



1. Application details

1.1. Permit application details

Permit application No.: 2161/1
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: BHP Billiton Iron Ore Pty Ltd

1.3. Property details

Property: State Agreement Act, Mining Lease 266SA (AM 70/266)
Local Government Area: Shire of East Pilbara
Colloquial name: South Jimblebar Project

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
755		Mechanical Removal	Mineral Exploration

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
<p>The area applied to clear has been broadly mapped at a scale of 1:250,000 as: Beard Vegetation Association 29: Sparse low woodland; Mulga, discontinuous in scattered groups, Beard Vegetation Association 82: Hummock grasslands, low tree steppe; snappy gum over <i>Triodia wiseana</i> and Beard Vegetation Association 216: Low woodland; Mulga (with spinifex) on rises (GIS Database).</p> <p>Ecologia Environment Pty Ltd (2006) undertook a baseline biological survey of the western portion of the proposed clearing area between 22nd and 28th May 2006. The following four vegetation types were identified from the area:</p> <ol style="list-style-type: none"> <i>Acacia aneura</i> / <i>Acacia pruinocarpa</i> / <i>Corymbia ferritcola</i> sometimes with <i>Eucalyptus leucophloia</i> open scrub to open low woodland B over <i>Eremophila fraseri</i> / <i>E. forrestii</i> / <i>Senna artemisioides</i> subsp. <i>oligophylla</i> x <i>helmsii</i> over mixed open herbs and hummock grass; <i>Acacia coleii</i> var. <i>coleii</i> open scrub to open low woodland, over <i>Acacia melleodora</i> open shrubs, over <i>Aristida</i> sp. / <i>Enneapogon</i> sp. open low grassland; Scattered <i>Corymbia hamersleyana</i> / <i>Corymbia ferritcola</i>, over <i>Acacia melleodora</i> open low shrubs, over <i>Triodia basedowii</i> / <i>Triodia wiseana</i> moderately dense hummock grass; and Scattered medium shrubs of <i>G. wickhami</i> / <i>A. pachyacra</i> / <i>Hakea lorea</i> sometimes with <i>Eucalyptus gamophylla</i>, over open to moderately dense <i>A. ancistrocarpa</i> sometimes with <i>Acacia hilliana</i>, over <i>Triodia</i> spp. 	<p>This clearing permit application is for a Purpose Permit to clear up to 755 hectares within a boundary of approximately 5,940 hectares (GIS Database). The proposed clearing area is located south, east and west of the existing Jimblebar mine, situated approximately 50 kilometres east of Newman in the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (BHP Billiton, 2007).</p> <p>The proposed work program for the South Jimblebar exploration project consists of an estimated 12, 267 drill holes (requiring 491 hectares of clearing for drill pads) and 264 hectares of clearing for access tracks and drill lines (BHP Billiton, 2007). The program is scheduled to take place over a 5 year period (BHP Billiton, 2007).</p>	<p>Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery 1994)</p> <p>to</p> <p>Degraded: Structure severely disturbed; regeneration to good condition requires intensive management (Keighery 1994)</p>	<p>A majority of the proposed clearing area is within the Sylvania Pastoral lease (GIS Database). Consequently, Buffel Grass (<i>Cenchrus ciliaris</i>) was a dominant component of the understorey vegetation in some areas (particularly fringing the Jimblebar Creek and the bordering floodplain) (Ecologia Environment Pty Ltd, 2007).</p> <p>Overgrazing by cattle was noted at several survey sites throughout the proposed clearing area, whilst some areas were observed to be in a post-fire regrowth stage (Ecologia Environment Pty Ltd, 2007).</p>

Ecologia Environment Pty Ltd (2007) conducted a dual season biological survey over the eastern portion of the proposed clearing area between 24th August and 1st September 2005 and 15th and 21st February 2006. The following seven vegetation types were mapped from the area at a scale of 1:25,000:

1. *Corymbia hamersleyana* open low woodland over *Acacia aneura* open low woodland over *Gossypium robinsonii* / *Grevillea wickhamii* open scrub over *Acacia sp.* / *Eremophila fraseri* / *Eremophila forrestii* open low scrub over *Ptilotus obovatus* / *Solanum lasiophyllum* open dwarf scrub over **Cenchrus ciliaris* open low grass;

2. *Grevillea wickhamii* open low scrub over *Sida arenicola* / *Ptilotus calostachyus* open dwarf scrub over *Acacia hilliana* / *Acacia adoxa* / *Goodenia stobbsiana* / *Halgania solanacea* / *Scaevola parvifolia* open dwarf scrub over *Triodia basedowii* open hummock grass;

