	0.1	40		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	2	60		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	80		
Themeda triandra	0.1	80		
Trichodesma zeylanicum var. *zeylanicum*	0.1	40		
Triodia pungens	0.1	40		
Waltheria indica	0.1	70		

Ministers North Phase 2 **Site** MNFR20
Described by PLSW **Date** 09-May-17 **Type** Quadrat 50 x 50 m
MGA Zone 50 719571 **mE** 7473656 **mN**
Habitat Major drainage surrounded by steep cliffs, flowing to the NE.
Soil Dark reddish brown clay loam to loam in areas.
Rock Type Ironstone outcropping, boulders, cobbles, pebbles, and gravel.
Broad Floristic Formation *Melaleuca argentea open forest*
Vegetation Code ME MaEcr TydCyv GoroCule
Vegetation Association Open forest of *Melaleuca argentea* (*Eucalyptus camaldulensis* subsp. *refulgens*) over open sedges of *Typha domingensis* (*Cyperus vaginatus*) with open shrubland of *Gossypium robinsonii* (*Cullen leucanthum*) over very open tussock grassland of *Eulalia aurea* (*Cymbopogon ambiguus, Sorghum plumosum* var. *plumosum*) on dark reddish brown clay loam along drainage lines.
Veg Condition Very Good: Weeds (**Argemone ochroleuca* subsp. *ochroleuca, *Bidens bipinnata *Cenchrus ciliaris, *Rumex vesicarius, *Setaria verticillata, *Sonchus oleraceus*).
Fire Age Burnt 1-2 years ago.
Notes Site has been inundated with water from heavy flow.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia colei	0.1	370		Sterile; ISM
Acacia pyrifolia	0.1	90		
Acacia tumida var. *pilbarensis*	0.5	210		
Alternanthera denticulata	0.1	40	MNFR20-03	
Amaranthus cuspidifolius	0.1	60		
Ammannia multiflora	2	40		
Androcalva luteiflora	0.1	120		
**Argemone ochroleuca* subsp. *ochroleuca*	0.1	20		NI =10.
Atalaya hemiglauca	0.1	50		
**Bidens bipinnata*	0.1	40		NI =20.
Boerhavia coccinea	0.1	25		
**Cenchrus ciliaris*	0.1	60		NI =20.
Centipeda minima subsp. *macrocephala*	0.1	20		
Chrysopogon fallax	0.1	80		
Cleome viscosa	0.1	70		
Crotalaria medicaginea var. *neglecta*	0.1	50		
Cullen leucanthum	1	180		
Cymbopogon ambiguus	0.1	140		
Cyperus difformis	0.1	40		
Cyperus vaginatus	6	120		
Eragrostis cumingii	0.1	30		
Eragrostis elongata	0.1	40		
Eragrostis tenellula	0.1	40		
Eriachne tenuiculmis	0.1	50		
Eucalyptus camaldulensis subsp. *refulgens*	9	1700		
Eulalia aurea	5	80		
Fimbristylis microcarya	0.1	30		
Fimbristylis sieberiana (Priority 3)	0.1	50	MNFR20-02	
Gomphrena cunninghamii	0.1	20		
Gossypium robinsonii	2	300		
Ipomoea muelleri	0.1	30		
Ipomoea plebeia	0.1	130		
Lobelia arnhemiaca	0.1	10		
Marsilea hirsuta	0.1	20		
Melaleuca argentea	36	1800		
Phyllanthus maderaspatensis	0.1	40		
Pluchea rubelliflora	0.1	40		
Polycarpaea longiflora	0.1	30		
Pterocaulon sphacelatum	0.1	35		
**Rumex vesicarius*	0.1	90		NI=18.
Schoenoplectus subulatus	0.1	160		

Name	Cover (%)	Height (cm)	Specimen	Notes
**Setaria verticillata*	0.1	100		
Sigesbeckia orientalis	0.1	90		NI =10.
**Sonchus oleraceus*	0.1	70		
Sorghum plumosum var. *plumosum*	1.5	140		
Stemodia grossa	0.5	50		
Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	0.1	45		
Themeda triandra	0.1	80		
Typha domingensis	13	230		
**Vachellia farnesiana*	0.1	140		NI =3.
Vigna lanceolata var. *lanceolata*	0.1	50		
Wahlenbergia tumidifructa	0.1	30		
Waltheria indica	0.1	40		

Ministers North Phase 2 **Site** MNFR21

Described by PLSW **Date** 09-May-17 **Type** Quadrat 50 x 50 m

MGA Zone 50 719011 **mE** 7472853 **mN**

Habitat Hillslope of medium hill in area of undulating hills. Just to the east of major drainage.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code FSTs EllCh Hc

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* over scattered tall shrubs of *Hakea chordophylla* over low open shrubland of *Acacia hilliana* on dark reddish brown sandy clay loam on footslopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Notes

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia adoxa var. *adoxa*	0.1	40		
Acacia hilliana	25	70		
Acacia inaequilatera	0.5	180		
Acacia pruinocarpa	0.1	30		
Acacia tumida var. *pilbarensis*	0.1	160		
Amphipogon sericeus	0.1	30		
Bulbostylis barbata	0.1	10		
Corchorus lasiocarpus subsp. *parvus*	0.1	70		
Corymbia hamersleyana	0.5	600		
Dysphania sp.	0.1	8		Seedling.
Eriachne mucronata	0.1	15		
Eriachne pulchella	0.1	5		
Gompholobium oreophilum	0.1	70		
Goodenia stobbsiana	0.1	30		
Goodenia triodiophila	0.1	40		
Hakea chordophylla	3	450		
Indigofera monophylla	0.1	45		
Polycarpaea holtzei	0.1	4		
Pterocaulon sphacelatum	0.1	10		
Ptilotus calostachyus	0.1	70		
Ptilotus nobilis subsp. *nobilis*	0.1	10		
Senna artemisioides subsp. *oligophylla*	0.1	45		
Senna glutinosa subsp. pruinosa	*0.1*	*60*		
Solanum phlomoides	0.1	45		
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	25	30		

Ministers North Phase 2				**Site**	MNFR22
Described by	PLSW	**Date**	13-Jul-17	**Type**	Quadrat 50 x 50 m
MGA Zone	50	712700	**mE**	7476703	**mN**

Habitat Low rocky rise in area of drainages and low hills.

Soil Dark reddish brown silty clay loam.

Rock Type Ironstone and quartz outcropping, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS TsTw Ell Ab

Vegetation Association Open hummock grassland of *Triodia* sp. Shovelanna hill (S. van Leeuwen 3835), *T. wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. *leucophloia* over *open shrubland* of *Acacia bivenosa* over on dark reddish brown sandy clay loam on lower hill slopes.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen
Acacia adoxa var. *adoxa*	0.1	45	
Acacia bivenosa	6	150	
Acacia dictyophleba	0.1	140	
Bulbostylis barbata	0.1	10	
Capparis lasiantha	0.1	50	
Dysphania rhadinostachya	0.1	20	
Eriachne mucronata	0.1	45	
Eriachne pulchella	0.1	15	
Eucalyptus leucophloia subsp. *leucophloia*	4	550	
Jasminum didymum subsp. *lineare*	0.1	60	
Lepidium pedicellosum	0.1	30	
Lepidium pholidogynum	0.1	30	MNFR22-01
Paraneurachne muelleri	0.1	25	
Paspalidium clementii	0.1	20	
Ptilotus nobilis subsp. *nobilis*	0.1	80	
Salsola australis	0.1	50	
Senna artemisioides subsp. *oligophylla*	0.1	65	
Senna glutinosa subsp. *pruinosa*	0.1	140	
Senna glutinosa subsp. x *luerssenii*	0.1	150	
Solanum lasiophyllum	0.1	40	
Streptoglossa decurrens	0.1	60	
Tribulus suberosus	0.1	30	
Triodia pungens	0.1	50	
Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	29	60	
Triodia wiseana	6	60	

Ministers North Phase 2 **Site** MNFRPCR04
Described by PLSW **Date** 13-Jul-17 **Type** R
MGA Zone 50 714243 **mE** 7473741 **mN**
Habitat Rocky gully within slope of large hill, with free-face edges and waterfalls.
Soil Dark reddish brown skeletal sandy clay loam.
Rock Type Ironstone cobbles, pebbles, and gravel.
Broad Floristic Formation *Triodia* open hummock grassland.
Vegetation Code GG TbifTw EllCfCh
Vegetation Association Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. leucophloia, *Corymbia ferriticola*, C. hamersleyana on dark reddish brown sandy clay loam in gullies.
Veg Condition Excellent: **Rumex vesicarius*.
Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia hamersleyensis	0.1	210		
Acacia pruinocarpa	0.1	240		
Acacia pyrifolia	0.1	250		
Amaranthus aff. undulatus (round leaves, short tepals)	0.1	20		
Aristida burbidgeae	0.1	40		
Astrotricha hamptonii	0.1	140		
Bulbostylis barbata	0.1	20		
Capparis spinosa subsp. *nummularia*	0.1	85		
Centipeda minima subsp. *macrocephala*	0.1	15		
Cheilanthes austrotenuifolia	0.1	10		
Cheilanthes brownii	0.1	20		
Clerodendrum floribundum var. *angustifolium*	0.1	60		
Corymbia ferriticola	1	650		
Corymbia hamersleyana	0.1	400		
Cucumis variabilis	0.1	75		
Cymbopogon ambiguus	1	90		
Cynanchum floribundum	0.1	40	MNFRPCR04-02	
Cyperus cunninghamii subsp. *cunninghamii*	0.1	45		
Duperreya commixta	*0.1*	*80*		
Dysphania rhadinostachya	0.1	10	MNFRPCR04-01	Sterile; ISM
Eremophila jucunda subsp. *pulcherrima*	0.1	80		
Eriachne mucronata	0.1	40		
Eucalyptus leucophloia subsp. *leucophloia*	4	550		
Euphorbia trigonosperma	0.1	20		
Ficus brachypoda	0.1	400		
Glycine canescens	0.1	40		
Gomphrena cunninghamii	0.1	20		
Gossypium robinsonii	0.1	220		
Hibiscus coatesii	0.1	50		
Indigofera fractiflexa subsp. *fractiflexa*	0.1	60		
Jasminum didymum subsp. *lineare*	0.1	65		
Lobelia heterophylla subsp. *pilbarensis*	0.1	25		
Nicotiana benthamiana	0.1	20		
Paspalidium clementii	0.1	20		
Peripleura virgata	0.1	25		
Pluchea dentex	0.1	20		
Pterocaulon serrulatum var. *velutinum*	0.1	30		
Pterocaulon sphacelatum	0.1	20		
Pterocaulon sphaeranthoides	0.1	90		
Ptilotus obovatus var. *obovatus*	0.1	65		
Rhodanthe margarethae	0.1	40		
**Rumex vesicarius*	0.1	60		NI =100
Santalum lanceolatum	0.1	190		

Name	Cover (%)	Height (cm)	Specimen	Notes
Senna glutinosa subsp. *glutinosa*	0.1	150		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	45		
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	0.1	20		
Stemodia grossa	0.1	10		
Streptoglossa decurrens	0.1	20		
Themeda triandra	0.1	80		
Trachymene oleracea subsp. *oleracea*	0.1	60		
Triodia biflora	45	70		
Triodia pungens	0.1	45		
Wahlenbergia tumidifructa	0.1	20		

Ministers North Phase 2 **Site** MNFRPS05

Described by PLSW **Date** 13-Jun-17 **Type** Relevé

MGA Zone 50 712567 **mE** 7473973 **mN**

Habitat steep slope of mesa (below freeface, facing south).

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone; shaley, stoney, angular. 25-50% cobble; 25-50% cobble; 1-25%

Broad Floristic Formation *Triodia* open hummock grassland.

Vegetation Code GG TbifTw EllCfCh

Vegetation Association Open hummock grassland of *Triodia biflora, T wiseana* with low open woodland of *Eucalyptus leucophloia* subsp. leucophloia, *Corymbia ferriticola*, C. hamersleyana on dark reddish brown sandy clay loam in gullies.

Veg Condition Pristine

Fire Age No sign of recent fire.

Name	Cover (%)	Height (cm)	Specimen	Notes
Acacia bivenosa	0.1	150		
Acacia dictyophleba	0.1	45		
Acacia elachantha	0.1	230		
Acacia tenuissima	0.1	100		
Bulbostylis barbata	0.1	15		
Cheilanthes brownii	0.1	8		
Dodonaea coriacea	0.1	60		
Eucalyptus leucophloia subsp. *leucophloia*	2	900		
Fimbristylis dichotoma	0.1	25		
Goodenia muelleriana	0.1	30	MNFRPS01-01	
Grevillea wickhamii subsp. *hispidula*	0.1	120		
Jasminum didymum subsp. *lineare*	0.1	240		
Polycarpaea holtzei	0.1	10		
Polygala glaucifolia	0.1	3		
Santalum lanceolatum	0.1	110		
Senna glutinosa subsp. *glutinosa*	0.1	110		
Senna glutinosa subsp. *pruinosa*	0.1	100		
Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	0.1	110		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	0.1	40		
Triodia wiseana	25	80		

Ministers North Phase 2 **Site** MNFRPSR01

Described by PLSW **Date** 12-Apr-17 **Type** Relevé

MGA Zone 50 712439 **mE** 7476816 **mN**

Habitat Open flat gully surrounded by tall cliffs, with minor incised gullies dissecting/flowing into.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone large boulders, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Triodia* open hummock grassland

Vegetation Code HS Tw Ell Ab

Vegetation Association Open hummock grassland of *Triodia wiseana* with scattered low trees of *Eucalyptus leucophloia* subsp. *leucophloia* over scattered shrubs of *Acacia bivenosa* on dark reddish brown sandy clay loam on steep hill slopes.

