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Dyno Nobel Asia Pacific Limited

Moranbah Ammonium Nitrate Project

Nature Conservation - Fauna Assessment Report

August 2006

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

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1. Introduction

Dyno Nobel Asia Pacific Limited (DN) is a leading global producer of ammonium nitrate with six plants in North America. Dyno Nobel Asia Pacific Limited produces and markets explosives and detonation devices for coal, metals quarry, tunneling, construction and seismic industries. The strategy of DN combines growth through incremental expansion of existing operations with acquisitions and the development, commercialisation and marketing of new products.

Dyno Nobel Asia Pacific Limited, together with its joint venture partner CSBP Limited, a subsidiary of Wesfarmers Limited, operate an ammonium nitrate plant at the existing Queensland Nitrates ("QNP") production facility at Moura, Queensland.

Dyno Nobel Asia Pacific Limited currently provides explosives for many of the mining operations in Central Queensland. To support the provision of explosives DN is proposing to develop an ammonium nitrate plant in Moranbah. This plant will provide permanent employment for 70 staff for the operation of the facility and during construction a peak of up to 550 construction personnel.

Dyno Nobel Asia Pacific Limited is seeking to construct and operate an ammonia plant, a nitric acid plant, an ammonium nitrate plant, an emulsion manufacturing plant and a construction camp for the above works in the Moranbah area. The combined plant would service the rapidly expanding demand for ammonium nitrate from mining in Queensland. The current concept is to construct a nominal 350,000 tonnes per annum (tpa) plant making ammonium nitrate prill (solid) and ammonium nitrate emulsion (viscous liquid).

The project represents a value-adding downstream processing facility from the utilisation of the significant gas reserves in the Moranbah region. The proposed facility development is to be located on Goonyella Road, approximately 4 km North West of Moranbah. With a total capital investment of approximately $500 million, the project will provide significant benefits for the local and regional economy.

The Dyno Nobel Asia Pacific Limited ammonium nitrate plant was declared a significant project by the Queensland Coordinator-General (CG) pursuant to Section 26 of the Queensland *State Development and Public Works Organisation Act 1971* (the SDPWO Act). This declaration requires DN to prepare an Environmental Impact Statement (EIS) for the project under the SDPWO Act – Section 26 (1)(a).

The following fauna report answers section 4.7.1.2 of the Terms of Reference for the EIS.

2. Methods

2.1.1 Desktop assessment

In order to assess the faunal values of the site, searches of the Environmental Protection Agency's (EPA) Wildlife Online database and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters search tool were undertaken to determine the occurrence of threatened or significant species in the locality. Threatened species are those considered to be endangered, vulnerable or rare as listed under the Nature Conservation (Wildlife) Regulation 1994 (NC Regulation) and critically endangered, endangered or vulnerable under the Commonwealth EPBC Act. Significant species are those protected by the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA) and Bonn Convention international agreements.

These search tools can be used to predict the likely faunal assemblage for the site and plan field investigations. However, because of the predictive nature of both search tools (less so for Wildlife Online) some desktop analysis is required, as habitat that is predicted to occur on a site may in fact not be present.

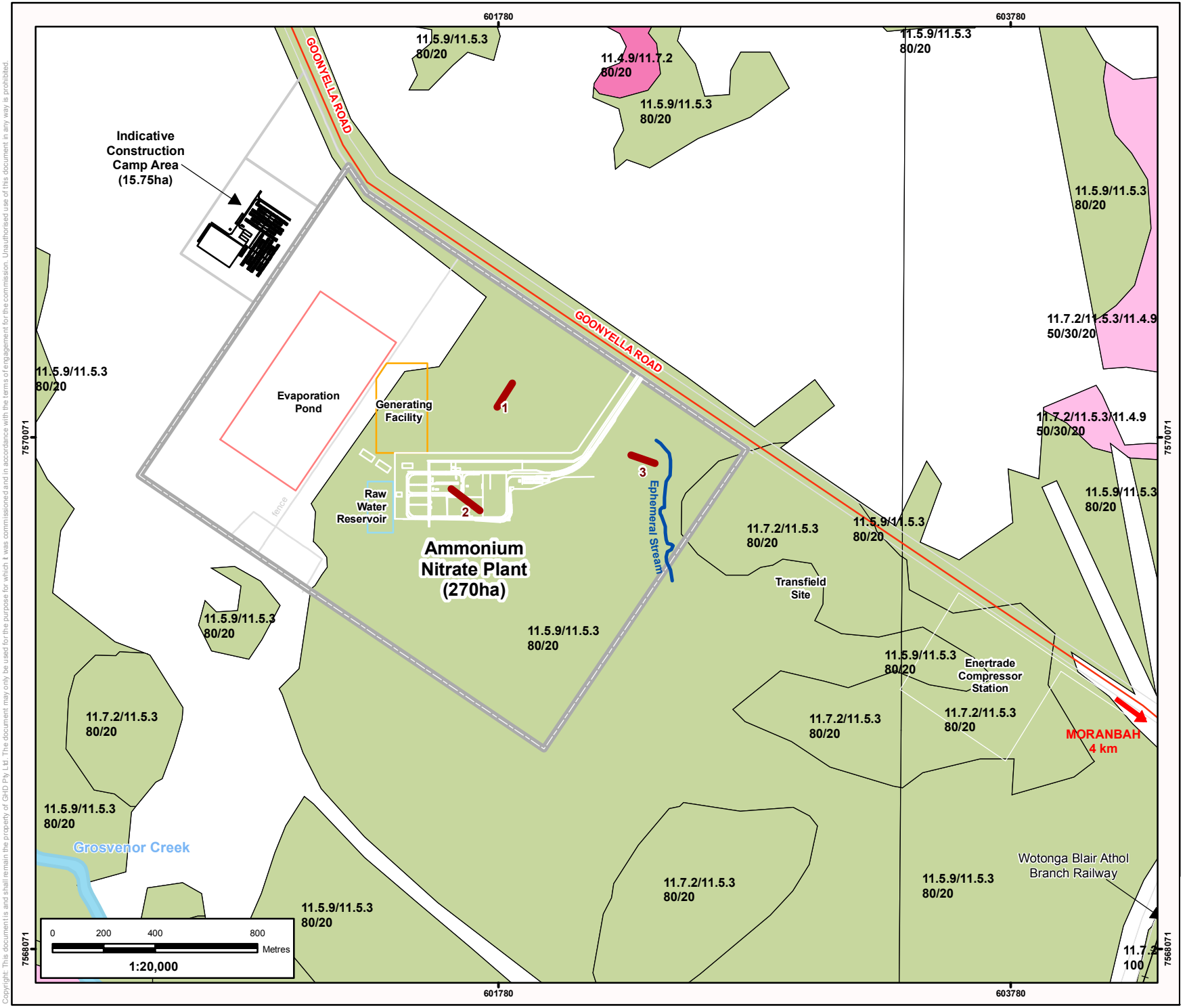
2.1.2 Field assessment

A GHD zoologist conducted fauna assessments on site from 8 to 12 May 2006 in order to investigate habitats that may be utilised by threatened fauna species in addition to recording the presence of fauna species utilising the study site. Assessments including diurnal and nocturnal surveys.

