



Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 7272/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: BHP Billiton Iron Ore Pty Ltd

1.3. Property details

Property: Iron Ore (Mount Newman) Agreement Act 1972, Mineral Lease 244SA (AML 70/244)
Iron Ore (McCarney's Monster) Agreement Act 1972, Mining Lease 266SA (AM 70/266)
Miscellaneous Licence 47/92
Local Government Area: Shire of East Pilbara
Colloquial name: Orebody 36 Project

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
200		Mechanical Removal	Geotechnical Investigations, Access Tracks, Exploration, Hydrogeological Drilling and Associated Infrastructure

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 3 November 2016

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description Beard vegetation associations have been mapped for the whole of Western Australia. Two Beard vegetation associations have been mapped within the application area (GIS Database).

18: Low woodland; mulga (*Acacia aneura*); and
82: Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana*.

Onshore Environmental (2014 and 2016) have been used for a majority of the vegetation association mapping with some additional mapping around the north of Kurra Village provided by Onshore Environmental (2015) and ENV Australia (2009).

The Onshore Environmental 2014 survey identified the following 30 vegetation associations:

Cenchrus Tussock Grassland

MA CcCs EvAciAh: Tussock Grassland **Cenchrus ciliaris* and **Cenchrus setiger* with Low Woodland of *Eucalyptus victrix*, *Acacia citrinoviridis* and *Atalaya hemiglauca* on brown sandy loam on major drainage lines and adjacent flood plains.

MA CcTtEa ChCa AbAtpAsc: Tussock Grassland of **Cenchrus ciliaris*, *Themeda triandra* and *Eulalia aurea* with Low Open Woodland of *Corymbia hamersleyana* and *Corymbia aspera* over High Open Shrubland of *Acacia bivenosa*, *Acacia tumida* var. *pilbarensis* and *Acacia sclerosperma* subsp. *sclerosperma* on brown loamy sand on levee banks of major drainage lines.

Acacia Low Open Forest

HS AcaAaApr SaEIIAb TbrTw: Low Open Forest of *Acacia catenulata* subsp. *occidentalis*, *Acacia aptaneura* and *Acacia pruinocarpa* over Open Shrubland of *Scaevola acacioides*, *Eremophila latrobei* subsp. *latrobei* and *Acacia bivenosa* over Open Hummock Grassland of *Triodia brizoides* and *Triodia wiseana* on red brown clay loam on breakaways and steep hill slopes.

SP AaApr TmTwTp TtCfAin: Low Open Forest of *Acacia aptaneura* and *Acacia pruinocarpa* over Open Hummock Grassland of *Triodia melvillei*, *Triodia wiseana* and *Triodia pungens* over Tussock Grassland of *Themeda triandra*, *Chrysopogon fallax* and *Aristida inaequiglumis* on red brown loam on plains.

Acacia Low Open Woodland

FP AaAciApr AsyAscAb Tp: Low Open Woodland of *Acacia aptaneura*, *Acacia citrinoviridis* and *Acacia pruinocarpa* over Open Shrubland of *Acacia synchronicia*, *Acacia sclerosperma* subsp. *Sclerosperma* and *Acacia bivenosa* over Very Open Hummock Grassland of *Triodia pungens* on red brown clay loam on floodplains and medium drainage lines.

SP AaAprAx Eff Tp: Low Open Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Acacia xiphophylla* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* over Open Hummock Grassland of *Triodia pungens* on red brown sandy clay loam on stony plains.

Acacia Low Woodland

FP AaAprAca EffDpeSe AcoDamAin: Low Woodland of *Acacia aptaneura*, *Acacia pruinocarpa* and *Acacia catenulata* subsp. *occidentalis* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii*, *Dodonaea petiolaris* and *Sida ectogama* over Open Tussock Grassland of *Aristida contorta*, *Digitaria ammophila* and *Aristida inaequiglumis* on red orange clay loam on floodplains.

FP AcaAaEx Eff Tp: Low Woodland of *Acacia catenulata* subsp. *occidentalis*, *Acacia aptaneura* and *Eucalyptus xerothermica* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* over Open Hummock Grassland of *Triodia pungens* on red sandy loam on floodplains.

Acacia Shrubland

MI AmoAanPI ChEl TtAin: Shrubland of *Acacia monticola*, *Acacia ancistrocarpa* and *Petalostylis labicheoides* with Scattered Low Trees of *Corymbia hamersleyana* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Tussock Grassland of *Themeda triandra* and *Aristida inaequilatera* on red loamy sand on minor drainage lines.

Corymbia Low Open Woodland

MI CcAa CcCs Tb: Low Open Woodland of *Corymbia candida* subsp. *dipsodes* and *Acacia aptaneura* over Open Tussock Grassland of **Cenchrus ciliaris* and **Cenchrus setiger* and Very Open Hummock Grassland of *Triodia basedowii* on red brown loam on floodplains and minor drainage lines.

Corymbia Low Woodland

GG CfeElFb AhDvmAha CaEmuTmb: Low Woodland of *Corymbia ferritcola*, *Eucalyptus leucophloia* subsp. *leucophloia* and *Ficus brachypoda* over Open Shrubland of *Acacia hamersleyensis*, *Dodonaea viscosa* subsp. *mucronata* and *Astrotricha hamptonii* over Open Tussock Grassland of *Cymbopogon ambiguus*, *Eriachne mucronata* and *Themeda* sp. Mt Barricade on red brown loam along cliff lines and gorges.

Eucalyptus Low Open Forest

MA EcEvEx ApyAtpGr TtEaCp: 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* and *Cymbopogon procerus* on red brown clay loam on major drainage lines.

Eucalyptus Low Woodland

ME TtEaEte ApyAtpPI 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* on red brown silty loam on medium drainage lines and flood plains.