3. *Acacia aneura* / *Acacia pruinocarpa* open low woodland over *Acacia maitlandii* open low scrub over *Ptilotus rotundifolius* / *Senna glutinosa* open dwarf scrub over *Acacia hilliana* / *Halgania solanacea* / *Gompholobium polyzygum* open low scrub over *Triodia basedowii* mid-dense hummock grass;

4. *Eucalyptus victrix* woodland over open low woodland over open scrub over **Cenchrus ciliaris* dense low grass;

5. *Acacia aneura* open scrub over *Eremophila compacta* open dwarf scrub over *Triodia basedowii* open hummock grass;

6. *Corymbia hamersleyana* open low woodland over *Petalostylis labicheoides* open low scrub over *Triodia basedowii* open hummock grass over **Cenchrus ciliaris* open low grass;

7. *Acacia aneura* / *Acacia rhodophloia* low woodland over *Eremophila latrobei* / *Eremophila exilifolia* / *Dodonaea petiolaris* / *Sida calyxhymenia* low scrub over *Triodia basedowii* hummock grass.

* = introduced flora species

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

The proposed clearing area is located approximately 40 kilometres east of Newman in the Fortescue Plains subregion of the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) bioregion (GIS Database). The Fortescue Plains subregion is characterised by alluvial plains and river frontage (CALM, 2001). Extensive salt marsh, bunch grass and short grass communities on alluvial plains are dominant features in the east of the subregion, whilst deeply incised gorges exist in the lower west (CALM, 2001). Large permanent wetlands supporting river gum communities are a feature of the central Fortescue (CALM, 2001). Dominant land uses of the Fortescue subregion include grazing, native pastures, unallocated crown land and crown reserves, conservation and Aboriginal leases (CALM, 2001).

Ecologia Environment Pty Ltd (2007) undertook a dual season vegetation and flora survey over the eastern portion of the proposed clearing area in August/September 2005 and February 2006. A total of 372 flora taxa were recorded from 43 families. Thirty eight flora collections could not be identified beyond genus level, whilst two collections could not be identified beyond family level (Ecologia Environment Pty Ltd, 2007). The total number of taxa recorded (372) was higher than the expected total of 348 which was calculated by examining all flora data collected from previous flora surveys in the Jimblebar area. Relative to other surveys undertaken in the area, Ecologia Environment Pty Ltd (2007) report the survey area to have high species richness. In addition, the number of land systems found in the survey area is large relative to other projects of similar size in the Pilbara, suggesting that the area may be of some regional conservation and ecological significance. Unless carefully managed, the proposed clearing and secondary disturbances associated with exploration drilling may

reduce the biodiversity of the flora within the survey area (Ecologia Environment Pty Ltd, 2007).

The high species richness recorded from the eastern portion of the proposed clearing area can most likely be attributed to the fact that the survey was conducted over two seasons (August/September 2005 and February 2006). A very wet season was experienced prior to the February 2006 survey, resulting in noticeable changes to the vegetation between the 2005 and 2006 survey. Many *Triodia* grasses were flowering at the time of the February survey, as were some other plants that had not been flowering during the August/September 2005 survey. Many small herbs had also emerged following significant rainfall (Ecologia Environment Pty Ltd, 2007).

Ecologia Environment Pty Ltd (2006) recorded a total of 267 flora taxa from 45 families and 119 genera during a vegetation and flora survey over the western portion of the proposed clearing area in May 2006. Twenty three flora collections could not be identified beyond genus level, whilst one collection could not be identified beyond family level. The total number of species recorded (267) was below the expected total of 348 species. However, in comparison to other vegetation and flora surveys undertaken in the Jimblebar area, this is still considered to be species rich (see Table 1 below). High species numbers can most likely be attributed to the high rainfall experienced in the wet season leading up to the survey (Ecologia Environment Pty Ltd, 2006). Many herbs and grasses were present that may not have been recorded in drier conditions.

Table 1: Flora Survey Results from the Jimblebar Area

Survey	Number of Plant Taxa Recorded
Endersby (1994)	89
Ecologia Environment Pty Ltd (1999)	93
Biota (2004)	204
Ecologia Environment Pty Ltd (2004)	181
Ecologia Environment Pty Ltd (2006)	267
Ecologia Environment Pty Ltd (2007)	372

Two Priority Flora species, *Goodenia hartiana* (P2) and *Goodenia nuda* (P3) were recorded within the proposed clearing area. One flora species of interest, *Wurmbea deserticola*, was also recorded. Neither *Goodenia hartiana* nor *Wurmbea deserticola* have previously been collected in the Pilbara bioregion (pers comm. L. Sage, 2008; Ecologia Environment Pty Ltd, 2006), therefore their collection within the proposed clearing area may be considered locally and regionally significant from a biodiversity perspective. *Goodenia nuda* is endemic to the Pilbara bioregion according to current information from the Western Australian Herbarium (2008), and its collection within the proposed clearing area may also be considered significant in terms of biodiversity value. Whilst only recorded in small numbers, it is recommended that *Goodenia hartiana*, *Goodenia nuda* and *Wurmbea deserticola* be managed by the imposition of appropriate conditions, should a clearing permit be granted.

