Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey

Memorandum to BHP Western Australian Iron Ore

27 October 2022

1 INTRODUCTION AND OBJECTIVES

Biologic Environmental Survey (Biologic) was commissioned by BHP Western Australia Iron Ore (BHP WAIO) to undertake a reconnaissance flora and vegetation survey for part of the Paddy Bore area within the Western Ridge Project area (herein the Survey Area) (Figure 1.1). The Survey Area is located directly south of BHP WAIO's Mt. Whaleback operations, approximately 2.2 kilometres (km) south-west of Newman, and covers approximately 513.46 hectares (ha) (Figure 1.1). Biologic conducted this field survey as part of a larger concurrent survey of potential pipeline options in the Western Ridge area, for which a separate report has been produced (Biologic, 2022b) (referred to in this memo as 'Pipelines Survey Area'). Sampling of both survey areas and subsequent vegetation type and condition mapping was completed simultaneously. As such, this memo report is not considered a standalone survey and its results and conclusions should be considered in conjunction with the Pipelines Survey Area.

The key objective of the single season reconnaissance flora and vegetation survey was to identify the flora and vegetation values to determine if there are any significant values that need to be considered during any future environmental approvals across the Survey Area. Species of significance considered during this assessment were derived as part of a desktop assessment for the Pipelines Survey Area, which encompassed a review of relevant literature and database searches for both survey areas.

Compliance

The survey was carried out in a manner consistent with the Western Australian Environmental Protection Authority (EPA), Department of Biodiversity Conservation and Attractions (DBCA) and BHP WAIO guidelines for the environmental surveying and reporting of flora and vegetation. The following guidelines, procedures and documents were used prior to, during and after completion of the field survey:

- EPA (2018) Statement of Environmental Principles, Factors and Objectives;
- EPA (2016a) Environmental Factor Guideline: Flora and Vegetation;
- EPA (2016b) Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment;
- BHP (2018a), BHP WAIO's Biological Survey Spatial Data Requirements (SPR-IEN-EMS-015); and
- BHP (2018b), BHP WAIO's Vegetation and Flora Survey Procedure (0124627).

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Mt Whaleback

Mt Newman
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G 5200277

AM 7000266

E 5203360

E 5203448

E 5203361

Mt Newman
24-25

AML7000244

NEWMAN

Marble Bar Rd

Great Northern Hwy

Legend

- Paddy Bore Survey Area
- Pipelines Survey Area
- BHP Tenement
- Operating Mine
- Local Road
- State Road

IBRA Region
- Gascoyne
- Pilbara

IBRA Subregion
- Augustus
- Fortescue
- Hamersley

N

biologic Environmental Survey

Scale: 1:98,500

0 2 4 Km

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994 Created 27/10/2022

TOM PRICE
PARABURDOO
NEWMAN

BHP WAIO

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Figure 1.1: Survey Area and regional location

2 METHODOLOGY

Desktop Assessment

The desktop assessment for flora and vegetation herein follows the methods of Biologic (2022b), which comprised a search of five databases (to generate a list of vascular flora taxa previously recorded within 40 km of the Survey Area, including introduced and significant taxa) and a review of 37 previous field surveys, all located within 10 km of the Survey Area. Detailed results of the desktop assessment is presented in Biologic (2022b).

Survey Type, Timing and Weather

A single season reconnaissance flora and vegetation survey of both survey areas (Paddy Bore and Pipelines) was undertaken over eight days, between 24 and 31 March 2021 (including mobilisation and demobilisation). Most of the Survey Area was sampled and traversed on the 25 and 30 March 2021. The daytime climatic conditions during the field survey consisted of clear skies and warm maximum temperatures ranging from 35.1°C and 38.6°C (BoM, 2021).

Rainfall in the months preceding the field survey was variable, with below long-term averages recorded through most of the dry and wet seasons. The exception to this was February, which recorded well above the long-term average for the month (169 mm compared with 72.3 mm) (Figure 2.1). The weeks preceding the survey received well below-average rainfall; 6.6 mm compared to an average of 41.7 mm. However, conditions within the Survey Area were still relatively wet, with a high number of annual or short-lived perennial flora taxa present and growing at the time of the field survey.

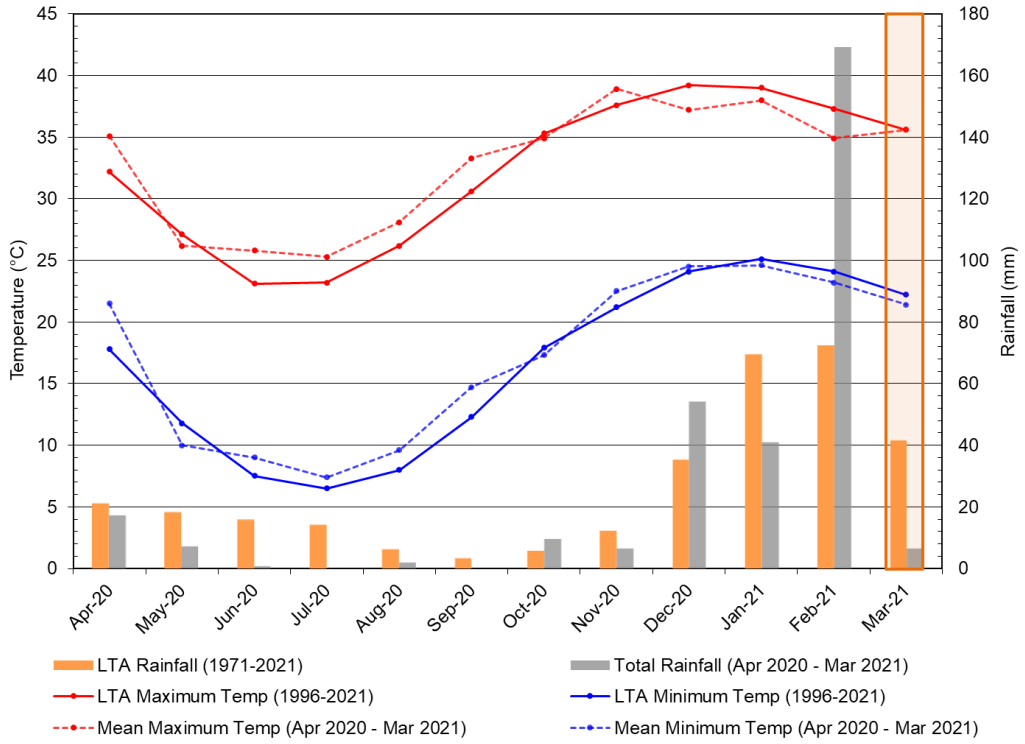

Figure 2.1: Monthly and long-term average rainfall and climatic data for Newman Airport (station 7176) (BoM, 2021) with approximate survey timing shaded orange.

Survey Team and Licensing

The field survey was led by Clinton van den Bergh, a principal botanist with over 14 years' experience. Clinton was assisted by botanist Mary van Wees. The collection of flora specimens was taken under flora collecting permit (FB62000105), pursuant to the *Biodiversity Conservation Act 2016* (BC Act) (Regulation 61). Clinton also holds a *Permit to Take Declared Rare Flora* for identification purposes (TFL 59-1819), issued under the BC Act, Section 40.

Field Survey

Reconnaissance Flora and Vegetation Survey

Aerial photography (Scale 1:15,000) of the Survey Area and Google Earth Pro©, were used with previous vegetation mapping (Beard, 1975; Shepherd *et al.*, 2002) and soil landscape mapping (Northcote *et al.*, 1960-1968), to determine broad preliminary vegetation unit boundaries prior to the field survey. Reconnaissance surveys are traditionally sampled at a low intensity via relevés (unmarked area within which data is collected; EPA, 2016b) and mapping points (unmarked area within which the vegetation unit and condition is broadly described).

Where practical, at least one relevé was established in each of the preliminary vegetation unit areas (Figure 2.2), to ensure that each vegetation unit was captured by the survey and described appropriately in accordance with EPA (2016b) and BHP (2018b) guidelines. The entire Survey Area was accessible via vehicle and on foot, with all the major landforms and vegetation units traversed and sampled.

A total of 21 relevé sites were sampled across the Survey Area, while an additional 148 relevé sites were sampled within the Pipelines Survey Area (Appendix A). Dominant vascular flora taxa within each relevé were recorded. Taxa not yet recorded from relevés or during site traverses, were recorded to document a comprehensive species list for the Survey Area. A brief summary of the condition and vegetation assemblage at each site was also recorded to aid in producing vegetation unit descriptions (NVIS Technical Working Group, 2017). In addition, the following information was recorded at each site:

- relevé number;
- date of survey;
- personnel;
- a central GPS coordinate (GDA 94);
- site photograph of the representative vegetation unit, generally facing south-east;
- soil characteristics (texture and colour);
- geology (type, size and nature of any rocks, stones, gravel, or outcropping);
- topography (landform type and aspect);
- vegetation condition;
- vegetation structure, including the dominant flora species in the three traditional strata, upper, mid and lower;
- disturbance (if present);
- approximate time since last fire; and
- GPS coordinates for significant or introduced flora.

Targeted Searches

Prior to the survey, a list of significant flora known, highly likely, likely or possible, to occur within the Survey Area was compiled as part of the desktop assessment. Field personnel familiarised themselves with photographs, reference samples and descriptions of these taxa before conducting the field survey. Once on the ground, personnel actively searched while traversing the Survey Area focussing on habitat and features considered likely to support significant flora (i.e., hill summits, gorges, and drainage lines) (Figure 2.2).

Where significant flora taxa were located in the field, a GPS coordinate of the individual was taken, or if the species existed within a small population, a central coordinate with an approximate 20 m radius was used. For larger populations the extent was mapped using a GPS to record the spatial extent of the population. Generalised information was collected for each occurrence, including a count or estimate of the number of individuals, reproductive status, condition and broad vegetation community and condition.

Threatened and Priority Flora Report Forms will be provided to the Parks and Wildlife Division (Parks and Wildlife) of DBCA, as required under the flora collecting permits. Significant flora specimens will be vouchered with the Western Australian Herbarium (WAH), where required and appropriate.

Flora

Nomenclature and Specimen Identification

Plant taxa that could not be identified during the field survey were collected, assigned a unique number for tracking purposes, and pressed for subsequent identification. Identifications were carried out by Biologic taxonomists, Dr Rachel Meissner and Mr Samuel Coultas, utilising the WAH's reference collection, taxonomic keys and reference material. All taxa were checked against Florabase© (version 2.9.31; WAH, 1998-) to ensure their currency and validity.