Eucalyptus Woodland

MA EcEv AciApyMg CcEaTt: Woodland of *Eucalyptus camaldulensis* subsp. *refulgens* and *Eucalyptus victrix* over High Open Shrubland of *Acacia citrinoviridis*, *Acacia pyrifolia* var. *pyrifolia* and *Melaleuca glomerata* over Tussock Grassland of **Cenchrus ciliaris*, *Eulalia aurea* and *Themeda triandra* on brown clay loam on banks of major drainage lines.

MA EvAciEc TrcCcrApy CcEaTt: Woodland of *Eucalyptus victrix*, *Acacia citrinoviridis* and *Eucalyptus camaldulensis* subsp. *refulgens* over Low Open Shrubland of *Tephrosia rosea* var. *clementii*, *Corchorus crozophorifolius* and *Acacia pyrifolia* var. *pyrifolia* over Very Open Tussock Grassland of **Cenchrus ciliaris*, *Eulalia aurea* and *Themeda triandra* on brown loamy sand on channels of major drainage lines.

Themeda Tussock Grassland

ME TtCfEa ExEvCh PIAPApy: Tussock Grassland of *Themeda triandra*, *Chrysopogon fallax* and *Eulalia aurea* with Low Open Woodland of *Eucalyptus xerothermica*, *Eucalyptus victrix* and *Corymbia hamersleyana* and Shrubland of *Petalostylis labicheoides*, *Acacia pachyacra* and *Acacia pyrifolia* var. *pyrifolia* on red sandy loam on medium drainage lines.

Triodia Hummock Grassland

CP TwTa Es AbPIApy: Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and Open Shrubland of *Acacia bivenosa*, *Petalostylis labicheoides* and *Acacia pyrifolia* var. *pyrifolia* on light brown clay loam on calcrete plains and rises.

FP Tb AaApr Eff: Hummock Grassland of *Triodia basedowii* with Low Open Woodland of *Acacia aptaneura* and *Acacia pruinocarpa* over Open Shrubland of *Eremophila forrestii* subsp. *forrestii* on red sandy loam on floodplains.

HC Tw AiAb IrSao: Hummock Grassland of *Triodia wiseana* with High Open Shrubland of *Acacia inaequilatera* and *Acacia bivenosa* over Low Open Shrubland of *Indigofera rugosa* and *Senna artemisioides* subsp. *oligophylla* on red silty loam on dolerite hill crests.

HC TwTbrTp ElCh AmaGwAb: Hummock Grassland of *Triodia wiseana*, *Triodia brizoides* and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* over High Open Shrubland of *Acacia maitlandii*, *Grevillea wickhamii* subsp. *hispidula* and *Acacia bivenosa* on red brown sandy loam on hill crests and upper hill slopes.

HS TpTs CdEl AanAbAte: Hummock Grassland of *Triodia pungens* and *Triodia* sp. Shovelanna Hill with Low Open Woodland of *Corymbia deserticola* subsp. *deserticola* and *Eucalyptus leucophloia* subsp. *leucophloia* over Open Shrubland of *Acacia ancistrocarpa*, *Acacia bivenosa* and *Acacia tenuissima* on red loamy sand on hill slopes and footslopes.

HS TsTwTp EICH AhiAad: 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. *adoxo* on red brown sandy loam on hill slopes.

HS Tw EICHhC AanAbAa: Hummock Grassland of *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* and *Hakea chordophylla* and Open Shrubland of *Acacia ancistrocarpa*, *Acacia bivenosa* and *Acacia aptaneura* on red sandy loam on hill slopes.

ME TpTI ExAciCh PIAPyGr: Hummock Grassland of *Triodia pungens* and *Triodia longiceps* with Low Woodland of *Eucalyptus xerothermica*, *Acacia citrinoviridis* and *Corymbia hamersleyana* over High Shrubland of *Petalostylis labicheoides*, *Acacia pyrifolia* var. *pyrifolia* and *Gossypium robinsonii* on red brown clay loam on medium drainage lines and surrounding floodplains.

SA Tb ChEg SpBeKp: Hummock Grassland of *Triodia basedowii* with Low Open Woodland of *Corymbia hamersleyana* and *Eucalyptus gamophylla* over Low Open Shrubland of *Scaevola parvifolia*, *Bonamia erecta* and *Kennedia prorepens* on red loamy sand on sand plains.

SP TSAi: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with High Open Shrubland of *Acacia inaequilatera* on red brown loamy sand on hill slopes and stony plains.

SP TpTb Eg PIAbAan: Hummock Grassland of *Triodia pungens* and *Triodia basedowii* with Open Mallee of *Eucalyptus gamophylla* and Shrubland of *Petalostylis labicheoides*, *Acacia bivenosa* and *Acacia ancistrocarpa* on red brown loamy sand on stony plains and footslopes.

SP TsTwTp EgEt AbApaApr: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835), *Triodia wiseana* and *Triodia pungens* with Very Open Mallee of *Eucalyptus gamophylla* and *Eucalyptus trivalva* over Open Shrubland of *Acacia bivenosa*, *Acacia pachyacra* and *Acacia pruinocarpa* on red brown sandy loam and clay loam on stony plains.

Triodia Open Hummock Grassland

HS TbTs AsyAaAte EcuMgSI: Open Hummock Grassland of *Triodia basedowii* and *Triodia* sp. Shovelanna Hill with Open Shrubland of *Acacia synchronicia*, *Acacia aptanera* and *Acacia tetragonophylla* over Low Open Shrubland of *Eremophila cuneifolia*, *Maireana georgei* and *Solanum lasiophyllum* on red sandy loam on floodplains and lower hill slopes.

SA TI AanApa ApaAprCh: Open Hummock Grassland of *Triodia lanigera* with Open Shrubland of *Acacia ancistrocarpa* and *Acacia pachyacra* and Scattered Low Trees of *Acacia paraneura*, *Acacia pruinocarpa* and *Corymbia hamersleyana* on red sandy loam on stony plains.