The assessment program involved:

- Active searches for reptiles, amphibians and mammals;
- Extensive daily bird searches (including long meander transects commenced from each trapping transect) conducted at dawn through to late morning;
- Spotlight searches for nocturnal birds, mammals, reptiles and amphibians;
- Elliot trapping for large reptiles and small to medium sized mammals;
- Cage trapping for medium sized mammals;
- Pitfall trapping for small reptiles, amphibians and mammals; and
- Ultrasonic echolocation detection (using Anabat II) for bats; and,
- Investigation of faunal traces such as scats and tracks.

The weather during the assessment was generally fine with little cloud cover and with a moderate southeasterly breeze most mornings, becoming still later in the day. Daytime highs were approximately 25-26°C and overnight lows down to around 15-16°C. During the spotlighting session, the evening was a warm 24°C, with no breeze and almost a full moon.



DYNO
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Date: 02-10-06 Rev D
Datum: GDA94 (MGA) Zone 55
Source: Base data sourced from the State of Queensland, Department of Natural Resources, Mines. All other infrastructure supplied by Dyno Nobel Asia Pacific Ltd.
File: G:\41\15824\GIS\Maps\Final\MXD fig36_Site_RE_Transect_RevD.mxd

Legend

- Ammonium Nitrate Plant Site
- Evaporation Pond
- Generating Facility*
- Raw Water Reservior
- Cadastre
- Watercourse
- Major Road
- Ephemeral Stream
- Transect

Regional Ecosystems

- No mapped vegetation
- Endangered RE (dominant)
- Endangered RE (subdominant)
- Of Concern RE (dominant)
- Not Of Concern RE

RE Numbering System:
11.4.9/11.7.2 = mosaic of two ecosystem types
80/20 = proportion of each ecosystem type
*Generating Facility location is subject to detailed engineering.

Moranbah Ammonium Nitrate Plant

Environmental Impact Statement

Figure 1
Regional Ecosystems

GHD
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2.1.3 Site selection

The day of the 8 May 2006 was utilised to "stratify"[1] the site and select suitable locations for transects to be located. Figure 1 shows the identified Regional Ecosystems and locations of transects within the site. The site was generally homogenous and composed primarily of poplar box (*Eucalyptus populnea*) woodland, with a number of subtle variations providing the basis for site selection.

Three sites in total were selected, with stratification based on minor variations in soil or topographical characteristics and floristic composition.

2.1.4 Elliott, cage and pitfall trapping

Elliot, cage and pitfall traps were established in order to trap diurnal/nocturnal small to large reptiles, amphibians and small to medium sized mammals.

Sixty Elliott traps (51 Type A and 9 Type B traps), six pitfall traps and six cage traps were established over three transects (see Figure 2 and Figure 3 and Figure 4). Trapping transects extended for approximately 60 m and were 10 m wide, with a configuration consisting of a central pitfall trap line, Elliot traps on either side of the transect at intervals of one every 5 m and a large cage trap at each end of each transect. Pitfall, Elliot and cage traps were checked twice a day (once at dawn and again at dusk) in order to prevent fauna from remaining within the traps for long periods and becoming distressed due to weather conditions and interference from predators and insects. Trapped animals were not handled, but placed into calico bags for identification purposes and subsequently released into appropriate shelter sites within suitable habitat – see Figure 4. A small dab of "white out" was applied to the base of the trapped animals' tail in order to identify individuals recaptured during the survey (note that no animals were recaptured during the assessments).

Elliot and cage trapping commenced on 8 May 2006 and concluded on 11 May 2006 and pitfall trapping commenced on 9 May 2006 and concluded on 12 May 2006. Overall, a total of three open trap nights *in situ* was achieved (180 trap nights for Elliott traps and 18 trap nights each for pitfall and cage traps).

Pitfall trap set-up

Two pitfall traps were installed at each transect, which consisted of two large 20 litre buckets sunk into the soil until the top lip of the bucket was flush with the soil surface – see Figure 2. Buckets were placed at a spacing of approximately 15 m apart with drift fence connecting the two "pits" and extending beyond each bucket for 2.5 m (total pit line of 20 m). The drift fence was held erect by recycled plastic stakes and embedded into the soil to prevent animals from passing underneath. Approximately 5 cm of soil was placed in the bottom of each bucket to act as a refuge for burrowing fauna and large pieces of bark were installed within each trap to act as refuge and shelter. Pitfall traps were established in close proximity to potential fauna habitat, such as low shrubs,

[1] Stratification refers to the dividing up of the study area into different units based on biophysical attributes, followed by vegetation structure.

fallen timber, large habitat trees and thick grass cover. The pitfall trapping line commenced at the beginning of each 60 m transect and extended for 20 m.

Elliot and cage trap set-up

Seventeen Type A and three Type B (larger) Elliot traps were installed at each 100 m transect and extended along the entire length of the transect. An Elliot trap was placed on either side of the transect at a spacing of approximately 5 m from the previous trap, with the three Type B traps randomly located along the transect. Elliot traps were placed near potential fauna habitat such as logs, rock outcrops, tree bases and clumping vegetation and shaded from excessive heat by pieces of bark and thick vegetation. The traps were baited with peanut butter, honey and oats.

One large cage trap was placed at each end of each transect in close proximity to potential fauna habitat and baited with the same substance as the Elliot traps. The traps were also sheltered with low vegetation or large pieces of bark.

Figure 2: Pitfall trap line at transect one

Figure 3: Cage traps were located at the extremities of each Elliot trap line (this trap at transect 3)

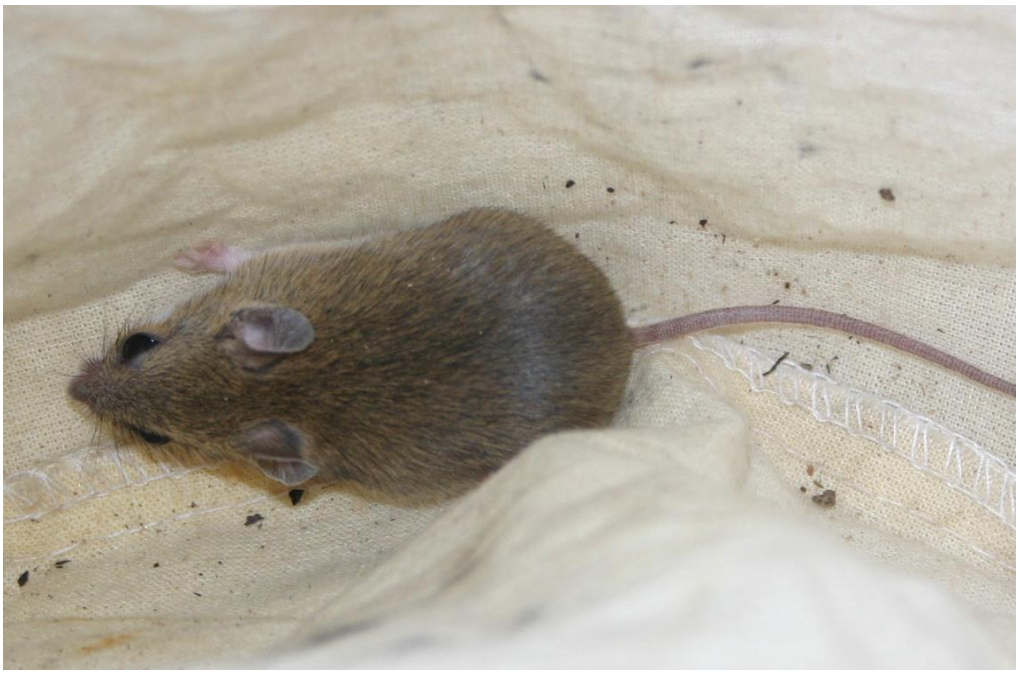

Figure 4: Delicate mouse caught in Elliot trap (viewed in calico bag)

2.1.5 Diurnal Birds

Surveys for diurnal birds were systematically conducted at each dawn until late morning, with a morning spent within and in close proximity to each of the three transect sites. Long meander transects were conducted from each of the three sites for several kilometres in order to thoroughly cover all habitats and areas within the entire study site. As a result, few new bird species were being added to the species list by the third day of survey, suggesting that a comprehensive coverage of the area had been achieved. Birds were identified through observation with field binoculars or identified from calls.

