



Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 3933/2
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: **Hamersley Iron Pty Ltd**

1.3. Property details

Property: *Iron Ore (Hamersley Range) Agreement Act 1963*, Mining Lease 272SA (AM 70/272)
Miscellaneous Licence 47/18
Miscellaneous Licence 47/334
Local Government Area: Shire of Ashburton
Colloquial name: Marandoo Mine Phase 2 Pipeline

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
260		Mechanical Removal	Pipeline Construction, Powerlines and Associated Activities

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 18 August 2011

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 and are useful to look at vegetation in a regional context. The following Beard vegetation associations have been mapped within the application area (GIS Database):

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

29: Sparse low woodland; mulga, discontinuous in scattered groups; and

82: Hummock grasslands, low tree steppe; snappygum over *Triodia wiseana*.

A flora and vegetation survey of the application area was conducted by Biota Environmental Sciences during March and May 2007, April 2008 and Mattiske Consulting in September 2008. The following vegetation communities were identified within the application area (Biota Environmental Sciences, 2008a; Mattiske Consulting, 2008):

C1: Open woodland of *Eucalyptus victrix*, *Eucalyptus camaldulensis* var. *obtusa* over *Acacia citrinoviridis* open *Petalostylis labicheoides*, *Acacia pyrifolia* over *Tephrosia rosea* var. *clement*, *Themeda triandra* and *Cleome viscosa* on major creeklines with sandy soils;

C3: Tall shrubland of *Acacia bivenosa*, *Acacia ancistrocarpa*, *Acacia maitlandii*, *Acacia monticola* with occasional emergent *Corymbia deserticola* subsp. *deserticola* and *Eucalyptus leucophloia* over *Gompholobium polyzyga*, *Rulingia luteiflora* and *Triodia pungens* on sandy-loam soils in minor gullies;

M1: Low woodland to low open forest of *Acacia aneura* var. *aneura*, *Acacia pruinocarpa*, *Grevillea berryana* over *Eremophila galeata*, *Acacia tetragonophylla*, *Eremophila forrestii* over *Triodia pungens* and a range of annual species on sandy-loam flats and broad plains;

S1: Hummock grassland of *Triodia pungens* and *Triodia wiseana* with emergent *Eucalyptus gamophylla*, *Eucalyptus leucophloia*, *Acacia aneura* var. *aneura*, *Acacia pruinocarpa*, *Acacia ancistrocarpa*, *Acacia bivenosa*, *Senna* spp. and a range of annual species on gravelly soil on lower to mid slopes;

S2: Hummock grassland of *Triodia wiseana*, *Triodia angusta*, *Triodia pungens* with emergent *Eucalyptus leucophloia* and *Eucalyptus gamophylla* over *Eremophila* spp., *Acacia bivenosa* and a range of annual species on gravelly soils on mid and upper slopes of small ranges;

S3: Hummock grassland of *Triodia wiseana* with emergent *Eucalyptus leucophloia*, *Corymbia deserticola* subsp. *deserticola* over *Acacia bivenosa*, *Themeda triandra*, *Solanum lasiophyllum* and mixed *Senna* and *Ptilotus* species on gravelly soils on upper slopes of ranges;

- 1a:** *Acacia aneura* woodland on broad flat alluvial and colluvial areas;
- 1a/1b:** *Acacia aneura* – *Acacia pruinocarpa* woodland on broad flat alluvial and colluvial areas/Open grasslands;
- 1c:** *Triodia melvillei* hummock grassland;
- 2a:** *Acacia aneura* – *Acacia pruinocarpa* woodland in major flowlines;
- 2e:** *Eucalyptus victrix* woodland in secondary creeklines;
- 3a:** *Acacia* species shrubland in minor flowline;
- 4a:** *Acacia aneura* – *Acacia pruinocarpa* woodland; majority of vegetation;
- 4b:** *Acacia synchronicia* – *Varchellia farnesiana* tall shrubland;
- 4c:** *Acacia aneura* scattered low trees over open grassland;
- 4d:** *Acacia xiphophylla* low woodland;
- 4e:** *Triodia wiseana*, *Triodia pungens* hummock grassland;
- 4f:** *Triodia wiseana*, *Triodia* sp. Shovelanna Hill, *Triodia angusta* hummock grassland;
- 4g:** *Triodia angusta*, *Triodia longiceps* hummock grassland;
- 5a:** *Eucalyptus leucophloia* scattered low trees over *Acacia* spp. scattered shrubs over *Triodia brizoides*, *Triodia wiseana* hummock grassland;
- 5b:** *Eucalyptus leucophloia* scattered low trees over *Acacia* spp. scattered shrubs over *Triodia wiseana* (*Triodia brizoides*, *Triodia* sp. Shovelanna Hill) hummock grassland;
- 5d:** *Eucalyptus gamophylla* scattered low mallees over *Acacia* spp. scattered tall shrubs over *Triodia* sp. Shovelanna Hill, (*Triodia wiseana*) hummock grassland;
- 5h:** *Triodia wiseana* hummock grassland with mixed *Acacia* spp. emergent shrubs; and
- 6a:** Mixed *Triodia* spp. hummock grassland on upper slopes and ridges of small foothills and escarpments.