Six introduced flora species were recorded within the proposed clearing area by Ecologia Environment Pty Ltd (2006; 2007): Buffel Grass (*Cenchrus ciliaris*), Bipinnate Beggartick (*Bidens bipinnata*), Prickly Paddy Melon (*Cucumis myriocarpus*), Spiked Malvastrum (*Malvastrum americanum*), Common Sowthistle (*Sonchus oleraceus*) and Jersey Cudweed (*Helichrysum luteoalbum*). The presence of introduced flora species 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. Should a clearing permit be granted, it is recommended that a condition be imposed for the purposes of weed management.

From a faunal perspective, a total of 98 vertebrate fauna taxa were recorded during a fauna survey over the western portion of the proposed clearing area in May 2006. This included 10 species of mammal, 64 species of bird, 23 species of reptile and one amphibian (Ecologia Environment Pty Ltd, 2006). The number of bird species recorded is greater than that recorded during other surveys of similar size and scope in the surrounding area. This can be accounted for by the favourable climatic conditions at the time of survey, number of plants flowering and number of fauna habitats within the survey area (Ecologia Environment Pty Ltd, 2006). The number of reptiles, mammals and amphibians is similar to that recorded in other surveys of similar size and scope in the surrounding area (Ecologia Environment Pty Ltd, 2006).

Three introduced mammal species were recorded within the proposed clearing area by Ecologia Environment Pty Ltd (2006). This included cattle (*Bos taurus*), the camel (*Camelus dromedarius*) and the feral cat (*Felis catus*). The presence of introduced fauna within the proposed clearing area is likely to have a detrimental impact upon native fauna species and their associated habitat.

The proposed clearing area consists of a variety of landform features, vegetation associations and habitat types which support flora and fauna indigenous to Western Australia. Low ridges, hills, scree slopes, gorges and gullies, drainage channels and creeklines, plains, range crests and slopes were all recorded by Ecologia Environment Pty Ltd (2006; 2007). Generally, vegetation was characterised by open low woodlands of Acacia and Eucalyptus over *Triodia* hummock grasslands. According to Ecologia Environment Pty Ltd (2006), the vegetation associations, habitats and landforms within the western portion of the proposed clearing area are not considered to be of regional conservation or ecological significance and are well represented across the Pilbara bioregion (Ecologia Environment Pty Ltd, 2006). The species richness and land system diversity recorded within the eastern portion of the proposed clearing area may be of some regional conservation and ecological significance (Ecologia Environment Pty Ltd, 2007).

BHP Billiton (2007b) have an Exploration Environmental Management Plan (EEMP) to ensure that all exploration activities are appropriately managed to minimise potential environmental impacts. The EEMP addresses a range of key environmental issues including management of flora and fauna, weeds, site rehabilitation and environmental education.

BHP Billiton (2007a) have made a number of commitments to ensure that this clearing proposal has a minimal environmental impact. Some key commitments include:

- disturbance to native vegetation will be kept to a necessary minimum. Drill pads will be a maximum size of 400 square metres, whilst access tracks will be a maximum width of four metres. Existing access tracks will be used wherever possible;
- no exploration drilling will be undertaken within major drainage lines, or within a 20 metre buffer from the boundary of riparian vegetation;
- additional flora surveys will be commissioned to target conservation significant flora species. This is intended to expand the known distribution of these species; and
- rehabilitation will be undertaken progressively throughout the life of the exploration program. Drill pads and access tracks will be rehabilitated within six months of completion of each stage of the program, and/or before the commencement of the next phase of drilling (whichever comes first).

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

Methodology BHP Billiton (2007a).
BHP Billiton (2007b).
Biota (2004).
CALM (2001).
Ecologia Environment Pty Ltd (1999).
Ecologia Environment Pty Ltd (2004).
Ecologia Environment Pty Ltd (2006).
Ecologia Environment Pty Ltd (2007).
Endersby (1994).
Western Australian Herbarium (2008).
GIS Database:
- Interim Biogeographic Regionalisation for Australia (Subregions) - EA - 18/10/00.

(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 is not likely to be at variance to this Principle

Ecologia Environment Pty Ltd (2006) undertook a vertebrate fauna survey over the western section of the proposed clearing area in May 2006. The survey consisted of the following methods:

1. Desktop search - Prior to undertaking any fieldwork, a list was prepared of vertebrate fauna species previously recorded or likely to occur in the project area. The list was compiled based on a search of the Department of Environment and Conservation's Threatened and Priority Fauna Database, the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* database, Western Australian Museum fauna database, available literature and other unpublished information relevant to the project area. A total of 302 taxa were recorded on the list.