Specimens of flora taxa that were Threatened, Priority listed, unique or unusual, range extensions or new weed species for the region have been verified and vouchered (if appropriate) at the WAH.

Introduced Taxa

While completing the reconnaissance flora survey, any significant environmental weeds (Weeds of National Significance and Declared Pests listed under Section 22 of the *Biosecurity and Agriculture Management Act 2007* (BAM Act)) located in the Survey Area had their locations noted and searches were conducted within a minimum radius of 20 m from the given specimen, to document the number of individual plants and map the spatial extent of the infestation.

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WRP-004
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WRP-124
WRP-125
WRP-126
WRP-110
WRP-123
WRP-111
WRP-108
WRP-101
WRP-102
WRP-121

Legend

- Paddy Bore Survey Area
- Pipelines Survey Area
- Local Road
- Relevé - Pipelines
- Relevé - Paddy Bore
- Traverse

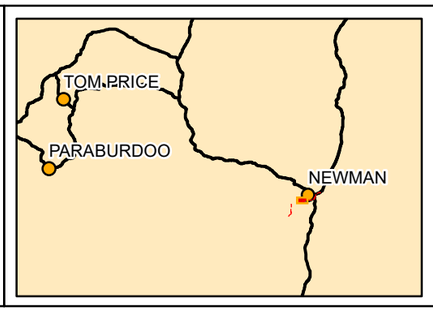
N

biologic Environmental Survey

Scale: 1:21,500

0 500 1,000 Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994 Created 27/10/2022



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Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey

Figure 2.2: Flora sample sites and traverses

Vegetation

Vegetation Mapping

Broad vegetation mapping was conducted in the field, with vegetation boundaries delineated over aerial photography. Following the field survey and completion of taxonomic identifications, the broad vegetation types were refined based on the review of floristic data collected from the relevés. The vegetation mapping was then digitised using geographic information systems (GIS) software.

Vegetation types were delineated and described from aerial imagery utilising flora sampling data. The vegetation structure information collected from the relevé and mapping points was reviewed to describe the vegetation associations based on the dominant taxa, foliar cover and height of the three traditional strata (upper, mid and lower/ground) (Appendix B). This method of vegetation type determination is consistent with EPA (2016b) and BHP (2018b).

The vegetation types have been described to Level 5 (Vegetation Association) in the NVIS hierarchical structure (NVIS Technical Working Group, 2017) and coded in accordance with BHP (2018b) standards. The mapping reliability is high across the Survey Area, with the majority of the Survey Area traversed and all vegetation units sampled.

Vegetation Condition

Vegetation condition was defined within the Survey Area using the BHP (2018b) vegetation condition scale which has been adapted from Keighery (1994) and Trudgen (1988), and is also presented in the EPA Technical Guidance (EPA, 2016b) (Appendix C). The vegetation condition was determined based on the level of disturbance observed in the area. Condition was recorded at each sampling site, while additional notes were taken while traversing the Survey Area and used to broadly map vegetation condition boundaries. The vegetation condition mapping was then digitised using GIS software.

Likelihood of Occurrence

Significant flora species identified in the database searches and previous reports were assessed per taxa for their likelihood of occurrence in the Survey Area. Biologic utilises botanical expertise and a decision matrix to guide the preliminary assessment prior to mobilisation. Following the field assessment, the occurrence assessment is reviewed taking into account ground-truthing of existing significant flora records and presence of potential habitat. The decision matrix is displayed in Table 2.1 and the full occurrence assessment (encompassing both preliminary and revised likelihood of occurrence) is given in Appendix D.

Table 2.1: Assessment of Occurrence Decision Matrix

		Habitat categories (within the Survey Area)			
		Core/ critical habitat present	**Suitable habitat present/ within known distribution**	**Marginal habitat present/ adjacent to known distribution**	**No suitable habitat present/ outside of known distribution**
Species Records / Occurrence Categories	**Recorded in the Survey Area**	Confirmed	Confirmed	Confirmed	Confirmed
	Recorded within <5 km	Highly Likely	Likely	Possible	Possible
	Recorded within 5-15 km	Likely	Possible	Possible	Unlikely
	Recorded within 15 -40 km	Possible	Possible	Unlikely	Unlikely
	Recorded >40 km	Possible	Unlikely	Unlikely	Highly Unlikely
	Species considered locally/regionally extinct	Unlikely	Unlikely	Highly Unlikely	Highly Unlikely

3 RESULTS

Desktop Assessment

The desktop assessment revealed a total of 35 significant flora as occurring within the search radius of 40 km (Appendix D). The literature review identified one significant taxon as having been previously recorded in the Survey Area. *Goodenia nuda* (P4) was recorded along the unsealed road that crosses the eastern half of the Survey Area by GHD (2011). A total of eight plants from four close-by point-locations were recorded. *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) was considered highly likely to occur, *Swainsona thompsoniana* (P3) was considered as likely to occur, and another nine taxa were assessed as possible to occur. The remaining 23 taxa were considered either unlikely or highly unlikely to occur within the Survey Area (Appendix D).

Field Survey

Flora Composition

A total of 131 confirmed vascular flora taxa from 25 families and 69 genera were recorded from the Survey Area during the field survey. The total number of confirmed vascular flora taxa comprised 127 native taxa and four introduced taxa (Appendix E). The total number of confirmed vascular flora taxa recorded from the Survey Area increases to 295, comprising 284 native and 11 introduced taxa (Appendix E), when combined with the taxa from the Pipelines Survey Area.

An additional two specimens could not be confirmed due to lack of diagnostic material for identification. Both of the unconfirmed taxa were identified down to genus level, with neither expected to be taxa of significance.

The dominant families equate to 56 % of the total taxa recorded and comprised Poaceae (31), Fabaceae (28), and Malvaceae (14). Of the 25 families recorded, seven were represented by one taxon, which equates to 5.3 % of the total taxa recorded.

The dominant genera make up 21 % of the total taxa recorded and comprised *Acacia* (13), *Ptilotus* (eight), and *Senna* (seven). Of the 69 genera recorded, 44 were represented by only one taxon, which equates to 34 % of the total taxa recorded.

Significant Flora

Threatened and Priority Flora

The desktop assessment identified one federal or state listed Threatened flora taxon (*Pityrodia augustensis*) as occurring near the Survey Area, however this species is restricted to Mount Augustus in the Gascoyne bioregion. The field survey confirmed that there were no threatened flora occurring, or likely to occur within the Survey Area due to no known records, distribution of these taxa, and a lack of preferred habitat.

No Priority Flora taxa were recorded from the Survey Area during the field survey.

Flora of other significance

The EPA (2016b) advises that flora species, subspecies, varieties, hybrids and ecotypes may be considered significant for reasons other than listing as a Threatened or Priority Flora taxa. This may include, but is not limited to, range extensions, keystone species, relic status, local endemism and anomalous features. Based on these features, one taxon (*Tribulopis angustifolia*) recorded from the Survey Area during the current assessment was considered to be flora of "other" significance.

Tribulopis angustifolia represents a range extension of approximately 125 km to the south. The closest record is located near to the Fortescue Marsh. Individuals were recorded from two sites within the Survey Area, with these being WRP-007 and WRP-115. This specimen has been vouchered with the WAH.

Introduced flora

Four introduced taxa were recorded from the Survey Area: **Bidens bipinnata, *Cenchrus ciliaris*, **Cenchrus setiger*, and **Malvastrum americanum* (Figure 3.1). The introduced taxa are not listed as Weeds of National Significance (WoNS) or Declared Pests (DPs) under the BAM Act, or as 'Priority Alert' weeds by Parks and Wildlife.

**Cenchrus ciliaris* and **Bidens bipinnata* were the most frequently observed introduced taxa occurring in the Survey Area (Table 3.1), with approximately 1,790 and 1,285 individuals being recorded respectively, predominantly along drainage lines and on floodplains. The number of individuals is considered to be an under-estimation due to survey coverage and the tendency for both introduced species to form large populations that are difficult to count/ estimate the number of individuals.

The remaining two introduced species, **Cenchrus setiger*, and **Malvastrum americanum*, were recorded from three or fewer locations (Table 3.1) and were recorded at floristic sites along drainage lines.

Table 3.1: Introduced flora taxa recorded within the Survey Area

Taxon	Number of locations	Approximate number of individuals recorded
**Bidens bipinnata*	8	1,790
**Cenchrus ciliaris*	22	1,285
**Cenchrus setiger*	1	500
**Malvastrum americanum*	3	40

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Legend

- Paddy Bore Survey Area
- Pipelines Survey Area
- Local Road

Taxon

- **Bidens bipinnata*
- **Cenchrus ciliaris*
- **Cenchrus setiger*
- **Malvastrum americanum*
- **Vachellia farnesiana*

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Scale: 1:21,500

0 500 1,000 Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994 Created 27/10/2022

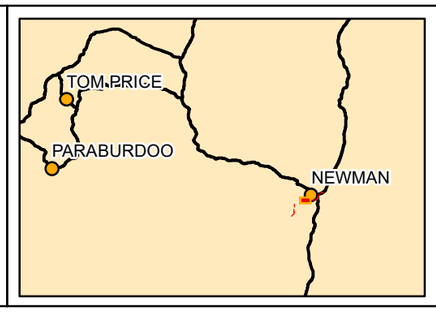

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Figure 3.1: Introduced flora recorded in the Survey Area

Vegetation

Broad Floristic Formations

Seven broad floristic formations were described from the Survey Area, based on the dominant growth form and land cover genus for the dominant stratum. The broad floristic formations were:

- *Acacia* low open woodland;
- *Acacia* tall open to sparse shrubland;
- *Acacia* tall shrubland to tall open shrubland;
- **Cenchrus* mid tussock grassland;
- *Eucalyptus* low open woodland;
- *Senna* mid to low sparse shrubland; and
- *Triodia* low hummock grassland.