Clearing Description

Hammersley Iron Pty Ltd has applied to clear up to 260 hectares within an application area of approximately 551.3 hectares (GIS Database). The application area is located approximately 20 kilometres north-east of Tom Price (GIS Database).

The proposed clearing is for the construction of a dewatering pipeline. The proposed work includes the construction of the pipeline, access roads, topsoil storage, installation of fibre optic cable and HV powerline, laydown areas and borrow pits. Clearing will be by mechanical means.

Vegetation Condition

Pristine: No obvious signs of disturbance (Keighery, 1994).

to

Degraded: Structure severely disturbed; regeneration to good condition requires intensive management (Keighery, 1994).

Comment

The vegetation condition was assessed by botanists from Biota Environmental Sciences. The vegetation condition was described using a scale based on Trudgen (1988) and has been converted to the corresponding condition from the Keighery (1994) scale.

Clearing permit CPS 3933/1 was granted by the Department of Mines and Petroleum on 11 November 2010 and was valid from 11 December 2010 to 31 July 2016. The clearing permit authorised the clearing of 260 hectares within an area of 546.3 hectares. The proponent has requested an amendment to increase the permit boundary by 5 hectares. This is due to an assessment of the mine pit batter slopes resulting in a powerline needing to be constructed slightly further north than originally planned. The amount of vegetation cleared will remain the same.

The vegetation within the additional area is vegetation unit 1c: *Triodia melvillei* hummock grassland and the fauna habitat present is Stony hillslopes vegetated with *Acacia* shrubs over *Triodia* on stony loam substrates. The potential clearing of an additional 5 hectares of this vegetation community and fauna habitat is not likely to have significant additional environmental impacts.

3. Assessment of application against clearing principles

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

Comments

Proposal may be at variance to this Principle

Flora and vegetation surveys of the application area identified 24 intact vegetation communities (Biota Environmental Sciences, 2008a; Mattiske Consulting, 2008). The vegetation condition of the application area ranged from 'pristine' to 'degraded' with the majority of the application area considered to be in 'pristine' and 'excellent' condition (Biota Environmental Sciences, 2008a).

There has been no Threatened or Priority Ecological Communities recorded within the application area (Biota Environmental Sciences, 2008a). The vegetation communities 1a, 2a, 2e, 4a and 4f are considered to be of moderate conservation significance (Biota Environmental Sciences, 2008a). They are all significant for different reasons including their ability to support restricted taxa, their species richness, supporting Priority Flora species and their position on an important drainage system feature (Biota Environmental Sciences, 2008a). Vegetation communities 1a, 2a and 2e have been identified as extending more broadly throughout the Marandoo area and Hamersley subregion.

A total of 537 native flora species from 176 genera and 60 families have been recorded from various surveys in the Marandoo area (Biota Environmental Sciences, 2008a). This number of species is higher than would be expected for a study area of this size in this locality (Biota Environmental Sciences, 2008a). This is likely to reflect the variety of habitats present within the application area. There has been 20 weed species recorded from within the survey area (Biota Environmental Sciences, 2008a).

No Declared Rare Flora has been recorded within the application area (Biota Environmental Sciences, 2008a). Four Priority Flora species have been recorded within the application area (Biota Environmental Sciences, 2008a):

- *Goodenia lyrata* (Priority 1);
- *Rhagodia* sp. Hamersley (Priority 3);
- *Rostellularia adscendens* var. *latifolia* (Priority 3); and
- *Calotis latiuscula* (Priority 3).