2. Census for birds - A total of 19.6 hours of bird surveys were undertaken over 59 sites (20 minutes at each site). A two hectare area was searched for each of the 59 sites, centred over the proposed drill points.

3. Hand foraging for mammals, reptiles and amphibians - A total of 39.3 hours was spent opportunistically searching for terrestrial vertebrates (40 minutes at each of the 59 sites). A two hectare area was searched for each of the 59 sites, replicating the area used for each bird census.

4. Opportunistic sightings - Any fauna species seen whilst searching or travelling within the project area during the day and night were recorded.

5. Secondary evidence - Tracks, diggings, scats, burrows and nests were recorded where observed.

6. Bat recordings - Surveying for bat species was undertaken using the Anabat II system (a bat detector that records and transforms ultrasonic bat echolocation calls for analysis and identification with computer software). Five sites were selected for bat recording, including a number of small caves, a small dam and a creekline.

7. Habitat assessment - All habitat types encountered were assessed as to their suitability and likelihood of

supporting threatened vertebrate fauna (Ecologia Environment Pty Ltd, 2006).

A total of 98 vertebrate fauna taxa were recorded during the field survey (all of which had been recorded in the region previously). This included 10 species of mammal, 64 species of bird, 23 species of reptile and one amphibian (Ecologia Environment Pty Ltd, 2006). It is noted that seasonal and climatic factors influenced the results of the survey. For example, bird activity was high given that the survey was conducted in May after high rainfall and cyclonic periods post summer; however reptile activity was reduced. Cool temperatures were experienced at night, thereby reducing the activity of nocturnal species (Ecologia Environment Pty Ltd, 2006).

Of the 10 mammal species recorded during the fauna survey, three were bat species. This included the Gould's Wattled Bat (*Chalinobus gouldii*), Inland Cave Bat (*Vespadelus finlaysoni*) and Little Broad-nosed Bat (*Scotorepens greyii*) (Ecologia Environment Pty Ltd, 2006). Two other bat species not recorded during the current survey, but previously recorded in the area during other fauna surveys, are also likely to occur in the proposed clearing area. These species are the Orange Leaf-nosed Bat; *Rhinonicterus aurantius* (Schedule 1 - Fauna that is rare or likely to become extinct, *Wildlife Conservation (Specially Protected Fauna) Notice, 2006*), and the Ghost Bat; *Macroderma gigas* (Priority 4 - Department of Environment and Conservation's Threatened and Priority fauna list). Ecologia Environment Pty Ltd (2006) state that there is a lack of potential roosting habitat within the survey area. All of the above listed bat species may forage in the proposed clearing area, however it is unlikely that the proposed clearing will result in a loss of significant roosting or foraging habitat for any bat species indigenous to Western Australia.

Three introduced mammal species were recorded during the current fauna survey. This included Cattle (*Bos taurus*), Feral Cat (*Felis catus*) and the Camel (*Camelus dromedaries*). An additional four introduced mammal species have previously been recorded in the Jimblebar area. These include the Horse (*Equus caballus*), House Mouse (*Mus musculus*), Rabbit (*Oryctologus cuniculus*) and Fox (*Vulpes vulpes*). The presence of introduced fauna within the proposed clearing area is likely to have diminished the habitat values of the area for native fauna.

Three potentially active mounds of the Western Pebble-mound Mouse; *Pseudomys chapmani* (Priority 4) were recorded within the proposed clearing area (Ecologia Environment Pty Ltd, 2006). It is therefore possible that a resident population is present in the area. However, Start et al (2000) reports that the Western Pebble-mound Mouse is much more widespread than first thought, and is in fact abundant in many areas of suitable habitat. The species is known from at least five large conservation reserves, including the Karijini, Collier Range, Millstream-Chichester and Rudall River National Parks; and the Barlee Range Nature Reserve (Start et al, 2000). Mounds can commonly be found on colluvial slopes throughout the Hamersley and Ophthalmia Ranges (Start et al, 2000). It is unlikely that the proposed clearing will result in a loss of significant habitat at the subregional or bioregional level.

The Rainbow Bee-eater (*Merops ornatus*) is listed as 'Migratory' and 'Marine' by the *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*, and was recorded within the proposed clearing area (Ecologia Environment Pty Ltd, 2006). This species has a widespread distribution over Australia, wintering in northern Australia and Indonesia, and migrating south during September and October (Johnstone and Storr, 1998 cited in Ecologia Environment Pty Ltd, 2006). Given the wide distribution of the Rainbow Bee-eater and the non-contiguous nature of the proposed clearing, it is unlikely that this proposal will result in a loss of significant habitat for the Rainbow Bee-eater.