The dominant broad floristic formation (based on extent across the Survey Area) was *Triodia* low hummock grassland (423 ha or 82.4 %), which supported a total of five vegetation types. The Acacia-dominated floristic formations (three formations) supported one vegetation type each, which together made up approximately 9.5 % of the Survey Area (48.7 ha). The introduced grass **Cenchrus ciliaris* dominated one floristic formation, encompassing two vegetation types, though this formation was limited to less than 2 % (8.2 ha) of the Survey Area. The remainder of the broad floristic formations, which included those dominated by *Eucalyptus* and *Senna*, supported one vegetation type each (Figure 3.2; Table 3.2).

Vegetation Types

A total of 12 vegetation types were described and delineated from the Survey Area (Figure 3.2; Table 3.2). The vegetation associations were located across six landforms: drainage area/ floodplain, hillcrest/ upper hillslope, hillslope and undulating low hill, stony plain, calcrete plain, and minor drainage line. All hill-type landforms were broadly grouped together as hillslope, as denoted by 'HS' at the beginning of the vegetation code.

The dominant landform across the Survey Area was hillslope at 66 % (338.6 ha) followed by drainage areas/ floodplains at 32.1 % (164.9 ha) (as denoted by 'FP').

Two mapping units were also delineated from the Survey Area; 'Cleared' and 'Rehab'. 'Cleared' consisted of roads, tracks and buildings/ infrastructure. Small patches of rehabilitation were observed in association with the Mt. Whaleback mine site and old tracks and were mapped as 'Rehab'. A total of 99 % of the Survey Area was comprised of native vegetation, including all vegetation types and the 'Rehab' mapping unit.

None of the vegetation types are considered to be analogous with any Threatened Ecological Community or Priority Ecological Community for the Pilbara region.

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Vegetation Type

- CP TragTpTw AbAsySeao Ese
- FP AaAinAte(±ExEg) CcEnpoChf BbClvAbl
- FP AaApAte SeglMam EnpoEmuAri Tp
- FP AadsAsiAte CcEnpoArc ChEx
- FP CcCsChf AaApAte Ex
- FP CcCsChf AciAaAin ExEgCocd
- FP EgCh TtCcPamu AdSalPl
- FP SeaoSesmSegl AaAsyAte ArcEnpoDar
- FP Tp(±Tw) AssAdErlo EnpoTtChf
- FP Trag(±Tw) AbAsyAsi EgExCh
- GP ErlcSeao ErfcEnpoDish(±AselAspe) AaAte
- HS Aa SeglErplErlt EnpoEmu
- HS Ts(±TragTw) AbHallAads SeahSeglErfs
- HS Tw AinAbAads EgEllCh
- Rehab
- Cleared

Legend

- Paddy Bore Survey Area
- Pipelines Survey Area
- Local Road

N

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Scale: 1:21,500

0 500 1,000 Meters

Coordinate System: GDA 1994 MGA Zone 50
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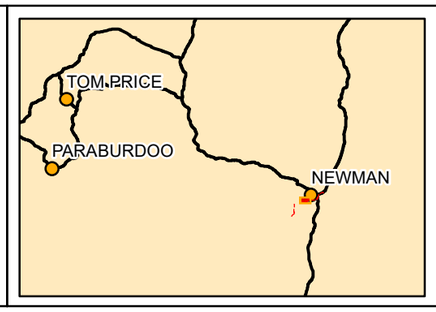

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Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey

Figure 3.2: Vegetation types in the Survey Area

Table 3.2: Vegetation type descriptions

Code	Description	Sample Sites	Extent (ha / %)	Significant features	Condition	Photo
Acacia low open woodland						
FP AaAinAte(±ExEg) CcEnpoChf BbClvAbl	Low open woodland of *Acacia aptaneura*, *Acacia incurvaneura*, and *Acacia tetragonophylla* (± *Eucalyptus xerothermica*, *Eucalyptus gamophylla*) over low open tussock grassland of **Cenchrus ciliaris*, *Enneapogon polyphyllus*, *Chrysopogon fallax* with low scattered herbs of **Bidens bipinnata*, *Arivela viscosa*, *Abutilon lepidum* on brown clay loam on drainage areas/ floodplains and minor drainage lines.	WRP-013, WRP-114, WRP-115	38.5 / 7.5	• Nil	Very Good to Poor	
Acacia tall open to sparse shrubland						
HS Aa SeglErplErlt EnpoEmu	Tall open to sparse shrubland of *Acacia aptaneura* over mid sparse shrubland of *Senna glutinosa* subsp. × *luerssenii*, *Eremophila* ?*platycalyx*, and *Eremophila latrobei* over low scattered tussock grasses of *Enneapogon polyphyllus*, and *Eriachne mucronata* on brown silty loam on hillslopes and upper hillslopes/ hillcrests.	WRP-010, WRP-012	6.1 / 1.2	• Nil	Excellent to Very Good	
Acacia tall shrubland to tall open shrubland						
FP AaApAte SeglMam EnpoEmuAri Tp	Tall shrubland to tall open shrubland of *Acacia aptaneura*, *Acacia paraneura* and *Acacia tetragonophylla* over mid to low scattered shrubs of *Senna glutinosa* subsp. × *luerssenii*, and *Maireana melanocoma* over low scattered, tussock and hummock grasses of *Enneapogon polyphyllus*, *Eriachne mucronata*, *Aristida inaequiglumis* and *Triodia pungens* on brown clay loam on stony plains and drainage areas/ floodplains.	WRP-015	4.1 / 0.8	• Nil	Very Good	

Code	Description	Sample Sites	Extent (ha / %)	Significant features	Condition	Photo
**Cenchrus* mid tussock grassland						
FP CcCsChf AciAaAin ExEgCocd	Mid tussock grassland of **Cenchrus ciliaris*, **Cenchrus setiger*, and *Chrysopogon fallax* with tall open shrubland of *Acacia citrinoviridis*, *Acacia aptaneura*, and *Acacia incurvaneura* with low open woodland of *Eucalyptus xerothermica*, *Eucalyptus gamophylla*, and *Corymbia candida* subsp. *dipsodes* on brown clay loam on drainage areas/ floodplains.	WRP-018	7.2 / 1.4	• Nil	Good	
FP CcCsChf AaApAte Ex	Mid tussock grassland of **Cenchrus ciliaris*, **Cenchrus setiger*, and *Chrysopogon fallax* with tall sparse shrubland to scattered trees of *Acacia aptaneura*, *Acacia paraneura*, and *Acacia tetragonophylla* with low scattered trees of *Eucalyptus xerothermica* on brown clay loam on drainage areas/ floodplains and minor drainage lines.	WRP-016	1.0 / 0.2	• Nil	Degraded	
Eucalyptus low open woodland						
FP EgCh TtCcPamu AdSalPl	Low open woodland of *Eucalyptus gamophylla*, and *Corymbia hamersleyana* over mid to low open tussock grassland of *Themeda triandra*, **Cenchrus ciliaris*, and *Paraneurachne muelleri* with tall scattered shrubs of *Acacia dictyophleba*, *Santalum lanceolatum*, and *Petalostylis labicheoides* on brown loamy sand on drainage areas/ floodplains.	WRP-005, WRP-006, CVM01, CVM05	19.1 / 3.7	• Nil	Very Good to Good	

Code	Description	Sample Sites	Extent (ha / %)	Significant features	Condition	Photo
Senna mid to low sparse shrubland						
FP SeaoSesmSegl AaAsyAte ArcEnpoDar	Mid to low sparse shrubland of *Senna artemisioides* subsp. *oligophylla*, *Senna* sp. Meekatharra (E. Bailey 1-36), and *Senna glutinosa* subsp. × *luerssenii* with tall scattered shrubs of *Acacia aptaneura*, *Acacia synchronicia*, and *Acacia tetragonophylla* over low scattered tussock grasses of *Aristida contorta*, *Enneapogon polyphyllus*, and *Dactyloctenium radulans* on brown clay loam on drainage areas/ floodplain.	WRP-130	7.6 / 1.5	• Nil	Excellent	
Triodia low hummock grassland						
CP TragTpTw AbAsySeao Ese	Low hummock grassland of *Triodia angusta*, *Triodia pungens*, and *Triodia wiseana* with mid to tall sparse shrubland to scattered shrubs of *Acacia bivenosa* (wispy form), *Acacia synchronicia*, and *Senna artemisioides* subsp. *oligophylla* with low scattered tree of *Eucalyptus socialis* subsp. *eucentrica* on red-brown clay loam on calcrete stony plains and platforms.	WRP-003	3.3 / 0.6	• Nil	Very Good	
FP Trag(±Tw) AbAsyAsi EgExCh	Low hummock grassland of *Triodia angusta*, ± *Triodia wiseana* with mid to low scattered shrubs of *Acacia bivenosa*, *Acacia synchronicia*, and *Acacia sibirica* with occasional low scattered trees of *Eucalyptus gamophylla*, *Eucalyptus xerothermica*, and *Corymbia hamersleyana* on brown clay loam on low slopes, drainage areas/ floodplains and undulating hills.	WRP-008, CVM03	20.4 / 4.0	• Nil	Excellent to Very Good	

Code	Description	Sample Sites	Extent (ha / %)	Significant features	Condition	Photo
FP Tp(±Tw) AssAdErlo EnpoTtChf	Low hummock grassland of *Triodia pungens*, ± *Triodia wiseana* with mid to tall sparse shrubland of *Acacia sclerosperma* subsp. *sclerosperma*, *Acacia dictyophleba*, and *Eremophila longifolia* over mid to low sparse tussock grassland of *Enneapogon polyphyllus*, *Themeda triandra*, and *Chrysopogon fallax* on brown silty clay loam on drainage areas/ floodplains and minor drainage lines.	WRP-007, WRP-112	66.9 / 13.0	• Nil	Excellent to Good	
HS Ts(±TragTw) AbHallAads SeahSeglErfs	Low hummock grassland of *Triodia vanleeuwenii* ± *Triodia angusta*, and *Triodia wiseana* with mid to tall sparse shrubland to scattered shrubs of *Acacia bivenosa*, *Hakea lorea* subsp. *lorea*, and *Acacia adsurgens* over low scattered shrubs of *Senna artemisioides* subsp. *helmsii*, *Senna glutinosa* subsp. × *luerssenii*, and *Eremophila fraseri* subsp. *fraseri* on brown silty loam on undulating low hills.	WRP-004, WRP-011	106.2 / 20.7	• Nil	Very Good to Good	
HS Tw AinAbAads EgEllCh	Low hummock grassland of *Triodia wiseana* with mid to tall sparse shrubland to scattered shrubs of *Acacia inaequilatera*, *Acacia bivenosa*, and *Acacia adsurgens* with low scattered trees of *Eucalyptus gamophylla*, *Eucalyptus leucophloia* subsp. *leucophloia*, and *Corymbia hamersleyana* on brown silty loam on undulating hills and lower slopes.	WRP-009, WRP-014, WRP-017, WRP-113, CVM02, CVM04, CVM35	226.3 / 44.1	• Nil	Excellent to Very Good	
Cleared	Cleared	-	3.6 / 0.7	• Nil	Cleared	-
Rehab	Rehab	-	3.1 / 0.6	• Nil	Completely Degraded	-
Total			**513.5 / 100**			

Vegetation Condition

The condition of the vegetation within the Survey Area ranged from excellent to completely degraded (Figure 3.3). The majority of the vegetation was in very good or excellent condition (453.7 ha / 88.4 %). The main disturbances observed were associated with introduced flora and pastoralism. All four introduced flora taxa were recorded from minor drainage lines and floodplains. It is likely that the main introduced taxa, **Cenchrus ciliaris*, would have been transported across the Survey Area via pastoralism and cattle grazing. There were signs of cattle grazing and trampling across floodplains and stony plains, but absent from upper hillslopes and hillcrests.