The Onshore Environmental 2016 survey identified the following 24 vegetation associations:

Cenchrus Tussock Grassland

GG CcCyaSopl EcEv MgApyGoro: Tussock Grassland of **Cenchrus ciliaris*, *Cymbopogon ambiguus* (riverine form) and *Sorghum plumosum* with Woodland of *Eucalyptus camaldulensis* and *Eucalyptus victrix* over High Open Shrubland of *Melaleuca glomerata*, *Acacia pyrifolia* and *Gossypium robinsonii* in major drainage lines surrounded by cliffs.

SP CcAriaChf AaCoas AbAsy: Tussock Grassland of **Cenchrus ciliaris*, *Aristida latifolia* and *Chrysopogon fallax* with Low Woodland of *Acacia aptaneura* and *Corymbia aspera* and High Open Shrubland of *Acacia bivenosa* and *Acacia synchronicia* on stony plains.

Acacia Closed Scrub

MI AmPIAnI Tp EIICh: Closed Scrub of *Acacia monticola*, *Petalostylis labicheoides* and *Androcalva luteiflora* over Hummock Grassland of *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and *Corymbia hamersleyana* in minor drainage lines.

Acacia Low Open Forest

SP AcaoAayAa TpTm ErffPsiPI: Low Open Forest of *Acacia catenulata* subsp. *occidentalis*, *Acacia ayersiana* and *Acacia aptaneura* over Open Hummock Grassland of *Triodia pungens* and *Triodia melvillei* with Open Shrubland of *Eremophila forrestii* subsp. *forrestii*, *Psydrax latifolia* and *Petalostylis labicheoides* on plains.

Acacia Low Woodland

SP AaAay AteAsy ErcuSesSegl: Low Woodland of *Acacia aptaneura* and *Acacia ayersiana* over High Shrubland of *Acacia tetragonophylla* and *Acacia synchronicia* over Shrubland of *Eremophila cuneifolia*, *Senna stricta* and *Senna glutinosa* subsp. *x luerissenii* on stony plains.

Acacia Open Scrub

MI AbAancAten Tp Eg: Open Scrub *Acacia bivenosa*, *Acacia ancistrocarpa* and *Acacia tenuissima* with Open Hummock Grassland of *Triodia pungens* and Very Open Mallee of *Eucalyptus gamophylla* in minor drainage lines.

Corymbia Low Woodland

GG CfAprAa CyaErnu DopErffPI: Low Woodland of *Corymbia ferritcola*, *Acacia pruinocarpa* and *Acacia aptaneura* over Open Tussock Grassland of *Cymbopogon ambiguus* and *Eriachne mucronata* with High Open Shrubland of *Dodonaea pachyneura*, *Eremophila forrestii* subsp. *forrestii* and *Petalostylis labicheoides* on cliff lines.

Cymbopogon Tussock Grassland

MA CyaCcErt EvAciEx GoroApyPI: Tussock Grassland of *Cymbopogon ambiguus* (riverine form), **Cenchrus ciliaris* and *Eriachne tenuiculmis* with Low Open Woodland of *Eucalyptus victrix*, *Acacia citrinoviridis* and *Eucalyptus xerothermica* and High Open Shrubland of *Gossypium robinsonii*, *Acacia pyrifolia* and *Petalostylis labicheoides* in major drainage lines.

Eulalia Open Tussock Grassland

FP EuaTtCc ExChAci PIAPyAb: Open Tussock Grassland of *Eulalia aurea*, *Themeda triandra* and **Cenchrus ciliaris* with Low Open Woodland of *Eucalyptus xerothermica*, *Corymbia hamersleyana* and *Acacia citrinoviridis* and High Open Shrubland of *Petalostylis labicheoides*, *Acacia pyrifolia* and *Acacia bivenosa* on floodplains.

Gossypium Shrubland

ME GoroAniAb BoeTtCya Ev: Shrubland of *Gossypium robinsonii*, *Androcalva luteiflora* and *Acacia bivenosa* over Open Tussock Grassland of *Bothriochloa ewartiana*, *Themeda triandra* and *Cymbopogon ambiguus* (riverine form) with Low Open Woodland of *Eucalyptus victrix* in medium drainage lines.

Triodia Hummock Grassland

FS TsTp EgvAbAancAi: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Very Open Mallee of *Eucalyptus gamophylla* and High Open Shrubland of *Acacia bivenosa*, *Acacia ancistrocarpa* and *Acacia inaequilatera* on footslopes.

HS TsTp EllChHc AhiAaaGoo: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Corymbia hamersleyana* and *Hakea chordophylla* and Low Open Shrubland of *Acacia hillianiana*, *Acacia adoxa* var. *adoxo* and *Gompholobium oreophilum* on hillslopes.

SA Tp EgEx ApaAb: Hummock Grassland of *Triodia pungens* with Very Open Mallee of *Eucalyptus gamophylla* and *Eucalyptus xerothermica* and High Open Shrubland of *Acacia pachyacra* and *Acacia bivenosa* on sand plains.

FS TsTp CdEll AiAancAads: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Woodland of *Corymbia deserticola*, *Eucalyptus leucophloia* subsp. *leucophloia* and High Open Shrubland of *Acacia inaequilatera*, *Acacia ancistrocarpa* and *Acacia adsurgens* on footslopes.

HS TpTbTw Ell AbSeglErpl: Hummock Grassland of *Triodia pungens*, *Triodia brizoides* and *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and High Open Shrubland of *Acacia bivenosa*, *Senna glutinosa* subsp. *luerssenii* and *Eremophila platycalyx* on steep hillslopes.

HS TsTp ArAaxr AaEll: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with High Shrubland of *Acacia rhodophloia* and *Acacia adsurgens* x *rhodophloia* with Low Open Woodland of *Acacia aptaneura* and *Eucalyptus leucophloia* subsp. *leucophloia* on hillslopes.

HS Ts AspAhiGoo Ell: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) with Low Shrubland of *Acacia spondylophylla*, *Acacia hillianiana* and *Gompholobium oreophilum* and Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* on hillslopes and crests.