2.1.6 Diurnal Reptiles and Amphibians

Reptile, amphibian and small mammal active searches were undertaken at each transect, in addition to incidental observations throughout the study site. Thorough searches involved looking under logs, lifting rocks, searching leaf litter, exfoliating bark on logs and peering in hollows of standing dead or live trees, as well as searches along drainage lines and fissures. Binoculars were also employed to search from a distance for shy basking reptiles on fallen timber, and particularly to search for the threatened Yakka Skink (*Egernia rugosa*). Active searching was conducted throughout the day and particularly in the afternoon when diurnal reptiles are active and foraging in the open at this cooler time of year. Burrows and potential reptile shelter sites were also kept under observation with binoculars so to identify any reptiles present.

2.1.7 Spotlighting and ultrasonic bat detection

Spotlighting using high-powered spotlights connected to battery packs was employed to sample nocturnal mammals (flying, arboreal and terrestrial), birds (owls and nightjars), reptiles and frogs. Spotlighting was conducted on the evening and night of 10 May 2006 from 1840 to 2040. Spotlighting was conducted by walking slowly through the study site, using the spotlight beam to search for the presence of fauna within trees, shrubs or at ground level. Additional fauna species heard but not seen were also recorded during spotlighting surveys. Total time spent spotlighting was four man hours.

Ultrasonic detection for microchiropteran bats (microbats) was conducted during the entire night of 10 May 2006 through use of an Anabat II ultrasonic recorder. These detectors reduce the frequency of bat calls by ten times, lowering the call frequency to the range within human hearing, therefore allowing the calls to be recorded for later identification by laboratory specialists. The digital record of the calls was sent for expert analysis (see Appendix C).

2.1.8 Evidential Traces

Other signs indicative of faunal presence such as scratch marks, scats, den sites, nests, hairs, burrowing activity, feeding scraps, remains and tracks were actively searched for and recorded.

2.2 Limitations

2.2.1 Desktop assessment

The desktop ecological assessment mostly covered terrestrial vertebrate fauna (mammals, birds, reptiles and frogs), as most information is available on these groups. Aquatic fauna (including fish) and terrestrial invertebrates have been considered as part of this assessment, although there is relatively little information available regarding these faunal groups.

2.2.2 Field survey

The field survey assessments were conducted during late autumn, which is generally a suitable time to record some species, but not others (such as some species of reptile and migratory birds). The dry conditions also precluded the observation of species triggered by wet weather such as burrowing amphibians. Additional surveys during different seasons or for longer periods would allow additional species to be detected that may be migratory, have seasonal movements or are generally more detectable at these times. This limitation is partially offset by the information available from the Wildlife Online database and other sources.

2.2.3 Definition of Significant Species and Communities

The conservation significance of flora and fauna species and ecological communities, and sites supporting flora and fauna, is based on a number of formally applied categories and criteria outlined in Appendix A.

3. Legislative requirements - fauna

3.1 *Nature Conservation Act 1992 (*Qld)

The Environmental Protection Agency is responsible for implementing the *Nature Conservation Act 1992* (NC Act). Under section 73 (a) of the NC Act, the EPA is required to conserve wildlife and its values to:

» Ensure the survival and natural development of the wildlife in the wild; and,

» Conserve the biological diversity of the wildlife to the greatest possible extent; and,

» Identify, reduce or remove, the effects of threatening processes relating to the wildlife; and,

» Identify the wildlife's critical habitat and conserve it to the greatest possible extent.

The NC Regulations lists species of flora and fauna that are endangered, vulnerable or rare. It is an offence to interfere with these species without approval from the EPA.

3.2 *Environmental Protection and Biodiversity Conservation Act 1999* (Cth)

The Commonwealth Department of Environment and Heritage (DEH) manages the EPBC Act. The EPBC Act requires that actions that may have a significant impact on matters of national environmental significance be assessed and approved by the Federal Environment Minister. Matters of national environmental significance (called Protected Matters by the EPBC Act) include:

» Ramsar wetlands of international significance;

» National Heritage places;

» Threatened species and ecological communities;

» Migratory species; and,

» Commonwealth marine areas.

Protected matters are listed on a database held by the DEH, and the results of a search for protected matters listed over this site are presented in below.

4. Fauna survey results

4.1 Habitat

Four main habitats were identified across the study area: open grassy woodland, shrubby woodland, rocky outcrops ("jump-ups") with *Acacia* sp. overstorey and semi-cleared woodland (mapped as non-remnant vegetation). These habitats are described below. The boundaries between these habitats are not distinct, with overlap and intergradation occurring particularly with regard to the open and shrubby woodland habitat types.

4.1.1 Open grassy woodland

Open woodland comprises the majority of the habitat type within the study area. The tree layer of this woodland habitat is dominated by poplar box (*Eucalyptus populnea*), with a scattering of Clarkson's bloodwood (*Corymbia clarksoniana*) and small-leaved ironbark (*Eucalyptus crebra*) in some areas. This vegetation type corresponds with Not of Concern regional ecosystem (RE) 11.5.3 – see Figure 5.

Figure 5: Open grassy woodland habitat

The trees are mostly reproductively mature (i.e. producing flowers and seeds), with relatively healthy numbers of large trees with a diameter at breast height in excess of 80 cm. Many of the larger trees contain hollows, with some hollows observed to be utilised by red-winged parrots (*Aprosmictus erythropterus*) for nesting and by various geckos, skinks and dragons for refuge. Seven species of bat were recorded within the study site, including the little pied bat (*Chalinolobus picatus*) (listed as rare by the

Queensland NC Act). The prevalence of hollow stags (dead hollow trees) and hollow mature trees provide excellent diurnal roosting sites for many bat species.

The midstorey layer is very sparse in this habitat type and is composed of regenerating poplar box trees and larger shrubs, predominately false sandalwood (*Eremophila mitchellii*). The bushy shrub *Carissa ovata* provided abundant cover for small mammals and reptiles.

The ground layer is a mix of primarily indigenous grasses and herbs, with cover varying from mid-dense to sparse. Ground debris such as large fallen hollow logs were common within this habitat type and provided extensive refuge sites for reptiles and small – medium sized mammals (including exotic species such as rabbits and foxes whose scats and traces were commonly encountered). Three delicate mice (*Pseudomys delicata*) and a myall snake (*Suta suta*), were pitfall trapped within open woodland, with many large hollow logs present at ground level. Ground litter was very sparsely distributed and cattle grazing within the study area have heavily impacted upon the soil structure. In general, at ground level the only available habitat exists in the form of fallen timber as grasses have probably been heavily grazed and "thinned-out" by cattle.