Veg Condition Pristine

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen
Acacia arida	1	110	
Acacia monticola	0.5	300	
Acacia pruinocarpa	0.1	180	
Acacia pyrifolia	0.1	110	
Bulbostylis barbata	0.1	20	
Cheilanthes brownii	0.1	15	
Corchorus laniflorus	0.1	120	
Corymbia hamersleyana	1	400	
Cucumis variabilis	0.1	100	
Cullen stipulaceum	0.1	120	MNFRPSR01-01
Cymbopogon ambiguus	0.1	110	
Dodonaea viscosa subsp. *mucronata*	0.1	400	
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	10	MNFRPSR01-03
Eriachne mucronata	0.1	40	
Eucalyptus leucophloia subsp. *leucophloia*	1	380	
Eucalyptus xerothermica	1	350	
Euphorbia trigonosperma	0.1	15	
Evolvulus alsinoides var. *villosicalyx*	0.1	10	
Gossypium robinsonii	0.1	420	
Grevillea wickhamii subsp. *hispidula*	0.1	210	MNFRPSR01-02
Hibiscus coatesii	0.1	10	
Indigofera fractiflexa subsp. *fractiflexa*	0.1	40	
Jasminum didymum subsp. *lineare*	0.1	60	
Lobelia heterophylla subsp. *pilbarensis*	0.1	10	
Polycarpaea corymbosa var. *corymbosa*	0.1	20	
Polycarpaea longiflora	0.1	10	
Pterocaulon serrulatum var. *velutinum*	0.1	20	
Pterocaulon sphaeranthoides	0.1	15	
Rhynchosia minima	0.1	80	
Santalum lanceolatum	0.1	400	
Senna glutinosa subsp. *glutinosa*	0.1	120	
Streptoglossa decurrens	0.1	10	
Trichodesma zeylanicum var. *zeylanicum*	0.1	10	
Triodia biflora	35	80	
Triodia wiseana	25	80	
Triumfetta maconochieana	0.1	60	

Ministers North Phase 2 **Site** MNFRPSR02

Described by PLSW **Date** 12-Jul-17 **Type** Relevé

MGA Zone 50 712691 **mE** 7473894 **mN**

Habitat Gorge with steep freeface (~40m) sides. Base is 10 m at its widest and 2 m at its narrowest. Running west-east.

Soil Dark reddish brown sandy loam.

Rock Type Ironstone large boulders, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Callitris* low open woodland

Vegetation Code GG Ccol Phba Cla TbifArb

Vegetation Association Low open woodland of *Callitris columellaris* over high open shrubland of *Phyllanthus baccatus* over open shrubland of *Corchorus laniflorus* over scattered hummock grasses of *Triodia biflora* over scattered tussock grasses of *Aristida burbidgeae* on dark reddish brown sand and clay loam in a gorge.

Veg Condition Excellent: **Rumex vesicarius*.

Fire Age Very long unburnt.

Name	Cover (%)	Height (cm)	Specimen
Acacia citrinoviridis	0.1	600	
Acacia pruinocarpa	0.1	30	
Acacia pyrifolia	0.1	110	
Amaranthus aff. undulatus (round leaves, short tepals)	0.1	40	MNFRPSR02-10
Amaranthus undulatus	0.1	50	
Aristida burbidgeae	0.5	40	
Brachychiton acuminatus	0.1	900	
Bulbostylis barbata	0.1	20	
Callitris columellaris	1	800	
Capparis spinosa subsp. *nummularia*	0.1	110	
Cheilanthes austrotenuifolia	0.1	20	
Cheilanthes brownii	0.1	10	MNFRPSR02-02
Cleome viscosa	0.1	40	
Corchorus laniflorus	2	160	
Corymbia ferriticola	0.1	300	
Cucumis variabilis	0.1	40	
Cullen stipulaceum	0.1	50	MNFRPSR02-04
Cymbopogon ambiguus	0.1	120	
Cyperus cunninghamii subsp. *cunninghamii*	0.1	35	
Dodonaea viscosa subsp. *mucronata*	0.1	120	
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	20	MNFRPSR02-06
Enneapogon lindleyanus	0.1	40	
Eragrostis cumingii	0.1	25	
Euphorbia trigonosperma	0.1	40	
Ficus brachypoda	0.1	480	
Glycine canescens	0.1	40	MNFRPSR02-03
Gomphrena cunninghamii	0.1	20	
Gossypium robinsonii	0.1	250	
Jasminum didymum subsp. *lineare*	0.1	25	
Lobelia heterophylla subsp. *pilbarensis*	0.1	25	
Nicotiana benthamiana	0.1	50	
Peripleura hispidula var. *hispidula*	0.1	30	MNFRPSR02-01
Peripleura virgata	0.1	25	
Phyllanthus baccatus	5	240	
Pimelea microcephala subsp. *microcephala*	0.1	210	
Pluchea dentex	*0.1*	*40*	*MNFRPSR02-09*
Polycarpaea longiflora	0.1	25	
Pterocaulon sphacelatum	0.1	25	
Pterocaulon sphaeranthoides	0.1	60	
Ptilotus obovatus var. *obovatus*	0.1	50	MNFRPSR02-05
Rhodanthe margarethae	0.1	40	
**Rumex vesicarius*	0.1	30	
Solanum cleistogamum	0.1	40	

Name	Cover (%)	Height (cm)	Specimen
Solanum gabrielae	0.1	80	
Teucrium disjunctum	0.1	30	
Trichodesma zeylanicum var. *zeylanicum*	0.1	40	
Triodia biflora	2	70	
Triumfetta leptacantha	0.1	25	MNFRPSR02-07
Triumfetta maconochieana	0.1	45	

Ministers North Phase 2 **Site** MNFRPSR03
Described by PLSW **Date** 14-Jul-17 **Type** Relevé
MGA Zone 50 713492 **mE** 7476566 **mN**
Habitat Moderate drainage in wide flood channel of ElAbTw.
Soil Dark reddish brown sand and clay loam.
Rock Type Riverstone and ironstone large boulders, boulders, cobbles, pebbles, gravel.
Broad Floristic Formation *Acacia* open scrub.
Vegetation Code GG AtpGrwhGoro ErmuTt Ch
Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.
Veg Condition Pristine
Fire Age Very long unburnt.
Notes Actual drainage channel 10 m wide. *Eucalyptus leucophloia, Acacia bivenosa* on sides.

Name	Cover (%)	Height (cm)	Specimen
Acacia maitlandii	0.1	190	
Acacia pyrifolia	0.1	140	
Acacia tumida var. *pilbarensis*	6	450	
Androcalva luteiflora	0.1	190	
Bulbostylis barbata	0.1	20	
Cleome viscosa	0.1	40	
Corchorus lasiocarpus subsp. *parvus*	0.1	60	
Corymbia hamersleyana	0.5	500	
Cucumis variabilis	0.1	50	
Cymbopogon ambiguus	0.1	80	
Duperreya commixta	0.1	25	
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	45	MNFRPSR03-03
Eremophila latrobei subsp. *latrobei*	0.1	50	
Eriachne mucronata	0.5	45	
Eriachne tenuiculmis	0.5	45	
Eucalyptus leucophloia subsp. *leucophloia*	0.5	600	
Euphorbia trigonosperma	0.1	50	
Gomphrena cunninghamii	0.1	25	
Gossypium robinsonii	0.1	400	
Grevillea wickhamii subsp. *hispidula*	2	400	MNFRPSR03-01
Hibiscus coatesii	0.1	50	
Hibiscus leptocladus	0.1	40	MNFRPSR03-02
Hybanthus aurantiacus	0.1	30	
Indigofera monophylla	0.1	40	
Isotropis atropurpurea	0.1	40	
Paraneurachne muelleri	0.1	40	
Petalostylis labicheoides	1	400	
Pluchea dentex	0.1	50	
Polycarpaea holtzei	0.1	10	
Polycarpaea longiflora	0.1	20	
Pterocaulon sphaeranthoides	0.1	30	
Ptilotus astrolasius	0.1	40	
Ptilotus nobilis subsp. *nobilis*	0.1	40	
Santalum lanceolatum	0.1	150	
Senna artemisioides subsp. *oligophylla*	0.1	60	
Senna ferraria			
Senna glutinosa subsp. *glutinosa*	0.1	140	
Senna glutinosa subsp. *pruinosa*	0.1	160	
Sida sp. Pilbara (A.A. Mitchell PRP 1543)	0.1	40	
Themeda triandra	0.5	100	
Trachymene oleracea subsp. *oleracea*	0.1	40	
Trichodesma zeylanicum var. *zeylanicum*	0.1	70	

Name	Cover (%)	Height (cm)	Specimen
Triodia pungens	20	80	

Ministers North Phase 2 **Site** MNFRPSR04

Described by PLSW **Date** 13-Jul-17 **Type** Relevé

MGA Zone 50 714642 **mE** 7476088 **mN**

Habitat Moderate drainage in area of low-moderate undulating hills.

Soil Dark reddish brown sandy clay loam.

Rock Type Ironstone, boulders, cobbles, pebbles, and gravel.

Broad Floristic Formation *Acacia* open scrub.

Vegetation Code GG AtpGrwhGoro ErmuTt Ch

Vegetation Association Open scrub of *Acacia tumida* var. *pilbarensis, Grevillea wickhamii* subsp. *hispidula, Gossypium robinsonii* over very open tussock grassland of *Eriachne mucronata, Themeda triandra* with very open hummock grassland of *Triodia pungens* and scattered low trees of *Corymbia hamersleyana* on dark reddish brown sandy clay loam in gullies and gorges.

Veg Condition Excellent: **Rumex vesicarius*.

Fire Age Very long unburnt.

Notes Weeds present.

Name	Cover (%)	Height (cm)	Specimen	Notes
Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	0.1	240		
Acacia hamersleyensis	0.1	310		
Acacia monticola	0.1	310		
Acacia pyrifolia	0.1	140		
Acacia tumida var. *pilbarensis*	5	500		
Amaranthus aff. undulatus (round leaves, short tepals)	0.1	20		
Amaranthus undulatus	0.1	40		
Androcalva luteiflora	2	230		
Aristida burbidgeae	0.1	40		
Aristida holathera var. *holathera*	0.1	20		
Atalaya hemiglauca	0.1	320		
Bidens bipinnata	0.1	50		NI=40
Bulbostylis barbata	0.1	20		
Cleome viscosa	0.1	40		
Clerodendrum floribundum var. *angustifolium*	0.1	60		
Corchorus lasiocarpus subsp. *parvus*	0.1	50		
Corymbia ferriticola	0.5	500		
Corymbia hamersleyana	0.5	700		
Cucumis variabilis	0.1	90		
Cymbopogon ambiguus	0.5	100		
Dodonaea lanceolata var. *lanceolata*	0.1	20		
Duperreya commixta	0.1	80		
Dysphania rhadinostachya subsp. *rhadinostachya*	0.1	30	MNFRPSR04-01	
Enneapogon lindleyanus	0.1	50		
Enneapogon polyphyllus	0.1	40		
Eragrostis cumingii	0.1	20		
Eriachne mucronata	0.1	40		
Euphorbia trigonosperma	0.1	40		
Evolvulus alsinoides var. *villosicalyx*	0.1	30		
Ficus brachypoda	0.1	120		
Gomphrena canescens	0.1	20		
Gossypium robinsonii	1	300		
Grevillea wickhamii subsp. *hispidula*	6	600		
Hibiscus coatesii	0.1	50		
Hibiscus sturtii var. *campylochlamys*	0.1	40		
Hybanthus aurantiacus	0.1	40		
Indigofera fractiflexa subsp. *fractiflexa*	0.1	40		
Jasminum didymum subsp. *lineare*	0.1	80		
Nicotiana benthamiana	0.1	40		
Paraneurachne muelleri	0.1	40		
Paspalidium clementii	0.1	40	MNFRPSR04-02	
Petalostylis labicheoides	3	400		
Phyllanthus erwinii	0.1	40	MNFRPSR04-03	

Name	Cover (%)	Height (cm)	Specimen	Notes
Polycarpaea longiflora	0.1	20		
Pterocaulon sphaeranthoides	0.1	40		
Ptilotus obovatus var. *obovatus*	0.1	60		
Rhynchosia minima	0.1	60		
**Rumex vesicarius*	0.1	30		NI=1
Santalum lanceolatum	0.1	220		
Senna glutinosa subsp. *glutinosa*	0.1	130		
Senna notabilis	0.1	20		
Senna venusta	0.1	20		
Sida sp. Articulation below (A.A. Mitchell PRP 1605)	0.1	160		
Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	0.1	40		NI=12
Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	*0.1*	*40*		
Solanum gabrielae	0.1	60		
Streptoglossa decurrens	0.1	40		
Tephrosia virens	0.1	50		
Themeda sp. Mt Barricade (M.E. Trudgen 2471)	2	80		
Themeda triandra	2	100		
Trachymene oleracea subsp. *oleracea*	0.1	70		
Trichodesma zeylanicum var. *zeylanicum*	0.1	190		
Triodia pungens	12	50		
Triumfetta leptacantha	0.1	40		
Triumfetta maconochieana	0.1	30		

Appendix 6

Flora of Conservation Significance and Introduced (Weed) Species Recorded from the Study Area