CP TwTa Ese PIAb: Hummock Grassland of *Triodia wiseana* and *Triodia angusta* with Very Open Mallee of *Eucalyptus socialis* subsp. *eucentrica* and High Open Shrubland of *Petalostylis labicheoides* and *Acacia bivenosa* on calcrete low rises and hills.

HC TsTw EllHcCh AaaPtro: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia wiseana* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Hakea chordophylla* and *Corymbia hamersleyana* and Low Open Shrubland of *Acacia adoxa* var. *adoxo* and *Ptilotus rotundifolius* on hillcrests.

HC TsTp AptAhi HcEll: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Low Open Shrubland of *Acacia ptychophylla* and *Acacia hillianiana* and Scattered Low Trees of *Hakea chordophylla* and *Eucalyptus leucophloia* subsp. *leucophloia* on hillcrests.

HS TbTw Ai AspAaaHete: Hummock Grassland of *Triodia brizoides* and *Triodia wiseana* with High Open Shrubland of *Acacia inaequilatera* and Low Open Shrubland of *Acacia spondylophylla*, *Acacia adoxa* var. *adoxo* and *Heliotropium tenuifolium* on ironstone/dolerite screeslopes.

HS TpTb Inr Ai: Hummock Grassland of *Triodia pungens* and *Triodia brizoides* with Low Shrubland of *Indigofera rugosa* and High Open Shrubland of *Acacia inaequilatera* on hillslopes.

HS TaTwTb Ell AsyAb: Hummock Grassland of *Triodia angusta*, *Triodia wiseana* and *Triodia brizoides* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia* and High Open Shrubland of *Acacia synchronicia* and *Acacia bivenosa* on hillslopes.

Triodia Open Hummock Grassland

SA Tp CyoCcPamu ApaAbPI: Open Hummock Grassland of *Triodia pungens* over Open Tussock Grassland *Cymbopogon obtectus*, **Cenchrus ciliaris* and *Paraneurachne muelleri* with High Open Shrubland of *Acacia pachyacra*, *Acacia bivenosa* and *Petalostylis labicheoides* on sandy plains.

The Onshore Environmental 2015 survey identified the following six vegetation associations:

Cenchrus Tussock Grassland

9b: Tussock Grassland of **Cenchrus ciliaris*, **Cenchrus setiger* and *Enneapogon polyphyllus* with High Open Shrubland of *Acacia synchronicia*, *Acacia tetragonophylla* and *Acacia bivenosa* and Open Shrubland of *Rhagodia eremaea* on stony plains and rises.

Acacia High Shrubland

4: High Shrubland of *Acacia tetragonophylla*, *Acacia synchronicia* and *Acacia pachyacra* over Open Hummock Grassland of *Triodia angusta* over Open Tussock Grassland of **Cenchrus ciliaris* and *Themeda triandra* on stony calcrete plains.

Acacia Low Open Forest

1a: Low Open Forest of *Acacia aptaneura*, *Acacia ayersiana* and *Acacia pruinocarpa* over Tussock Grassland of **Cenchrus ciliaris* and *Chrysopogon fallax* with High Shrubland of *Acacia tetragonophylla*, *Acacia sibirica* and *Acacia kempeana* on flats.

Acacia Low Woodland

2: Low Woodland of *Acacia aptaneura*, *Acacia ayersiana* and *Acacia pruinocarpa* over Open Hummock Grassland of *Triodia pungens* over Open Tussock Grassland of **Cenchrus ciliaris* and *Chrysopogon fallax* on stony plains.

Aristida Closed Tussock Grassland

7: Closed Tussock Grassland of *Aristida latifolia* and **Cenchrus ciliaris* with Low Shrubland of *Sida fibulifera*, *Neptunia dimophantha* and *Maireana villosa* and High Open Shrubland of *Acacia synchronicia* on stony gilgai plains.

Triodia Hummock Grassland

6: Hummock Grassland of *Triodia* sp. Shovelanna Hill and *Triodia pungens* with Low Open Woodland of *Eucalyptus leucophloia* subsp. *leucophloia*, *Acacia aptaneura* and *Acacia pruinocarpa* and High Open Shrubland of *Acacia tetragonophylla*, *Acacia kempeana* and *Acacia bivenosa* on stony hill slopes.

The ENV Australia 2009 survey identified the following two vegetation associations:

Triodia Hummock Grassland

1a: Hummock Grassland of *Triodia* sp. Shovelanna Hill (S. van Leeuwen 3835) and *Triodia pungens* with Open Shrubland of *Acacia bivenosa* and *Acacia aneura* var. *aneura* with Scattered Low Trees of *Eucalyptus leucophloia* subsp. *leucophloia*.

1d: Open Hummock Grassland of *Triodia pungens* with Open Shrubland of *Acacia aneura* var. *aneura*, *Acacia bivenosa* and *Acacia synchronicia* with Scattered Trees of *Corymbia aspera*.

Clearing Description	Orebody 36 Project BHP Billiton Iron Ore Pty Ltd proposes to clear up to 200 hectares of native vegetation within a total boundary of approximately 4,956 hectares for the purposes of geotechnical investigations, access tracks, exploration, hydrogeological drilling and associated infrastructure. The project is located immediately north and east of the town of Newman within the Shire of East Pilbara.
Vegetation Condition	Completely Degraded: No longer intact; completely/almost completely without native species (Keighery, 1994); To: Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery, 1994).
Comment	The vegetation condition was assessed by botanists from Onshore Environmental (2014; 2015) and ENV Australia (2009).