Rhagodia sp. Hamersley was recorded from two populations and the other species were all recorded from one population (Biota Environmental Sciences, 2008a). *Goodenia lyrata* has a relatively broad range, however, it is infrequently recorded and the records on Hamersley Iron tenure are thought to represent the only records in the Marandoo area (Biota Environmental Sciences, 2008a). The removal of the other Priority 3 flora species is not expected to have a significant impact on those species as they are more widespread and represented within the Pilbara bioregion.

A seasonal fauna survey of the Marandoo Mine Phase 2 area recorded a total of 125 species comprising 54 avifauna, 20 mammals and 51 herpetofauna (Biota Environmental Sciences, 2008b). There was also several species of invertebrate fauna recorded representing terrestrial snails, pseudoscorpions and scorpions. The diversity of fauna species recorded from the survey area is considered comparatively low for the Pilbara bioregion (Biota Environmental Sciences, 2008b). This is most likely due to the relatively small size of the study area and the low degree of habitat diversity present (Biota Environmental Sciences, 2008b).

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

Methodology Biota Environmental Sciences (2008a)
Biota Environmental Sciences (2008b)
Mattiske Consulting (2008)

(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**

The application area contained four primary habitat types identified on the basis of vegetation structure and landforms (Biota Environmental Sciences, 2008b):

- Small drainage lines vegetated with *Acacia aneura* over tussock grasses on loamy substrates;
- Stony hillslopes vegetated with *Acacia* shrubs over *Triodia* on stony loam substrates;
- Flat outwash plains vegetated with *Acacia* shrubs on loamy substrates; and
- Rocky gorges.

From these four habitat types a total of 125 fauna species were recorded during two survey phases, including four species of conservation significance. The species recorded from the Marandoo Mine Phase 2 survey area (approximately 5,000 hectares), while comparatively low for the Pilbara bioregion, is representative of both the relatively small total area encompassed by the study, and the consequently low degree of habitat diversity available to fauna (Biota Environmental Sciences, 2008b).

The fauna species of conservation significance recorded were;

- Northern Quoll (*Dasyurus hallucatus*) (Endangered under the *EPBC Act 1999*);
- Rainbow Bee-eater (*Merops ornatus*) (migratory and marine species under the *EPBC Act 1999*);
- Ghost Bat (*Macroderma gigas*) (DEC Priority 4 listing); and
- Western Pebble-mound Mouse (*Pseudomys chapmanii*) (DEC Priority 4 listing).

The conservation status of these species is unlikely to be altered either at the local or regional level by the proposed clearing (Biota Environmental Sciences, 2008b).

The rocky gorges and vegetation associated with small drainage lines within the application area may provide significant fauna habitat. The fauna habitats identified in the study area appear typical of the area surrounding

the Marandoo Mine Site and are well represented across the Pilbara (Biota Environmental Sciences, 2008b). The fauna habitats identified within the application area are not considered as necessary for the on-going maintenance of any significant fauna habitat. It is likely that equal or higher quality vegetation and fauna habitats would exist throughout the surrounding area, and Pilbara region. Furthermore, the habitat types described by Biota Environmental Sciences (2008b) are well represented within Karijini National Park, which provides potentially important contemporary refugia for many species.

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

Methodology Biota Environmental Sciences (2008b)

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

Comments Proposal may be at variance to this Principle

According to available databases, there are no records of Declared Rare Flora (DRF) within the application area (GIS Database). A flora survey of the Marandoo Mine Phase 2 area was conducted by Biota Environmental Sciences between 6-9 March, 18-26 May 2007 and 21-28 April 2008. A flora survey of the pipeline corridor was undertaken by Mattiske Consulting in September 2008. Neither of these surveys recorded any DRF (Biota Environmental Sciences, 2008a; Mattiske Consulting, 2008). However, it has been noted that the DRF *Lepidium catapycnon* has been recorded from several locations around Tom Price and suitable habitat of stony hills and plains occurs within the application area (Biota Environmental Sciences, 2008a). Given this, there is the slight possibility that this species may occur within the application area (Biota Environmental Sciences, 2008a).

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

Methodology Biota Environmental Sciences (2008a)
Mattiske Consulting (2008)
GIS Database:
- Declared Rare and Priority Flora List

(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 reveals that there are no Threatened Ecological Communities (TECs) within the application area (GIS Database; Biota Environmental Sciences, 2008a). The nearest TEC is located approximately 7 kilometres north-west of the application area (Themeda Grasslands). At this distance there is little likelihood of any impact to the TEC from the proposed clearing.

