



Clearing Permit Decision Report

1. Application details

1.1. Permit application details

Permit application No.: 3016/2
Permit type: Purpose Permit

1.2. Proponent details

Proponent's name: ARC Energy Limited

1.3. Property details

Property: Production Licence L 4
Production Licence L 5
Local Government Area: Shire of Carnamah
Colloquial name: Woodada 20 Well Project

1.4. Application

Clearing Area (ha)	No. Trees	Method of Clearing	For the purpose of:
3		Mechanical Removal	Petroleum Production

1.5. Decision on application

Decision on Permit Application: Grant
Decision Date: 9 June 2011

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>Beard Vegetation Associations have been mapped at a 1:250,000 scale for the whole of Western Australia. One Beard Vegetation Association has been mapped within the application area (GIS Database; Shepherd, 2009).</p> <p>378: Shrublands; scrub-heath with scattered <i>Banksia</i> spp, <i>Eucalyptus todtiana</i> & <i>Xylomelum angustifolium</i> on deep sandy flats in the Geraldton Sandplains Region.</p> <p>The application area was surveyed by Woodman Environmental Consulting staff in January 2009 (Woodman Environmental Consulting, 2009). The following vegetation types were identified within the application area.</p> <p>W1: Low woodland of <i>Banksia attenuata</i> and <i>Banksia menziesii</i> over heath on brown over yellow sand on mid slopes.</p> <p>W2: Low woodland of <i>Banksia prionotes</i> over heath of mixed species over <i>Ecdeicola monostachya</i> on yellow sand on upper slopes.</p> <p>Two alien weed species were recorded within the application area: Cape Bluebell (<i>Wahlenbergia caponise</i>), and Smooth Catsear (<i>Hypochaeris glabra</i>) (Woodman Environmental Consulting, 2009).</p>	<p>ARC Energy Limited is proposing to clear up to 3 hectares of native vegetation for the purposes of extending the existing Woodada-06 wellpad, installation of a flare pit and associated tracks and firebreaks (AWE, 2009). The proposed program falls within Petroleum Production Licences L4 and L5 and involves drilling the Woodada-20 well from the existing Woodada-06 well site (AWE, 2009).</p>	<p>Pristine: No obvious signs of disturbance (Keighery, 1994)</p> <p>To</p> <p>Excellent: Vegetation structure intact; disturbance affecting individual species, weeds non-aggressive (Keighery, 1994).</p>	<p>The application is located in the Geraldton Sandplains region, approximately 9 kilometres west of Eneabba (GIS Database). The application area is located within the Lake Logue Nature Reserve (GIS Database). The vegetation condition was derived from a vegetation survey conducted by Woodman Environmental Consulting (2009).</p> <p>An amendment was initiated by the Department of Mines and Petroleum on 27 May 2011. The amendment is to remove Condition 5 (Offset condition) from the permit. The amount of vegetation to be cleared and permit boundary will remain the same.</p>

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 application area occurs within the Lesueur Sandplains (GS3) subregion of the Geraldton Sandplain Interim Biogeographic Regionalisation of Australia (IBRA) bioregion (GIS Database). This sub-region is comprised of coastal Aeolian and limestones, Jurassic siltstones and sandstones of the central Perth Basin (CALM, 2002). There are extensive yellow sandplains in the south-eastern parts and shrub-heaths rich in endemics occur on a mosaic of lateritic mesas, sandplains, coastal sands and limestones (CALM, 2002).

The Lesueur Sandplains bioregion contains a high proportion of endemic plants with over 250 plants endemic to the subregion (CALM, 2002). The area is recognised Australia-wide and internationally as having particularly high floristic diversity, with an area of 10 square metres supporting up to 80 different species. The level of threat faced is similar to that of the Avon Wheatbelt, but the reserve system is more representative (CALM, 2002). The main threatening processes to the region are feral animals, grazing pressures, changing fire regimes, increasing land fragmentation, exotic weeds and changes to hydrology (ANRA, 2009).

A vegetation survey of the application area and surrounding vegetation identified 71 native flora species belonging to 25 families (Woodman Environmental Consulting, 2009). This is not considered to be biologically diverse. Proteaceae (15) and Myrtaceae (14) were the most species rich and diverse families within the application area (Woodman Environmental Consulting, 2009).