The Australian Bustard; *Ardeotis australis* (Priority 4) is a wide ranging, nomadic species which moves in response to the availability of food (Pizzey and Knight, 1997). This species was recorded within the proposed clearing area (Ecologia Environment Pty Ltd, 2006). This species is likely to vacate the proposed clearing area at the onset of disturbance. Given the broad habitat requirements of the Australian Bustard and the nature of the proposed clearing activity, it is unlikely that significant habitat will be lost as a result of this proposal (Ecologia Environment Pty Ltd, 2006).

It is acknowledged that the proposed clearing is for a large area (755 hectares) and loss of habitat and fauna displacement are inevitable consequences of clearing activity. However, clearing will be non-contiguous, consisting of discrete drill pads (maximum size of 400 square metres) and access tracks (maximum width of 4 metres) (BHP Billiton, 2007b). This clearing proposal is likely to have localised impacts to fauna species and their associated habitat given the nature of the proposal. Many of the bird species and larger reptile species within the proposed clearing area are mobile and will be able to move to adjacent habitat at the onset of disturbance (Ecologia Environment Pty Ltd, 2006). Sedentary species are more likely to suffer mortality during the proposed clearing operations, and are also more likely to be sensitive to habitat loss (Ecologia Environment Pty Ltd, 2006).

It is relevant to note that habitat loss as a result of the proposed clearing will be temporary. BHP Billiton (2007a) commit to rehabilitating drill pads and access tracks within six months of completion of each stage of the program, and/or before the commencement of the next phase of drilling (whichever comes first). Ecologia Environment Pty Ltd (2006) noted that the survey area lacks specialised habitat which is known to promote short-range endemism. None of the species recorded in the Jimblebar area were confined to habitats that are not strongly represented outside of the project area (Ecologia Environment Pty Ltd, 2006).

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

Methodology BHP Billiton (2007a).
BHP Billiton (2007b).
Ecologia Environment Pty Ltd (2006).
Pizzey and Knight (1997).
Start et al (2000).

(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**

There are no known records of Declared Rare Flora (DRF) within the proposed clearing area (GIS Database). The nearest known DRF to the proposed clearing area is six populations of *Lepidium catapycnon*, located approximately 40 kilometres to the west (GIS Database). Ecologia Environment Pty Ltd (2006; 2007) did not locate any DRF during a baseline biological survey over part of the proposed clearing area between 22 - 28 May 2006, or during a dual season biological survey carried out over part of the proposed clearing area in August/September 2005 and February 2006.

Two Priority Flora species were located within the proposed clearing area by Ecologia Environment Pty Ltd (2006; 2007). This included the Priority 2 species *Goodenia hartiana* and the Priority 3 species *Goodenia nuda*.

Goodenia hartiana is a multistemmed perennial herb or shrub, typically found growing in sand in dune swales and on sand hills (Western Australian Herbarium, 2008). Sage and Albrecht (2006) report that this species is known from the extreme northern Little Sandy Desert bioregion and the Great Sandy Desert bioregion. This species was recorded from two sites within the proposed clearing area during the 2007 flora survey (Ecologia Environment Pty Ltd, 2007). *Goodenia hartiana* was found growing on sandy loam soils with coarse gravel on hillslopes, gentle slopes and the crest of a low rise (BHP Billiton, 2007a). Personal communication with L. Sage (2008) confirmed that this species has not been previously recorded in the Pilbara bioregion. *Goodenia hartiana* faces immediate threats from mining and is not represented in conservation estate (pers comm., L. Sage, 2008). Collections of this species within the proposed clearing area (if confirmed by the Western Australian Herbarium) represent an important range extension. BHP Billiton (2007b) has committed to undertake further survey work to improve knowledge of the distribution of this species.

Goodenia nuda is an erect to ascending herb, growing to a height of 0.5 metres (Western Australian Herbarium, 2008). This species is characterised by yellow flowers between April and August, and is endemic to the Pilbara bioregion according to current information (Western Australian Herbarium, 2008). *Goodenia nuda* was recorded from four sites within the proposed clearing area (Ecologia Environment Pty Ltd, 2006; 2007). A single specimen of this species was found at two of the four collection sites, whilst the species was found in greater numbers along minor creeklines and on a floodplain at the other two sites (BHP Billiton, 2007a). BHP Billiton (2007b) have committed to undertake further survey work to improve knowledge of the distribution of this species.