3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments	<p>Proposal is not likely to be at variance to this Principle</p> <p>The clearing permit areas are located within the Hamersley Interim Biogeographic Regionalisation of Australia (IBRA) subregion (GIS Database). Vegetation of the subregion is described by Kendrick (2001) as being composed of mulga low woodland over bunch grasses on fine textured soils in valley floors, and <i>Eucalyptus leucophloia</i> over <i>Triodia brizoides</i> on skeletal soils of the ranges. Known features of the region with special value include the gorges and waterfalls of Hamersley Range, particularly those of Karijini National Park, spectacular exposures of Banded Iron Formations, the Themeda Grasslands of the Pilbara region and the Red Hill Station mulga stands (Kendrick, 2001). The dominant land uses within this subregion are grazing, UCL and Crown reserves, native pastures, conservation and mining (Kendrick, 2001).</p> <p>Numerous flora and vegetation surveys have been undertaken over the application area (BHP Billiton, 2016) with the largest two covering the vast majority of the application areas undertaken in 2014 and 2016 by Onshore Environmental. None of the vegetation associations within the application areas represent or are associated with a Threatened Ecological Community (TEC) listed under the <i>Environment Protection and Biodiversity Conservation Act, 1999</i> or the <i>Environment Protection Act 1986</i>, an Environmentally Sensitive Area under the <i>Environment Protection Act 1986</i> or a Priority Ecological Community (PEC).</p> <p>Three Priority Flora species were recorded within the application area during the flora surveys: <i>Aristida lazaridis</i> (P2), <i>Goodenia nuda</i> (P4) and <i>Lepidium catapycnon</i> (P4) (Onshore Environmental, 2014; Onshore Environmental, 2016). BHP Billiton (2016) have committed, where possible, to avoid clearing within 10 metres of all locations where Priority Flora species were recorded. Potential impacts to Priority Flora as a result of the proposed clearing may be minimised by the implementation of a flora management condition.</p> <p>There were 15 weed species recorded during the surveys of the application area, none of which are listed as Declared Pest under the <i>Biosecurity and Agriculture Management Act, 2007</i>. The presence of weeds lowers the biodiversity value of the proposed clearing area. Care must be taken to ensure that the proposed clearing activities do not spread or introduce weed species to non-infested areas. Potential impacts to biodiversity as a result of the proposed clearing may be minimised by the implementation of a weed management condition.</p>
-----------------	---

There have been numerous fauna assessments undertaken over the application areas with the most relevant having been undertaken by Biologic (2014a; 2014b; 2016), ENV Australia (2012) and Eco Logical Australia (2012). During the fauna assessments there were three conservation significant fauna species recorded within the application area: Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia*), Rainbow Bee-eater (*Merops ornatus*), and Western Pebble-mound Mouse (*Pseudomys chapmani*). BHP Billiton (2016) has acknowledged that suitable habitat for ten other conservation significant fauna occurs in the application areas, however, more suitable habitat occurs in the surrounding area. Based on this, it is unlikely that the proposed clearing will significantly reduce the overall habitat of any of these species.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology BHP Billiton (2016)
Biologic (2014a)
Biologic (2014b)
Biologic (2016)
Eco Logical Australia (2012)
ENV Australia (2012)
Kendrick (2001)
Onshore Environmental (2014)
Onshore Environmental (2016)

GIS Database:
- IBRA WA (Regions - Sub Regions)
- Threatened and Priority Flora
- Threatened Ecological Sites Buffered

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments Proposal may be at variance to this Principle

There has been numerous fauna surveys previously conducted over the application area. Based on the results

of these surveys the following seven broad fauna habitats have been identified within the application area (Biologic, 2014a, 2014b and 2016; ENV Australia, 2012; Eco Logical Australia, 2012):

- Crest/Slope;
- Drainage Area / Floodplain;
- Major Drainage Line;
- Minor Drainage Line;
- Mulga;
- Sand Plain; and
- Stony Plain.

Habitat types such as Caves and Gorge/Gully have been excluded from the application areas (BHP Billiton, 2016). All these habitats present within the application areas are considered to be common and well represented within the region (BHP Billiton, 2016). The Drainage Line habitats only occupy a small part of the application areas, however, Eucalypt lined creeks provide greater cover and habitat complexity than vegetation of the surrounding plains and can be used as dispersal corridors for fauna

The Major Drainage Line habitat contains breeding and foraging sites for a number of bird species and significant tree hollows that may be used by parrots and owls for roosting and nesting (Biologic, 2016). This habitat is also important for dispersal of mammal and reptile species in the local area. The majority of this habitat appears to be associated with Whaleback Creek and Fortescue River (GIS Database). Many parts of this habitat have been degraded by existing activities and invasion of weeds (BHP Billiton, 2016). Similar habitat within close vicinity to the application areas was found to be in the same or better condition than that of the application areas. Similar habitat is also well represented within the region (BHP Billiton, 2016).

There were three species of conservation significant fauna recorded during the fauna survey. These being:

- Pilbara Leaf-nosed Bat (*Rhinonictoris aurantia* - Threatened)
- Rainbow Bee-eater (*Merops ornatus* - Migratory)
- Western Pebble-mound Mouse (*Pseudomys chapmani* – P4)

A further ten species of conservation significance are considered to have the potential to be found within the application areas:

- Cattle Egret (*Ardea ibis* - Migratory)
- Common Sandpiper (*Tringa hypoleucos*- Migratory)
- Eastern Great Egret (*Ardea modesta* - Migratory)
- Fork-tailed Swift (*Apus pacificus* - Migratory)
- Ghost Bat (*Macroderma gigas* - Threatened)
- Glossy Ibis (*Plegadis falcinellus* - Migratory)
- Peregrine Falcon (*Falco peregrinus* - Migratory)

- Pilbara Flat-headed Blind-snake (*Aniliios ganei* – P1)
- Pilbara Olive Python (*Liasis olivaceus* subsp. *Barroni* - Threatened)
- Wood Sandpiper (*Tringa glareola* - Migratory)

The Pilbara Leaf-nosed Bat and Ghost Bat are both expected to forage over the application areas (BHP Billiton, 2016). All caves and Gorge/Gully habitat has been excluded from the application areas (BHP Billiton, 2016). Whilst foraging habitat for these species will be lost, it is not expected to have a significant impact on these species.