The open woodland areas however were generally of a high quality from a habitat perspective, with many scattered dead or hollow stag trees and large piles of hollow timber on the ground. Woodland bird species such as the grey-crowned babbler (*Pomatostomus temporalis*) and brown treecreeper (*Climacteris picumnus*) were common within the study site. The grey-crowned babbler partially forages on the ground among fallen debris and is a key indicator species for healthy woodlands. This species has disappeared over much of its' former range throughout south-eastern Australia due to impacts on open woodland such as the removal of fallen timber and clearing and excessive grazing preventing regeneration of these communities. The presence of this key species in healthy numbers (groups of 7-8 birds were commonly encountered particularly near transect 1), suggests an intact and high quality woodland community.

This habitat type appeared to improve in quality towards the centre and eastern portions of the study site, where thinning of native vegetation had not occurred[2] and the various vegetation stratification layers appeared to be more intact.

4.1.2 Shrubby woodland

The shrubby woodland habitat type was scattered in patches throughout the study site and was dominated by poplar box. It was characterised by a denser shrub layer than that found elsewhere on the site, with shrubs such as false sandalwood, *Flindersia dissosperma* and *Erythroxylum australe*. The ground layer was dominated a dense, spreading low shrub, *Carissa ovata*. This vegetation type corresponds with not of concern regional ecosystem 11.5.3 – see Figure 6.

[2] Thinning of the canopy layer has occurred to the far-west of the study area.

Figure 6: Shrubby woodland

This habitat type provided increased foraging and shelter sites for smaller woodland bird species such as the variegated fairy wren (*Malurus lamberti*) and double-barred finch (*Taeniopygia bichenovii*) in addition to many other woodland bird species. These birds were observed within the open woodland areas but may utilise denser habitats for refuge and roosting sites. The shrubby areas also appeared to be commonly utilised by grey-crowned babblers during their daily foraging activities.

The dense clumps of *Carissa ovata* may provide habitat for small woodland birds, mammals and reptiles. An eastern striped skink (*Ctenotus robustus*) was observed foraging within this low vegetation type and had constructed a burrow system within the roots of some low shrubs.

4.1.3 Rocky outcrops with *Acacia* sp. overstorey

This habitat type occurred in a few isolated patches within the study area and appeared to be restricted to rocky "jump-ups" of eroded slopes on a heavier clay based soil. It is analogous with not of concern regional ecosystem 11.7.2 – see Figure 7.

A greater diversity of gecko species such as oscellated velvet gecko (*Oedura monilis)* appeared to favour the roughly barked Acacia trees (*Acacia catenulata, A. harpophylla* and *A. shirleyii*) for shelter and foraging. The rocky areas would likely provide habitat for a range of skink, dragon and gecko species, though few were observed during the assessment. Fallen debris (logs) littered this habitat type, providing additional habitat at ground level for terrestrial fauna species.

A greater abundance of woodland bird species were observed within this habitat type, many of which were also present within the other woodland habitat types,

demonstrating the overlap in habitat use by the majority of bird species recorded within the study area.

Figure 7: Rocky outcrops with Acacia stands

4.1.4 Thinned woodland

This habitat type existed toward the southern and western fringes of the study area and appeared to be a direct result of previous chemical clearing of poplar box and Clarkson's bloodwood trees. It is mapped as non-remnant vegetation.

Numerous dead trees (some of which were hollow-bearing) were present within these areas and provided habitat for nesting and roosting birds. Many dead trees had fallen, forming piles of hollow logs in large clumps. This ground debris appeared to provide refuge for a number of common reptile species such as Bynoe's gecko (*Heteronotia binoei*) and *Gehyra dubia*. Domestic cattle appeared to favour these more open areas and add to the impacts through heavier grazing and spread of exotic weed species. Rabbits were also observed to be more common in this habitat, with many burrows and diggings observed. A large Major Skink (*Egernia frerei*) was identified utilising an old rabbit warren as a shelter and basking site.

These areas appeared to attract common native "increaser" species such as magpies, galahs, sulphur crested cockatoo, magpie lark and masked lapwing, all of which favour more open areas. Such species were less common or entirely absent from the woodland towards the core and eastern portions of the study area.

This habitat type has received the most impacts from an ecological perspective, is dominated by common native "increaser species" and is more open and less suitable for nationally and state listed threatened fauna species. These areas, which occur

towards the western and southwestern boundaries of the study area, would be preferred areas to target for development.

Figure 8: Semi-cleared areas of woodland

4.1.5 Grosvenor Creek

Grosvenor Creek runs in a west-east direction, 1.7 km to the south of the study site. The area between the site and Grosvenor Creek is populated by poplar box open woodland to woodland. The creek appears to be generally ephemeral in nature and contained water during the recent assessment (8-12 May), though was dry during an earlier visit – see Figure 9. The banks were lined by a taller suite of canopy trees, dominated by river red gums (*Eucalyptus camaldulensis*) with some *Eucalyptus orgadophila*, which could potentially provide nesting sites for a broad range of bird species, including medium to large raptors. Many of the large canopy trees contained hollows, which could be utilised for roosting, nesting and refuge sites by a selection of mammals, bird and reptiles.

Water quality of Grosvenor Creek was not measured during the field investigation. However, from observation the water appeared to opaque, demonstrating a high degree of turbidity. With a very slow flow rate it can be assumed that dissolved oxygen levels would reach low levels within weeks of any flood event. Some grass appeared to be present in the stream, however this was probably not a water plant but was growing on soil that was had been very recently inundated. This high turbidity level is expected for an ephemeral stream with a low flow rate that drains grazed open woodland.

The waterway itself could possibly provide periodic habitat for various species of fish and macro-invertebrates, which in turn would provide foraging opportunities for birds, amphibians, mammals and reptiles.

Species utilising Grosvenor Creek for breeding and foraging may occasionally visit or overfly the study site, en-route to other feeding and breeding areas.

Figure 9: Grosvenor Creek

4.2 Field results

A total of 63 native terrestrial fauna species and two introduced fauna species were recorded within the Moranbah study site during the field survey. Of the native species, 11 mammal, 41 bird and 11 reptile species were recorded. The introduced species included two mammals. All species detected are listed below in Table 1.

A large number of additional species have been recorded from the local area and were listed in the Wildlife Online database search. Some of these species could potentially use the study area, either as residents or visitors on a regular, uncommon or rare frequency.