One flora species of interest, *Wurmbea deserticola*, was recorded within the proposed clearing area. (Ecologia Environment Pty Ltd, 2006). *Wurmbea deserticola* is a cormous perennial herb growing to a height of 0.07 - 0.25 metres (Western Australian Herbarium, 2008). This species is characterised by pink and white flowers from May to December and is typically found growing on red sand, lateritic loam, rocky soils and sand dunes (Western Australian Herbarium, 2008). This species has not previously been recorded in the Pilbara bioregion, therefore its collection within the proposed clearing area represents a range extension (Ecologia Environment Pty Ltd, 2006). Only a solitary plant of *Wurmbea deserticola* was collected within the proposed clearing area, however this species was also opportunistically collected outside of the application area (Ecologia Environment Pty Ltd, 2006). BHP Billiton (2007b) have committed to undertake further survey work to improve knowledge of the distribution of this species.

BHP Billiton are committed to avoiding significant flora species where possible during exploration drilling programs. The location of significant species and their habitat is recorded and used at exploration planning and operational levels (BHP Billiton, 2007b). Should a clearing permit be granted, it is recommended that conditions be imposed on the permit to ensure that known specimens of *Goodenia hartiana*, *Goodenia nuda* and *Wurmbea deserticola* are not removed until the proponent can provide additional information about the local distribution of these species.

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

Methodology BHP Billiton (2007a).
BHP Billiton (2007b).
Ecologia Environment Pty Ltd (2006).
Ecologia Environment Pty Ltd (2007).
Sage and Albrecht (2006).
Western Australian Herbarium (2008).
GIS Database:
- Declared Rare and Priority Flora List - CALM 01/07/05.

(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

There are no known Threatened Ecological Communities (TECs) within, or in close proximity to, the proposed clearing area (GIS Database). The nearest known TEC is the Ethel Gorge aquifer stygobiont community, located approximately 30 kilometres west north-west of the proposed clearing area (GIS Database).

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

Methodology GIS Database:
- Threatened Ecological Communities - CALM 12/04/05.

(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 area applied to clear is within the Interim Biogeographic Regionalisation for Australia (IBRA) Pilbara bioregion (GIS Database). According to Shepherd et al (2001) there is approximately 99.9% of the pre-European vegetation remaining in the Pilbara bioregion. The vegetation of the application area is classified as Beard Vegetation Association 29: Sparse low woodland; Mulga, discontinuous in scattered groups, Beard Vegetation Association 82: Hummock grasslands, low tree steppe; snappy gum over *Triodia wiseana* and Beard Vegetation Association 216: Low woodland; Mulga (with spinifex) on rises (GIS Database). There is approximately 100% of the pre-European vegetation remaining of Beard Vegetation Associations 29, 82 and 216 in the Pilbara bioregion (Shepherd et al, 2001). Approximately 10.2% of Beard Vegetation Association 82 is represented in conservation reserves within the Pilbara bioregion, however Beard Vegetation Associations 29 and 216 are poorly represented. The area proposed to clear does not represent a significant remnant of vegetation in the wider regional area. The proposed clearing will not reduce the extent of Beard Vegetation Associations 29, 82 or 216 below current recognised threshold levels, below which species loss increases significantly.

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in IUCN Class I-IV Reserves
IBRA Bioregion – Pilbara	17,804,164	17,794,651	~99.9	least concern	~6.3
Beard veg assoc. – State					
29	7,904,064	7,904,064	~100	least concern	~0.3
82	2,565,930	2,565,930	~100	least concern	~10.2
216	280,760	280,760	~100	least concern	0
Beard veg assoc. – Bioregion					
29	1,133,228	1,133,228	~100	least concern	~1.9
82	2,563,610	2,563,610	~100	least concern	~10.2
216	26,670	26,670	~100	least concern	0

* Shepherd et al. (2001) updated 2005

** 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).
Shepherd et al (2001).
GIS Databases:
- Interim Biogeographic Regionalisation of Australia - EA 18/10/00.
- Pre-European Vegetation - DA 01/01.

(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 no permanent watercourses or wetlands within the proposed clearing area (GIS Database; BHP Billiton, 2007a). Numerous ephemeral drainage channels run through the project area, including the Jimblebar Creek (a major tributary of the Fortescue River) (BHP Billiton, 2007a).

The flora and vegetation survey by Ecologia Environment Pty Ltd (2007) indicates that River Gum woodlands fringe the Jimblebar Creek. Whilst several survey sites along the Jimblebar Creek indicate that vegetation is degraded and infested with Buffel Grass, the proposed clearing area does support riparian vegetation. Based

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

BHP Billiton (2007a) have made a commitment not to undertake any exploration drilling within major drainage lines, or within a 20 metre buffer from the boundary of riparian vegetation. Should a permit be granted, it is recommended that a condition be imposed on the permit to exclude clearing from the bed and banks of the Jimblebar Creek. Such a condition will ensure that larger trees such as Blunt-budded River Red Gums (*Eucalyptus camaldulensis* var. *obtusa*) are not cleared. Ecologia Environment Pty Ltd (2007) report these trees to be 10 - 15 metres high. They are likely to act as buffers for the Jimblebar Creek and provide habitat for a range of fauna species.