Pilbara Olive Pythons are widespread across the Pilbara, with many significant populations remaining (BHP Billiton, 2016). This species may utilise the application areas in a transitory manner when conditions are suitable as it has been recorded in the Gorge/Gully habitat adjacent to the proposed clearing area (BHP Billiton, 2016). Suitable Gorge/Gully habitat has been excluded from the proposal.

The Rainbow Bee-eater is a common and widespread species in Western Australia, except in the drier interior of the State and the far south-west. This species is expected to forage within the Sand Plain, Minor Drainage Line and Major Drainage Line habitats within the application areas (BHP Billiton, 2016). The Rainbow Bee-eater has been recorded across the application areas and in the wider region (BHP Billiton, 2016). As this species is common and widespread in the Pilbara, the potential impact on this species from the proposed clearing is considered low.

The Pilbara Flat-headed Blind-snake is endemic to the Pilbara. This insectivorous species feeds on termites and their eggs, and larvae and pupae of ants (BHP Billiton, 2016). Little is known about this species habitat preferences and it may occur within habitats of the application areas. This species may forage the habitat types within the application areas however is unlikely to be reliant on the areas within the application areas given its preferred habitat (Gorge/Gully) has been excluded from the proposal (BHP Billiton, 2016).

The Western Pebble-mound Mouse has been recorded on numerous occasions within the application area (BHP Billiton, 2016). This species most commonly utilises the Crest/Slope habitat where it constructs its characteristic mounds. Similar habitat for this species is common throughout the Pilbara bioregion and the proposed clearing is not expected to have a significant impact on habitat for the Western Pebble-mound Mouse.

The migratory species listed above are wide ranging and are unlikely to rely just on habitats within the application areas, given that more suitable habitat occurs in the surrounding region (BHP Billiton, 2016).

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology BHP Billiton (2016)
Biologic (2014a)
Biologic (2014b)
Biologic (2016)
Eco Logical Australia (2012)
ENV Australia (2012)

GIS Database:
- Dampier and Extensions 50 cm Orthomosaic - Landgate 2008
- Hydrography, Linear

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments **Proposal is not likely to be at variance to this Principle**
According to available databases there are no known records of Threatened Flora species within the application area (GIS Database).

Several Threatened Flora and vegetation surveys of the application area have been undertaken (BHP Billiton, 2016). No Threatened Flora species were recorded during these surveys (BHP Billiton, 2016).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology BHP Billiton (2016)
GIS Database:
- Threatened and Priority Flora

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments Proposal is not likely to be at variance to this Principle

A search of available databases revealed there is one Threatened Ecological Community (TECs) within the application areas (GIS Database). The south-eastern application area falls within the Ethel Gorge Aquifer Stygobiont community listed by the Department of Parks and Wildlife (not listed under the *Environment Protection and Biodiversity Conservation Act, 1999*) (BHP Billiton, 2016; GIS Database). The proposed application will not impact on groundwater of the region and hence will not impact upon this Threatened Ecological Community (BHP Billiton, 2016).

No TECs were identified during the flora and vegetation survey conducted by the Onshore Environmental botanists (BHP Billiton, 2016).

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology BHP Billiton (2016)

GIS Database:
- Threatened Ecological Sites Buffered

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments Proposal is not at variance to this Principle

The application area falls within the Pilbara IBRA bioregion (GIS Database). The vegetation within the application area is recorded as:

18: Low woodland; mulga (*Acacia aneura*); and

82: Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana* (GIS Database).

The vegetation of the application area has been mapped as Beard vegetation associations 18 and 82 (GIS Database). These vegetation associations have not been extensively cleared as over 99% remains at both a State and bioregional level (see table) (Government of Western Australia, 2015). There has been large amounts of vegetation cleared in the Mt Whaleback area, however, the vegetation within the application area is not a remnant nor does it form part of any remnants within the local area (GIS Database).

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in DPaW Managed Land
IBRA Bioregion - Pilbara	17,808,657	17,733,584	~99.58	Least Concern	10.12
Beard vegetation associations - State					
18	19,892,305	19,843,727	~99.76	Least Concern	6.62
82	2,565,901	2,553,217	~99.51	Least Concern	11.51
Beard vegetation associations - Bioregion					
18	676,557	672,424	~99.39	Least Concern	25.17
82	2,563,583	2,550,899	~99.51	Least Concern	11.52

* Government of Western Australia (2015)

** Department of Natural Resources and Environment (2002)

Based on the above, the proposed clearing is not at variance to this Principle.

Methodology Department of Natural Resources and Environment (2002)
Government of Western Australia (2015)

GIS Database:
- IBRA WA (Regions - Sub Regions)
- Pre-European Vegetation

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments Proposal is at variance to this Principle

There are numerous ephemeral watercourses within the application area (GIS Database). The majority of these are minor drainage lines similar to those that are widespread throughout the surrounding area. The most significant ephemeral watercourses that pass through the application areas are Fortescue River and Whaleback Creek. BHP Billiton (2016) have committed to avoid clearing where possible near Fortescue River and will utilise existing tracks and crossings. If it is necessary for new crossings to be installed, clearing will be kept to a bare minimum and will be constructed flat level to the surface (i.e. a simple clearing with no bunds) to maintain the natural surface flow (BHP Billiton, 2016). Potential impacts to Fortescue River and Whaleback Creek as a result of the proposed clearing may be minimised by the implementation of a watercourse management condition.

Based on the above, the proposed clearing is at variance to this Principle.

Methodology BHP Billiton (2016)

GIS Database:

- Geodata, Lakes
- Hydrography, Linear

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments Proposal is may be at variance to this Principle

According to available datasets the application areas intersect five land systems (GIS Database):

- Boolgeeda;
- Elimunna;
- Newman;
- River; and
- Wannamunna.

The Boolgeeda land system is described as stony lower plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands (Van Vreeswyk et al., 2004). The landform of this system in which the application area is found is described as stony slopes and upper plains - very gently inclined slopes and upper interfluvies immediately down slope from adjacent hill systems. The soils are described as red shallow loams or red loamy earths with surface mantles of common to abundant pebbles or chert ironstone and quartz (Van Vreeswyk et al., 2004). According to Van Vreeswyk et al. (2004), the Boolgeeda land system is not susceptible to soil erosion due to the presence of a stony mantle.