Table 1 Fauna species recorded from the study area, Moranbah, Queensland, 8 – 12 May 2006

Common Name	Scientific Name	Type of Record
Mammals		
Northern Freetail Bat	*Chaerephon jobensis*	Ana
Eastern Freetail Bat	*Mormopterus* species 2	Ana
Gould's Wattled Bat	*Chalinolobus gouldii*	Ana
Hoary Wattled Bat	*Chalinolobus nigrogriseus*	Ana
Little Pied Bat (r)	*Chalinolobus picatus*	Ana
Greater Broad-nosed Bat	*Scoteanax rueppellii*	Ana
Eastern Cave Bat	*Vespadelus troughtoni*	Ana
Short-beaked Echidna	*Tachyglossus aculeatus*	Ind
Delicate Mouse	*Pseudomys delicata*	Pit, Ell(A)
Eastern Grey Kangaroo	*Macropus giganteus*	Obs
Red Kangaroo	*Macropus rufus*	Obs
*European Rabbit	*Oryctolagus cuniculus*	Obs
*European Fox	*Vulpes vulpes*	Ind
Birds		
Grey-crowned Babbler	*Pomatostomus temporalis*	Obs
Brown Treecreeper	*Climacteris picumnus*	Obs
Varied Sitella	*Daphoenositta chrysoptera*	Obs
Noisy Friarbird	*Philemon corniculatus*	Obs

Common Name	Scientific Name	Type of Record
Yellow-throated Miner	*Manorina flavigula*	Obs
Striped Honeyeater	*Plectorhyncha lanceolata*	Obs
White-throated Honeyeater	*Melithreptus albogularis*	Obs
Grey Shrike-thrush	*Colluricincla harmonica*	Obs
Dusky Woodswallow	*Artamus cyanopterus*	Obs
Magpie Lark	*Grallina cyanoleuca*	Obs
Jacky Winter	*Microeca fascinans*	Obs
Masked Lapwing	*Vanellus miles*	Hrd
Mistletoe Bird	*Dicaeum hirundinaceum*	Obs
Rufous Whistler	*Pachycephala rufiventris*	Obs
Crested Pigeon	*Ocyphaps lophotes*	Obs
Common Bronzewing	*Phaps chalcoptera*	Obs
Black-faced Cuckoo-shrike	*Coracina novaehollandiae*	Obs
Weebill	*Smicornis brevirostris*	Obs
Yellow Thornbill	*Acanthiza nana*	Obs
Striated Pardalote	*Pardalotus striatus*	Obs
Rufous Fantail	*Rhipidura rufifrons*	Obs
Grey Fantail	*Rhipidura albiscapa*	Obs
Variegated Fairy Wren	*Malurus lamberti*	Obs
Willie Wagtail	*Rhipidura leucophrys*	Obs
Rainbow Lorikeet	*Trichoglossus haematodus*	Obs
Pale-headed Rosella	*Platycerus eximius*	Obs
Galah	*Cacatua roseicapillus*	Obs
Sulphur-crested Cockatoo	*Cacatua galerita*	Obs
Red-winged Parrot	*Aprosmictus erythropterus*	Obs
Double-barred Finch	*Taeniopygia bichenovii*	Obs
Red-backed Kingfisher	*Todiramphus pyrrhopygia*	Obs
Blue-winged Kookaburra	*Dacelo leachii*	Obs
Laughing Kookaburra	*Dacelo novaeguineae*	Obs

Common Name	Scientific Name	Type of Record
Grey Butcherbird	*Cracticus torquatus*	Obs
Pied Butcherbird	*Cracticus nigrogularis*	Obs
Australian Raven	*Corvus coronoides*	Obs
Torresian Crow	*Corvus orru*	Obs
Australian Magpie	*Gymnorhina tibicen*	Obs
Nankeen Kestrel	*Falco cenchroides*	OH
Whistling Kite	*Haliastur sphenurus*	Obs
Black Kite	*Milvus migrans*	OH
Reptiles		
Eastern Bearded Dragon	*Pogona barbata*	Obs
Burns' Dragon	*Amphibolurus burnsi*	Obs
Carnaby's Wall Skink	*Cryptoblepharus carnabyi*	Obs
Major skink	*Egernia frerei*	Obs
Eastern Striped Skink	*Ctenotus robustus*	Obs
A striped skink	*Ctenotus strauchii strauchii*	Obs
Bynoe's Gecko	*Heteronotia binoei*	Obs
A gecko	*Gehyra catenata*	Obs (S)
A gecko	*Gehyra dubia*	Obs (S)
Ocellated Velvet Gecko	*Oedura monilis*	Obs (S)
Myall Snake	*Suta suta*	Pit

Key to Table:

Type	Type of record of fauna from present assessment
Obs	Observed on the ground or in vegetation
Obs (S)	Observed spotlighting
OH	Observed in flight overhead
Hrd	Heard only
Ind	Indirect evidence (e.g. scats, tracks, diggings, burrows).
Pit	Pit trapped
Ell(A)	Elliot trapped (Type A)
Ell(B)	Elliot trapped (Type B)
Ana	Identified from ultrasonic call detection (Anabat)
*	Introduced, non-indigenous species
r	Rare under the NC Act

4.2.1 Mammals

Eleven native mammal species and two introduced mammal species were recorded from the study site during the present assessments (see Table 1). A number of other mammals predicted to occur in the local area could potentially use the study area to some extent (see Table 2 and Table 3). These mammals are discussed below.

» Seven species of bat were recorded during the present assessment. These species were identified through the analysis of their ultrasonic calls, which were recorded through the Anabat II call detection system. The little pied bat (*Chalinolobus picatus*) was identified from the study site and is listed as rare under the NC Regulations. Large hollow stags and hollow mature trees were common throughout the study site and would provide excellent diurnal roosting and breeding sites for bats.

» Two large species of kangaroo were observed within the study site. A single sub-adult male red kangaroo was observed moving through the study site. This species is on the edge of its range in the Moranbah area and usually seems to prefer semi-arid and arid inland areas. A small group of five eastern grey kangaroos were also observed and appeared to be relatively common within the study area due to the frequency of scats observed. Eastern grey kangaroos are a common species throughout the eastern portion of Australia and have become more common since the introduction of artificial watering points throughout agricultural areas.

» Three delicate mice (*Pseudomys delicata*) were trapped during the survey period. Two were found within the Type A Elliot traps and one was found within a pitfall trap. This species inhabits open habitats, such as open grassy woodlands and shelters within hollow logs, which were common within the area that these individuals were trapped.

» The short-beaked echidna occurs within the study area and can be identified through the observation of ripped open termite mounds in some areas. Extensive suitable refuge sites (in the form of large hollow logs) and foraging opportunities exist within the study area (for example, abundant termitaria), and the species is probably relatively common within the district.

» A fox den was recorded within a thicker, shrubbier area of the study site, although it appeared not to be in use at the time of the survey. A number of fox scats were also observed throughout the study area. The presence of the fox in the study area suggests increased predation on small – medium sized native mammals such as bandicoots, rodents and small native carnivores. The fox would also compete for food resources with quolls. However, the fox may also prey on the introduced rabbit, which appears to be relatively common within the study area.

» Rabbits appear to be relatively numerous within the study area and have constructed burrows under hollow logs and low shrubs. Rabbit grazing levels may be contributing to the sparsely grassed habitats within the study area, which in combination with domestic cattle, may be diminishing ground layer vegetation to the point where terrestrial fauna are uncommon (as appears to be the case from this assessment).

A number of additional microchiropteran bat species have been previously recorded from the study area (as documented in Wildlife Online), for example the yellow-bellied sheathtail bat and *Mormopterus* sp. These species are all highly likely to inhabit the study area due to the prevalence of dead stags and hollows present in large mature trees, which could be utilised for shelter.