Two alien weed species were recorded within the vegetation survey area (Woodman Environmental Consulting, 2009). These were Cape Bluebell (*Wahlenbergia capensis*) and Smooth Catsear (*Hypochaeris glabra*) (Woodman Environmental Consulting, 2009). Weeds have the potential to alter the biodiversity of an area, competing with native vegetation for available resources and making areas more fire prone. This in turn can lead to greater rates of infestation and further loss of biodiversity if the area is subject to repeated fires. Neither of these species are listed as 'Declared Plant' species under the *Agriculture and Related Resources Protection Act 1976* by the Department of Agriculture and Food. Impacts from weed species may be minimised by the implementation of a weed management condition.

The application area is located within a *Phytophthora cinnamomi* dieback risk area. A total of 18 locations within the Woodada Gas Field recorded plant deaths indicative of *Phytophthora cinnamomi* infestation (Woodman Environmental Consulting, 2009). Impacts from dieback may be minimised by the implementation of a dieback management condition.

An area search of the Department of Environment and Conservation's (DEC) online fauna database conducted by the assessing officer suggests that the application area is diverse in avian and reptile species, particularly Skinks (22) (DEC, 2009b). The database search found 65 reptile species from 8 families and 78 avian species from 34 families as potentially occurring within the application area, or within a 50 kilometre radius of the application area.

The small area applied to be cleared consists largely of previously cleared land (AWE, 2009). Therefore the biodiversity values of the vegetation proposed to be cleared have been significantly reduced. The vegetation communities within the application area are not likely to be considered as rare, geographically restricted or of significant conservation value. DEC advised that the proposed clearing is not likely to lead to a significant additional impact on biodiversity (DEC, 2009a).

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

Methodology

ANRA (2009)
AWE (2009)
CALM (2002)
DEC (2009a)
DEC (2009b)
Woodman Environmental Consulting (2009)
GIS Database
- IBRA Wa (Regions - Subregions)

(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

The assessing officer conducted a search of the Department of Environment and Conservation's (DEC) online fauna database between the co-ordinates 115.7046°E, 29.3484°S and 114.6135°E, 30.3058°S, representing a 50 kilometre radius around the application area.

This search identified 9 Amphibian, 22 Mammalian, 65 Reptilian and 78 Avian fauna species that may occur within the application area (DEC, 2009b). Of these, the following species of conservation significance have the potential to occur within the application area:

Schedule 1 - Fauna that is rare or likely to become extinct, Wildlife Conservation (Specially Protected Fauna) Notice, 2008: Jurien Bay Skink (*Egernia pulchra longicauda*), Malleefowl (*Leipoa ocellata*), Lesser Noddy (*Anous tenuirostris*) and the Western Ground Parrot (*Pezoporus wallicus flaviventris*); and
Schedule 4 - Other specially protected fauna, Wildlife Conservation (Specially Protected Fauna) Notice, 2008: Peregrine Falcon (*Falco peregrinus* subsp. *macropus*); and
P1 - DEC Priority Fauna List: Woma (*Aspidites ramsayi*) and the Carpet Python (*Morelia spilota imbricata*); and
P4 - DEC Priority Fauna List: Ghost Bat (*Macroderma gigas*), Brush Bronzewing (*Phaps elegans*) and the Hooded Plover (*Charadrius rubricollis*).

Ecologia Environment (2009) conducted a desktop search of:

- Department of Environment and Conservation's (DEC) Priority and Threatened Fauna Database;
- DEC NatureMap;
- Birds Australia Birddata; and
- Western Australian Museum (WAM) FaunaBase (Ecologia Environment, 2009).

The co-ordinates used were similar to those used by the assessing officer above. In addition to those species listed above, the following fauna species of conservation significance were identified through this database search:

Schedule 1 - Fauna that is rare or likely to become extinct, Wildlife Conservation (Specially Protected Fauna) Notice, 2008: Carnaby's Black Cockatoo (*Calypotornhynchus latirostris*) and the Gilled Slender Blue-tongue (*Cyclodomorphus branchialis*); and
P3 - DEC Priority Fauna List: *Ctenotus gemmula* and the Black-striped snake (*Neelaps calonotos*); and
P4 - DEC Priority Fauna List: Australian Bustard (*Ardeotis australis*), Rufous Fieldwren (*Campestris montanellus montanellus*), Crested Bellbird (*Oreoica gutturalis gutturalis*), Shy Heathwren (*Hylacola cauta whitlocki*) and the Western Brush Wallaby (*Macropus irma*); and
Environment Protection and Biodiversity Conservation (EPBC) Act: Rainbow Bee-eater (*Merops ornatus*).