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

Methodology Biota Environmental Sciences (2008a)
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 Biogeographic Regionalisation of Australia (IBRA) bioregion in which approximately 99.9% of the Pre-European vegetation remains (see table) (GIS Database, Shepherd, 2009).

The vegetation of the application area has been mapped as the following Beard vegetation associations (GIS Database):

18: Low woodland; mulga (*Acacia aneura*);
29: Sparse low woodland; mulga, discontinuous in scattered groups; and
82: Hummock grasslands, low tree steppe; snappygum over *Triodia wiseana*.

According to Shepherd (2009) approximately 100% of these Beard vegetation associations remains at both a state and bioregional level. Therefore the area proposed to be cleared does not represent a significant remnant of native vegetation within an area that has been extensively cleared.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in IUCN Class I-IV Reserves
IBRA Bioregion – Pilbara	17,804,187	17,794,646	~99.9	Least Concern	6.3
Beard veg assoc. – State					
18	19,892,305	19,890,195	~100	Least Concern	2.1
29	7,903,991	7,903,991	~100	Least Concern	0.3
82	2,565,901	2,565,901	~100	Least Concern	10.2
Beard veg assoc. – Bioregion					
18	676,557	676,557	~100	Least Concern	16.8
29	1,133,219	1,133,219	~100	Least Concern	1.9
82	2,565,583	2,565,583	~100	Least Concern	10.2

* Shepherd (2009)

** Department of Natural Resources and Environment (2002)

Options to select from: Bioregional Conservation Status of Ecological Vegetation Classes (Department of Natural Resources and Environment 2002)

Presumed extinct	Probably no longer present in the bioregion
Endangered	<10% of pre-European extent remains
Vulnerable	10-30% of pre-European extent exists
Depleted	>30% and up to 50% of pre-European extent exists
Least concern	>50% pre-European extent exists and subject to little or no degradation over a majority of this area

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

Methodology Department of Natural Resources and Environment (2002)
Shepherd (2009)
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 minor ephemeral watercourses within the application area (GIS Database). Based on vegetation mapping conducted by Biota Environmental Sciences (2008a) and Matiske Consulting (2008) nine of the vegetation associations recorded are associated with flowlines and drainage areas.

The riparian vegetation of the application area is likely to be disturbed due to the construction of access tracks and pipeline crossing the drainage lines which may alter the watercourses natural regime. To minimise the impact and ensure the natural water flow is maintained it is recommended that culverts and floodways be installed where drainage lines are intersected.

Based on the above, the proposed clearing is at variance to this Principle. However, the proposed clearing is not likely to significantly impact on the conservation of vegetation growing in association with permanent watercourses or wetlands due to the absence of these within the application area. Minor ephemeral watercourses and their associated vegetation communities are common and widespread in the local area. The proposed clearing is not likely to impact on any significant watercourses or wetlands in the local area.

Methodology Biota Environmental Sciences (2008a)
Matiske Consulting (2008)
GIS Database:
- 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 not likely to be at variance to this Principle

According to available databases, the application area is mapped as occurring on the Paraburdoo, Boolgeeda,

Newman, Jurrawarrina and Wannamuna land systems (GIS Database). The Newman and Boolgeeda land systems are generally not prone to erosion, however, the Paraburdoo, Jurrawarrina and Wannamunna land systems are prone to degradation if they are overgrazed (Van Vreeswyk et al., 2004). The Wannamunna and Newman land systems only make up a very small portion of the application area with the majority being mapped as Paraburdoo, Jurrawarrina and Boolgeeda (GIS Database).

The application area spans a distance of over 30 kilometres and is relatively flat for this whole length (GIS Database). Therefore, the proposed clearing is not expected to lead to an increase in runoff, in turn increasing erosion. At a broad scale the surface soil pH of the application area is 5.5 - 6.0 and there is no known occurrence of acid sulphate soils (CSIRO, 2009). Given the proposed clearing is mostly narrow and linear in nature, it is not expected to cause appreciable land degradation.

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

Methodology CSIRO (2009)
Van Vreeswk 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**
Approximately 40 hectares of the application area is located within land vested with the Conservation Commission for the purposes of an infrastructure corridor (GIS Database). The application area also lies within an area that has been excised from Karijini National Park, and the majority of the application area has a proximity of less than 2 kilometres to the National Park (GIS Database).