Family	Species	Site ¥	Easting	Northing	Number of Individuals (or % cover)	Notes	Source
Priority 3							
Cyperaceae	*Fimbristylis sieberiana*	MNF20	719575	7473621	0.1%		Current Study
		Opp Coll	719881	7473814	1		
		MNF18	720113	7473886	0.1%		
Malvaceae	*Sida* sp. Barlee Range (S. van Leeuwen 1642)	Opp Coll	712548	7473574	1		Current Study
		MNFRPS02	712739	7473855	1		
		Opp Coll	713285	7474889	1		
		Opp Coll	713294	7474870	2		
		Opp Coll	713368	7475270	2		
		Opp Coll	713398	7475280	30		
		Opp Coll	713425	7475245	2		
		Opp Coll	713543	7473772	12		
		MNFRPC04	714240	7473774	5		
		Opp Coll	714273	7473740	1		
		Opp Coll	714519	7474129	4		
		Opp Coll	714592	7475072	2		
		MNFRPS04	714645	7476138	6		
		Opp Coll	714995	7474153	7		
		MNF-OPPL	715044	7474050	1		
		Opp Coll	715056	7474049	2		
		Opp Coll	715157	7475782	8		
		Opp Coll	717256	7473739	7		
		Opp Coll	718407	7472403	3		
		Opp Coll	718817	7472475	17		
		Opp Coll	718909	7472458	15		
		Opp Coll	718922	7472427	3		
		Opp Coll	718938	7472392	3		
		MNFRPC02	720060	7472058	2		
		Opp Coll	720093	7471185	3		
		Opp Coll	720211	7472089	1		
		Opp Coll	720248	7472494	3		
		Opp Coll	720587	7474076	3		
		Opp Coll	720602	7474119	10		
		Opp Coll	720620	7474113	12		
		MI54	715828	7472918	0.1%		ENV (2009a)
		MI60	717843	7472408	0.1%		
Priority 4							
Fabaceae	*Acacia bromilowiana*	Opp Coll	712167	7475055	2		Current Study
		Opp Coll	712221	7475078	30		
		Opp Coll	712284	7475092	5		
		Opp Coll	712390	7474373	2		
		Opp Coll	712520	7475158	10		
		Opp Coll	712534	7475204	15		

Family	Species	Site ¥	Easting	Northing	Number of Individuals (or % cover)	Notes	Source
Fabaceae (cont.)	*Acacia bromilowiana* (cont.)	Opp Coll	712572	7475250	2		Current Study (cont.)
		Opp Coll	712636	7475285	5		
		Opp Coll	712718	7475510	5		
		Opp Coll	712769	7475367	5		
		Opp Coll	712812	7475373	15		
		Opp Coll	712822	7475759	2		
		Opp Coll	712841	7475874	4		
		Opp Coll	713272	7475004	6		
		Opp Coll	713285	7474889	5		
		Opp Coll	713290	7474713	13		
		Opp Coll	713316	7474472	8		
		Opp Coll	713316	7474574	8		
		Opp Coll	713316	7474596	12		
		Opp Coll	713317	7474655	3		
		Opp Coll	713319	7475169	2		
		Opp Coll	713322	7474516	6		
		Opp Coll	713331	7474459	2		
		Opp Coll	713368	7475270	3		
		Opp Coll	713471	7475275	1		
		Opp Coll	713504	7475284	12		
		Opp Coll	713643	7474505	20		
		Opp Coll	713651	7474392	10		
		Opp Coll	713686	7474524	50		
		Opp Coll	713726	7474512	30		
		Opp Coll	713787	7474538	15		
		Opp Coll	713800	7474578	20		
		Opp Coll	713836	7474420	20		
		Opp Coll	713854	7474565	6		
		Opp Coll	713855	7474734	20		
		Opp Coll	713867	7474516	10		
		Opp Coll	718248	7473172	7		
		ACY10	717251	7473123	1		Astron (2010)

¥ Opp Coll = opportunistic collection.

Introduced flora (weeds) recorded from the study area.

Family	Species	Site¥	Easting	Northing	No. of Individuals	Source
Amaranthaceae	**Aerva javanica*	Opp Coll	719232	7475211	1	BHPBIO Database
Asteraceae	**Bidens bipinnata*	MNFRPSR04	714645	7476138	40	Current Study
		MNFR17	718480	7472462	300	
		Opp Coll	718537	7472494	50	
		MNFR19	719271	7473470	5	
		MNFR20	719575	7473621	20	
		Opp Coll	720059	7472111	5	
		MNFR18	720113	7473886	20	
Asteraceae	**Flaveria trinervia*	MNF20	719575	7473621	2	Current Study
		MNF18	720113	7473886	2	
Asteraceae	**Malvastrum americanum*	Opp Coll	719534	7473573	20	Current Study
		MNF20	719575	7473621	1	
		Opp Coll	719598	7473635	1	
		Opp Coll	719993	7473885	2	
		MNF18	720113	7473886	2	
Asteraceae	**Sigesbeckia orientalis*	MNFR17	718480	7472462	400	Current Study
		Opp Coll	718537	7472494	150	
		MNFRPC07	718955	7473600	20	
		MNF19	719271	7473470	1	
		MNFR20	719575	7473621	10	
		MNFR18	720113	7473886	3	
Asteraceae	**Sonchus oleraceus*	MNF17	718480	7472462	1	Current Study
		Opp Coll	718605	7473430	4	
		Opp Coll	718667	7473293	3	
		Opp Coll	718712	7473182	5	
		MNFRPC07	718955	7473600	20	
		Opp Coll	719109	7473521	10	
		MNF19	719271	7473470	11	
		Opp Coll	719524	7473540	2	
		MNF20	719575	7473621	70	
		MNF18	720113	7473886	30	
		Opp Coll	720274	7473863	10	
		Opp Coll	720442	7473894	10	
		MNFRPC08	720715	7473974	1	
		MI06	715828	7472918	1	ENV (2009a)
		MI54	714599	7475067	1	

Family	Species	Site¥	Easting	Northing	No. of Individuals	Source
Asteraceae	**Tridax procumbens*	MNF20	719575	7473621	1	Current Study
		Opp Coll	719653	7473720	2	
Fabaceae	**Vachellia farnesiana*	MNFR20	719575	7473621	3	Current Study
		MNF18	720113	7473886	1	
		Opp Coll	720137	7473824	1	
Papaveraceae	**Argemone ochroleuca* subsp. *ochroleuca*	Opp Coll	718298	7472381	2000	Current Study
		Opp Coll	718407	7472403	15	
		MNF17	718480	7472462	10	
		Opp Coll	718605	7473430	15	
		Opp Coll	718667	7473293	700	
		Opp Coll	718712	7473182	2000	
		Opp Coll	718730	7472868	5000	
		MNFRPC07	718955	7473600	1000	
		Opp Coll	718989	7473576	100	
		Opp Coll	719109	7473521	150	
		Opp Coll	719141	7473677	50	
		MNF19	719271	7473470	40	
		Opp Coll	719524	7473540	4	
		MNF20	719575	7473621	60	
		Opp Coll	719881	7473814	30	
		MNFRPC08	720715	7473974	5	
Poaceae	**Cenchrus ciliaris*	Opp Coll	718592	7472513	2000	Current Study
		Opp Coll	718605	7473430	3	
		Opp Coll	718667	7473293	200	
		Opp Coll	718724	7472901	1000	
		MNFRPC07	718955	7473600	6	
		Opp Coll	719109	7473521	20	
		MNF19	719271	7473470	1	
		MNF20	719575	7473621	30	
		Opp Coll	719963	7473815	10	
		Opp Coll	719993	7473885	100	
		MNF18	720113	7473886	15	
		MI43	718916	7475580	1	ENV (2009a)
Poaceae	**Chloris virgata*	MI33	715897	7474267	1	ENV (2009a)
Poaceae	**Melinis repens*	MNF17	718480	7472462	200	Current Study
		Opp Coll	719534	7473573	20	
		Opp Coll	719653	7473720	30	

Family	Species	Site¥	Easting	Northing	No. of Individuals	Source
Poaceae (cont.)	*Melinis repens* (cont.)	MNF18	720113	7473886	45	Current Study (cont.)
		Opp Coll	720399	7473890	10	
		MNFRPC08	720715	7473974	20	
Poaceae	*Setaria verticillata*	Opp Coll	718298	7472381	3	Current Study
		MNF17	718480	7472462	4	
		Opp Coll	718592	7472513	5	
		Opp Coll	718767	7472732	1	
		MNFRPC07	718955	7473600	15	
		Opp Coll	719202	7473488	1	
		Opp Coll	719530	7473546	4	
		MNF20	719575	7473621	1	
		MNF18	720113	7473886	40	
		MNFRPC08	720715	7473974	1	
Polygonaceae	*Rumex vesicarius*	Opp Coll	712495	7473620	1	Current Study
		MNFRPSR02	712739	7473855	1	
		Opp Coll	718667	7473293	4	
		MNFRPC04	714240	7473774	100	
		MNFRPSR04	714645	7476138	1	
		Opp Coll	713632	7473966	1	
		Opp Coll	717752	7475487	1	
		MNF17	718480	7472462	5	
		Opp Coll	718537	7472494	10	
		Opp Coll	718592	7472513	20	
		Opp Coll	718605	7473430	20	
		Opp Coll	718667	7473293	4	
		Opp Coll	718712	7473182	100	
		Opp Coll	718722	7472680	4	
		Opp Coll	718730	7472868	4	
		Opp Coll	718855	7474374	200	
		Opp Coll	718879	7474335	20	
		Opp Coll	718923	7472452	1	
		MNFRPC07	718955	7473600	1	
		Opp Coll	718989	7473576	200	
		Opp Coll	719047	7474035	30	
		Opp Coll	719071	7473525	40	
		Opp Coll	719109	7473521	10	
		MNF19	719271	7473470	40	

Family	Species	Site¥	Easting	Northing	No. of Individuals	Source
Polygonaceae (cont.)	**Rumex vesicarius* (cont.)	Opp Coll	719370	7473476	1	Current Study (cont.)
		Opp Coll	719549	7472603	1	
		MNF20	719575	7473621	2	
		Opp Coll	719598	7473635	1	
		Opp Coll	719866	7472092	1	
		Opp Coll	719881	7473814	4	
		Opp Coll	719963	7473815	1	
		MNFRPC02	720060	7472058	1	
		MNF18	720113	7473886	20	
		Opp Coll	720211	7472089	1	
		Opp Coll	720274	7473863	20	
		Opp Coll	720442	7473894	5	
		MNFRPC08	720715	7473974	1	
		Opp Coll	718076	7472555	1	BHPBIO database
		Opp Coll	718705	7474009	1	
		Opp Coll	718648	7473884	1	
		Opp Coll	718630	7473845	1	
		Opp Coll	717792	7472192	1	
		Opp Coll	718656	7473902	1	
		Opp Coll	718846	7474407	1	
		Opp Coll	718665	7473924	1	
		Opp Coll	718677	7473958	1	
		Opp Coll	718623	7473828	1	
		Opp Coll	717550	7472028	1	
		Opp Coll	718638	7473866	1	
		Opp Coll	718162	7472772	1	
		Opp Coll	718691	7473989	1	
		Opp Coll	718616	7473806	1	
		Opp Coll	717833	7472252	1	
		Opp Coll	718671	7473940	1	
		Opp Coll	718147	7472740	1	
		Opp Coll	718837	7474386	1	
		Opp Coll	718342	7474365	1	ENV (2009b)
Solanaceae	**Solanum nigrum*	MNF20	719575	7473621	1	Current Study
		MNF18	720113	7473886	2	
		Opp Coll	720442	7473894	4	

¥ Opp Coll = opportunistic collection.

Appendix 7

Specimen Identification Chain of Custody Form

BHPBilliton Chain of Custody

Company Biota Environmental Sciences
Date Submitted
Project Code 1226
Project Location Ministers North (5 km south of Yandi) Pilbara