A vegetation survey conducted by Ecologia Environment (2009) recorded three habitat types as occurring within the application area:

Survey Area A - Moderately dense proteaceous shrubland on sandy soil, dominated by low to medium *Banksia attenuata* and occasional emergent *Eucalyptus tottiana*, whilst the south-east corner consists of regenerating vegetation on open sandy areas;

Survey Area B - Moderately dense proteaceous shrubland on either side of a sandy track with some emergent *Banksia attenuata*; and

Survey Area C - Open sandy area with some regenerating vegetation, surrounded by moderately dense medium to tall *Banksia attenuata* with little undergrowth, and proteaceous shrubland (Ecologia Environment, 2009).

The Lake Logue Nature Reserve contains predominately undisturbed native vegetation and as such contains habitat for many fauna species of conservation significance (Australian Heritage Database, 2009). The habitat types described by Ecologia Environment (2009) are well represented throughout the Geraldton Sandplain Bioregion and the Lake Logue Nature Reserve. Given the small size of the application area (3 hectares) and that approximately 40% of the application area consists of previously cleared land with patches of bare soil and regenerating vegetation it is unlikely that the proposed clearing will significantly impact on fauna habitat.

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

Methodology Australian Heritage Database (2009)
 DEC (2009b)
 Ecologia Environment (2009)
 Western Australian Museum (2009)

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

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

According to available GIS databases there are no known records of Declared Rare Flora (DRF) or Priority Flora within the application area (GIS Database).

A flora survey was conducted over the application area by Woodman Environmental Consulting on January 22, 2009 (Woodman Environmental Consulting, 2009). This survey involved on-foot traverses over the entire application area and the vegetation associations were examined for the presence or absence of any DRF and Priority Flora species (Woodman Environmental Consulting, 2009). However, this survey was conducted during the summer season and therefore the majority of annual species had senesced and could not be identified (Woodman Environmental Consulting, 2009).

No DRF were recorded and two Priority flora were recorded during the flora survey, namely *Banksia elegans* (P4) and *Stawellia dimorphantha* (P4) (Woodman Environmental Consulting, 2009).

Banksia elegans (P4) is a shrub, 1 - 4 metres tall with yellow and green flowers (Western Australian Herbarium, 2009). This species is associated with yellow, white or red sand and sandplains and low consolidated dunes (Western Australian Herbarium, 2009). *B. elegans* has previously been recorded from a range of approximately 180 kilometres, between Hill River and Geraldton (Woodman Environmental Consulting, 2009). Woodman Environmental Consulting (2009) recorded 24 individuals of *B. elegans* from within the application area. It is unlikely that the vegetation contained within the application area is necessary for the continued existence of this species.

Stawellia dimorphantha (P4) is a stilt rooted perennial herb, 0.05 - 0.2 metres tall with purple and cream flowers (Western Australian Herbarium, 2009). This species is associated with white, grey or yellow sand and has a range of approximately 90 kilometres from between Eneabba and Greenough (Western Australian Herbarium, 2009; Woodman Environmental Consulting, 2009). Only 1 individual of this species was recorded from within the application area (Woodman Environmental Consulting, 2009). This species is a disturbance opportunist, and therefore the proposed clearing is unlikely to impact on the continued existence of this species (Western Australian Herbarium, 2009)

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

Methodology Woodman Environmental Consulting (2009)
Western Australian Herbarium (2009)
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 (TEC's) within the application area (GIS Database).

The nearest TEC is located approximately 8.5 kilometres to the south-east (Ferricrete floristic community) (CALM, 2002). 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 CALM (2002)
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 Geraldton Sandplains IBRA bioregion (GIS Database). Shepherd (2009) reports that approximately 42.77% of the pre-European vegetation still exists in this bioregion.