Review of Occurrence Assessment

Goodenia nuda (P4) was identified by the literature review as occurring within the Survey Area but was not found during the field survey. Biologic did not have access to the coordinates for this taxon so were unable to check its exact location. Suitable habitat of mulga hardpan plains, minor drainage lines and floodplains was found across the Survey Area, however the species could have been missed due to the lower intensity of the reconnaissance survey. The likelihood of occurrence post-survey thus remains as confirmed to occur within the Survey Area.

Goodenia sp. East Pilbara (A.A. Mitchell PRP 727) (P3) was considered highly likely to occur prior to the field survey, with the closest record only 400 m away. This taxon is an annual or short-lived perennial but is likely to have been growing at the time of the survey if present. Suitable habitat (calcrete plains) was present as vegetation type CP TragTpTw AbAsySeao Ese, which comprised 3.3 ha or 0.6 % of the Survey Area. As the Survey Area was not intensively grid-searched, there is still a small possibility that *Goodenia* sp. East Pilbara (A.A. Mitchell PRP 727) (P3) may be present in the aforementioned vegetation type.

Swainsona thompsoniana (P3) was considered likely to occur within the Survey Area pre-survey. This taxon is an annual (or biennial) prostrate herb that flowers from April to August, and therefore is not likely to have been present and flowering during the March field survey. Most specimens of *Swainsona thompsoniana* (P3) held at the WAH have been found on cracking clays, which were not present in the Survey Area. Due to this lack of suitable habitat, the likelihood of occurrence for this taxon has been downgraded to unlikely post-survey.

One taxon, *Aristida lazaridis* (P2), was upgraded from unlikely to possible to occur post-survey. This species was recorded in a subsequent survey conducted by Biologic for BHP WAIO in the vicinity of the Survey Area (Biologic, 2022a). Furthermore, suitable habitat was found during the field survey.

Significant taxa from the desktop assessment considered possible and unlikely to occur pre-survey were downgraded to either unlikely or highly unlikely. Taxa which were large and conspicuous or where no suitable habitat was found within the Survey Area were downgraded one or two levels to highly unlikely. Small annual taxa which also had suitable habitat present either retained their pre-survey likelihood or were downgraded one level to unlikely/ highly unlikely. Reasoning behind the decision for each taxon is provided in Appendix D.

772000
774000
776000
778000
7410000
7408000

Legend

- Paddy Bore Survey Area
- Pipelines Survey Area
- Local Road

Vegetation Condition

- Excellent
- Very Good
- Good
- Poor
- Degraded
- Completely Degraded
- Cleared

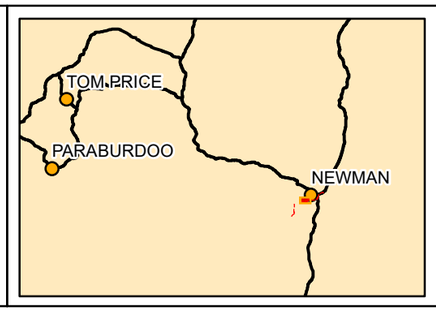
N

biologic Environmental Survey

Scale: 1:21,500

0 500 1,000 Meters

Coordinate System: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994 Created 27/10/2022



BHP WAIO

Western Ridge Paddy Bore Area Reconnaissance Flora and Vegetation Survey

Figure 3.3: Vegetation condition in the Survey Area

4 CONCLUSION

A single season reconnaissance flora and vegetation survey was completed over eight days as part of a larger concurrent survey of the Western Ridge Pipelines Survey Area. A total of 21 relevés were sampled in the Survey Area, with an additional 109 relevés being sampled in the adjacent Pipelines Survey Area. The floristic data recorded was used in conjunction with sample site data from the Pipelines Survey Area to determine the vegetation types and their condition within the Survey Area. All major vegetation types were visited and sampled. Work was completed to a level sufficient enough to meet EPA requirements. The key findings of the survey were:

- A total of 131 confirmed vascular flora taxa from 25 families and 69 genera, comprising 127 native and four introduced taxa;
- The desktop assessment identified one significant taxon that had been previously recorded within the Survey Area – four point-locations totalling eight individuals of *Goodenia nuda* (P4) was found by GHD in 2011 (GHD, 2011). No individuals of *Goodenia nuda* (P4) were recorded from the Survey Area during the field survey;
- No significant taxa were recorded in the Survey Area during the field survey
- One range extension, *Tribulopis angustifolia*, was recorded, with the closest existing record approximately 125 km to the north;
- Four introduced taxa were recorded from the Survey Area: **Bidens bipinnata*, **Cenchrus ciliaris*, **Cenchrus setiger*, and **Malvastrum americanum*. The introduced taxa are not listed as WoNS or DPs under the BAM Act, or as 'Priority Alert' weeds. **Cenchrus ciliaris* and **Bidens bipinnata* were the most frequently observed;
- Twelve vegetation units were described and delineated from seven broad floristic formations in the Survey Area;
- No Threatened or Priority Ecological Communities were recorded from the Survey Area; and
- The vegetation condition ranged from Degraded to Excellent, with the majority considered to be Excellent (56 %) or Very Good (32 %).

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6 APPENDICES

Appendix A: Sample Site Data

Western Ridge Pipeline **Site WRP-004**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776927 mE; 7410399 mN 119.7094 E -23.392771 S
Veg Condition	Very Good
Soil	Silty Loam
Rock Type	BIF
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	*Triodia vanleeuwenii* low open hummock grassland with *Acacia bivenosa*, *Acacia synchronicia* and *Acacia sibirica.*

SPECIES LIST

Name	Specimen
Abutilon lepidum	WRP004.03
Acacia bivenosa	
Acacia sibirica	WRP004.01
Acacia tetragonophylla	
Eremophila latrobei subsp. *latrobei*	
Fimbristylis simulans	
Goodenia muelleriana	
Hakea chordophylla	
Heliotropium ovalifolium	WRP004.02
Paraneurachne muelleri	
Ptilotus calostachyus	
Ptilotus clementii	
Senna glutinosa subsp. *pruinosa*	
Senna glutinosa subsp. x *luerssenii*	
Tribulus suberosus	
Triodia vanleeuwenii	

Western Ridge Pipeline **Site WRP-005**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776607 mE; 7410098 mN 119.7063 E -23.395538 S
Veg Condition	Very Good
Soil	Loamy Sand
Rock Type	None Discernible
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Eucalyptus gamophylla* and *Corymbia hamersleyana* low open woodland over Acacia *dictyophleba* tall scattered shrubs over *Paraneurachne muelleri*, *Eragrostis xerophila* and *Aristida holathera* var. *holathera* low sparse tussock grassland.

SPECIES LIST

Name	Specimen
Acacia dictyophleba	
Aristida holathera var. *holathera*	
Aristida inaequiglumis	WRP005.01
Corchorus lasiocarpus subsp. *parvus*	
Cucumis variabilis	
Cymbopogon ambiguus	
Enneapogon polyphyllus	
Eragrostis xerophila	WRP005.02
Eucalyptus gamophylla	
Hibiscus sturtii var. *campylochlamys*	WRP005.03
Indigofera monophylla	
Paraneurachne muelleri	
Rhynchosia minima	
Scaevola amblyanthera var. *centralis*	WRP005.04
Senna artemisioides subsp. *oligophylla*	
Triodia pungens	

Western Ridge Pipeline **Site WRP-006**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 777019 mE; 7410175 mN 119.7103 E -23.394774 S
Veg Condition	Good
Soil	Loamy Sand
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Minor Drainage Line
Vegetation	*Eucalyptus gamophylla* with occasional *Corymbia hamersleyana* low open woodland over *Themeda triandra*, **Cenchrus ciliaris* and *Eulalia aurea* mid open tussock grassland with *Santalum lanceolatum*, *Petalostylis labicheoides* and *Acacia dictyophleba* tall scattered shrubs.

SPECIES LIST

Name	Specimen
Abutilon cunninghamii	WRP006.01
Acacia dictyophleba	
Acacia tetragonophylla	
Aristida contorta	
**Cenchrus ciliaris*	
Corymbia hamersleyana	
Duperreya commixta	
Eragrostis xerophila	
Eucalyptus gamophylla	
Eulalia aurea	
Petalostylis labicheoides	
Pterocaulon sphacelatum	
Ptilotus astrolasius	
Ptilotus obovatus var. *obovatus*	
Santalum lanceolatum	
Themeda triandra	
Triodia pungens	

Western Ridge Pipeline **Site WRP-007**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776194 mE; 7409858 mN 119.7023 E -23.397774 S
Veg Condition	Very Good
Soil	Clay Loam
Rock Type	None Discernible
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Triodia pungens* low open hummock grassland with *Chrysopogon fallax*, **Cenchrus ciliaris* and *Paraneurachne muelleri* low sparse tussock grassland with *Acacia dictyophleba*, *Acacia sclerosperma* subsp. *sclerosperma* and *Hakea lorea* subsp. l*orea* mid to tall sparse shrubland with *Eucalyptus xerothermica* and *Corymbia hamersleyana* low scattered trees.