According to the Australian Heritage Database (Australian Heritage Database, 2010) the Karijini National Park is an area of approximately 620,000 hectares and its value as a representative example of the Hamersley Ranges is enhanced by most of the area being relatively unmodified by pastoralism or large scale mining operations.

The application area contains vegetation types and habitats which are well represented and conserved within Karijini National Park (GIS Database; Australian Heritage Database, 2010). The area under application is unlikely to be acting as an important buffer for, or significant ecological linkage to, Karijini National Park given that the area surrounding Karijini National Park is largely uncleared.

The Marandoo Mine Phase 2 proposal was approved on 7 July 2010, subject to Ministerial conditions on the protection of the environment and pursuant to the provisions of the *Environmental Protection Act 1986*. Conditions have been imposed specific to dewatering discharge and the effects the dewatering has in Karijini National Park.

The application area stretches over 30 kilometres and the majority is approximately 100 metres wide. The clearing of this narrow area though the infrastructure corridor is not likely to significantly impact the environmental values of Karijini National Park.

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

Methodology Australian Heritage Database (2010)
GIS Database:
- DEC Tenure
- Pre-European Vegetation

(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 is not likely to be at variance to this Principle**
The application area is not located within a Public Drinking Water Sources Area (PDWSA) (GIS Database). There are no permanent watercourses within the application area (GIS Database). Numerous minor non-perennial watercourses intersect the application area (GIS Database). The proposed clearing is not expected to impact the quality of water within these watercourses.

The annual average rainfall for the application area is 398.4 millimetres and the average annual evaporation rate is 3,400 millimetres (BoM, 2010: GIS Database). Therefore, during normal rainfall events surface water within the application area is likely to evaporate quickly. However, substantial rainfall events create surface sheet flow which is likely to have a higher level of sediments. During normal rainfall events, the proposed clearing would not likely lead to an increase in sedimentation of watercourses within the application area.

The groundwater salinity within the application area is between 500 – 1,000 milligrams per litre of Total Dissolved Solids (TDS) (GIS Database). This is considered to be potable water. The proposed clearing is not

likely to cause salinity levels within the application area to alter.

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

Methodology BoM (2010)
GIS Database:
- Evaporation Isopleths
- Groundwater Salinity, Statewide
- Hydrography, linear
- Public Drinking Water Source Areas (PDWSAs)

(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

With an average annual rainfall of 400 millimetres and an average annual evaporation rate of 3,400 millimetres there is likely to be little surface flow during normal seasonal rains (BoM, 2010; GIS Database). Whilst large rainfall events may result in the flooding of the area, the proposed clearing is not likely to lead to an increase in incidence or intensity of flooding.

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

Methodology BoM (2010)
GIS Database:
- Evaporation Isopleths

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

Comments

Clearing permit CPS 3933/1 was granted by the Department of Mines and Petroleum on 11 November 2010 and was valid from 11 December 2010 to 31 July 2016. The clearing permit authorised the clearing of 260 hectares within an area of 546.3 hectares. The proponent has requested an amendment to increase the permit boundary by 5 hectares. This is due to an assessment of the mine pit batter slopes resulting in a powerline needing to be constructed slightly further north than originally planned. The amount of vegetation cleared will remain the same.

The vegetation within the additional area is vegetation unit 1c: *Triodia melvillei* hummock grassland and the fauna habitat present is Stony hillslopes vegetated with *Acacia* shrubs over *Triodia* on stony loam substrates. The potential clearing of an additional 5 hectares of this vegetation community and fauna habitat is not likely to have significant additional environmental impacts.

There is one native title claim over the area under application (GIS Database). This claim (WC97/89) has been registered with the National Native Title Tribunal on behalf of the claimant group (GIS Database). 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*.

According to available databases, there are seven registered Aboriginal Sites of Significance within the application area (GIS Database). 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 and Conservation 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 amendment was advertised on 4 July 2011 by the Department of Mines and Petroleum inviting submissions from the public. There were no submissions received.

Methodology GIS Database:
- Aboriginal Sites of Significance
- Native Title Determined

4. References

- Australian Heritage Database (2010) Register of National Estate: Hamersley Range National Park. <http://www.environment.gov.au> (Accessed 1 November 2010).
- Biota Environmental Sciences (2008a) Marandoo Mine Phase 2 Project Vegetation and Flora Survey. Prepared for Rio Tinto. Unpublished report dated August 2008.
- Biota Environmental Sciences (2008b) Marandoo Mine Phase 2 Seasonal Fauna Survey. Prepared for Rio Tinto. Unpublished report dated August 2008.
- Bureau of Meteorology (2010) BOM Website - Climate statistics for Australian locations, Averages for Karratha Aero. Available

online at: http://www.bom.gov.au/climate/averages/tables/cw_005072.shtml Accessed on 2 November 2010.