4.2.2 Birds

A total of 41 native bird species were recorded from the study area during the assessment (Table 1). No introduced bird species were sighted. Many other species have either been previously recorded from the Moranbah area, or have been recorded from the local area and could potentially utilise the study site. Observations on bird species are provided below:

» The open woodland habitat of the study area provides habitat for a broad diversity of birds, including some species such as the grey-crowned babbler and brown treecreeper that have diminished in abundance in other agriculturally developed areas of southeastern Australia. Many of the other species recorded within the study site are quite common woodland birds throughout many parts of eastern Australia, though a few species such as the blue-winged kookaburra are less abundant species. The relatively complex habitat present within the study area appears to be a key characteristic supporting the high diversity of bird species present. Mature trees with hollows, dead hollow stag trees, scattered fallen timber and areas of shrubby understorey are habitat attributes favoured by many species of woodland bird present within the study site.

» Poplar box with a scattering of Clarkson's bloodwood and narrow-leaved ironbark are the dominant canopy species in the area. Poplar box and narrow-leaved ironbark were flowering at the time of the survey, and a number of nectar feeding birds were recorded within the study area, particularly rainbow lorikeets, noisy friarbirds, striped honeyeaters and white-throated honeyeaters. Other nectar-feeding birds could be expected to utilise the study site.

» Laughing and blue-winged kookaburras, red-backed kingfisher, grey and pied butcherbirds, black and whistling kites and Nankeen kestrel were the main diurnal birds of prey recorded during the present study. These species would predominantly feed upon rodents, lizards, frogs and invertebrates.

  No other diurnal birds of prey were recorded, although corvids (e.g. crows and Australian magpies) will occasionally forage on other animals as part of a broader diet. Other birds of prey such as eagles and other species of falcon and kite would likely be recorded within the study area over a longer period of survey.

4.2.3 Reptiles

Eleven species of reptile were recorded from the study site (see Table 1), although each of the species recorded were either single individuals or in relatively low numbers. This is likely to be attributed to the time of year the assessment was conducted (autumn), which is not considered to be the peak activity period for most

species of reptile (period of peak activity is generally late winter, spring and summer). Although many fallen trees and branches were present throughout the study area, very little ground litter or thick ground level vegetation was present, which may account for the low abundances of terrestrial reptiles. Observations on reptiles are provided below:

» Four species of gecko were recorded, mainly on the bark of live trees during the nocturnal assessment and under pieces of fallen debris during diurnal active reptile searches (e.g. Bynoe's gecko).

» Four species of skink were recorded, predominantly utilising fallen hollow timber and low vegetation. A large Major skink was observed retreating down and basking at the entrance to a rabbit burrow. The low abundance of skinks could possibly be attributed to the cooler weather of autumn, although thorough coverage of the study site and lifting of fallen timber, rocks and bark yielded few additional species.

» Two large species of dragon, eastern bearded dragon and Burns' dragon, were observed within and basking upon large fallen hollow trees. One adult and one juvenile of each species were observed during the investigation. These species mainly consume insects, but will also overpower small mammals and reptiles on occasion.

» One myall snake was recovered from a pitfall trap in an open grassy woodland association with heavy loam soils. This species occurs throughout much of eastern Australia and generally favours heavier loam and cracking clay soils. The ornamental snake (*Denisonia maculata*) is known from the Moranbah area though is unlikely to occur within the study area, as it prefers wetter, low-lying areas characterised by gilgai[3] and inhabited by frogs (its preferred prey).

4.2.4 Amphibians

No amphibians were recorded from the study area, though this is probably due to the dry conditions experienced during the survey period (although heavy rain had fallen four weeks earlier). Species recorded for the area from the Wildlife Online database includes the common green tree frog, eastern snapping frog and ornate burrowing frog. These species may have been observed under different conditions, particularly burrowing frogs, which emerge for breeding following rainy periods.

4.2.5 Fish

No wetlands or permanent waterways exist on the site. However, a number of small eroded channels do cross the study site, which could fill during periods of heavy rain (see Figure 10). These areas have suffered from severe bank erosion, possibly caused by domestic cattle trampling and over grazing of supporting vegetation. Due to the lack of standing water on the study site, no aquatic sampling was undertaken and therefore no fish species observed. Grosvenor Creek nearby could potentially provide habitat for a number of fish species at certain times of the year (see Figure 9).

[3] 'gilgai' is a land form of alternating mounds and depressions sometimes referred to as 'crabhole country'. It is formed on shrink-swell clays (or grey vertosols) when the soil undergoes alternate drying and wetting cycles.

Figure 10: Ephemeral stream in the east of the lot

5. Legislative implications - fauna

The recommendations below are provided based upon GHD's understanding of the legislation and policy, and the consultant's experience with their implementation. The relevant regulatory authorities may interpret and implement the legislation and policies differently. Only issues relating to fauna are considered.

5.1 *Nature Conservation Act 1993*

The only species detected on the site that is listed under the *Nature Conservation (Wildlife) Regulation 1994* was the little pied bat.

This species was detected on the Anabat II recording device, and no data on population numbers, nesting locations or site utilisation was gathered. Little Pied Bats are known to nest in caves and sometimes abandoned human structures, none of which exist on the subject lot. However, the little pied bat is a little known species and it is possible that they may also utilise large hollow stages and dead trees for nesting. Therefore, the study site may potentially support a population of little pied bats, with higher numbers of the species expected toward the eastern parts of the study area due to the greater presence of large hollow trees and dead hollow stags.

A number of other listed threatened fauna may be occasional to rare visitors to the study site. For example, the squatter pigeon, the black-necked stork, the cotton pygmy-goose and other state listed species may occasionally feed on or overfly the study site.

If mitigation measures are implemented as outlined in the associated report 'Report for Environmental Impact Statement: Potential Impacts and Mitigation – Nature Conservation', significant impacts on fauna species of state conservation significance are unlikely to occur.

5.2 *Environmental Protection and Biodiversity Conservation Act 1999*

The Protected Matters Search Tool was used to search for relevant Matters of National Environmental Significance within 5 km of the proposed development site.

- World Heritage Areas – there are no World Heritage Areas within 5 km of the study area.
- National Heritage Places – there are no National Heritage places identified within 5 km of the study area.
- Threatened Species and Communities – No nationally threatened species were recorded during the assessment of the study site, though the area may potentially be utilised on occasion by the squatter pigeon (which has habitat toward the eastern parts of the study area). The project is not considered to significantly impact on this species due to the presence of suitable habitat surrounding the site.
- A small number of additional mobile threatened fauna species such as the red goshawk may use the study area for foraging on occasion. The Yakka skink may

also be present, however a week of extensive targeted searches for the species failed to locate any individuals or traces. The proposed works, if located away from the eastern-most part of the study site, should not pose a significant impact on nationally threatened fauna species.

» Migratory Species – The study area does not provide habitat that would likely support an ecologically significant proportion of the population of any listed migratory species (see Appendix B for list of migratory species). The proposed works are not expected to have a significant impact on any listed migratory species, particularly if mitigation measures are implemented.

» Commonwealth Marine Areas – The study area does not include a commonwealth marine area. If mitigation measures are implemented (see 'Report for Environmental Impact Statement: Potential Impacts and Mitigation – Nature Conservation'), there should be a minimal likelihood of downstream effects upon a marine environment. The study area obviously does not provide habitat that would support an ecologically significant proportion of the population of any listed marine species (see Appendix B for list of marine species).