SPECIES LIST

Name	Specimen
Acacia aptaneura	WRP007.01
Acacia dictyophleba	
Acacia sclerosperma subsp. *sclerosperma*	
Acacia tetragonophylla	
**Cenchrus ciliaris*	
Chrysopogon fallax	
Dipteracanthus australasicus subsp. *australasicus*	
Enneapogon polyphyllus	
Eragrostis xerophila	WRP005.02
Eucalyptus xerothermica	
Euphorbia australis var. *subtomentosa*	
Euphorbia boophthona	
Evolvulus alsinoides var. *villosicalyx*	
Hakea lorea subsp. lorea	
Hibiscus sturtii var. *campylochlamys*	WRP005.03
Paraneurachne muelleri	
Pterocaulon sphacelatum	
Ptilotus helipteroides	
Ptilotus obovatus var. *obovatus*	
Senna artemisioides subsp. x *artemisioides*	
Sida fibulifera	
Sporobolus australasicus	
Themeda triandra	
Tribulopis angustifolia	WRP007.02
Triodia pungens	

Western Ridge Pipeline **Site WRP-008**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 775847 mE; 7409804 mN 119.6989 E -23.398315 S
Veg Condition	Excellent
Soil	Clay Loam
Rock Type	BIF
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	*Triodia angusta* low open hummock grassland with tall sparse scattered shrubland *Acacia tetragonophylla*, *Acacia synchronicia* and *Acacia aptaneura* with *Eucalyptus leucophloia* subsp. *leucophloia* low scattered trees.

SPECIES LIST

Name	Specimen
Acacia aptaneura	WRP08.01
Acacia bivenosa	
Acacia synchronicia	
Acacia tetragonophylla	
Eremophila cuneifolia	
Eriachne pulchella subsp. *pulchella*	
Eucalyptus leucophloia subsp. *leucophloia*	
Euphorbia australis var. *subtomentosa*	
Maireana melanocoma	
Senna glutinosa subsp. x *luerssenii*	
Triodia angusta	

Western Ridge Pipeline **Site WRP-009**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 775602 mE; 7409506 mN 119.6966 E -23.401047 S
Veg Condition	Excellent
Soil	Clay Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	Low *Triodia wiseana* hummock grassland with scattered shrubs of *Acacia inaequilatera*, *Acacia tetragonophylla* and *Acacia pruinocarpa.*

SPECIES LIST

Name	**Specimen**
Acacia pruinocarpa	
Acacia synchronicia	
Acacia tetragonophylla	
Aristida contorta	
Goodenia muelleriana	
Hakea lorea subsp. lorea	
Indigofera monophylla	
Ptilotus clementii	
Ptilotus exaltatus	
Senna artemisioides subsp. *oligophylla*	
Trichodesma zeylanicum var. *zeylanicum*	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-010**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 774066 mE; 7409500 mN 119.6816 E -23.401365 S
Veg Condition	Excellent
Soil	Clay Loam
Rock Type	BIF
Fire Age	Old (6+ yr)
Habitat	Hillcrest/ Upper Hillslope
Vegetation	*Acacia aptaneura* tall open shrubland with scattered *Eremophila latrobei* shrubs.

SPECIES LIST

Name	Specimen
Acacia aptaneura	WRP010.01
Acacia tetragonophylla	
**Cenchrus ciliaris*	
Dodonaea petiolaris	WRP010.02
Enneapogon polyphyllus	WRP010.05
Eremophila latrobei subsp. *latrobei*	
Eremophila platycalyx subsp. *pardalota*	
Eriachne mucronata	
Hibiscus burtonii	WRP010.04
Portulaca oleracea	
Rhagodia eremaea	
Senna artemisioides subsp. *helmsii*	
Senna artemisioides subsp. x *artemisioides*	WRP010.06
Tephrosia sp. Newman (A.A. Mitchell PRP 29)	WRP010.03
Tribulus suberosus	
Triodia pungens	

Western Ridge Pipeline **Site WRP-011**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 774177 mE; 7409307 mN 119.6827 E -23.403088 S
Veg Condition	Excellent
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Stony Plain
Vegetation	*Triodia vanleeuwenii* and *Triodia angusta* low hummock grassland with *Acacia bivenosa* and *Acacia synchronicia* mid to tall sparse shrubland with *Eucalyptus leucophloia* subsp. *leucophloia* and *Eucalyptus gamophylla* low scattered trees.

SPECIES LIST

Name	**Specimen**
Acacia bivenosa	
Acacia pachyacra	
Acacia synchronicia	
Acacia tetragonophylla	
Eucalyptus gamophylla	
Eucalyptus leucophloia subsp. *leucophloia*	
Senna artemisioides subsp. *oligophylla*	
Senna glutinosa subsp. *pruinosa*	
Triodia angusta	
Triodia vanleeuwenii	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-012**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 773573 mE; 7409617 mN 119.6767 E -23.400387 S
Veg Condition	Very Good
Soil	Silty Loam
Rock Type	BIF
Fire Age	Old (6+ yr)
Habitat	Boulders/ Rockpiles
Vegetation	*Acacia aptaneura* tall sparse shrubland over *Dodonaea petiolaris* mid open shrubland over *Eriachne mucronata* and **Cenchrus ciliaris* low sparse tussock grassland.

SPECIES LIST

Name	Specimen
Acacia aptaneura	WRP010.01
**Cenchrus ciliaris*	
Digitaria brownii	
Dodonaea petiolaris	WRP010.02
Enneapogon polyphyllus	
Eremophila platycalyx subsp. *pardalota*	
Eriachne mucronata	
Evolvulus alsinoides var. *decumbens*	
Perotis rara	
Sida fibulifera	
Tribulus suberosus	

Western Ridge Pipeline **Site WRP-013**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 772760 mE; 7409999 mN 119.6687 E -23.397077 S
Veg Condition	Very Good
Soil	Clay Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Acacia aptaneura*, *Acacia sibirica* and *Hakea lorea* subsp. *lorea* tall open shrubland with *Eucalyptus gamophylla* low scattered trees over *Triodia pungens* low open hummock grassland.

SPECIES LIST

Name	Specimen
Abutilon lepidum	WRP004.03
Abutilon sp. Pilbara (W.R. Barker 2025)	WRP013.02
Acacia aptaneura	WRP013.01
Acacia inaequilatera	
Acacia sibirica	WRP004.01
Arivela viscosa	
**Bidens bipinnata*	
Chrysopogon fallax	
Eucalyptus gamophylla	
Goodenia muelleriana	
Hakea lorea subsp. *lorea*	
Ptilotus helipteroides	
Senna artemisioides subsp. *oligophylla*	
Solanum cleistogamum	
Solanum lasiophyllum	
Triodia pungens	
Vigna lanceolata	

Western Ridge Pipeline **Site WRP-014**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 772759 mE; 7409633 mN 119.6688 E -23.400384 S
Veg Condition	Excellent
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	*Triodia wiseana* low hummock grassland with *Acacia inaequilatera*, *Senna glutinosa* subsp. *pruinosa* and *Senna glutinosa* subsp. x *luerssenii* mid to tall scattered shrubs.

SPECIES LIST

Name	Specimen
Acacia inaequilatera	
Aristida contorta	
Eremophila cuneifolia	
Euphorbia australis var. *subtomentosa*	
Indigofera monophylla	
Ptilotus astrolasius	
Ptilotus clementii	
Ptilotus rotundifolius	
Senna artemisioides subsp. *helmsii*	
Senna artemisioides subsp. *oligophylla*	
Senna glutinosa subsp. *pruinosa*	
Senna glutinosa subsp. x *luerssenii*	
Tribulus hirsutus	
Tribulus suberosus	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-015**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 775802 mE; 7409159 mN 119.6986 E -23.404142 S
Veg Condition	Very Good
Soil	Silty Clay Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Sandy/ Stony Plain
Vegetation	*Acacia aptaneura* tall scattered shrubs over windmill, *Aristida inaequiglumis* and *Dichanthium sericeum* subsp. *humilius* low scattered tussock grasses with *Triodia pungens* low scattered hummock grasses.

SPECIES LIST

Name	Specimen
Abutilon otocarpum	
Acacia aptaneura	WRP015.02
Aristida inaequiglumis	
Corchorus tridens	
Cynodon convergens	WRP015.01
Dactyloctenium radulans	
Dichanthium sericeum subsp. *humilius*	
Enneapogon polyphyllus	WRP015.03
Euphorbia biconvexa	
Heliotropium tenuifolium	
Indigofera linifolia	
**Malvastrum americanum*	
Portulaca oleracea	
Ptilotus helipteroides	
Rhagodia eremaea	
Rhynchosia minima	
Sida fibulifera	
Sida sp. Indet	
Solanum lasiophyllum	
Sporobolus australasicus	

Western Ridge Pipeline **Site WRP-016**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776023 mE; 7409197 mN 119.7008 E -23.403765 S
Veg Condition	Degraded
Soil	Clay Loam
Rock Type	None Discernible
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	**Cenchrus setiger*, **Cenchrus ciliaris* and *Panicum decompositum* mid tussock grassland with *Acacia aptaneura* and *Eucalyptus leucophloia* subsp. *leucophloia* low open woodland.

SPECIES LIST

Name	Specimen
Abutilon macrum	WRP016.01
Acacia aptaneura	WRP015.02
**Bidens bipinnata*	
**Cenchrus ciliaris*	
**Cenchrus setiger*	
Dipteracanthus australasicus subsp. *australasicus*	
Eucalyptus leucophloia subsp. *leucophloia*	
Evolvulus alsinoides var. *decumbens*	
**Malvastrum americanum*	
Panicum decompositum	
Psydrax latifolia	
Sporobolus australasicus	

Western Ridge Pipeline **Site WRP-017**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776692 mE; 7409583 mN 119.7072 E -23.400171 S
Veg Condition	Excellent
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	*Triodia wiseana* low hummock grassland with *Acacia inaequilatera*, *Acacia bivenosa* and *Senna glutinosa* subsp. *pruinosa* mid to tall sparse shrubland.