Wherever practicable, BHP Billiton (2007a) will not encroach within 10 metres of minor drainage lines that may be considered significant in relation to local and/or regional surface water flow.

Methodology BHP Billiton (2007a).
Ecologia Environment Pty Ltd (2007).

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

Comments Proposal may be at variance to this Principle

The proposed clearing area is comprised of eight different land systems (GIS Database) as mapped by Van Vreeswyk et al (2004). The Newman, Jamindie, Divide, and Boolgeeda land systems are the main components of the proposed clearing area, with smaller parts mapped as Sylvania, Zebra, McKay and Washplain land systems (GIS Database).

The Newman land system is comprised of four land units. These are:

- plateau, ridge, mountain and hill;
- lower slope;
- stony plain; and
- narrow drainage floor with channel.

The Newman land system is characterised by soil surface mantles of abundant to very abundant pebbles, cobbles and stones of ironstone and other rocks. The Newman land system is generally not prone to erosion (Van Vreeswyk et al, 2004).

The Jamindie land system is comprised of eight land units. These are:

- low ridge and hill;
- stony upper plain and low rise;
- hardpan plain;
- grove;
- gilgai plain;
- drainage tract;
- sandy bank; and
- channel and bank.

Drainage tracts within this land system are moderately susceptible to erosion, whilst some hardpan plains are slightly susceptible. The remaining land units within the Jamindie land system are generally erosion resistant (Van Vreeswyk et al, 2004).

The Divide land system is comprised of six land units. These are:

- low hill;
- sand dune;
- sand plain;
- plain with thin sand cover;
- stony plain; and
- tract receiving run-on.

Vegetation in the Divide land system is subjected to fairly regular burning. Immediately after burning there is some susceptibility to wind erosion, however stabilisation occurs rapidly following rainfall (Van Vreeswyk et al, 2004).

The Boolgeeda land system is comprised of five land units. These are:

- low hill and rise;

- stony slope and upper plain;
- stony lower plain;
- grove; and
- narrow drainage floor and channel.

According to Van Vreeswyk et al (2004), the Boolgeeda land system is not susceptible to erosion and is subject to frequent burning.

Based on the land system mapping undertaken by Van Vreeswyk et al (2004), soils in the proposed clearing area are likely to be stony, red shallow loams, red shallow and deep sands and earths. Ecologia Environment Pty Ltd (2006) generally report that stony loams occur in the valley floors, whilst wide areas on the ridge tops have little or no soil cover. Red/brown sandy loams were characteristic of most sites surveyed by Ecologia Environment Pty Ltd (2007). Some areas were characterised by a surface mantle of ironstone pebbles, rocks and/or boulders; whilst other sites were characterised by loose soil (Ecologia Environment Pty Ltd, 2007).

Given the varying landform and soil characteristics of the proposed clearing area, some areas are more prone to land degradation than others. Following vegetation removal, loose soils in the proposed clearing area will be exposed to the erosive forces of intense summer rainfall events associated with cyclonic activity. Soils protected by a stony mantle are less likely to erode, however removal of the stony mantle during clearing may initiate soil erosion. Based on the above, the proposed clearing may be at variance to this Principle.

However, it is acknowledged that progressive rehabilitation will be undertaken throughout the life of the proposed five year drilling program. BHP Billiton (2007a) commit to rehabilitating drill pads and access tracks within six months of completion of each stage of the program, and/or before the commencement of the next phase of drilling (whichever comes first). All disturbance to the land surface made as a result of the exploration program will be rehabilitated as per BHP Billiton's 'Site Preparation and Rehabilitation of Drill Sites Procedure' (BHP Billiton, 2007b).

Erosion is likely to be minimised as BHP Billiton (2007a) will not undertake any clearing (or subsequent drilling) in erosion sensitive areas such as drainage lines. Should a clearing permit be granted, it is recommended that a condition be imposed on the permit to exclude clearing from the bed and banks of the Jimblebar Creek.

Methodology BHP Billiton (2007a).
BHP Billiton (2007b).
Ecologia Environment Pty Ltd (2006).
Ecologia Environment Pty Ltd (2007).
Van Vreeswyk et al (2004).
GIS Database:
- Rangeland Land System Mapping - DA.

(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**
There are no conservation reserves in close proximity to the proposed clearing area (GIS Database). The nearest conservation reserve is the Collier Range National Park, located approximately 130 kilometres south west of the proposed clearing area (GIS Database). Based on the above, the proposed clearing is not likely to be at variance to this Principle.