Specimen Code	Consultant ID	Extra Consultant Info	BHP Sponsored Botanist ID	BHP Sponsored Botanist Comments	Habit (including height & form)	Plant Description (including flower/fruit colour)	Habitat (including landscape form & soil)	Vegetation	Datum	Latitude	Longitude	Collector/s	Collection Date	Collection Number
MNFRPS04-04	Sida sp. Barlee Range		*Sida* sp. Barlee Range (S. van Leeuwen 1642)	P3	low shrub to 0.4 m.	Small orange flowers	rocky gorge, ironstone	Provided upon request.	WGS84	714642	7476088	Pierre-Louis de Kock	2016 September	
MNFRPS02-04	Sida sp. Barlee Range		*Sida* sp. Barlee Range (S. van Leeuwen 1642)	P3	low shrub to 0.4 m.	Small orange flowers	rocky gorge, ironstone	Provided upon request.	WGS84	712691	7473894	Pierre-Louis de Kock	2016 September	
MNF-PL26	Sida sp. Barlee Range		*Sida* sp. Barlee Range (S. van Leeuwen 1642)	P3	low shrub to 0.4 m.	Small orange flowers	rocky gorge, ironstone	Provided upon request.	WGS84	720248	7472494	Pierre-Louis de Kock	2016 September	
MNF-PL36	Acacia bromilowiana		*Acacia bromilowiana*	P4	dense shrub to 6 m	distinctly pruinose	rocky breakaways and slopes, ironstone	Provided upon request.	WGS84	713331	7474459	Pierre-Louis de Kock	2016 September	
MNF-PL02	Acacia bromilowiana		*Acacia bromilowiana*	P4	dense shrub to 3 m	distinctly pruinose	rocky slope	Provided upon request.	WGS84	712812	7475373	Pierre-Louis de Kock	2016 September	
MNFPC06-04	Ficus ? Virens var. virens		*Ficus brachypoda*	The ID is tentative as there are no fruits. There are ferruginous hairs present on the abaxial surface of some leaves (absent from *F. virens*). I checked numerous specimens of all the species known to occur in and near the Pilbara (and even some outside of WA) and *F. brachypoda* is the only species that matches. *Ficus brachypoda* is regarded as being very variable, especially in regards to leaf shape and indumentum and this was evident after examining the specimens def'd by Dale Dixon. I also noted that the prominenince of the intercostals of *F. bracypoda* is also highly variable, ranging from barely noticiable to extreme (approaching *F. platypoda*). Further work may show that there is more than one entity under *F. brachypoda*.	shrub/ tree to 6m	Fig	Gorge	Provided upon request.	WGS84	717736	7475463	Pierre-Louis de Kock	2016 September	
MNFRPC03-03	Ficus ? brachypoda	lacking orange hairlets, and distinct intercostals. Petiole too short for F. virens.	*Ficus brachypoda*	The ID is tentative as there are no fruits. There are ferruginous hairs present on the abaxial surface of some leaves. See note above.	shrub/ tree to 8m	Fig	Gorge	Provided upon request.	WGS84	713448	7473917	Pierre-Louis de Kock	2016 September	
MNFRPS02-05	Ficus ? brachypoda	lacking orange hairlets, and distinct intercostals. Petiole too short for F. virens.	*Ficus brachypoda*	The ID is tentative as there are no fruits. There are ferruginous hairs present on the abaxial surface of some leaves. See note above.	shrub/ tree to 8m	Fig	Gorge	Provided upon request.	WGS84	712691	7473894	Pierre-Louis de Kock	2016 September	
MNF-CEF09	? Calocephalus knappii (?aff)	Vegetatively similar, However pappus not matching this taxon.	*Myriocephalus oldfieldii*	NB there were several florets (with achenes and a distinct pappus) from a different species stuck to this specimen, they have been placed in a cellophane bag with a note.	small decumbent herb to 0.3 m	Annual daisy, flowers white/yellow	ironstone medium slope	Eucalyptus leucophloia, Hakea chordophylla, Acacia hilliana, Triodia sp. Shovelanna hill	WGS84	718250	7472353	Chloe Flaherty	2016 September	
MNFRPC03-02	Glycine aff. arenaria	Interesting specimen, only one other similar has been recorded by Biota at Yandi (specimen lost).	*Glycine canescens*	In the broad sense (which, going by def'd specimens, is very broad indeed). *Glycine arenaria* has straight pods with 3-4 seeds and broad stipules with prominent parallel longitudinal nerves. This specimen has pods that curve towards the apex, narrow stipules, pinnately compund leaves, an inflorescence that is not terminally compressed and seeds with a rough adherent pericarp. I looked at all the WA *Glycine* collections that had any resemblence to this specimen and *G. canescens* is the only reasonable match. *Glycine canescens* is variable in a number of characters including leaf/leaflet size and seed number (I observed 4-7), size and shape (but the pericarp is usually consistant).	Climbing to 1m.	Climbing pea, purple flowers.	Gullies	Eucalyptus leucophloia, Ficus brachypoda, Dodonaea viscosa, Pimelea forrestiana, Triodia biflora	WGS84	713448	7473917	Pierre-Louis de Kock	2016 September	
MNFRPC04-01	Glycine aff. arenaria	As above	*Glycine canescens*	See note above.	Climbing to 1m.	Climbing pea, purple flowers.	Gullies	Eucalyptus leucophloia, Ficus brachypoda, Dodonaea viscosa, Pimelea forrestiana, Triodia biflora	WGS84	714243	7473741	Pierre-Louis de Kock	2016 September	
MNF18-06	Fimbristylis ferruginea	would be a large range extension.	*Fimbristylis sieberiana*	P3	small sedge to 0.3 m	Sedge, brown nutlets	Major drianage line	Melaleuca argentea forest.	WGS84	720089	7473905	Pierre-Louis de Kock	2016 September	
MNF-PL30	Cynanchum ? Pedunculatum	Colleters 4-5, continually have trouble with this group with number of colleters not matching.	*Cynanchum floribundum*	There are several problems with *Cynanchum* including the fact that several couplets of the key do not align with the descriptions (this is true for both the Flora of Australia vol 28 and the Austrobalileya vol 3 treatment). Having looked at numerous specimens it appears that *C. floribundum* can have 1-5 colleters and differs significantly from *C. pedunculatum* in that the outer corona has long lobes (as well as other differences).	creeping vine to 0.2m tall 2m wide	vine		Provided upon request.	WGS84	713713	7474002	Pierre-Louis de Kock	2016 September	
MNF-PL08	Eucalyptus ? trivalva	recorded from major range top/ slope, unusual habitat (documented as occuring there, but never seen before)	*Eucallyptus pilbarensis*	Not convinced either way. The main differences between *E. trivalva* and *E. pilbarensis* are some loose rogh bark and dull crown leaves for *E. trivalva* cf smooth bark and glossy leaves for *E. pilbarensis*. Unfortunately leaf sheen is not obvious on dried specimens of *E. pilbarensis* and they often appear dull. The habitat and bud shape are more typical for *E. pilbarensis*.	mallee to 3 m	mallee	Major range/ slope	Eucalyptus leucophloia, Acacia hamersleyensis, Triodia wiseana.	WGS84	712310	7475100	Pierre-Louis de Kock	2016 September	
MNF-PL29	Eucalyptus ? trivalva	recorded from major range top/ slope, unusual habitat (documented as occuring there, but never seen before)	*Eucallyptus pilbarensis*	See note above	mallee to 3 m	mallee	Major range/ slope	Eucalyptus leucophloia, Acacia hamersleyensis, Triodia wiseana.	WGS84	713854	7474565	Pierre-Louis de Kock	2016 September	
MNF-PL09	Hibbertia aff. glaberrima	Carpels 3 or 4	*Hibbertia glaberrima*	A minority of the WA collections have been pressed in a way that allows carpels to be counted (without getting destructive) and for most they have 3 carpels but some do have a flower which has 4. This variation has most likely been overlooked.	small shrub to 0. 5 m	small shrub, yellow flowers	Major range summit	Eucalyptus leucophloia, E. kinsgmillii, Acacia hamersleyensis, Triodia wiseana	WGS84	712014	7474905	Pierre-Louis de Kock	2016 September	

Appendix 8

List of Vascular Flora Species Recorded in the Study Area

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Amaranthaceae	*Achyranthes aspera*	✓	
	Alternanthera denticulata	✓	
	Alternanthera nana	✓	✓
	Amaranthus aff. undulatus (round leaves, short tepals)	✓	
	Amaranthus cuspidifolius	✓	
	Amaranthus mitchellii		✓
	Amaranthus undulatus	✓	✓
	Gomphrena canescens	✓	✓
	Gomphrena cunninghamii	✓	✓
	Ptilotus astrolasius	✓	✓
	Ptilotus auriculifolius	✓	✓
	Ptilotus calostachyus	✓	✓
	Ptilotus clementii	✓	✓
	Ptilotus drummondii		✓
	Ptilotus fusiformis	✓	✓
	Ptilotus helipteroides	✓	
	Ptilotus incanus		✓
	Ptilotus nobilis subsp. *nobilis*	✓	✓
	Ptilotus obovatus var. *obovatus*	✓	✓
	Ptilotus rotundifolius		✓
	Ptilotus schwartzii var. *schwartzii*	✓	
Apocynaceae	*Cynanchum floribundum*	✓	
	Tylophora flexuosa	✓	
Araliaceae	*Astrotricha hamptonii*	✓	✓
	Trachymene oleracea subsp. *oleracea*	✓	✓
Asteraceae	**Bidens bipinnata*	✓	
	Blumea tenella	✓	
	Calocephalus beardii	✓	
	Centipeda minima subsp. macrocephala	✓	
	**Flaveria trinervia*	✓	✓
	Helichrysum luteoalbum	✓	
	Ixiochlamys cuneifolia	✓	
	Myriocephalus oldfieldii	✓	
	Peripleura arida		✓
	Peripleura hispidula var. *hispidula*	✓	
	Peripleura virgata	✓	✓
	Pluchea dentex	✓	✓
	Pluchea rubelliflora	✓	
	Pterocaulon serrulatum		✓
	Pterocaulon serrulatum var. *velutinum*	✓	
	Pterocaulon sphacelatum	✓	
	Pterocaulon sphaeranthoides	✓	✓
	Pterocaulon sphaeranthoides x sphacelatum	✓	
	Rhodanthe margarethae	✓	✓
	Rutidosis helichrysoides subsp. *helichrysoides*	✓	
	**Sigesbeckia orientalis*	✓	
	Sonchus oleraceus	✓	✓
	Streptoglossa decurrens	✓	✓
	**Tridax procumbens*	✓	
Boraginaceae	*Heliotropium cunninghamii*	✓	✓
	Heliotropium glabellum	✓	
	Heliotropium inexplicitum	✓	
	Heliotropium ovalifolium		✓
	Heliotropium pachyphyllum	✓	
	Heliotropium tenuifolium		✓
	Trichodesma zeylanicum var. *zeylanicum*	✓	✓
Brassicaceae	*Lepidium pedicellosum*	✓	✓
	Lepidium pholidogynum	✓	
Campanulaceae	*Lobelia arnhemiaca*	✓	
	Lobelia heterophylla subsp. *pilbarensis*	✓	✓
	Wahlenbergia tumidifructa	✓	

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Capparaceae	*Capparis lasiantha*	✓	
	Capparis spinosa subsp. nummularia	✓	✓
	Capparis umbonata	✓	
Caryophyllaceae	*Polycarpaea corymbosa* var. *corymbosa*	✓	✓
	Polycarpaea holtzei	✓	✓
	Polycarpaea longiflora	✓	✓
Celastraceae	*Stackhousia intermedia*		✓
	Stackhousia sp.		✓
	Stackhousia sp. swollen gynophore (W.R. Barker 2041)	✓	
Chenopodiaceae	*Dysphania kalpari*	✓	
	Dysphania rhadinostachya	✓	✓
	Dysphania rhadinostachya subsp. *rhadinostachya*	✓	✓
	Dysphania sp.	✓	
	Salsola australis	✓	✓
Cleomaceae	*Cleome viscosa*	✓	✓
Convolvulaceae	*Bonamia erecta*	✓	
	Bonamia pilbarensis	✓	✓
	Duperreya commixta	✓	✓
	Evolvulus alsinoides var. *decumbens*	✓	✓
	Evolvulus alsinoides var. *villosicalyx*	✓	
	Ipomoea muelleri	✓	
	Ipomoea plebeia	✓	
	Polymeria ambigua	✓	
Cucurbitaceae	*Cucumis variabilis*	✓	✓
Cupressaceae	*Callitris columellaris*	✓	
Cyperaceae	*Bulbostylis barbata*	✓	✓
	Cyperus cunninghamii subsp. *cunninghamii*	✓	✓
	Cyperus dactylotes	✓	
	Cyperus difformis	✓	
	Cyperus iria	✓	
	Cyperus ixiocarpus	✓	
	Cyperus sp.		✓
	Cyperus vaginatus	✓	
	Eleocharis geniculata	✓	
	Fimbristylis dichotoma	✓	✓
	Fimbristylis microcarya	✓	
	Fimbristylis sieberiana (Priority 3)	✓	
	Fimbristylis simulans	✓	
	Schoenoplectus subulatus	✓	
Dilleniaceae	*Hibbertia glaberrima*	✓	
Elatinaceae	*Bergia pedicellaris*	✓	
Euphorbiaceae	*Adriana tomentosa* var. *tomentosa*	✓	
	Euphorbia australis		✓
	Euphorbia australis var. *subtomentosa*	✓	
	Euphorbia biconvexa	✓	✓
	Euphorbia boophthona	✓	✓
	Euphorbia careyi	✓	
	Euphorbia coghlanii		✓
	Euphorbia sp. (*biconvexa/coghlanii/trigonosperma*; sterile)	✓	✓
	Euphorbia tannensis subsp. *eremophila*	✓	✓
	Euphorbia trigonosperma	✓	
Fabaceae	*Acacia adoxa* var. *adoxa*	✓	✓
	Acacia ancistrocarpa	✓	
	Acacia aneura		✓
	Acacia aneura var. *intermedia*		✓
	Acacia aptaneura	✓	✓
	Acacia arida	✓	
	Acacia bivenosa	✓	✓
	Acacia bromilowiana (Priority 3)	✓	
	Acacia catenulata subsp. *occidentalis*		✓
	Acacia citrinoviridis	✓	✓
	Acacia colei	✓	