SPECIES LIST

Name	Specimen
Acacia bivenosa	
Acacia inaequilatera	
Acacia tetragonophylla	
Corchorus lasiocarpus subsp. *parvus*	
Eriachne mucronata	
Eucalyptus leucophloia subsp. *leucophloia*	
Goodenia muelleriana	
Heliotropium ovalifolium	WRP004.02
Ptilotus astrolasius	
Ptilotus clementii	
Scaevola amblyanthera var. *centralis*	WRP005.04
Senna artemisioides subsp. *oligophylla*	
Senna glutinosa subsp. *pruinosa*	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-018**

Date	25/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 776676 mE; 7409739 mN 119.7070 E -23.398769 S
Veg Condition	Good
Soil	Clay Loam
Rock Type	None Discernible
Fire Age	Old (6+ yr)
Habitat	Minor Drainage Line
Vegetation	**Cenchrus ciliaris*, *Chrysopogon fallax* and *Eragrostis xerophila* mid tussock grassland with *Eucalyptus xerothermica*, *Acacia aptaneura* and *Eucalyptus gamophylla* low open woodland

SPECIES LIST

Name	Specimen
Acacia aptaneura	
Acacia pruinocarpa	
Acacia tetragonophylla	
**Bidens bipinnata*	
**Cenchrus ciliaris*	
Chrysopogon fallax	
Eragrostis xerophila	WRP005.02
Eriachne mucronata	
Eucalyptus gamophylla	
Eucalyptus xerothermica	
**Malvastrum americanum*	
Paraneurachne muelleri	
Portulaca filifolia	
Ptilotus obovatus var. *obovatus*	
Senna artemisioides subsp. x *artemisioides*	
Sida fibulifera	
Themeda triandra	
Triodia pungens	

Western Ridge Pipeline **Site WRP-100**

Date	29/03/2021
Described by	CvdB & MvW
Type	Relevé
Location	MGA Zone 50 777344 mE; 7410220 mN 119.7135 E -23.394309 S
Veg Condition	Very Good
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Moderate (3 to 5 yr)
Habitat	Hillslope
Vegetation	*Triodia wiseana* low sparse hummock grassland with *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* low scattered trees over *Hakea lorea* subsp. *lorea*, *Senna glutinosa* subsp. *pruinosa* and *Acacia bivenosa* mid to tall scattered shrubs.

SPECIES LIST

Name	Specimen
Acacia bivenosa	
Bonamia pilbarensis	
Codonocarpus cotinifolius	
Corchorus sp. Indet	
Corymbia hamersleyana	
Dolichocarpa crouchiana	
Eucalyptus leucophloia subsp. *leucophloia*	
Hakea lorea subsp. *lorea*	
Hibiscus coatesii	CVopp.11
Indigofera monophylla	
Paraneurachne muelleri	
Ptilotus astrolasius	
Ptilotus calostachyus	
Ptilotus exaltatus	
Ptilotus polystachyus	
Senna artemisioides subsp. *oligophylla*	
Senna glutinosa subsp. *pruinosa*	
Senna notabilis	
Sida sp. Indet	
Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)	WRP100.01
Triodia vanleeuwenii	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-112**

Date	30/03/2021
Described by	CvdB
Type	Relevé
Location	MGA Zone 50 775146 mE; 7409770 mN 119.6921 E -23.398741 S
Veg Condition	Good
Soil	Silty Clay Loam
Rock Type	None Discernible
Fire Age	Moderate (3 to 5 yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Triodia pungens* low hummock grassland with **Cenchrus ciliaris*, *Chrysopogon fallax* and *Enneapogon polyphyllus* mid to low open tussock grassland with *Acacia dictyophleba* mid scattered shrubs with *Eucalyptus gamophylla* low scattered mallee trees.

SPECIES LIST

Name	Specimen
Abutilon cunninghamii	CVopp.14
Acacia dictyophleba	
Aristida contorta	
Aristida inaequiglumis	WRP005.01
Boerhavia coccinea	
**Cenchrus ciliaris*	
Chrysopogon fallax	
Corchorus incanus subsp. lithophilus	WRP046.02
Cucumis variabilis	
Cymbopogon ambiguus	
Enneapogon polyphyllus	
Eragrostis xerophila	WRP005.02
Eremophila longifolia	
Eucalyptus gamophylla	
Evolvulus alsinoides var. decumbens	
Goodenia vilmoriniae	
Hibiscus sturtii var. campylochlamys	WRP005.03
Paraneurachne muelleri	
Paspalidium constrictum	WRP112.01
Pterocaulon sphacelatum	
Ptilotus astrolasius	
Ptilotus exaltatus	
Ptilotus helipteroides	
Scaevola amblyanthera var. centralis	WRP005.04
Sida fibulifera	
Trichodesma zeylanicum var. zeylanicum	
Triodia pungens	

Western Ridge Pipeline **Site WRP-113**

Date	30/03/2021
Described by	CvdB
Type	Relevé
Location	MGA Zone 50 774825 mE; 7409691 mN 119.6890 E -23.399511 S
Veg Condition	Excellent
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Undulating Low Hills
Vegetation	*Triodia wiseana* low hummock grassland with *Acacia inaequilatera, Acacia maitlandii* and *Acacia adsurgens* mid to tall scattered shrubs.

SPECIES LIST

Name	Specimen
Acacia adsurgens	
Acacia inaequilatera	
Acacia maitlandii	
Acacia tetragonophylla	
Aristida contorta	
Corchorus incanus subsp. lithophilus	WRP046.02
Eremophila fraseri subsp. fraseri	
Eriachne mucronata	
Heliotropium tenuifolium	
Indigofera monophylla	
Ptilotus astrolasius	
Ptilotus exaltatus	
Ptilotus polystachyus	WRP045.01
Ptilotus rotundifolius	
Santalum lanceolatum	
Tribulus hirsutus	
Triodia wiseana	

Western Ridge Pipeline **Site WRP-114**

Date	30/03/2021
Described by	CvdB
Type	Relevé
Location	MGA Zone 50 774776 mE; 7409270 mN 119.6885 E -23.403316 S
Veg Condition	Degraded
Soil	Clay Loam
Rock Type	None Discernible
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Acacia aptaneura* low woodland over **Cenchrus ciliaris* and *Chrysopogon fallax* low open tussock grassland over **Bidens bipinnata* sparse herbland.

SPECIES LIST

Name	Specimen
Abutilon cryptopetalum	
Abutilon otocarpum	
Acacia aptaneura	
Acacia pruinocarpa	
Acacia pyrifolia var. *pyrifolia*	
**Bidens bipinnata*	
**Cenchrus ciliaris*	
Chrysopogon fallax	
Eucalyptus gamophylla	
Eucalyptus xerothermica	
Ptilotus exaltatus	
Trichodesma zeylanicum var. *zeylanicum*	

Western Ridge Pipeline **Site WRP-115**

Date	30/03/2021
Described by	CvdB
Type	Relevé
Location	MGA Zone 50 773431 mE; 7409249 mN 119.6754 E -23.403734 S
Veg Condition	Poor
Soil	Silty Clay Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Drainage Area/ Floodplain
Vegetation	*Acacia aptaneura*, *Eucalyptus xerothermica* and *Eucalyptus gamophylla* low woodland over *Digitaria ctenantha, *Cenchrus ciliaris, Enneapogon polyphyllus* and *Chrysopogon fallax* low open tussock grassland over **Bidens bipinnata* and *Arivela viscosa* low scattered herbs.

SPECIES LIST

Name	Specimen
Abutilon cryptopetalum	
Abutilon lepidum	
Acacia aptaneura	
Acacia pruinocarpa	
Acacia tetragonophylla	
Acrachne racemosa	
**Bidens bipinnata*	
**Cenchrus ciliaris*	
Chrysopogon fallax	
Dactyloctenium radulans	
Digitaria ctenantha	WRP019.03
Enneapogon polyphyllus	WRP019.04
Eucalyptus gamophylla	
Eucalyptus xerothermica	
Euphorbia biconvexa	
Gomphrena canescens	
Hibiscus burtonii	WRP010.04
Iseilema membranaceum	
Kennedia prorepens	
Perotis rara	
Portulaca oleracea	
Ptilotus helipteroides	
Rhynchosia minima	
Sporobolus australasicus	
Tribulopis angustifolia	
Triodia pungens	

Western Ridge Pipeline **Site WRP-130**

Date	31/03/2021
Described by	CvdB
Type	Relevé
Location	MGA Zone 50 776179 mE; 7409362 mN 119.7023 E -23.402249 S
Veg Condition	Excellent
Soil	Silty Loam
Rock Type	Dolerite
Fire Age	Old (6+ yr)
Habitat	Stony Plain
Vegetation	*Senna glutinosa* subsp. x *luerssenii* sparse mid shrubland over *Triodia pungens* and *Triodia wiseana* low sparse hummock grassland with *Acacia aptaneura, Acacia synchronicia* and *Acacia tetragonophylla* tall scattered shrubs

SPECIES LIST

Name	**Specimen**
Acacia aptaneura	
Acacia synchronicia	
Acacia tetragonophylla	
Anthobolus leptomerioides	
Aristida contorta	
Eremophila cuneifolia	
Maireana georgei	
Senna glutinosa subsp. x *luerssenii*	
Tribulus suberosus	
Triodia pungens	
Triodia wiseana	

Appendix B: Vegetation Structure Definition

NVIS Vegetation Structural Classifications

Cover Characteristics							
Foliage cover *	70-100	30-70	10-30	<10	≈0	0-5	unknown
Crown cover **	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
% Crown cover ***	>80	50-80	20-50	0.25-20	<0.25	0-5	unknown
Cover code	d	c	i	r	bi	bc	unknown

Growth Form	Height ranges (m)	Structural Formation Classes						
tree, palm	>30 Tall 10-30 Mid <10 Low	closed forest	open forest	woodland	open woodland	isolated trees	isolated clumps of trees	trees
tree mallee	10-30 Tall <10 Mid <3 Low	closed mallee forest	open mallee forest	mallee woodland	open mallee woodland	isolated mallee trees	isolated clumps of mallee trees	mallee trees
shrub, cycad, grass-tree, fern	>2 Tall 1-2 Mid <1 Low	closed shrubland	shrubland	open shrubland	sparse shrubland	isolated shrubs	isolated clumps of shrubs	shrubs
mallee shrub	10-30 Tall <10 Mid <3 Low	closed mallee shrubland	mallee shrubland	open mallee shrubland	sparse mallee shrubland	isolated mallee shrubs	isolated clumps of mallee shrubs	mallee shrubs
heath shrub	>2 Tall 1-2 Mid <1 Low	closed heathland	heathland	open heathland	sparse heathland	isolated heath shrubs	isolated clumps of heath shrubs	heath shrubs