Methodology GIS Database:
- CALM Managed Lands and Waters - CALM 01/07/05.

(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 proposed clearing area is not located within a Public Drinking Water Source Area (GIS Database). There are no permanent watercourses or wetlands within the project area, however a number of ephemeral creeks (including the Jimblebar Creek, a major tributary of the Fortescue River) traverse the area (GIS Database). 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 (2007a) have advised that all exploration drill sites will be selected a suitable distance from natural drainage courses, including a 20 metre buffer from the boundary of riparian vegetation and a 10 metre buffer from minor drainage lines (BHP Billiton, 2007a). Sediment traps and sumps will be constructed where necessary to minimise the potential impacts on the quality of surface water (BHP Billiton, 2007a). Should a clearing permit be granted, it is recommended that a condition be imposed on the permit to exclude clearing from the bed and banks of the Jimblebar Creek.

No studies have been undertaken to determine what impact vegetation removal will have upon groundwater levels or quality in the area. However, the proposed clearing will be non-contiguous, and will consist of discrete drill pads and access tracks. It is not expected that the proposed clearing will significantly impact upon

groundwater levels or quality.

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

Methodology BHP Billiton (2007a).
GIS Database:
- Hydrography, linear - DOE 01/02/04.
- Public Drinking Water Source Areas (PDWSAs) - DOE 28/04/05.

(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 average annual rainfall of Newman is 310 millimetres (BHP Billiton, 2007a). Average annual evaporation exceeds rainfall by as much as 500 millimetres per year (BHP Billiton, 2007a). Rainfall in the Pilbara is highly erratic and variable, with intense rainfall events typically associated with thunderstorms and cyclonic activity (BHP Billiton, 2007a). Localised flooding is known to occur following intense rainfall events, however the incidence or intensity of flooding is not likely to be significantly influenced by the proposed vegetation clearing.

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

Methodology BHP Billiton (2007a).

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

Comments
The clearing permit application was advertised by DoIR, inviting submissions from the public. One public submission was received, raising concerns regarding the potential impacts of the proposed vegetation clearing on Native Title rights, Sites of Aboriginal Significance and land degradation.

There is one native title claim over the area under application (GIS Database). This claim (WC05/006) has been registered with the National Native Title Tribunal on behalf of the claimant group (GIS Database). However, the mining tenement 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 seven registered Sites of Aboriginal Significance within the area applied to clear (GIS Database). It is the proponent's responsibility to comply with the *Aboriginal Heritage Act 1972* and ensure that no Sites of Aboriginal Significance are damaged through the clearing process. The proponent is committed to the management and protection of Aboriginal heritage sites (BHP Billiton, 2005). BHP Billiton has a heritage protocol agreement with the Nyiyaparli people (traditional owners of the proposed clearing area), and regularly consult with the Nyiyaparli people to undertake Aboriginal heritage surveys in and around Newman (BHP Billiton, 2005). BHP Billiton also has an internal process; the Project Environment and Aboriginal Heritage Review (PEAHR), which is designed to prevent inadvertent disturbance of Aboriginal heritage sites within BHP Billiton operations. Prior to the commencement of any land disturbance activity, a PEAHR must be completed and submitted to BHP Billiton's Aboriginal Affairs Department, for assessment. All land disturbance activities must be approved by BHP Billiton's Environment and Aboriginal Heritage staff (BHP Billiton, 2005).

The potential impacts of the proposed clearing on land degradation are addressed under Clearing Principle (g).

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.

Methodology BHP Billiton (2005).
GIS Databases:
- Aboriginal Sites of Significance - DIA 04/07/02.
- Native Title Claims - DLI 19/12/04.

4. Assessor's comments

Purpose	Method	Applied area (ha)/ trees	Comment
State Agreement	Mechanical Removal	755	The Clearing Principles have been addressed and the proposed clearing is at variance to Principle (f), may be at variance to Principles (a), (c) and (g), is not likely to be at variance to Principles (b), (d), (h), (i) or (j), and is not at variance to Principle (e). Should the permit be granted, it is recommended that conditions be imposed on the permit for the purposes of weed management, preservation of riparian vegetation, management of Priority and significant flora, rehabilitation and permit reporting.

5. References

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- BHP Billiton (2007b) Exploration Environmental Management Plan. Revision 1. July 2007.
- Biota (2004) Jimblebar-Wheelarra Hill 3 Flora and Fauna Assessment. Unpublished report for BHP Billiton Iron Ore Pty Ltd.
- 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.
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- 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.
- Western Australian Herbarium (2008). Florabase - The Western Australian Flora. Department of Environment and Conservation. <http://florabase.calm.wa.gov.au/>

6. Glossary

Acronyms:

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

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:
- is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
 - 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.