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Fabaceae cont.	*Acacia coriacea* subsp. *pendens*	✓	✓
	Acacia cowleana		✓
	Acacia dictyophleba	✓	✓
	Acacia elachantha	✓	
	Acacia hamersleyensis	✓	✓
	Acacia hilliana	✓	✓
	Acacia inaequilatera	✓	✓
	Acacia maitlandii	✓	✓
	Acacia monticola	✓	✓
	Acacia pachyacra	✓	
	Acacia pruinocarpa	✓	✓
	Acacia pyrifolia	✓	✓
	Acacia rhodophloia		✓
	Acacia spondylophylla	✓	✓
	Acacia tenuissima	✓	
	Acacia tumida var. *pilbarensis*	✓	✓
	Acacia tumida var. *tumida*		✓
	Cajanus cinereus	✓	
	Crotalaria medicaginea var. *neglecta*	✓	✓
	Crotalaria novae-hollandiae subsp. *novae-hollandiae*	✓	✓
	Cullen leucanthum	✓	
	Cullen stipulaceum	✓	
	Glycine canescens	✓	
	Gompholobium oreophilum	✓	✓
	Indigofera fractiflexa subsp. *fractiflexa*	✓	✓
	Indigofera monophylla	✓	✓
	Isotropis atropurpurea	✓	
	Isotropis forrestii	✓	
	Mirbelia viminalis	✓	✓
	Petalostylis labicheoides	✓	✓
	Rhynchosia minima	✓	✓
	Senna artemisioides subsp. *helmsii*	✓	✓
	Senna artemisioides subsp. *oligophylla*	✓	
	Senna artemisioides subsp. *oligophylla* x subsp. *helmsii*	✓	
	Senna ferraria	✓	✓
	Senna glaucifolia		✓
	Senna glutinosa subsp. *glutinosa*	✓	✓
	Senna glutinosa subsp. *glutinosa* x subsp. x *luerssenii*	✓	
	Senna glutinosa subsp. *pruinosa*	✓	✓
	Senna glutinosa subsp. x *luerssenii*	✓	✓
	Senna notabilis	✓	✓
	Senna sericea	✓	
	Senna sp.		✓
	Senna sp. Meekatharra (E. Bailey 1-26)	✓	✓
	Senna venusta	✓	✓
	Tephrosia oxalidea	✓	✓
	Tephrosia rosea		✓
	Tephrosia rosea var. Fortescue creeks (M.I.H. Brooker 2186)	✓	
	Tephrosia sp. Bungaroo Creek (M.E. Trudgen 11601)	✓	
	Tephrosia sp. Fortescue (A.A. Mitchell 606)		✓
	Tephrosia spechtii		✓
	Tephrosia virens	✓	
	**Vachellia farnesiana*	✓	
	Vigna lanceolata var. *lanceolata*	✓	
Gentianaceae	*Schenkia clementii*	✓	
Goodeniaceae	*Dampiera candicans*	✓	✓
	Goodenia cusackiana	✓	✓
	Goodenia lamprosperma	✓	✓
	Goodenia muelleriana	✓	✓
	Goodenia sp.		✓
	Goodenia stobbsiana	✓	✓
	Goodenia triodiophila	✓	✓

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Goodeniaceae cont.	*Scaevola* aff. *browniana*		✓
	Scaevola browniana subsp. *browniana*		✓
	Scaevola parvifolia subsp. *pilbarae*	✓	
	Scaevola sp. Mt Bruce (M.E. Trudgen 1333)	✓	
	Velleia connata		✓
Gyrostemonaceae	*Codonocarpus cotinifolius*	✓	✓
Haloragaceae	*Haloragis gossei* var. *gossei*	✓	✓
Lamiaceae	*Clerodendrum floribundum* var. *angustifolium*	✓	✓
	Newcastelia sp. Hamersley Range (S. van Leeuwen 4264)	✓	✓
	Teucrium sp.	✓	
	Cassytha capillaris	✓	✓
Loganiaceae	*Mitrasacme connata*	✓	
Loranthaceae	*Amyema gibberula* var. *gibberula*	✓	
	Amyema sanguinea var. *pulcher*	✓	
	Amyema sanguinea var. *sanguinea*		✓
	Diplatia grandibractea	✓	✓
Lythraceae	*Ammannia baccifera*	✓	
	Ammannia multiflora	✓	
Malvaceae	*Abutilon amplum*	✓	
	Abutilon lepidum	✓	✓
	Abutilon macrum	✓	
	Abutilon otocarpum	✓	✓
	Abutilon sp. Dioicum (A.A. Mitchell PRP 1618)	✓	✓
	Abutilon sp. Pilbara (W.R. Barker 2025)	✓	
	Androcalva luteiflora	✓	✓
	Brachychiton acuminatus	✓	✓
	Corchorus crozophorifolius	✓	
	Corchorus incanus subsp. *lithophilus*		✓
	Corchorus laniflorus	✓	
	Corchorus lasiocarpus		✓
	Corchorus lasiocarpus subsp. *lasiocarpus*	✓	✓
	Corchorus lasiocarpus subsp. *parvus*	✓	✓
	Corchorus tridens	✓	
	Gossypium australe	✓	
	Gossypium robinsonii	✓	✓
	Hibiscus aff. *goldsworthi*		✓
	Hibiscus coatesii	✓	✓
	Hibiscus haynaldii		✓
	Hibiscus leptocladus	✓	
	Hibiscus sp. Gardneri (A.L. Payne PRP 1435)		✓
	Hibiscus sp. Mt Robinson (G. Byrne 3537)	✓	
	Hibiscus sturtii var. *campylochlamys*	✓	✓
	Hibiscus sturtii var. *platychlamys*	✓	
	**Malvastrum americanum*	✓	
	Melhania oblongifolia	✓	✓
	Seringia elliptica	✓	✓
	Seringia nephrosperma	✓	✓
	Sida arenicola	✓	✓
	Sida cardiophylla		✓
	Sida echinocarpa	✓	✓
	Sida fibulifera	✓	
	Sida sp. Articulation below (A.A. Mitchell PRP 1605)	✓	✓
	Sida sp. Barlee Range (S. van Leeuwen 1642) (Priority 3)	✓	✓
	Sida sp. Excedentifolia (J.L. Egan 1925)	✓	✓
	Sida sp. Pilbara (A.A. Mitchell PRP 1543)	✓	✓
	Sida sp. Shovelanna Hill (S. van Leeuwen 3842)	✓	✓
	Sida sp. spiciform panicles (E. Leyland s.n. 14/8/90)	✓	
	Sida sp. verrucose glands (F.H. Mollemans 2423)	✓	
	Triumfetta leptacantha	✓	✓
	Triumfetta maconochieana	✓	✓
	Waltheria indica	✓	
Marsileaceae	*Marsilea hirsuta*	✓	

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Menispermaceae	*Tinospora smilacina*	✓	✓
Molluginaceae	*Trigastrotheca molluginea*		✓
Moraceae	*Ficus brachypoda*	✓	✓
	Ficus sp.		✓
Myrtaceae	*Calytrix carinata*	✓	✓
	Corymbia deserticola subsp. *deserticola*	✓	✓
	Corymbia ferriticola	✓	✓
	Corymbia hamersleyana	✓	✓
	Corymbia opaca		✓
	Eucalyptus camaldulensis subsp. *refulgens*	✓	
	Eucalyptus gamophylla	✓	✓
	Eucalyptus kingsmillii subsp. *kingsmillii*	✓	
	Eucalyptus leucophloia subsp. *leucophloia*	✓	✓
	Eucalyptus pilbarensis	✓	
	Eucalyptus sp.		✓
	Eucalyptus victrix	✓	
	Eucalyptus xerothermica	✓	✓
	Melaleuca argentea	✓	
	Melaleuca bracteata	✓	
	Melaleuca glomerata	✓	
Nyctaginaceae	*Boerhavia coccinea*	✓	✓
Oleaceae	*Jasminum didymum* subsp. *lineare*	✓	✓
Papaveraceae	**Argemone ochroleuca* subsp. *ochroleuca*	✓	
Phrymaceae	*Mimulus gracilis*	✓	
Phyllanthaceae	*Flueggea virosa* subsp. *melanthesoides*		✓
	Phyllanthus baccatus	✓	
	Phyllanthus erwinii	✓	
	Phyllanthus maderaspatensis	✓	
Plantaginaceae	*Stemodia grossa*	✓	✓
Poaceae	*Amphipogon sericeus*	✓	✓
	Aristida burbidgeae	✓	
	Aristida contorta	✓	✓
	Aristida holathera		✓
	Aristida holathera var. *holathera*	✓	✓
	**Cenchrus ciliaris*	✓	
	**Cenchrus setiger*		✓
	**Chloris virgata*		✓
	Chrysopogon fallax	✓	
	Cymbopogon ambiguus	✓	✓
	Cymbopogon obtectus	✓	✓
	Cymbopogon sp.		✓
	Digitaria brownii	✓	
	Digitaria ctenantha	✓	
	Elytrophorus spicatus	✓	
	Enneapogon caerulescens	✓	✓
	Enneapogon lindleyanus	✓	✓
	Enneapogon polyphyllus	✓	✓
	Enneapogon robustissimus	✓	
	Enneapogon sp.	✓	
	Enteropogon ramosus	✓	
	Eragrostis cumingii	✓	✓
	Eragrostis elongata	✓	
	Eragrostis pergracilis		✓
	Eragrostis tenellula	✓	
	Eriachne aristidea	✓	✓
	Eriachne lanata	✓	✓
	Eriachne mucronata	✓	✓
	Eriachne pulchella	✓	✓
	Eriachne tenuiculmis	✓	✓
	Eulalia aurea	✓	✓
	Eulalia sp. (Three Rivers Station, B.Forsyth AQ6789133)	✓	
	Imperata cylindrica	✓	

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
	**Melinis repens*	✓	
	Paraneurachne muelleri	✓	✓
	Paspalidium basicladum	✓	
	Paspalidium clementii	✓	✓
	Paspalidium constrictum	✓	
	Paspalidium sp.	✓	
	Perotis rara		✓
	Schizachyrium fragile	✓	✓
	Setaria surgens	✓	
	**Setaria verticillata*	✓	
	Sorghum plumosum var. *plumosum*	✓	
	Sporobolus australasicus		✓
	Themeda sp. Mt Barricade (M.E. Trudgen 2471)	✓	
	Themeda triandra	✓	✓
	Triodia basedowii		✓
	Triodia biflora	✓	
	Triodia brizoides	✓	
	Triodia pungens	✓	✓
	Triodia sp. Shovelanna Hill (S. van Leeuwen 3835)	✓	✓
	Triodia wiseana	✓	✓
	**Tripogonella loliiformis*		✓
	Triraphis mollis	✓	
Polygonaceae	**Rumex vesicarius*	✓	
Proteaceae	*Grevillea berryana*	✓	✓
	Grevillea pyramidalis subsp. *leucadendron*		✓
	Grevillea wickhamii (sterile)	✓	✓
	Grevillea wickhamii subsp. *aprica*	✓	
	Grevillea wickhamii subsp. *hispidula*	✓	✓
	Hakea chordophylla	✓	✓
	Hakea lorea subsp. *lorea*	✓	✓
Pteridaceae	*Cheilanthes austrotenuifolia*	✓	
	Cheilanthes brownii	✓	
	Cheilanthes sieberi subsp. *sieberi*	✓	✓
	Cheilanthes sp.	✓	
Rubiaceae	*Oldenlandia crouchiana*	✓	✓
	Psydrax latifolia	✓	
	Synaptantha tillaeacea var. *tillaeacea*	✓	
Santalaceae	*Santalum lanceolatum*	✓	✓
Sapindaceae	*Atalaya hemiglauca*	✓	✓
	Dodonaea coriacea	✓	✓
	Dodonaea lanceolata var. *lanceolata*	✓	✓
	Dodonaea pachyneura	✓	
	Dodonaea petiolaris		✓
	Dodonaea viscosa subsp. *mucronata*	✓	✓
Scrophulariaceae	*Eremophila forrestii* subsp. *forrestii*	✓	
	Eremophila forrestii x *latrobei*		✓
	Eremophila fraseri subsp. *fraseri*	✓	
	Eremophila jucunda subsp. *pulcherrima*	✓	✓
	Eremophila latrobei subsp. *filiformis*	✓	
	Eremophila latrobei subsp. *glabra*		✓
	Eremophila latrobei subsp. *latrobei*	✓	
	Eremophila longifolia	✓	✓
Solanaceae	*Nicotiana benthamiana*	✓	✓
	Nicotiana occidentalis subsp. *obliqua*	✓	
	Solanum cleistogamum	✓	✓
	Solanum gabrielae	✓	✓
	Solanum horridum	✓	✓
	Solanum lasiophyllum	✓	✓
	**Solanum nigrum*	✓	
	Solanum phlomoides	✓	✓
Surianaceae	*Polygala glaucifolia*	✓	
	Stylobasium spathulatum	✓	✓

Family	Species (NB *denotes weed species)	Current Survey	Previous Surveys
Thymelaeaceae	*Pimelea forrestiana*	✓	
	Pimelea microcephala subsp. *microcephala*	✓	
Typhaceae	*Typha domingensis*	✓	
Violaceae	*Hybanthus aurantiacus*	✓	✓
Zygophyllaceae	*Tribulus hirsutus*	✓	✓
	Tribulus suberosus	✓	✓