Growth Form	Height ranges (m)	Structural Formation Classes						
chenopod shrub	>2 Tall 1-2 Mid <1 Low	closed chenopod shrubland	chenopod shrubland	open chenopod shrubland	sparse chenopod shrubland	isolated chenopod shrubs	isolated clumps of chenopod shrubs	chenopod shrubs
samphire shrub	>0.5 Low <0.5 Low	closed samphire shrubland	samphire shrubland	open samphire shrubland	sparse samphire shrubland	isolated samphire shrubs	isolated clumps of samphire shrubs	samphire shrubs
hummock grass	>2 Tall <2 Tall	closed hummock grassland	hummock grassland	open hummock grassland	sparse hummock grassland	isolated hummock grasses	isolated clumps of hummock grasses	hummock grasses
tussock grass	>0.5 Mid <0.5 Low	closed tussock grassland	tussock grassland	open tussock grassland	sparse tussock grassland	isolated tussock grasses	isolated clumps of tussock grasses	tussock grasses
other grass	>0.5 Mid <0.5 Low	closed grassland	grassland	open grassland	sparse grassland	isolated grasses	isolated clumps of grasses	other grasses
sedge	>0.5 Mid <0.5 Low	closed sedgeland	sedgeland	open sedgeland	sparse sedgeland	isolated sedges	isolated clumps of sedges	sedges
rush	>0.5 Mid <0.5 Low	closed rushland	rushland	open rushland	sparse rushland	isolated rushes	isolated clumps of rushes	rushes
forb	>0.5 Mid <0.5 Low	closed forbland	forbland	open forbland	sparse forbland	isolated forbs	isolated clumps of forbs	forbs
fern	>2 Tall 1-2 Tall <1 Low	closed fernland	fernland	open fernland	sparse fernland	isolated ferns	isolated clumpsof ferns	ferns
bryophyte	<0.5	closed bryophyte land	bryophyte land	open bryophyte land	sparse bryophyte land	isolated bryophytes	isolated clumps of bryophytes	bryophytes

Growth Form	Height ranges (m)	Structural Formation Classes						
lichen	<0.5	closed lichenland	lichenland	open lichenland	sparse lichenland	isolated lichens	isolated clumps of lichens	lichens
vine	>30 Tall	closed vineland	vineland	open vineland	sparse vineland	isolated vines	isolated clumps of vines	vines
	10-30 Med							
	<10 Low							
aquatic	<1 Tall	closed aquatic bed	aquatic bed	open aquatic bed	sparse aquatics	isolated aquatics	isolated clumps of aquatics	aquatics
	0-0.5 Low							
seagrass	<1 Tall	closed seagrass bed	Seagrass bed	open seagrass bed	sparse seagrass bed	isolated seagrasses	isolated clumps of seagrasses	seagrasses

From: NVIS Structural Formation Terminology (Australian Vegetation Attribute Manual Version 6.0 August 2003 http://www.environment.gov.au/erin/nvis/publications/avam/pubs/vegetation-attribute-manual-6.pdf)

* Foliage Cover is defined for each stratum as 'the proportion of the ground, which would be shaded if sunshine came from directly overhead'. It includes branches and leaves and is similar to the Crown type of Walker and Hopkins (1990) but is applied to a stratum or plot rather than an individual crown. It is generally not directly measured in the field for the upper stratum, although it can be measured by various line interception methods for ground layer vegetation. For the attribute COVER CODE in the Stratum table, the ground cover category refers to ground foliage cover not percentage cover.

** Crown Cover (canopy cover) as per Walker and Hopkins (1990). Although relationships between the two are dependent on season, species, species age etc. (Walker & Hopkins, 1990), the crown cover category classes have been adopted as the defining measure.

*** The percentage cover is defined as the percentage of a strictly defined plot area, covered by vegetation. This can be an estimate and is a less precise measure than using, for example, a point intercept transect methods on ground layer, or overstorey vegetative cover. That is for precisely measured values (e.g. crown densitometer or point intercept transects) the value measured would be 'foliage' cover. Where less precise or qualitative measures are used these will most probably be recorded as 'percentage' cover.

Appendix C: Vegetation Condition Definitions

Vegetation Condition Scale (adapted from Keighery (1994) and Trudgen (1988))

Condition Scale	Description
Excellent (1)	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good (2)	Some relatively slight signs of damage caused by human activities since European settlement. For example, some sings of damage to tree trunks cause by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good (3)	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor (4)	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded (5)	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded (6)	Areas that are completely or almost completely without native species in the structure of their vegetation; i.e., areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

Appendix D: Occurrence Assessment

Taxon	Conservation Code			Habit and Habitat	Habitat within Survey Area	Within Current Known Distribution	Distance to Nearest Record	Likelihood		Reasoning
	DBCA	BC Act	EPBC Act					Pre-survey	Post-survey	
Goodenia nuda	P4			Erect to ascending herb, to 0.5 m high. Fl. yellow, Apr to Aug. Red clay loam. Mulga hardpan plains, minor drainage lines, floodplains.	Yes	Yes	Within	Confirmed	Confirmed	Not found by the current survey but was confirmed to occur by GHD (2011).
Goodenia sp. East Pilbara (A.A. Mitchell PRP 727)	P3			Open, erect annual or biennial, herb, to 0.2 m high. Fl. yellow. Red-brown clay soil, calcrete pebbles. Low undulating plain, swampy plains.	Yes	Yes	0.4 km SE	Highly Likely	Possible	Species is a small annual and may be present in suitable habitat (calcrete plains) that was not intensively traversed.
Swainsona thompsoniana	P3			Prostrate annual herb, to 0.2m high, Fl. blue. Higher altitude floodplains, top of hilltops and cracking clays on red-brown clay.	Yes	Yes	1.5 km N	Likely	Unlikely	This species occurs mostly on cracking clays, which were not present in the Survey Area.
Hibiscus campanulatus	P1			Erect bushy shrub, 1-3.5 m high. Fl. White/pale pink. Brown loamy to skeletal soils. Rocky gullies, ironstone range.	Possible	Adjacent	10 km NW	Possible	Highly Unlikely	Species is large and conspicuous. Suitable habitat not present.
Ipomoea racemigera	P2			Creeping annual, herb or climber. Fl. white.	Possible	Yes	2.8 km NNW	Possible	Unlikely	Species may not have been present at time of survey, but usually occurs as riparian vegetation adjacent to larger drainage lines. Only limited minor drainage lines were found in the Survey Area.
Isotropis parviflora	P2			Shrub, 0.1 m high. Fl. white/pink, Mar. Valley slope of ironstone plateau.	Possible	Yes	14.9 km ENE	Possible	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Aristida jerichoensis var. *subspinulifera*	P3			Compactly tufted perennial, grass-like or herb, 0.3-0.8 m high, lemma groove muricate. Hardpan plains.	Possible	Yes	3.3 km NW	Possible	Possible	Suitable habitat present within Survey Area. Taxon is a short-lived perennial tussock grass that grows throughout the year depending on conditions. It therefore may not have been present at time of survey.
Eremophila sp. Hamersley Range (K. Walker KW 136)	P3			Erect shrub, 1-3 m high. Fl. White/pale blue. Red brown sandy clay loam. Upper slopes, gullies, gorges.	Possible	Yes	5 km NW	Possible	Highly Unlikely	Large and conspicuous shrub, limited suitable habitat present.
Gymnanthera cunninghamii	P3			Erect shrub, 1-2 m high. Fl. cream-yellow-green, Jan to Dec. Sandy soils.	Possible	Yes	4.8 km NE	Possible	Highly Unlikely	Sandy soils not found in Survey Area
Indigofera gilesii	P3			Shrub, to 1.5 m high. Fl. purple-pink, May or Aug. Pebbly loam. Amongst boulders & outcrops, hills.	Possible	Yes	12.8 km NNW	Possible	Unlikely	Large and conspicuous shrub, limited suitable habitat present.
Eremophila youngii subsp. lepidota	P4			Dense, spreading shrub, (0.2-)1-3 m high. Fl. purple-red-pink, Jan or Mar or Jun or Aug to Sep. Stony red sandy loam. Flats plains, floodplains, sometimes semi-saline, clay flats.	Possible	Yes	11.8 km NNE	Possible	Highly Unlikely	Some suitable habitat present, but taxon is large and conspicuous and unlikely to have been missed.
Lepidium catapycnon	P4			Open, woody perennial, herb or shrub, 0.2-0.3 m high, stems zigzag. Fl. white, Oct. Skeletal soils. Hillsides.	Yes	Adjacent	5.6 km NW	Possible	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Acacia corusca	P1			Shrub, 1.5-5(-7) m high. Red brown sandy loam soils. Hill slopes, hillcrests, drainage lines.	No	No	25.8 km ENE	Unlikely	Highly Unlikely	Taxon is large and conspicuous and unlikely to have been missed.
Eremophila capricornica	P1			Compact shrub, 0.2-0.5(-0.75) m high. Fl. blue-purple. Red brown loam soil. Hardpan plain over granite.	Possible	No	27.6 km ENE	Unlikely	Highly Unlikely	Suitable habitat found, but species is readily noticeable in the field.
Eremophila rhegos	P1			Erect shrub, ca 1 m high. Fl. blue-purple-white, Sep. Skeletal stony loam over granite.	No	No	27.6 km SE	Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Eremophila sp. West Angelas (S. van Leeuwen 4068)	P1			Spindly shrub, 0.4-3 m high. Skeletal brown-red soil or loam. Hill slopes and summits.	No	No	32.9 km NW	Unlikely	Highly Unlikely	
Vittadinia sp. Coondewanna Flats (S. van Leeuwen 4684)	P1			Erect annual herb, 0.3-1 m high. Fl. cream. Red-brown sandy loam. Drainage areas, floodplains, flat and/or stony plains.	Possible	Yes	22.6 km ESE	Unlikely	Unlikely	Unlikely to have been present and growing at time of survey. Suitable habitat found.
Aristida lazaridis	P2			Tufted perennial, grass-like or herb, 0.4-1.5 m high. Fl. green/purple, Apr. Sand or loam. Floodplains, drainage lines.	Possible	No	29.9 km NW	Unlikely	Possible	Suitable habitat present within the Survey Area. Recent adjacent records found by Biologic (2022a).
Euphorbia inappendiculata var. *inappendiculata*	P2			Prostrate annual herb, to 0.1 m high. Red brown clay loam. Flat plain, cracking clay floodplain, gentle slopes.	Possible	Yes	23.5 km E	Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Goodenia hartiana	P2			Erect to spreading, multistemmed perennial, herb or shrub (sub-shrub). Fl. blue-purple. Sand. Sand dune swales, sandhills.	No	No	20.9 km E	Unlikely	Highly Unlikely	
Oxalis sp. Pilbara (M.E. Trudgen 12725)	P2			Annual herb, 0.1-0.3 m high. Fl. Yellow. Brown sandy loam or clay. Gorge, ironstone outcrops, gully, shaded areas, creeklines.	Possible	Adjacent	41.2 km NW	Unlikely	Highly Unlikely	
Acacia subtiliformis	P3			Spindly, slender, erect shrub, to 3.5 m high, phyllodes green; inflorescence in heads to 6 mm diameter; peduncles red. Fl. yellow, Jun. On rocky calcrete plateau.	No	No	31 km NNW	Unlikely	Highly Unlikely	
Amaranthus centralis	P3			Annual herb, decumbent or erect to 0.6 m high. Red clay loam or sand. Flats, plains, granite outcrops, riverbanks.	No	No	39.4 km NE	Unlikely	Highly Unlikely	
Crotalaria smithiana	P3			Annual, herb, to 0.4 m high. Fl. yellow, Jun. Regeneration site on floodplain.	Possible	No	20.7 km NNE	Unlikely	Highly Unlikely	Unlikely to have been present and growing at time of survey. Suitable habitat found.