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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.

Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia.

Mattiske Consulting (2008) Flora and Vegetation on the Pipeline Corridor from the Fortescue Borefield to Tom Price. Prepared for Pilbara Iron. Unpublished report dated November 2008.

Shepherd, D.P. (2009) Adapted from: Shepherd, D.P., Beeston, G.R., and Hopkins, A.J.M. (2001), Native Vegetation in Western Australia. Technical Report 249. Department of Agriculture Western Australia, South Perth.

Trudgen M.E. (1988) A Report on the Flora and Vegetation of the Port Kennedy Area. Unpublished report prepared for Bowman Bishaw and Associates, West Perth.

Van Vreeswyk, A.M, Payne, A.L, Leighton, K.A & Hennig, P (2004) Technical Bulletin No. 92: An inventory and condition survey of the Pilbara region, Western Australia. Department of Agriculture, South Perth, Western Australia.

5. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government
CALM	Department of Conservation and Land Management (now DEC), Western Australia
DAFWA	Department of Agriculture and Food, Western Australia
DEC	Department of Environment and Conservation, Western Australia
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DEC), Western Australia
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia
DMP	Department of Mines and Petroleum, Western Australia
DoE	Department of Environment (now DEC), Western Australia
DoIR	Department of Industry and Resources (now DMP), Western Australia
DOLA	Department of Land Administration, Western Australia
DoW	Department of Water
EP Act	Environmental Protection Act 1986, Western Australia
EPBC Act	Environmental Protection and Biodiversity Conservation Act 1999 (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
RIWI Act	Rights in Water and Irrigation Act 1914, Western Australia
s.17	Section 17 of the Environment Protection Act 1986, Western Australia
TEC	Threatened Ecological Community

Definitions:

{Atkins, K (2005). *Declared rare and priority flora list for Western Australia, 22 February 2005*. Department of Conservation and Land Management, Como, Western Australia} :-

- P1** **Priority One - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P2** **Priority Two - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P3** **Priority Three - Poorly Known taxa:** taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
- P4** **Priority Four – Rare taxa:** taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.
- R** **Declared Rare Flora – Extant taxa (= Threatened Flora = Endangered + Vulnerable):** taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the

Environment, after recommendation by the State's Endangered Flora Consultative Committee.

- X Declared Rare Flora - Presumed Extinct taxa:** taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

{Wildlife Conservation (Specially Protected Fauna) Notice 2005} [Wildlife Conservation Act 1950] :-

- Schedule 1 Schedule 1 – Fauna that is rare or likely to become extinct:** being fauna that is rare or likely to become extinct, are declared to be fauna that is need of special protection.
- Schedule 2 Schedule 2 – Fauna that is presumed to be extinct:** being fauna that is presumed to be extinct, are declared to be fauna that is need of special protection.
- Schedule 3 Schedule 3 – Birds protected under an international agreement:** being birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is need of special protection.
- Schedule 4 Schedule 4 – Other specially protected fauna:** being fauna that is declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

{CALM (2005). *Priority Codes for Fauna*. Department of Conservation and Land Management, Como, Western Australia} :-

- P1 Priority One: Taxa with few, poorly known populations on threatened lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P2 Priority Two: Taxa with few, poorly known populations on conservation lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P3 Priority Three: Taxa with several, poorly known populations, some on conservation lands:** Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P4 Priority Four: Taxa in need of monitoring:** Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
- P5 Priority Five: Taxa in need of monitoring:** Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of threatened species (*Environment Protection and Biodiversity Conservation Act 1999*)

- EX Extinct:** A native species for which there is no reasonable doubt that the last member of the species has died.
- EX(W) Extinct in the wild:** A native species which:
(a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
(b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- CR Critically Endangered:** A native species which is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
- EN Endangered:** A native species which:
(a) is not critically endangered; and
(b) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
- VU Vulnerable:** A native species which:
(a) is not critically endangered or endangered; and
(b) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- CD Conservation Dependent:** A native species which is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.