Appendix 9

Floristic Analysis

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 1	29	1	42.1%	**Habitat:** Plains, slopes, crests and minor drainage. **Contributing species:** *Triodia* sp. (*epactia/pungens*), *Acacia inaequilatera, Senna glutinosa* subsp. *glutinosa, Indigofera monophylla, Cymbopogon ambiguus.* **Sites from the study area:** MI46 (ENV data). **Fire age:** 2 years to No sign of recent fire.
Group 2	6	1	39.1%	**Habitat:** Plains, slopes and crests. **Contributing species:** *Triodia brizoides, Acacia aneura, Acacia pruinocarpa, Solanum lasiophyllum, Acacia bivenosa, Senna glutinosa* subsp. x *luerssenii, Triodia* sp. (*epactia/pungens*). **Sites from the study area:** MNFRPC10. **Fire age:** No sign of recent fire.
Group 3	8	0	50.1%	**Habitat:** Drainage. **Contributing species:** *Eriachne aristidea, Indigofera monophylla, Bonamia erecta, Cleome viscosa, Rhynchosia minima, Solanum lasiophyllum, Gossypium australe, Stylobasium spathulatum, Acacia pyrifolia, Corymbia hamersleyana, Corchorus tectus, Hybanthus aurantiacus, Polymeria ambigua, Eragrostis eriopoda, Grevillea wickhamii, Aristida holathera, Triodia* sp. *(epactia/pungens), Gossypium robinsonii, Acacia tumida* var. *pilbarensis, *Cenchrus* sp. **Sites from the study area:** None. **Fire age:** 3 – 5 years to No sign of recent fire.
Group 4	43	16	43.9%	**Habitat:** Plains, slopes and crests. **Contributing species:** *Acacia pruinocarpa, Acacia inaequilatera, Corymbia hamersleyana, Ptilotus calostachyus, Hakea chordophylla, Goodenia stobbsiana, Triodia wiseana, Grevillea wickhamii, Eucalyptus leucophloia* subsp. *leucophloia, Acacia hilliana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835). **Sites from the study area:** MNF01, MNF06, MNF07, MNF08, MNF09, MNF12, MNF15, MNF16, MNF21, MI12 (ENV Data), MI27 (ENV Data), MI55 (ENV Data), MI58 (ENV Data), MI61 (ENV Data), MI62 (ENV Data). **Fire age:** Less than 1 year to No sign of recent fire.
Group 5	6	0	42.2%	**Habitat:** Drainages and plains. **Contributing species:** *Cleome viscosa, Duperreya commixta, Ptilotus obovatus* var. *obovatus, Pterocaulon* sp., *Atalaya hemiglauca, Eucalyptus victrix*, *Acacia citrinoviridis*, *Cenchrus* sp. **Sites from the study area:** None. **Fire age:** 1 – 2 years to No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 6	14	3	36.3%	**Habitat:** Drainages and gullies. **Contributing species:** *Eragrostis cumingii, Acacia bivenosa, Pterocaulon* sp.*., Aristida holathera, Dysphania rhadinostachya, Duperreya commixta, Cleome viscosa, Hybanthus aurantiacus, Eriachne mucronata, Gossypium robinsonii, Bulbostylis barbata, Androcalva luteiflora, Paraneurachne muelleri, Petalostylis labicheoides, Grevillea wickhamii, Corymbia hamersleyana, Themeda triandra, Acacia tumida* var. *pilbarensis, Triodia* sp. *(epactia/pungens*). **Sites from the study area:** MNF14, MNFRPS03, MNFRPS04. **Fire age:** Less than 1 year to No sign of recent fire.
Group 7	39	15	38.4%	**Habitat:** Slopes, drainages, gullies, crests, plains. **Contributing species:** *Corchorus lasiocarpus, Acacia bivenosa, Goodenia stobbsiana, Eriachne mucronata, Senna glutinosa* subsp. *glutinosa, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia, Triodia wiseana.* **Sites from the study area:** 1MNF02, MNF03, MNF04, MNF05, MNF10, MNF11, MNF13, MNF22, MI11 (ENV data), MI15 (ENV data), MI22 (ENV data), MI41 (ENV data), MI42 (ENV data), MI50 (ENV data), MI63 (ENV data). **Fire age:** 3 – 5 years to No sign of recent fire.
Group 8	4	0	41.0%	**Habitat:** Slopes and drainages. **Contributing species:** *Amaranthus undulatus, Boerhavia coccinea, Hybanthus aurantiacus, Melhania oblongifolia, Polycarpaea longiflora, Rhynchosia minima, Senna glutinosa* subsp. *glutinosa, Stemodia grossa, Boerhavia gardneri, Eriachne mucronata, Gomphrena cunninghamii, Indigastrum parviflorum, Tephrosia* sp. Fortescue (A.A. Mitchell 606), *Eriachne tenuiculmis, Grevillea pyramidalis* subsp. *leucadendron, Enneapogon lindleyanus, Hakea lorea* subsp. *lorea, Senna artemisioides* subsp. *oligophylla, Tinospora smilacina, Flueggea virosa* subsp. *melanthesoides, Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618), *Atalaya hemiglauca, Cleome viscosa, Cucumis variabilis, Eremophila longifolia, Euphorbia drummondii, Jasminum didymum* subsp. *lineare, Phyllanthus maderaspatensis, Corymbia hamersleyana, Acacia pyrifolia, Cymbopogon ambiguus, Triodia* sp. *(epactia/pungens)*. **Sites from the study area:** None. **Fire age:** Less than 1 year to 3 – 5 years.
Group 9	1	0	(less than two samples in group)	**Habitat:** Drainage. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** Not recorded.
Group 10	1	0	(less than two samples in group)	**Habitat:** Slope. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** 3 – 5 years.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 11	1	0	(less than two samples in group)	**Habitat:** Drainage. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 12	5	0	38.7%	**Habitat:** Drainages. **Contributing species:** *Ammannia baccifera, Eragrostis cumingii, Acacia pyrifolia, Cyperus squarrosus, Peplidium* sp. E Evol. Fl. Fauna Arid Aust. (A.S. Weston 12768), *Flueggea virosa* subsp. *melanthesoides, Euphorbia* sp. (*biconvexa/coghlanii/trigonosperma;* sterile), *Acacia trachycarpa, Amaranthus undulatus, Atalaya hemiglauca, Cleome viscosa, Eragrostis tenellula, Lobelia arnhemiaca, Phyllanthus maderaspatensis, Pluchea rubelliflora, Acacia coriacea* subsp. *pendens, Stemodia grossa, Sesbania cannabina, *Cenchrus* sp., *Eucalyptus victrix, Eucalyptus camaldulensis* subsp. *refulgens, Melaleuca linophylla, Melaleuca glomerata, Cyperus vaginatus.* **Sites from the study area:** None. **Fire age:** Less than 1 year to no sign of recent fire.
Group 13	3	0	39.8%	**Habitat:** Drainages. **Contributing species:** *Acacia bivenosa, Melhania oblongifolia, Panicum decompositum, Polymeria ambigua, Sesbania cannabina, Acacia coriacea* subsp. *pendens, Eragrostis tenellula, Pterocaulon* sp., *Rhynchosia minima, Acacia pyrifolia, Sorghum plumosum* var. *plumosum*. **Sites from the study area:** None. **Fire age:** 1 – 2 years to 3 – 5 years.
Group 14	4	0	40.2%	**Habitat:** Drainages. **Contributing species:** *Acacia pruinocarpa, Enneapogon polyphyllus, Acacia maitlandii, Aristida contorta, Cymbopogon ambiguus, Eremophila longifolia, Phyllanthus maderaspatensis, Pterocaulon* sp., *Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186), *Glycine canescens, Acacia aneura, Enteropogon ramosus, Isotropis forrestii, Rhagodia eremaea, Rhynchosia minima, Acacia pyrifolia, Themeda triandra, Cleome viscosa, Dicladanthera forrestii, Duperreya commixta, Enneapogon robustissimus, Eulalia aurea, Evolvulus alsinoides, Hybanthus aurantiacus, Ptilotus obovatus* var. *obovatus, Salsola australis, Sida fibulifera, Triodia longiceps, Triodia* sp. *(epactia/pungens), Eucalyptus victrix.* **Sites from the study area:** None. **Fire age:** 1 – 2 years to No sign of recent fire.
Group 15	1	0	(less than two samples in group)	**Habitat:** Plain. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 16	17	6	35.4%	**Habitat:** Drainages and gullies. **Contributing species:** *Pluchea dentex, Corchorus crozophorifolius, Pluchea rubelliflora, Pterocaulon* sp., *Melaleuca argentea, Gomphrena cunninghamii, Waltheria indica, Eragrostis tenellula, Amaranthus undulatus, Polycarpaea longiflora, Triodia* sp. *(epactia/pungens), Trachymene oleracea* subsp. *oleracea, Melaleuca glomerata, Gossypium robinsonii, Stemodia grossa, Rhynchosia minima, *Cenchrus* sp., *Eriachne tenuiculmis, Acacia tumida* var. *pilbarensis, Cymbopogon ambiguus, Phyllanthus maderaspatensis, Cleome viscosa, Tephrosia rosea* var. Fortescue creeks (M.I.H. Brooker 2186), *Acacia pyrifolia, Atalaya hemiglauca, Cyperus vaginatus, Acacia coriacea* subsp. *pendens, Eulalia aurea, Eucalyptus camaldulensis* subsp. *refulgens, Themeda triandra, Eucalyptus victrix.* **Sites from the study area:** MNF17, MNF18MNF19, MNF20, MNFRPC07, MNFRPC08. **Fire age:** Less than 1 year to No sign of recent fire.
Group 17	6	5	42.0%	**Habitat:** Drainages and gullies. **Contributing species:** *Solanum horridum, Eremophila jucunda* subsp. *pulcherrima, Senna glutinosa* subsp. *glutinosa, Triumfetta leptacantha, Ptilotus obovatus* var. *obovatus, Triodia* sp. *(epactia/pungens), Acacia hamersleyensis, Corymbia ferriticola, Corymbia hamersleyana, Acacia pruinocarpa, Eucalyptus leucophloia* subsp. *leucophloia, Eriachne mucronata, Cymbopogon ambiguus, Triodia wiseana.* **Sites from the study area:** MI20 (ENV data), MI30 (ENV data), MI59 (ENV data), MI60 (ENV data), MI64 (ENV data). **Fire age:** 3 – 5 years to No sign of recent fire.
Group 18	1	0	(less than two samples in group)	**Habitat:** Slope. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 19	1	0	(less than two samples in group)	**Habitat:** Plain. **Contributing species:** Group only contains one quadrat. **Sites from the study area:** None. **Fire age:** No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 20	34	34	40.8%	**Habitat:** Crests, slopes, drainages, gullies. **Contributing species:** *Schizachyrium fragile, Acacia spondylophylla, Scaevola browniana, Aristida holathera, Dampiera candicans, Eucalyptus xerothermica, Trachymene oleracea* subsp. *oleracea, Petalostylis labicheoides, Solanum phlomoides, Ptilotus calostachyus, Eriachne mucronata, Amphipogon sericeus, Eriachne pulchella, Grevillea wickhamii, Acacia hilliana, Hakea chordophylla, Corchorus lasiocarpus, Goodenia triodiophila, Corymbia hamersleyana, Eriachne lanata, Eucalyptus leucophloia* subsp. *leucophloia, Goodenia stobbsiana, Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Gompholobium oreophilum, Triodia wiseana.* **Sites from the study area:** MNFRPC01, MI01 (ENV data), MI03 (ENV data), MI04 (ENV data), MI05 (ENV data), MI07 (ENV data), MI08 (ENV data), MI09 (ENV data), MI14 (ENV data), MI17 (ENV data), MI18 (ENV data), MI19 (ENV data), MI21 (ENV data), MI24 (ENV data), MI25 (ENV data), MI28 (ENV data), MI31 (ENV data), MI32 (ENV data), MI33 (ENV data), MI34 (ENV data), MI35 (ENV data), MI36 (ENV data), MI37 (ENV data), MI38 (ENV data), MI39 (ENV data), MI40 (ENV data), MI44 (ENV data), MI47 (ENV data), MI48 (ENV data), MI51 (ENV data), MI52 (ENV data), MI53 (ENV data), MI57 (ENV data), MI65 (ENV data). **Fire age:** Less than 1 year since fire to No sign of recent fire.
Group 21	9	9	41.2%	**Habitat:** Gullies and drainages. **Contributing species:** *Solanum phlomoides, Solanum horridum, Ptilotus obovatus* var. *obovatus, Clerodendrum floribundum* var. *angustifolium, Ptilotus calostachyus, Cucumis variabilis, Acacia pyrifolia, Euphorbia biconvexa, Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618), *Androcalva luteiflora, Senna glutinosa* subsp. *glutinosa, Triodia wiseana, Cyperus cunninghamii* subsp. *cunninghamii, Trachymene oleracea* subsp. *oleracea, Corymbia ferriticola, Corchorus lasiocarpus, Jasminum didymum* subsp. *lineare, Acacia tumida* var. *pilbarensis, Goodenia stobbsiana, Grevillea wickhamii, Cymbopogon ambiguus, Gossypium robinsonii, Eucalyptus leucophloia* subsp. *leucophloia, Petalostylis labicheoides, Eriachne mucronata, Corymbia hamersleyana, Themeda triandra.* **Sites from the study area:** MNFRPC02, MI02 (ENV data), MI06 (ENV data), MI10 (ENV data), MI13 (ENV data), MI23 (ENV data), MI26 (ENV data), MI45 (ENV data), MI54 (ENV data). **Fire age:** Less than 1 year since fire to No sign of recent fire.
Group 22	10	3	42.1%	**Habitat:** Gullies, plains, slopes, crests. **Contributing species:** *Eucalyptus leucophloia* subsp. *leucophloia*, *Ptilotus roei, Acacia inaequilatera, Nicotiana rosulata* subsp. *rosulata, Triodia angusta, Triodia biflora*. **Sites from the study area:** MNFRPC03, MNFRPC04, MNFRPS01. **Fire age:** 3 – 5 years to no sign of recent fire.
Group 23	1	1	(less than two samples in group)	**Habitat:** Gully. **Contributing species:** *Aristida burbidgeae, Triodia biflora, Corchorus laniflorus.* **Sites from the study area:** MNFRPS02. **Fire age:** Very long unburnt.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 24	1	1	(less than two samples in group)	**Habitat:** Slope. **Contributing species:** *Eucalyptus xerothermica, Sida arenicola, Indigofera monophylla, Trachymene oleracea* subsp. *oleracea, Acacia inaequilatera.* **Sites from the study area:** MI16 (ENV data). **Fire age:** 1- 2 years.
Group 25	1	1	(less than two samples in group)	**Habitat:** Gully. **Contributing species:** *Acacia pruinocarpa, Amphipogon sericeus, Grevillea wickhamii, Acacia tumida* var. *pilbarensis, Ficus brachypoda, Cymbopogon ambiguus, Cyperus cunninghamii* subsp. *cunninghamii, Corymbia ferriticola, Eriachne tenuiculmis*. **Sites from the study area:** MI29 (ENV data). **Fire age:** No sign of recent fire.
Group 26	1	1	(less than two samples in group)	**Habitat:** Drainages. **Contributing species:** *Abutilon* sp. Dioicum (A.A. Mitchell PRP 1618), *Triodia wiseana, Eucalyptus leucophloia* subsp. *leucophloia, Sida echinocarpa, Gossypium robinsonii, Ptilotus nobilis* subsp. *nobilis.* **Sites from the study area:** MI43 (ENV data). **Fire age:** 1 – 2 years.
Group 27	1	1	(less than two samples in group)	**Habitat:** Drainages. **Contributing species:** *Cymbopogon ambiguus, Eriachne mucronata, Corymbia hamersleyana, Eucalyptus leucophloia* subsp. *leucophloia, Trachymene oleracea* subsp. *oleracea.* **Sites from the study area:** MI56 (ENV data). **Fire age:** 3 – 5 years.
Group 28	2	0	54.6%	**Habitat:** Plains. **Contributing species:** *Triodia lanigera, Acacia ancistrocarpa, Aristida holathera, Eucalyptus gamophylla, Acacia pachyacra, Cleome viscosa, Corchorus tectus, Cucumis variabilis, Cullen leucochaites, Eragrostis eriopoda, Eriachne aristidea, Hakea lorea* subsp. *lorea, Portulaca oleracea/intraterranea, Ptilotus polystachyus, Senna artemisioides* subsp. *oligophylla.* **Sites from the study area:** None. **Fire age:** No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 29	3	0	42.1%	**Habitat:** Drainages. **Contributing species:** *Triodia* sp. (*epactia/pungens*), *Melaleuca linophylla, Eucalyptus victrix, Acacia trachycarpa, Chrysopogon fallax, Acacia coriacea subsp. pendens, Bulbostylis barbata, Cleome viscosa, Crotalaria cunninghamii, Cyperus squarrosus, Eragrostis cumingii, Eulalia aurea, Euphorbia sp. (biconvexa/coghlanii/trigonosperma;* sterile*), Evolvulus alsinoides, Fimbristylis microcarya, Gonocarpus ephemerus, Goodenia lamprosperma, Hybanthus aurantiacus, Ipomoea polymorpha, Lipocarpha microcephala, Phyllanthus erwinii, Phyllanthus maderaspatensis, Pluchea dentex, Senna notabilis, Trachymene oleracea* subsp. *oleracea.* **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 30	1	0	(less than two samples in group)	**Habitat:** Drainage. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** 3-5 years.
Group 31	1	0	(less than two samples in group)	**Habitat:** Plain. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** 3 – 5 years.
Group 32	6	0	42.0%	**Habitat:** Crests, and slopes. **Contributing species:** *Triodia lanigera, Indigofera monophylla, Senna glutinosa* subsp. *glutinosa, Goodenia stobbsiana, Polycarpaea holtzei, Bulbostylis barbata.* **Sites from the study area:** None. **Fire age:** 1 year to No sign of recent fire.
Group 33	4	0	41.6%	**Habitat:** Plains and minor drainages. **Contributing species:** *Aristida holathera, Triodia* sp. (epactia/pungens), *Eragrostis eriopoda, Paraneurachne muelleri, Acacia pachyacra, Ptilotus astrolasius, Acacia dictyophleba, Senna notabilis, Hakea lorea* subsp. *lorea, Goodenia microptera, Hibiscus sturtii, Sida echinocarpa, Acacia inaequilatera, Gossypium australe, Corymbia hamersleyana, Eulalia aurea, Euphorbia australis, Acacia sclerosperma* subsp. *sclerosperma, *Cenchrus sp., Euphorbia* sp. (*biconvexa/coghlanii/trigonosperma*; sterile). **Sites from the study area:** None. **Fire age:** 1 year to No sign recent fire.
Group 34	2	0	31.6%	**Habitat:** Plain, and slope. **Contributing species:** *Triodia* sp. (*epactia/pungens*), *Eucalyptus leucophloia* subsp. *leucophloia, Acacia aneura, Acacia pruinocarpa, Eremophila forrestii* subsp. *forrestii, Petalostylis labicheoides.* **Sites from the study area:** None. **Fire age:** 3 years to No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 35	8	0	40.0%	**Habitat:** Plains, slopes and minor drainages. **Contributing species:** *Trianthema oxycalyptrum* var. *oxycalyptrum, Cajanus cinereus, *Cenchrus* sp., *Eucalyptus camaldulensis* subsp. *refulgens, Urochloa occidentalis, Eriachne ciliata, Convolvulus angustissimus* subsp. *angustissimus, Amaranthus undulatus, Tephrosia* sp. Fortescue (A.A. Mitchell 606), *Brachychiton acuminatus, Sida arenicola, *Cynodon dactylon.* **Sites from the study area:** None. **Fire age:** 3 years to No sign of recent fire.
Group 36	62	2	37.3%	**Habitat:** Plains, slopes, crests and minor drainages. **Contributing species:** *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), *Nicotiana rosulata* subsp. *rosulata, Ptilotus obovatus* var. *obovatus, Tephrosia* sp. Newman (A.A. Mitchell PRP 29*), Triodia angusta, Senna sericea, Convolvulus angustissimus* subsp. *angustissimus, Dodonaea coriacea, Cajanus cinereus.* **Sites from the study area:** None. **Fire Age:** 2 years to No sign of recent fire.
Group 37	1	0	(less than two samples in group)	**Habitat:** Drainage. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 38	2	0	46.8%	**Habitat:** Plains and minor drainages. **Contributing species:** *Streptoglossa decurrens, *Cenchrus* sp., *Acacia kempeana, Psydrax latifolia, Sida ectogama, Acacia inaequilatera, Maireana melanocoma, Acacia bivenosa, Acacia sclerosperma* subsp. *sclerosperma, Alectryon oleifolius* subsp. *oleifolius, Bergia trimera, Cassytha capillaris, *Cynodon dactylon, Cyperus bulbosus, Eremophila cuneifolia, Eriachne pulchella, Eucalyptus camaldulensis* subsp. *refulgens, Eucalyptus victrix, Helichrysum luteoalbum, Indigofera linifolia, Marsilea hirsuta, Nicotiana benthamiana, Ptilotus helipteroides, Rhodanthe floribunda, Senna glutinosa* subsp. *pruinosa, Senna sericea, Senna* sp. Meekatharra (E. Bailey 1-26). **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 39	23	0	40.5%	**Habitat:** Plains and minor drainages. **Contributing species:** *Heliotropium heteranthum, Zaleya galericulata* subsp. *galericulata, Swainsona formosa, Amaranthus undulatus, Acacia inaequilatera, Cajanus cinereus, Eucalyptus camaldulensis* subsp. *refulgens, Alternanthera denticulata, Senna glaucifolia, Eucalyptus socialis* subsp. *eucentrica, Psydrax latifolia, *Cynodon dactylon, Tephrosia* sp. Fortescue (A.A. Mitchell 606), *Psydrax suaveolens, Sida arenicola, Urochloa occidentalis, Sida ectogama, Trianthema oxycalyptrum* var. *oxycalyptrum, Maireana melanocoma, *Cenchrus* sp. **Sites from the study area:** None. **Fire age:** 3-5 years to No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 40	9	0	49.1%	**Habitat:** Plains, slopes, and minor drainages. **Contributing species:** *Eragrostis leptocarpa, *Cenchrus* sp., Cajanus cinereus, Acacia ayersiana, Trianthema oxycalyptrum* var. *oxycalyptrum, Urochloa occidentalis, Eriachne ciliata, Psydrax suaveolens, Themeda* sp. Hamersley Station (M.E. Trudgen 11431), *Convolvulus angustissimus* subsp. *angustissimus, Tephrosia* sp. Fortescue (A.A. Mitchell 606), *Maireana pyramidata, Triodia angusta.* **Sites from the study area:** None. **Fire Age:** 3 - 5 years to No sign of recent fire.
Group 41	12	0	36.3%	**Habitat:** Plains and minor drainages. **Contributing species:** *Trianthema oxycalyptrum* var. *oxycalyptrum, Calytrix carinata, Eriachne ciliata, Jasminum didymum* subsp. *lineare, Blumea tenella, Acacia monticola, Senna sericea, Pentalepis trichodesmoides, Peripleura virgata, Urochloa subquadripara, Acacia pyrifolia, Indigofera boviperda* subsp. *boviperda, Acacia ancistrocarpa, Indigofera fractiflexa* subsp. *fractiflexa, Isotropis forrestii, Corymbia hamersleyana, Menkea villosula.* **Sites from the study area:** None. **Fire age:** 3 - 5 years to No sign of recent fire.
Group 42	10	0	37.1%	**Habitat:** Drainages. **Contributing species:** *Psydrax latifolia, Hakea chordophylla, Trianthema oxycalyptrum* var. *oxycalyptrum, Bonamia erecta, Maireana melanocoma, Typha domingensis, Gonocarpus ephemerus, Senna sericea, Jasminum didymum* subsp. *lineare, Acacia ancistrocarpa, Blumea tenella, Themeda sp*. Hamersley Station (M.E. Trudgen 11431), *Ipomoea lonchophylla, Cyperus squarrosus, Santalum spicatum, Corymbia ferriticola, *Cynodon dactylon, Goodenia nuda, Dysphania kalpari, Crotalaria novae-hollandiae* subsp. *novae-hollandiae, Acacia pyrifolia, Sida arsiniata, Gossypium sturtianum* var. *sturtianum, Amphipogon sericeus, Rostellularia adscendens, Sida arenicola, Lepidium pedicellosum, Tribulus hirsutus, Indigofera boviperda* subsp. *boviperda, Peripleura virgata, Nicotiana rosulata* subsp. *rosulata, Sida ectogama, Tephrosia* sp. Fortescue (A.A. Mitchell 606). **Sites from the study area:** None. **Fire age:** 3-5 years – No sign recent fire.
Group 43	57	0	38.9%	**Habitat:** Drainages, plains and slopes. **Contributing species:** *Trianthema oxycalyptrum* var. *oxycalyptrum, Acacia aneura, Eulalia aurea, Eragrostis xerophila, Hakea chordophylla, Indigofera boviperda* subsp. *boviperda, Swainsona formosa, Blumea tenella, Peripleura virgata, Gonocarpus ephemerus, Sida arenicola, Heliotropium crispatum, Solanum phlomoides, Cheilanthes sieberi* subsp. *sieberi, Portulaca oleracea/intraterranea, Senna sericea, Heliotropium cunninghamii, Marsilea hirsuta, Amaranthus undulatus, Eremophila forrestii x latrobei, Urochloa occidentalis, Hibiscus brachysiphonius, Acacia coriacea* subsp. *pendens.* **Sites from the study area:** None. **Fire age:** 3-5 years to No sign of recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 44	23	0	42.0%	**Habitat:** Drainage, plains, slopes. **Contributing species:** *Tribulus suberosus, Jasminum didymum* subsp. *lineare, Peripleura virgata, Convolvulus clementii, Senna sericea, Ptilotus obovatus* var. *obovatus, Acacia coriacea* subsp. *pendens, Acacia subtiliformis, Cajanus cinereus, Streptoglossa liatroides, Tephrosia* sp. Newman (A.A. Mitchell PRP 29), *Calytrix carinata, Ipomoea lonchophylla, Acacia monticola, Gonocarpus ephemerus, Acacia ancistrocarpa* x *trachycarpa, Alectryon oleifolius* subsp. *oleifolius, Dodonaea coriacea, Bulbostylis barbata, Blumea tenella, Nicotiana rosulata* subsp. *rosulata, Marsilea hirsuta.* **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 45	4	0	35.5%	**Habitat:** Drainage and gullies. **Contributing species:** *Eragrostis xerophila, Trianthema oxycalyptrum* var. *oxycalyptrum, Indigofera boviperda* subsp. *boviperda, Heliotropium crispatum, Streptoglossa decurrens, Amaranthus undulatus, Peripleura virgata, Senna sericea, Sida arsiniata, Santalum lanceolatum, Menkea villosula, Blumea tenella, Corymbia ferriticola, Psydrax latifolia, Alternanthera nana, Bothriochloa ewartiana, Cajanus cinereus, Corchorus tectus, *Cynodon dactylon, Eremophila forrestii* x *latrobei, Gonocarpus ephemerus, Hakea lorea* subsp. *lorea, Bonamia erecta, Cyperus squarrosus, Solanum phlomoides, Urochloa occidentalis.* **Sites from the study area:** None. **Fire Age:** No sign of recent fire.
Group 46	9	0	44.9%	**Habitat:** Slopes, plains and drainages. **Contributing species:** *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), *Flueggea virosa* subsp. *melanthesoides, Triodia angusta, Eriachne ciliata, Indigofera boviperda* subsp. *boviperda, Goodenia stobbsiana, Convolvulus angustissimus* subsp. *angustissimus, Brunonia australis, Cyperus squarrosus, Corchorus tectus, Cajanus cinereus, Acacia spondylophylla, Pentalepis trichodesmoides, Lotus cruentus.* **Sites from the study area:** None. **Fire age:** 3-5 years – No sign of recent fire.
Group 47	37	0	44.8%	**Habitat:** Plains and minor drainages. **Contributing species:** *Triodia melvillei, Peripleura virgata, Indigofera boviperda* subsp. *boviperda, Blumea tenella, Swainsona formosa, Acacia monticola, Jasminum didymum* subsp. *lineare, Trianthema oxycalyptrum* var. *oxycalyptrum, Sida* sp. Shovelanna Hill (S. van Leeuwen 3842), *Senna sericea, Ptilotus obovatus* var. *obovatus, Heliotropium cunninghamii, Corymbia hamersleyana, Calytrix carinata.* **Sites from the study area:** None. **Fire age:** 3-5 years – No sign recent fire.