Taxon	Conservation Code			Habit and Habitat	Habitat within Survey Area	Within Current Known Distribution	Distance to Nearest Record	Likelihood		Reasoning
	DBCA	BC Act	EPBC Act					Pre-survey	Post-survey	
Eremophila magnifica subsp. *velutina*	P3			Shrub, 0.5-1.5 m high. Fl. blue-purple, Aug to Sep. Skeletal soils over ironstone. Summits.	No	Yes	26.9 km SE	Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Eremophila rigida	P3			Bushy shrub, 0.3-4 m high. Fl. cream, Sep. Red sand alluvium. Hardpan plains, stony clay depressions.	Possible	Yes	16.6 km S	Unlikely	Highly Unlikely	Taxon is large and conspicuous and unlikely to have been missed.
Maireana prosthecochaeta	P3			Open, densely-leaved shrub, 0.3-0.6 m high. Laterite. Hills, salty places.	No	No	21.2 km SSW	Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Rhagodia sp. Hamersley (M. Trudgen 17794)	P3			Tall spindly shrub, 1.5-4 m high. Fl. yellow. Red brown sandy loam or clay, ironstone plain. Undulating plains, floodplain.	Possible	Yes	17.6 km NNE	Unlikely	Highly Unlikely	Taxon is large and conspicuous and unlikely to have been missed.
Themeda sp. Hamersley Station (M.E. Trudgen 11431)	P3			Tussocky perennial, grass-like or herb, 0.9-1.8 m high. Fl. Aug. Red clay. Clay pan, grass plain.	Possible	Yes	23.7 km NNE	Unlikely	Highly Unlikely	
Triodia sp. Mt Ella (M.E. Trudgen 12739)	P3			Perennial, grass-like or herb, 0.4 m high. Light orange-brown, pebbly loam. Amongst rocks & outcrops, gully slopes.	No	Yes	15.3 km NNW	Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Acacia bromilowiana	P4			Tree or shrub, to 12 m high. Fl. yellow/pink, Jul to Aug. Red skeletal stony loam, orange-brown pebbly, gravel loam, laterite, banded ironstone, basalt. Rocky hills, breakaways, scree slopes, gorges, creek beds.	Possible	Yes	32.9 km NW	Unlikely	Highly Unlikely	
Eremophila magnifica subsp. *magnifica*	P4			Shrub, 0.5-1.5 m high. Fl. blue, Aug to Nov. Skeletal soils over ironstone. Rocky screes.	No	Adjacent	5.7 km NNW	Unlikely	Highly Unlikely	
Goodenia berringbinensis	P4			Ascending annual, herb, 0.1-0.3 m high. Fl. yellow, Oct. Red sandy loam. Along watercourses.	Possible	Yes	17.3 km ESE	Unlikely	Unlikely	Unlikely to have been present and growing at time of survey.
Dampiera metallorum	P3			Rounded, multistemmed perennial, herb, to 0.5 m high. Fl. blue, Apr or Jun to Oct. Skeletal red-brown gravelly soil over banded ironstone. Steep slopes, summits of hills.	No	No	45.9 km WNW	Highly Unlikely	Highly Unlikely	Marginal or unsuitable habitat present in Survey Area.
Pityrodia augustensis	T	VU	VU	Bushy shrub, ca 1 m high. Fl. purple/purple-red, Aug to Sep. Amongst rocks on slopes or in drainage lines.	No	No	>200 km SW	Highly Unlikely	Highly Unlikely	Taxon is large and conspicuous and unlikely to have been missed.

Appendix E: Flora Composition

Family	Taxon
Acanthaceae	*Dipteracanthus australasicus* subsp. *australasicus*
Amaranthaceae	*Gomphrena canescens*
	Ptilotus astrolasius
	Ptilotus calostachyus
	Ptilotus clementii
	Ptilotus exaltatus
	Ptilotus helipteroides
	Ptilotus obovatus var. *obovatus*
	Ptilotus polystachyus
	Ptilotus rotundifolius
Asteraceae	**Bidens bipinnata*
	Peripleura arida
	Pterocaulon sphacelatum
Boraginaceae	*Heliotropium ovalifolium*
	Heliotropium tenuifolium
	Trichodesma zeylanicum var. *zeylanicum*
Chenopodiaceae	*Maireana georgei*
	Maireana melanocoma
	Rhagodia eremaea
Cleomaceae	*Arivela viscosa*
Convolvulaceae	*Bonamia pilbarensis*
	Duperreya commixta
	Evolvulus alsinoides var. *decumbens*
	Evolvulus alsinoides var. *villosicalyx*
Cucurbitaceae	*Cucumis variabilis*
Cyperaceae	*Fimbristylis simulans*
Euphorbiaceae	*Euphorbia australis* var. *subtomentosa*
	Euphorbia biconvexa
	Euphorbia boophthona
Fabaceae	*Acacia adsurgens*
	Acacia aptaneura
	Acacia bivenosa
	Acacia dictyophleba
	Acacia inaequilatera
	Acacia maitlandii
	Acacia pachyacra
	Acacia pruinocarpa
	Acacia pyrifolia var. *pyrifolia*
	Acacia sclerosperma subsp. *sclerosperma*
	Acacia sibirica
	Acacia synchronicia
	Acacia tetragonophylla
	Indigofera linifolia
	Indigofera monophylla

Family	Taxon
Fabaceae cont.	*Isotropis iophyta*
	Kennedia prorepens
	Petalostylis labicheoides
	Rhynchosia minima
	Senna artemisioides subsp. *helmsii*
	Senna artemisioides subsp. *oligophylla*
	Senna artemisioides subsp. x *artemisioides*
	Senna glutinosa subsp. *glutinosa*
	Senna glutinosa subsp. *pruinosa*
	Senna glutinosa subsp. x *luerssenii*
	Senna notabilis
	Tephrosia sp. clay soils (S. van Leeuwen et al. PBS 0273)
	Tephrosia sp. Newman (A.A. Mitchell PRP 29)
	Vigna lanceolata
	Goodenia microptera
	Goodenia muelleriana
	Goodenia vilmoriniae
	Scaevola amblyanthera var. *centralis*
Gyrostemonaceae	*Codonocarpus cotinifolius*
Malvaceae	*Abutilon cryptopetalum*
	Abutilon cunninghamii
	Abutilon lepidum
	Abutilon macrum
	Abutilon otocarpum
	Abutilon sp. Pilbara (W.R. Barker 2025)
	Corchorus incanus subsp. *lithophilus*
	Corchorus lasiocarpus subsp. *parvus*
	Corchorus sp. Indet
	Corchorus tridens
	Hibiscus burtonii
	Hibiscus coatesii
	Hibiscus sturtii var. *campylochlamys*
	**Malvastrum americanum*
	Sida fibulifera
	Sida sp. Indet
Myrtaceae	*Corymbia hamersleyana*
	Eucalyptus gamophylla
	Eucalyptus leucophloia subsp. *leucophloia*
	Eucalyptus xerothermica
Nyctaginaceae	*Boerhavia coccinea*
Poaceae	*Acrachne racemosa*
	Aristida contorta
	Aristida holathera var. *holathera*
	Aristida inaequiglumis

Family	Taxon
Poaceae cont.	**Cenchrus ciliaris*
	**Cenchrus setiger*
	Chrysopogon fallax
	Cymbopogon ambiguus
	Cynodon convergens
	Dactyloctenium radulans
	Dichanthium sericeum subsp. *humilius*
	Digitaria brownii
	Digitaria ctenantha
	Enneapogon polyphyllus
	Enteropogon ramosus
	Eragrostis xerophila
	Eriachne mucronata
	Eriachne pulchella
	Eriachne pulchella subsp. *pulchella*
	Eulalia aurea
	Iseilema membranaceum
	Panicum decompositum
	Paraneurachne muelleri
	Paspalidium constrictum
	Perotis rara
	Sporobolus australasicus
	Themeda triandra
	Triodia angusta
	Triodia pungens
	Triodia vanleeuwenii
	Triodia wiseana
Portulacaceae	*Portulaca filifolia*
	Portulaca oleracea
Proteaceae	*Hakea chordophylla*
	Hakea lorea subsp. *lorea*
Rubiaceae	*Dolichocarpa crouchiana*
	Psydrax latifolia
Santalaceae	*Anthobolus leptomerioides*
	Santalum lanceolatum
Sapindaceae	*Dodonaea petiolaris*
Scrophulariaceae	*Eremophila cuneifolia*
	Eremophila fraseri subsp. *fraseri*
	Eremophila latrobei subsp. *latrobei*
	Eremophila longifolia
	Eremophila platycalyx subsp. *pardalota*
Solanaceae	*Solanum cleistogamum*
	Solanum lasiophyllum

Family	Taxon
Zygophyllaceae	*Tribulopis angustifolia*
	Tribulus hirsutus
	Tribulus suberosus