» Ramsar wetlands of international significance – There are no Ramsar wetlands within 5 km of the study area. The study area does however occur within the same catchment as a Ramsar site, the Shoalwater and Corio Bays area. It is unlikely that this proposal will have any significant impact on those wetlands.

» Nuclear Actions – The proposed works do not constitute a nuclear action.

Conclusions

Not including flora issues, it is considered unlikely that the proposed works would have a significant impact on a matter of national conservation significance, particularly if mitigation measures are implemented (as recommended in the EIS report – Potential Impacts and Mitigation).

6. Conservation Significance

6.1 Site

The study site is of local faunal significance, because:

- The presence of healthy poplar box woodland, containing numerous mature hollow bearing trees, large dead hollow stags and many piles of fallen timber, in addition to intact patches of woodland with a moderately dense shrub layer.
- Known use of the site by a broad range of native fauna species, including one species considered rare in Queensland (little pied bat) and some other woodland species that are considered threatened in other parts of Australia (e.g. grey-crowned babbler, brown treecreeper).
- Potential use by a range of other native fauna species, including likely occasional visitation by more mobile threatened fauna (e.g. squatter pigeon) and other more sedentary fauna whose habitat exists within the study site (e.g. Yakka skink).

The habitat values for the site are in a relatively good condition, particularly the canopy layer and some shrubby areas. The ground layer appears to have been significantly impacted by domestic cattle, which have disturbed the soil structure and reduced the abundance of ground vegetation. Management of these issues may improve structural diversity of the site and improve habitat for terrestrial species.

6.2 Threatened species

Assigning a level of conservation status to fauna species was conducted using criteria outlined in Appendix A. It is based upon a hierarchy dependent upon the highest landscape scale in which a fauna species is considered threatened (national, state, local). The threat status of fauna considered in relation to the Moranbah study site is provided in Table 2 and Table 3 and discussed in greater detail below.

6.2.1 National significance

No species of national conservation significance was recorded from the study area during the field assessment.

The Wildlife Online database indicates that there are records of two nationally significant species (squatter pigeon and ornamental snake) within a 20 km radius of the study site. The potential use of the study area by these species of national conservation significance predicted for the study area is discussed in Table 2 below:

Table 2: Predicted use of the study area by fauna species of national conservation significance

Common Name	Predicted Use of the Study area	EPBC	NCA
Squatter Pigeon	Possible occasional visitor. Species inhabits the grassy understorey of open eucalypt woodlands, usually within ready access of water(Garnett and Crowley, 2000). The squatter pigeon nests on the ground and would be highly susceptible to predation by exotic predators such as foxes, which are present within the study site. It is considered likely that this species occupies the study site on occasion, however it is unlikely to be impacted as similar habitat is common directly adjacent to the site.	V	V
Red Goshawk	Possible rare visitor. Utilises tall open forest, open woodland, forested rivers and rainforest margins. This species nests in trees greater than 20 m tall and within 1 km of a watercourse or wetland. This species may occasionally move through the study area, though nesting is unlikely as the canopy layer was less than 20 m in height and the site was greater that 1 km from a watercourse.	V	E
Star Finch (eastern & southern)	Very rare to vagrant visitor. Inhabitant of grasslands or grassy woodland near water. Records since 1990 have been scattered through central Queensland in addition to records near Rockhampton. Sedentary in nature. Probably unlikely in study area and no records for the Belyando Shire.	E	E
Australian Painted Snipe	Unlikely. This species inhabits wetlands with well-vegetated dense low cover. Habitat of this description does not exist within the study area.	V	-
Eastern Long-eared Bat	Possible visitor. Inhabitant of dry woodland in eastern Australia. Roosts in tree hollows. Habitat present in eastern parts of the study site.	V	V
Yakka Skink	Possible resident. Inhabits dry forests, open woodlands and rocky areas. Dwells in hollow fallen timber, rock crevices, burrows under logs and rocks and disused rabbit burrows. Possible habitat in eastern parts of study area, though the species was not observed despite extensive targeted searches throughout.	V	V
Ornamental Snake	Unlikely. Species inhabits wet and low-lying gilgaied areas within 20 km of the study area and preys almost exclusively on frogs. The species has been recorded within the Moranbah area. Preferred habitat does not appear to exist within the study area.	V	V

Key to Table:

EPBC	Environment Protection and Biodiversity Conservation Act 1999
NCA	Nature Conservation Act 1992
CE	Critically Endangered
E	Endangered
V	Vulnerable

6.2.2 State significance

The little pied bat was recorded within the study area and is listed as rare under the NC Regulation.

The Wildlife Online database indicates that there have been six fauna species of state conservation significance recorded within 20 km of the study area.

The potential use of the study area by all species of state conservation significance is discussed in Table 3.

Table 3: Predicted use of the study area by fauna species of state conservation significance

Species Name	Predicted Use of the Study Area	NCA
Cotton Pygmy Goose	Occasional flyover of study area possible, unlikely visitor. Species found on freshwater lakes, swamps and large water impoundments. Lays eggs in hollow trees standing in water and feeds on aquatic vegetation. This species has likely been recorded from wetlands near the study area, but suitable habitat does not exist within the study area.	R
Black-necked Stork	Occasional flyover of study area possible, unlikely visitor. This species inhabits wetlands and associated habitats, such as swamps, billabongs, flooded grasslands, sewage farms and dams. This species is likely to have been recorded from waterways and wetlands within a 20 km radius of the study area. Suitable habitat for this species does not exist within the study site.	R
Squatter Pigeon (southern subspecies)	Likely visitor but will not be impacted by this proposal because substantial areas of suitable/identical habitat are found directly adjacent to the site.	V
Troughton's Sheathtail Bat	Highly unlikely. Species only known from a few records near Mt Isa and Cloncurry, where the species roosts in caves and abandoned mines. The single record of this species from the Moranbah area is likely to be a misidentification or the animal observed was an extreme vagrant.	E
Little Pied Bat	Recorded within the study area.	R
Ornamental Snake	Unlikely Species inhabits wet and low-lying gilgai areas within 20 km of the study area and has been recorded within the Moranbah area. Preferred habitat does not appear to exist within the study area.	V

Key to Table:

NCA	Nature Conservation Act 1992
E	Endangered
V	Vulnerable
R	Rare
NT	Near Threatened

6.2.3 Local significance

Fauna species indigenous to the local area are considered to be of at least local conservation significance. All native fauna species recorded during the present assessment are considered to be of local conservation significance (see discussion of significance in Appendix A.

6.2.4 Migratory Species

The Commonwealth EPBC Act contains a list of species it considers to be migratory. This incorporates all fauna listed on international migratory fauna agreements to which Australia is a signatory - CAMBA, JAMBA and the Bonn Convention.

Four migratory bird species were recorded during the present assessment. Another 46 bird species considered as part of this assessment (from other sources such as Wildlife Online) are also considered migratory. These species are listed in Appendix B. While some of the species are considered to be true migrants (*e.g.* Latham's snipe), this list also includes a number of fauna species that do not display migratory behaviour. For example, all duck and raptor families are listed on the Bonn Convention, and are therefore listed as migratory on the EPBC Act.