The vegetation in the application area is recorded as Beard Vegetation Associations 378: Shrublands; scrub-heath with scattered *Banksia* spp, *Eucalyptus todtiana* & *Xylomelum angustifolium* on deep sandy flats in the Geraldton Sandplains Region (GIS Database; Shepherd, 2007).

According to Shepherd (2007) approximately 63.66% of this Beard Vegetation Association remains within the Geraldton Sandplains bioregion (see table below).

	Pre-European area (ha)*	Current extent (ha)*	Remaining %*	Conservation Status**	Pre-European % in IUCN Class I-IV Reserves (and post clearing %)
IBRA Bioregion – Geraldton Sandplains	3,136,024.64	1,341,266.64	~42.77%	Depleted	~15.35% (~35.58%)
IBRA Subregion – Lesueur Sandplains	1,171,777.48	495,451.01	~42.28%	Depleted	~17.78% (~41.43%)
Local Government – Carnamah	287,239.30	113,090.49	~39.37%	Depleted	~21.31% (~42.23%)
Beard veg assoc. – State					
378	95,109	60,550	~63.66%	Least Concern	~13.34% (~20.91%)
Beard veg assoc. – Bioregion					
378	95,109.42	60,549.91	~63.66%	Least Concern	~13.34% (~20.91%)
Beard veg assoc. - subregion					
378	90,932	60,370.35	~66.40%	Least Concern	~13.95% (~20.98%)

* Shepherd (2009)

** Department of Natural Resources and Environment (2002)

Whilst the sub-region has been extensively cleared, the proposed clearing of 3 hectares is unlikely to significantly reduce the extent of Beard vegetation association 378 below current levels. Therefore, the vegetation within the application area is not likely to be a significant remnant in an area that has been extensively cleared.

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
- Pre-European Vegetation
- IBRA WA (Regions - Subregions)

(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 not likely to be at variance to this Principle

According to available GIS datasets, there are no known permanent watercourses or water bodies within the application area (GIS Database).

However, there are numerous lakes located approximately 0.95 kilometres from the western boundary of the application area, as well as minor non-perennial watercourses running approximately 0.16 kilometres east of application area section C, and 0.08 kilometres east of application area section E (GIS Database).

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

Methodology 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 may be at variance to this Principle

The soils within the application area are bleached sands, turning yellow at depth with clay loams approximately 1 metre below the surface (Woodman Environmental Consulting, 2009).

According to available datasets, there is one soil type (CA27) within the application area (GIS Database). This soil type is described as:

CA27 - Sandy plains with occasional pockets of sand dunes, a few small swamps, and stream courses with the chief soils being leached sands, often with a sandy clay substrate between 3 and 6 foot in depth (Bureau of Rural Sciences, 1992).

Schoknecht (2002) describes these soils as being yellow/brown deep sandy duplexes. These have a high risk of wind erodibility and are prone to wind erosion in exposed situations if left bare of surface cover (Schoknecht, 2002).

Based on the above, the proposed clearing may be at variance to this Principle. It is recommended that should a permit be granted, a condition be imposed on the permit for the purpose of rehabilitation and stockpiling of all cleared topsoil and vegetation.

The Department of Environment and Conservation (DEC) recommends that prior to rehabilitation works, the proponent should develop a closure and rehabilitation plan to the satisfaction of DEC, which outlines activities including, but not limited to, sourcing of brush and seed source material to be used in revegetation works and earthworks and contouring of old borrow pits (DEC, 2009a).

Methodology Bureau of Rural Sciences (1992)
DEC (2009a)
Schoknecht (2002)
Woodman Environmental Consulting (2009)
GIS Database
- Soils - 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 may be at variance to this Principle

The application area occurs within an Environmentally Sensitive Area (ESA) (Register of National Estate), which is the Lake Logue C-Class Nature Reserve (GIS Database).

According to the Australian Heritage Database (Australian Heritage Database, 2009) the Lake Logue Nature Reserve is approximately 4,886 hectares and is a wide shallow valley which is flanked on the west coastal limestone ridges and a high ridge of Mesozoic sandstone and shale on the east. The deep sand of the Lake Logue Nature Reserve supports rich heath which is dominated by Banksia, Myrtle, Legume and Wattle species (Australian Heritage Database, 2009).