Floristic Group	Total No. of Quadrats	No. of Quadrats in Study Area	% Similarity within Group	Floristic and Habitat Characteristics
Group 48	3	0	34.3%	**Habitat:** Drainages and gullies. **Contributing species:** *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), *Indigofera boviperda* subsp. *boviperda, Triodia angusta, Psydrax latifolia, Acacia ancistrocarpa, Amaranthus undulatus, Dicladanthera forrestii, Eriachne ciliata, Menkea villosula, Mimulus gracilis, Paspalidium jubiflorum, Senna sericea, Senna stricta, Peripleura virgata, Acacia marramamba, Blumea tenella, Bonamia erecta, Cheilanthes lasiophylla, Enteropogon ramosus, Evolvulus alsinoides, Gossypium sturtianum* var. *sturtianum, Ipomoea lonchophylla.* **Sites from the study area:** None. **Fire age:** 3-5 years to no sign of recent fire.
Group 49	2	0	36.7%	**Habitat:** Plains. **Contributing species:** *Triodia lanigera, *Cenchrus* sp., *Acacia inaequilatera, Amaranthus undulatus, Cajanus cinereus, Cyperus bifax, Eucalyptus camaldulensis* subsp. *refulgens, Exocarpos sparteus, Psydrax suaveolens, Sporobolus australasicus.* **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 50	1	0	(less than two samples in group)	**Habitat:** Drainage. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 51	3	0	38.3%	**Habitat:** Slopes. **Contributing species:** *Themeda* sp. Hamersley Station (M.E. Trudgen 11431), *Amaranthus* aff. *undulatus* (round leaves, short tepals), *Atalaya hemiglauca, Indigofera boviperda* subsp. *boviperda, Marsilea hirsuta, Menkea villosula, Peripleura virgata, Ptilotus obovatus* var. *obovatus, Swainsona formosa, Trichodesma zeylanicum* var. *grandiflorum,* **Sites from the study area:** None. **Fire age:** 3-5 years to No sign of recent fire.
Group 52	2	0	39.4%	**Habitat:** Plains. **Contributing species:** *Jasminum didymum* subsp. *lineare, Cajanus cinereus, Acacia aneura, Acacia inaequilatera, Acacia pyrifolia, Alectryon oleifolius* subsp. *oleifolius, *Cenchrus* sp., *Corymbia deserticola* subsp. *deserticola, *Cynodon dactylon, Paspalidium clementii, Peripleura virgata, Sida ectogama, Sida* sp. Shovelanna Hill (S. van Leeuwen 3842), *Tephrosia* sp. Newman (A.A. Mitchell PRP 29). **Sites from the study area:** None. **Fire age:** No sign of recent fire.
Group 53	1	0	(less than two samples in group)	**Habitat:** Crest. **Contributing species:** Group only contains one quadrat, not in study area. **Sites from the study area:** None. **Fire age:** 2 – 3 years.