The Elimunna land system is described as stony plains on basalt supporting sparse acacia and cassia shrublands and patchy tussock grasslands (Van Vreeswyk et al., 2004). The landform in which the application area lies is stony plains - level to gently undulating plains extending up to four kilometres, mantles of abundant pebbles of basalt, quartz and ironstone. This system is generally not susceptible to erosion (Van Vreeswyk et al., 2004).

The Newman land system is described as rugged jaspilite plateaux, ridges and mountains supporting hard spinifex grasslands (Van Vreeswyk et al., 2004). The landform in which the application area lies is plateaux, ridges, mountains and hills - up to 400 metres; level or rounded plateaux summits and mountain crests, ridges and indented escarpments with vertical upper cliff faces and moderately inclined to very steep upper scree slopes; surface mantles of abundant to very abundant pebbles, cobbles and stones of ironstone, jaspilite, chert and other rocks. Also outcrop of parent rock (Van Vreeswyk et al., 2004). The Newman land system has a nil to minor erosion potential, which is likely to be due to the surface mantle present which provides protection from erosional forces (Van Vreeswyk et al., 2004).

The Wannamunna land system is described as hardpan plains and internal drainage tracts supporting mulga shrublands and woodlands (Van Vreeswyk et al., 2004). The hardpan plains landform is made up of red-brown shallow loams with surface mantles of few pebbles of ironstone and is subject to sheetflows. According to Van Vreeswyk et al. (2004) this system is not particularly susceptible to soil erosion as a result of the stony mantle present.

The River land system is described as active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft Spinifex grasslands (Van Vreeswyk et al., 2004). The landform in which the application area lies is minor and major channels 30 - 1000 metres wide between sandy banks 1-10 metres above channel beds, bedloads of sand, gravel, pebbles and stones. Van Vreeswyk et al. (2004) has stated that this system is largely stabilised by buffel grass and Spinifex and accelerated erosion is uncommon. However, susceptibility to erosion is high or very high if vegetative cover is removed.

The majority of the application area (including the Newman, Boolgeeda, Elimunna and Wannamunna land systems) in its current form are protected from erosional forces as a stony mantle is present (Van Vreeswyk et al., 2004). However, low lying areas (floodplains and drainage lines) of the River land system, are likely to be a

lot more susceptible to erosional forces due to the sandy nature of soils within this system. Given the intense summer rainfall events associated with cyclonic activities (BoM, 2016) and sandy soils present, it is likely that soil erosion may occur from the proposed clearing in the River land system. Some other parts of the application area may also be subject to some erosion once the stony mantle is removed during the clearing process. Potential long-term impacts of erosion may be minimised by the implementation of a rehabilitation condition.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology BoM (2016)
Van Vreeswyk et al. (2004)

GIS Database:
- Rangeland Land System Mapping
- Topographic Contours, Statewide

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments Proposal is not likely to be at variance to this Principle

The closest conservation area to the application area is Karijini National Park which is located approximately 110 kilometres to the west (GIS Database). Given the large distance between these two areas it is unlikely that the environmental values of Karijini National Park will be compromised from the proposed clearing.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology GIS Database:
- DPaW Tenure
- Register of National Estate (Status)

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments Proposal may be at variance to this Principle

The application area is located within the Newman Water Reserve (GIS Database). All activities conducted within the Public Drinking Water Supply Area should be in accordance with the Department of Water (DoW) Land Use Compatibility Tables (DoW, 2016). The proponent is advised to follow the Water Quality Protection Guidelines produced by the DoW, to minimise any risk that the proposed clearing and associated activities may pose to the Newman Water Reserve (DoW, 2016). The DoW is satisfied that the proposed clearing of 200 hectares is unlikely to have a significant impact on the quality or quantity of groundwater (DoW, 2016). The proposed clearing will be non-contiguous, and will consist of discrete drill pads and access tracks (BHP Billiton, 2008). It is not expected that the proposed clearing will significantly impact upon groundwater levels or quality within the application area.

There is one major watercourse named Fortescue River which intersects the the application area (GIS Database). In addition to Fortescue River, there are a number of minor non-perennial watercourses which are located within the application area. Care must be taken to ensure that the proposed clearing activities do not cause or increase sedimentation, erosion or turbidity to watercourses on or off site. BHP Billiton (2016) has advised that where practicable existing cleared tracks will be used to cross areas identified as Major Drainage Lines. If it is necessary for new crossings to be installed, clearing will be kept to a bare minimum and will be constructed flat level to the surface (i.e. a simple clearing with no bunds) to maintain the natural surface flow (BHP Billiton, 2016). Potential impacts to Fortescue River as a result of the proposed clearing may be minimised by the implementation of a watercourse management condition.

Based on the above, the proposed clearing may be at variance to this Principle.

Methodology BHP Billiton (2016)
DoW (2016)

GIS Database:
- Hydrography, Linear
- Public Drinking Water Source Areas

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments Proposal is not likely to be at variance to this Principle

The application area is located within the Pilbara region of Western Australia (GIS Database). This region is subject to an arid tropical climate with two distinct seasons, a hot summer (October - April) and a mild winter (May - September) (BoM, 2016). The nearby Newman town site has an average annual rainfall of 313 millimetres per year (BoM, 2016). Intense rainfall events generally associated with cyclonic activity during the summer months are known to occur in the area and these often result in localised flooding (BoM, 2016).

The application area experiences a high annual evaporation rate of approximately 2,400 millimetres (GIS Database). Given the low level of annual rainfall (313 millimetres) in relation to the high evaporation rate (2,400 millimetres), it is likely that any water that collects and pools during heavy rainfall periods will evaporate quickly.

Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology BOM (2016)

GIS Database:
- Hydrographic Catchments - Catchments

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

There is one Native Title Claim (WC05/6) over the area under application (DAA, 2016). This claim has been registered with the National Native Title Tribunal on behalf of the claimant group. However, the mining tenure has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

There are numerous registered Aboriginal sites of significance within the application area (DAA, 2016). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Aboriginal sites of significance are damaged through the clearing process.

It is the proponent's responsibility to liaise with the Department of Environment Regulation, Department of Parks and Wildlife and the Department of Water, to determine whether a Works Approval, Water Licence, Bed and Banks Permit, or any other licences or approvals are required for the proposed works.

The clearing permit application was advertised on 10 October 2016 by the Department of Mines and Petroleum inviting submissions from the public. No submissions were received.

Methodology DAA (2016)

4. References

- BHP Billiton (2016) Orebody 36 and Surrounds NVCP - Native Vegetation Clearing Permit Application Supporting Document for Exploration Drilling. Unpublished report prepared by BHP Billiton Iron Ore Pty Ltd, September 2016.
- Biologic (2014a) Consolidation of Regional Fauna Habitat Mapping BHP Billiton Iron Ore Pilbara Tenure. Internal Report for BHP Billiton Iron Ore prepared by Biologic, 2014.
- Biologic (2014b) Ore Body 24 Targeted Vertebrate Fauna Survey. Internal Report for BHP Billiton Iron Ore prepared by Biologic, 2014.
- Biologic (2016) *Cathedral Gorge Level 1 Vertebrate Fauna Survey*. Internal Report for BHP Billiton Iron Ore prepared by Biologic, 2016.
- BoM (2016) Bureau of Meteorology Website - Climate statistics for Australian locations, Newman Aero. Available online at: http://www.bom.gov.au/climate/averages/tables/cw_007176.shtml Accessed on 31 October 2016.
- DAA (2016) Aboriginal Heritage Inquiry System, Government of Western Australia, Department of Aboriginal Affairs, Perth <<http://maps.dia.wa.gov.au/AHIS2/>> accessed 31 October 2016.
- Department of Natural Resources and Environment (2002) Biodiversity Action Planning. Action planning for native biodiversity at multiple scales; catchment bioregional, landscape, local. Department of Natural Resources and Environment, Victoria.
- DoW (2016) Advice regarding clearing permit application CPS 7272/1, Department of Water, 12 October 2016.
- Eco Logical Australia (2012) Orebody 37 Level 1 Vertebrate Fauna Assessment. Internal Report for BHP Billiton Iron Ore prepared by Eco Logical Australia, 2012.
- ENV Australia (2009) Orebody 25 to Newman Flora and Vegetation Assessment. Internal Report for BHP Billiton Iron Ore prepared by ENV Australia, 2009.
- ENV Australia (2012) Eastern Ridge (OB23/24/25) Fauna Assessment. Internal Report for BHP Billiton Iron Ore prepared by ENV Australia, 2012.
- Government of Western Australia (2015) 2015 Statewide Vegetation Statistics incorporating the CAR Reserve Analysis (Full Report). WA Department of Environment and Conservation, Perth.
- Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.
- Kendrick, P. (2001) Pilbara 2 (PIL2 - Fortescue Plains Subregion) Subregional description and biodiversity values in "A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002" published by the Department of Conservation and Land management Western Australia.
- Onshore Environmental (2014) Consolidation of Regional Vegetation Mapping BHP Billiton Iron Ore Pilbara Tenure. Internal Report for BHP Billiton Iron Ore prepared by Onshore Environmental, 2014.
- Onshore Environmental (2015) *Kurra Village Targeted Flora, Vegetation and Fauna Survey*. Internal Report for BHP Billiton Iron Ore prepared by Onshore Environmental, 2015.
- Onshore Environmental (2016) *Cathedral Gorge Level 2 Flora and Vegetation Survey*. Internal Report for BHP Billiton Iron Ore

by Onshore Environmental, 2016.

Van Vreeswyk A.M.E., Payne A.L., Leighton K.A. and Hennig P. (2004) Technical Bulletin - An Inventory and Condition Survey of the Pilbara Region, Western Australia, No. 92. Department of Agriculture, Perth, Western Australia.

5. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government
DAA	Department of Aboriginal Affairs, Western Australia
DAFWA	Department of Agriculture and Food, Western Australia
DEC	Department of Environment and Conservation, Western Australia (now DPaW and DER)
DEE	Department of the Environment and Energy, Australian Government
DER	Department of Environment Regulation, Western Australia
DMP	Department of Mines and Petroleum, Western Australia
DRF	Declared Rare Flora
DoE	Department of the Environment, Australian Government (now DEE)
DoW	Department of Water, Western Australia
DPaW	Department of Parks and Wildlife, Western Australia
DSEWPaC	Department of Sustainability, Environment, Water, Population and Communities (now DEE)
EPA	Environmental Protection Authority, Western Australia
EP Act	<i>Environmental Protection Act 1986</i> , Western Australia
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Federal Act)
GIS	Geographical Information System
ha	Hectare (10,000 square metres)
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
PEC	Priority Ecological Community, Western Australia
RIWI Act	<i>Rights in Water and Irrigation Act 1914</i> , Western Australia
TEC	Threatened Ecological Community

Definitions:

{DPaW (2015) Conservation Codes for Western Australian Flora and Fauna. Department of Parks and Wildlife, Western Australia}:-

T	Threatened species: Published as Specially Protected under the <i>Wildlife Conservation Act 1950</i> , 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 <i>Wildlife Conservation Act 1950</i> , 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 <i>Wildlife Conservation Act 1950</i> , 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 <i>Wildlife Conservation Act 1950</i> , 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**
Species which are poorly known; or
Species that are adequately known, are rare but not threatened, and 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.
- P1 Priority One - Poorly-known species:**
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
- P2 Priority Two - Poorly-known species:**
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
- P3 Priority Three - Poorly-known species:**
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
- P4 Priority Four - 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.