The Lake Logue Nature Reserve supports extensive populations of the rare *Banksia elegans* (Conservation Through Reserves Committee, 1974). This species only occasionally sets seed and as such should be preserved for seed source. However records indicate that populations of *B. elegans* have previously been recorded from 3 IBRA Bioregions (Western Australian Herbarium, 2009) and this species is known to have a range of approximately 180 kilometres with it being recorded from between Hill River and Geraldton (Woodman Environmental Consulting, 2009).

Based on the above, the proposed clearing may be at variance to this Principle. However, despite the area being on the Register of National Estate for natural values, it is considered that the clearing to take place is low impact and of a small scale (3 hectares) and subsequently will not significantly impact on the environmental values of the Lake Logue Nature Reserve.

Methodology Australian Heritage Database (2009)
Conservation Through Reserves Committee (1974)
Western Australian Herbarium (2009)
Woodman Environmental Consulting (2009)
GIS Database
- DEC Tenure

(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

According to available databases, the application area is not located within a Public Drinking Water Source Area (PDWSA) (GIS Database).

The groundwater salinity within the application area is approximately 1,000 - 3,000 milligrams/Litre Total Dissolved Solids (TDS) (GIS Database). Given the size of the area to be cleared (3 hectares) compared to the size of the Perth Groundwater Province (4,660,027 hectares) (GIS Database), the proposed clearing is not

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

The application area experiences a Mediterranean climate (CALM, 2002). With an average rainfall of approximately 500.5 millimetres/year recorded from Eneabba weather station located approximately 9 kilometres north east of the application area (BoM, 2009) and an annual pan evaporation rate of 2,400 millimetres (Luke et al., 1987), there is little surface flow during normal seasonal rains. The permeable nature of the soils within the application area tends to allow rainwater to percolate vertically to the water table rather than running laterally off the surface (ARC Energy, 2006). The proposed clearing is not likely to cause the quality of surface water to deteriorate.

There are several known groundwater dependent ecosystems within the application area (GIS Database). Given the small size and nature of the proposed clearing it is unlikely to alter the watertable or salinity levels within the application area. Therefore the proposed clearing is unlikely to significantly impact upon the groundwater dependent ecosystems within the application area.

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

Methodology ARC Energy (2006)
BoM (2009)
CALM (2002)
Luke et al. (1987)
GIS Database
- Groundwater Provinces
- Groundwater Salinity, Statewide
- Potential Groundwater Dependent Ecosystems
- Public Drinking Water Source Area

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

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

The application area is located within a Mediterranean environment (CALM, 2002). Low annual rainfall (approximately 500.5 millimetres) (BoM, 2009), high evaporation rates (2,400 millimetres/year) (Luke et al., 1987) and the absence of permanent water bodies and watercourses in the application area (GIS Database) would suggest that this area is not prone to flooding under normal rainfall conditions, whilst the permeable nature of the soils within the application area tends to allow rainwater to percolate vertically to the water table rather than running laterally off the surface (ARC Energy, 2006).

The application area is located within the Indoon Logue catchment area (GIS Database). However, the small area to be cleared (3 hectares) in relation to the size of the Indoon Logue catchment area (137,421 hectares) (GIS Database) is not likely to increase the potential for flooding within the application area, local area or within the catchment (GIS Database).

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

Methodology ARC Energy (2006)
BoM (2009)
CALM (2002)
Luke et al. (1987)
GIS Database
- Hydrographic Catchments - Catchments
- Hydrography - Linear

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

Comments

The original clearing permit application (CPS 3016/1) was referred to the Department of Environment and Conservation on 18 November 2009 by Department of Mines and Petroleum DMP. The Department of Environment and Conservation determined that the proposed clearing does not appear likely to have a significant additional impact on biodiversity (DEC, 2009a). Additionally DEC (2009a) advised that strict hygiene measures should be implemented to ensure *Phytophthora cinnamomi* dieback is not spread further within Lake Logue Nature Reserve. Furthermore, future rehabilitation programs for the Woodada project area should be developed with consideration given to the use of vegetative material gained from clearing to assist in the rehabilitation of old well sites within the Lake Logue Nature Reserve that have comparable vegetation types (DEC, 2009a).