Appendix 10

Summary of Major Previous Botanical Surveys Conducted within 40 km of the Study Area

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
NVCP Rehabilitation Survey (Biota 2016a)	Level 1 survey (single season) at South Flank and Hill 65, including rare flora searches and vegetation descriptions within 10 x 10 m quadrats. 23-27 May 2016	Hill 65: 10,810 ha South Flank: 12,294 ha	Hill 65: 11 rehab and 6 analogue sites. South Flank: 16 rehab and 4 analogue sites.	Adequate (33.9 mm)	• 141 native taxa • 2 weeds • 72 genera • 27 families	• No TECs or PECs. • No Threatened flora. • One Priority 3 species: *Rhagodia* sp. Hamersley (M. Trudgen 17794).	• Recently burnt areas of Hill 65 and South Flank limited number of sites established, and dictated placement. • Fewer analogue sites were established than expected.
Oxbow E8 Level 2 Vegetation and Flora Survey (Biota 2016b)	Level 2 survey (two phase seasonal), including rare flora searches, vegetation descriptions and mapping. 12-13 July 2014 and 29 April – 3 May 2015	142.2 ha	14 quadrats and 8 relevés	Poor (~6.2 mm) & Optimal (278 mm)	• 294 native taxa • 19 weeds • 137 genera • 49 families	• No TECs or PECs. • No Threatened flora. • Three Priority flora species: *Rostellularia adscendens* var. *latifolia* (P3), Sida sp. Barlee Range (S. van Leeuwen 1642), and Goodenia *nuda* (P4).	• Three riparian vegetation types associated with Marillana Creek identified as being of local conservation value. • Not all vegetation units sampled with two quadrats due to size of study area.

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
Yandi JSW / Oxbow Vegetation and Flora Integration Report (Biota 2014b)	Integration of exiting data with a further botanical survey to provide additional information on the values associated with the Yandi JSW and Oxbow study areas. 27 February – 4 March 2012	NA – integration of collective reports	16 quadrats	Optimal (353 mm)	• 343 taxa • 17 weeds	• No TECs or PECs. • No Threatened flora. • Three Priority flora species: *Rostellularia adscendens* var. *latifolia* (P3), *Goodenia nuda* (P4) and *Lepidium catapycnon* (P4) (revised from Threatened to Priority 4 since the survey).	• One vegetation association of high conservation significance at both JSW and Oxbow
Yandi Additional Areas Vegetation and Flora Level 2 Assessment (Biota 2014c)	Single phase Level 2 flora assessment including quadrat sampling, rare for a searches, and vegetation mapping. 12-18 June 2012	2,828 ha	36 quadrats 9 relevés	Adequate (59 mm)	• 313 native taxa • 14 weeds • 125 genera • 45 families	• No TECs or PECs. • No Threatened flora. • One Priority flora species: *Goodenia nuda* (P4).	• Two vegetation associations occurring in major creeklines (Marillana and Weeli Wolli creeks) represent ecosystems at risk according to Kendrick (Kendrick 2003).

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
Area C West to Yandi Level 2 Flora and Vegetation Survey (Onshore Environmental 2014a)	Two phase level 2 survey, including quadrat sampling, vegetation mapping, and rare flora searches. 21 May – 3 June 2011 19 July – 1 August 2012 20 – 29 August 2013	23,500 ha	170 quadrats	2011 Survey: Optimal (78.1 mm) 2012 Survey: Poor (4.4 mm) 2013 Survey: Optimal (91.3 mm)	• 428 taxa • 12 weeds • 174 genera • 58 families	• No TECs or PECs. • No Threatened flora. • 13 Priority flora species: Priority 1: *Aristida jerichoensis* var. *subspinulifera, Synostemon hamersleyensis,* and *Vittadinia* sp. Coondewanna Flats (S. Van Leeuwen 4684). Priority 2: *Spartothamnella puberula*. Priority 3: *Acacia effusa, Acacia subtiliformis, Gymnanthera cunninghamii, Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727), *Rostellularia adscendens* var. *latifolia, Sida* sp. Barlee Range (S. van Leeuwen 1642). Priority 4: *Acacia bromilowiana, Goodenia nuda, Rhynchosia bungarensis.*	• Nil.
Southern Flank to Jinidi Level 2 Flora and Vegetation Survey (Biota 2012f)	Two phase level 2 flora and vegetation survey including, quadrat sampling, vegetation mapping, and rare flora searches. 22 March – 2 April 2011 22 – 31 August 2011	8,588 ha	67 quadrats 8 relevés	Optimal (274.3 mm) & Adequate (32.1 mm)	• 453 taxa • 15 weeds • 169 genera • 52 families	• No TECs or PECs. • No Threatened flora. • Nine Priority flora species: Priority 3: *Acacia subtiliformis, Goodenia lyrata, Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727), *Rostellularia adscendens* var. *latifolia*. Priority 4: *Eremophila magnifica* subsp. *magnifica, Goodenia nuda, Lepidium catapycnon* (listed as Threatened flora species at time of survey), *Ptilotus mollis*.	• 20 of the 67 quadrats were sampled twice. • Seven described vegetation associations considered to be of elevated conservation significance.

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
Flora and Vegetation Review – Yandi Study Area (Onshore Environmental 2011a)	Desktop and literature review, followed by targeted rare flora survey including vegetation mapping. 9-16 December 2010	13,200 ha	115 relevés	Adequate (71.4 mm)	Desktop review of 29 studies: • 452 taxa • 21 weeds • 178 genera • 56 families	• No TECs or PECs. • No Threatened flora. • Three Priority flora species: *Rostellularia adscendens* var. *latifolia* (P3), *Goodenia nuda* (P4) and *Lepidium catapycnon* (P4) (revised from Threatened to Priority 4 since the survey).	• Priority 1 PEC: Weeli Wolli Spring Community occurs approximately 9 km south of the study area.
Flora and Vegetation Survey: Area C and Surrounds (Onshore Environmental 2011b)	Level 2 flora and vegetation survey – review of previous surveys and assessment of two smaller areas. 26 November – 6 December 2009 9-18 February 2010 14-21 June 2010	29,411 ha	510 quadrats	2009 Survey: Poor (15 mm) 2010 Surveys: Optimal (68.2 mm) & Poor (19.6 mm)	• 479 native taxa • 10 weeds • 166 genera • 53 families	• No TECs or PECs. • No Threatened flora. • 15 Priority flora species: Priority 1: *Vittadinia* sp. Coondewanna Flats (S. Van Leeuwen 4684). Priority 2: *Aristida lazaridis*, *Spartothamnella puberula, Stylidium weeliwolli.* Priority 3: *Acacia subtiliformis, Aristida jerichoensis* var. *subspinulifera, Fimbristylis sieberiana, Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727), *Nicotiana umbratica, Rhagodia* sp. Hamersley (M. Trudgen 17794), *Rostellularia adscendens* var. *latifolia,* and *Sida* sp. Barlee Range (S. van Leeuwen 1642). Priority 4: *Eremophila magnifica* subsp. *magnifica, Goodenia nuda, Lepidium catapycnon.*	• *Lepidium catapycnon* (P4) has been downgraded from Threatened to a Priority 4 flora species since the survey. • Searches for rare flora in gorge habitats were difficult as they were often inaccessible.

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
Vegetation and Flora Surveys of the Oxbow and Junction South West Deposits, near Yandicoogina (Biota 2010)	Vegetation and flora survey of JSW and Oxbow deposits. JSW: 4-16 June 2007 27 July – 6 August 2008 3-9 June 2009 Oxbow: 27 July – 6 August 2008 3-9 June 2009	1,477 ha	JSW: 19 quadrats Oxbow: 11 quadrats	2007 Survey: Optimal (119.6 mm) 2008 Survey: Adequate (40 mm) 2009 Survey: Optimal (158 mm)	JSW: • 278 native taxa • 13 weeds Oxbow: • 220 native taxa • 13 weeds	• No TECs or PECs. • No Threatened flora. • Two Priority flora species: *Goodenia nuda* (P4) and *Lepidium catapycnon* (P4) (revised from Threatened to Priority 4 since the survey).	• One vegetation association of high conservation significance at both JSW and Oxbow.
Yandi Expansion Flora and Vegetation Survey (Biota 2004c)	Vegetation and Flora survey 30 August – 5 September 2004	2,455 ha	39 quadrats	Poor (17.8 mm)	• 319 native taxa • 13 weeds	• No TECs or PECs. • No Threatened flora. • Two Priority flora species (three additional species are no longer listed): *Sida* sp. Barlee Range (S. van Leeuwen 1642) (P3) and *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3).	• Unfavourable climatic conditions during the survey for identification of cryptic and annual species. • Quadrats were sampled once only.
Flora and Vegetation. Northern Transport Corridor. Yandicoogina Junction Project Area (Mattiske 1995a)	Single phase survey, including vegetation site sampling, vegetation mapping, and rare flora searches February 1995	23,300 ha	67 "opportunistic sites" or "transect sites"	No data recorded at Marillana recording station.	• 359 native taxa • 3 weeds • 158 genera • 57 families	• No TECs or PECs. • No Threatened flora. • One Priority 3 species: *Rhagodia* sp. Hamersley (M. Trudgen 17794).	• Large study area; difficulty accessing particular sites.

Project/Survey (Reference)	**Survey Methodology; Date of Field Survey**	**Size of Survey Area (ha)**	**Number of Sampling Sites**	**Seasonal Conditions (Total Rainfall in 3 Months Preceding Survey ¥)**	**Summary of Species Richness †**	**Features of Conservation Significance (Currently Listed):** • **Threatened Ecological Communities (TECs) / Priority Ecological Communities (PECs)** • **Threatened / Priority flora species**	• **Study Limitations and Other Comments**
Flora and Vegetation. Yandicoogina Junction Area (Mattiske 1995b)	Two phase survey, including vegetation site sampling, vegetation mapping, rare flora searches. Jan & Mar 1994, and Feb 1995	3,700 ha	113 "opportunistic sites" or "transect sites"	Adequate (31.8 mm) & no data recorded at Marillana for second phase.	• 367 native taxa • 6 weeds • 159 genera • 57 families	• No TECs or PECs. • No Threatened flora. • No Priority flora.	• Both surveys were conducted in the first three months of the year (January, February, March).
Flora and Vegetation. Southern Transport Corridor. Yandicoogina Junction Project Area (Mattiske 1995c)	Two phase survey, including vegetation site sampling, vegetation mapping, rare flora searches. Jan & Mar 1994, and Feb 1995	26,500 ha	116 "opportunistic sites" or "transect sites"	Adequate (31.8 mm) & no data recorded at Marillana for second phase.	• 426 native taxa • 6 weeds • 172 genera • 60 families	• No TECs or PECs. • No Threatened flora. • Three Priority flora species: • *Stylidium weeliwolli* (P2), *Rhagodia* sp. Hamersley (M. Trudgen 17794)(P3), and *Lepidium catapycnon* (P4).	• Recent fires and slightly less than optimal climatic conditions prior to the survey. • Difficulties accessing particular sites.