There are two native title claims (WC98/057 and WC04/002) over the area under application. These claims have been registered with the National Native Title Tribunal on behalf of the claimant group. However, the petroleum titles have 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 no known Aboriginal sites of significance within the application area, however there is one known Aboriginal site of significance (ID_4660) within close proximity of 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 DEC 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.

An amendment was initiated by the Department of Mines and Petroleum on 27 May 2011. The amendment is to remove Condition 5 (Offset condition) from the permit. The amount of vegetation to be cleared and permit boundary will remain the same.

Methodology DEC (2009a)
GIS Database
- Aboriginal Sites of Significance
- Native Title Claims

4. Assessor's comments

Comment

The proposal has been assessed against the Clearing Principles, and the proposal may be at variance to Principle (a), (g), (h), is not likely to be at variance to Principles (b), (c), (d), (e), (f), (i) and (j).

It is recommended that should a permit be granted, conditions be imposed on the permit for the purpose of weed and dieback management, retention, revegetation and rehabilitation, offsets, record keeping and permit reporting.

5. References

- ANRA (2009) Australian Natural Resources Atlas - Biodiversity Assessment - Geraldton Sandplains. <http://www.anra.gov.au/topics/vegetation/assessment/wa/ibra-gs-ecosystems-recovery.html> (Accessed 9 April 2009)
- ARC Energy (2006) Woodada Gas Field Environmental Management Plan - Production Licence L4/L5. Unpublished Report dated 19 May 2006
- Australian Heritage Database (2009) Lake Logue Nature Reserve <http://www.environment.gov.au> (Accessed 9 April 2009)
- AWE (2009) Woodada Gas Field Clearing Permit Application. Supporting Documentation. Australian Worldwide Exploration Limited, Western Australia
- BoM (2009) Bureau of Meteorology Website - Climate Averages by Number, Averages for ENEABBA. www.bom.gov.au/climate/averages/tables/cw_008225.shtml (Accessed 16 April 2009)
- Bureau of Rural Sciences (1992). Interpretations of the Digital Atlas of Australian Soils Mapping Units (ARC/INFO format). <http://www.daff.gov.au/brs/data-tools/daas-download> (Accessed 8 April 2009)
- CALM (2002) A Biodiversity Audit of Western Australia's 53 Biogeographic Subregions in 2002. Department of Conservation and Land management, Western Australia
- Conservation Through Reserves Committee (1974) Conservation Reserves in Western Australia, Report of the Conservation Through Reserves Committee on systems one-five to the Environmental Protection Authority 1974. Western Australia
- DEC (2009a) Biodiversity Advice. Advice to assessing officer, Native Vegetation Assessment Branch, Department of Mines and Petroleum (DMP), received (17 December). Department of Environment and Conservation, Western Australia
- DEC (2009b) NatureMap - Department of Environment and Conservation and Western Australian Museum. <http://naturemap.dec.wa.gov.au/default.aspx> (Accessed 9 April 2009)
- 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
- Ecologia Environment (2009) ARC Energy Woodada Level 1 Fauna Survey. Prepared for ARC Energy. Unpublished Report dated March 2009
- Keighery, B.J. (1994) Bushland Plant Survey: A Guide to Plant Community Survey for the Community. Wildflower Society of WA (Inc). Nedlands, Western Australia
- Luke, G.J., Burke, K.L. and O'Brien, T.M. (1987) Evaporation Data for Western Australia. Resource Management Technical Report No. 65. Department of Agriculture, Western Australia
- Schoknecht N. (2002) Soil Groups of Western Australia. A simple guide to the main soils of Western Australia. Resource Management Technical Report 246. Edition 3
- 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.
- Western Australian Herbarium (2009) - FloraBase - The Western Australian Flora. Department of Environment and Conservation. <http://florabase.calm.wa.gov.au/> (Accessed 8 April 2009)
- Western Australian Museum (2009). Faunabase - Western Australian Museum, Queensland Museum and Museum and Art Gallery of NT Collections Databases. <http://www.museum.wa.gov.au/faunabase/prod/index.htm> (accessed 9 April 2009). Western Australian Museum
- Woodman Environmental Consulting (2009) Australian Worldwide Exploration Woodada-20-Drill Site Flora and Vegetation Assessment. Prepared for Australian Worldwide Exploration. Unpublished Reported dated February 2009

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.
DMP	Department of Mines and Petroleum, 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:
(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.