The habitats present across the Moranbah study site all provide suitable habitat for one or more species listed as migratory under the EPBC Act. The habitats present are of good quality, particularly for raptor species, such as whistling and black kites and Nankeen kestrels, which were observed during the present assessment. However, significant wetlands and waterways do not exist within the study site, although Grosvenor Creek nearby could potentially provide habitat for a number of migratory species, which could on occasion overfly or rest within the study site.

7. Potential impacts

The proponent wishes to construct and operate an ammonium nitrate plant within the Moranbah study area. Preparation of the site will involve the clearing of approximately 60 ha of native vegetation. The impacts from this project will primarily relate to the removal of native vegetation and potential fauna habitat. In addition, noise, vibration and human activity once the plant has been constructed is likely to at least exert minor impacts upon the fauna species present within the local area and may cause some species to avoid the area in the future.

7.1 Potential impacts

Potential impacts upon native fauna species are based upon a scenario where no mitigation measures are undertaken.

7.1.1 Loss of fauna habitat

The proposed development process would result in the clearing of 60 ha of woodland vegetation. This process will result in the removal of many large Eucalypt trees (some containing hollows), hollow ground debris and clumps of shrubs that are likely to provide habitat for local bird, bat, reptile, amphibian and mammal species. This process will also fragment the current block of existing vegetation and may act as a barrier to faunal movements currently occurring through the area.

The opening up of the woodland habitat and human presence in the area, may possibly cause a shift in species composition toward common “native” increaser species such as crows, magpies and noisy mynas. Smaller woodland bird species may become less common as these more aggressive colonists drive them away from the edges of the cleared area.

7.1.2 Direct injury or mortality

The proposed clearing process will likely involve the use of large earth moving machinery in order to remove trees, flatten out the construction area and build the dam site. These activities may possibly cause injury and/or mortality to sedentary, nocturnal and less mobile species of fauna that are unable to escape the area during the clearing process.

The increased presence of vehicles and people in the area during the plant construction process and following establishment of the plant may increase the occurrence of road mortality and injury to local fauna.

7.1.3 Disturbance to fauna

An increased level of disturbance to native fauna is likely to occur as a result of the plant establishment. Human and vehicular movements, in addition to noise levels created by the plant could possibly cause various species of fauna to avoid the

development area. Vibrations and artificial light produced by the plant may also adversely impact upon local fauna within the area.

Plant construction, operation and artificial lighting may encourage timid fauna species to actively avoid the area and forage and breed elsewhere, which may be increasingly difficult in a fragmented landscape.

7.1.4 Increase in feral animals

Construction and operation of the proposed development will increase the opportunities for feral animals to infiltrate the area. Foxes appear to be already common on the site, and it is likely that cats would be present from time to time. However, an increased human presence often provides increased opportunities for scavenging. Therefore, cats, foxes and dingos/dogs may be expected to use the site more frequently after construction.

8. Conclusions and recommendations

The open grassy poplar box woodlands present within the Moranbah study area are considered to have local significance as a habitat for a diverse range of fauna species. The study site is relatively intact and exhibits a low degree of habitat complexity, particularly for arboreal species such as birds, bats and reptiles. Numerous large hollow-bearing trees are present, in addition to large hollow stags and fallen hollow branches and logs, providing habitat for a broad range of birds, mammals (including bats) and reptiles. Avian fauna exhibited a high diversity, with 41 species recorded in addition to bats, with seven species recorded.

Extensive targeted searches were conducted for threatened species such as Yakka skink - this particular species was not observed, though may possibly occur within the eastern parts of the study area. The Little Pied Bat, listed as rare under the *Nature Conservation (Wildlife) Regulation 1994*, was recorded from the study site and is may to be relatively common within the area. Whilst this species is known to roost only in caves and buildings, it may utilise hollow stags and mature hollow trees for this purpose, all of which were abundant in the study area.

The Squatter Pigeon was not recorded during the present assessment, however open grassy woodland habitats near water were found in the eastern section of the study area. An opportunity exists to improve retained (uncleared) vegetation for Squatter Pigeon by removing domestic and exotic grazing species such as cattle and rabbits (improve ground cover abundance) and through controlling fox numbers. Improved management of this eastern area, including the fencing off and removal of domestic and exotic grazing animals, weed control and control of exotic predators, would serve to increase the habitat values for a range of local fauna species (including other state and nationally listed threatened species).

Ideally, the eastern half of the study site (east of the transect lines established during the present assessment – see Figure 1) should not be developed due to the potential fauna habitat values for the Little Pied Bat and Squatter Pigeon, in addition to the potential presence of the Yakka Skink. The western parts of the study site (west of the established transects) should be targeted for the development proposal due to the already degraded nature of the semi-cleared non-remnant habitat in this area, generally lower habitat values for threatened species and higher prevalence of exotic species such as rabbits.

As a general conclusion, if appropriately managed the proposed establishment of the ammonium nitrate plant at the Moranbah study site should not impose a significant impact on species of national and state significance.

Appendix A

Significance Assessment

Definition of Significance

Significance is defined as “noteworthy, of considerable importance” by the Oxford Dictionary. However, when defining the conservation significance value of ecological communities, species and sites, a more detailed scientific definition is required.

Species

The conservation significance of an individual species is defined according to two main criteria: the level of threat (conservation status) ascribed to the species, and the scale/context in which it occurs.

Conservation status of individual species falls into one of the following categories: not rare, poorly known, rare, vulnerable, endangered or extinct, with ‘threatened’ species being those that are classified as either vulnerable or endangered. Scale is defined at four levels: national (Australia), state (Queensland), regional (Belyando Shire) and local (Moranbah, within a 5 kilometre radius of the study area).

Therefore, in accordance with these criteria, a species is considered significant at the largest scale at which it is at least rare.

National significance

Species of national significance are either:

» Flora or fauna listed as extinct, extinct in the wild, critically endangered, endangered, vulnerable or conservation dependent in Australia under the *Environment Protection and Biodiversity Conservation Act 1999*.

» Fauna listed as extinct, endangered, vulnerable, rare, lower risk-near threatened or data deficient in Australia in an Action Plan published by the Department of the Environment and Heritage.

State significance

Species of state significance are either:

» Fauna listed as extinct, endangered, vulnerable, rare or near threatened in the *Nature Conservation (Wildlife) Regulation* 1994.

Local

All species of indigenous fauna are considered to have at least local significance, owing to the degree of habitat modification across much of the state.

Sites

A site is considered significant at a specific geographic scale (national, state, regional, local) when it is deemed to make a considerable contribution to biodiversity at that level.

The major factors affecting site significance are:

» Presence or likely presence of significant flora and fauna species;

» Presence of threatened ecological communities;

» Ecological condition (e.g. level of intactness, human disturbance, weed invasion, etc); and

» Size of the site.

The combination of the highest level of community and/or species significance at which at least 1% of the remaining extent occurs is considered to be the threshold for a 'considerable contribution' (e.g. if one plant of a nationally significant species was recorded in a small, high quality remnant of a state significant community, the site would most likely be regarded as being of regional significance, as both the species and the community are unlikely to comprise 1% of the total population/extent at either the state or national level).

Other factors likely to influence site significance include the following:

» Species, community and habitat diversity;

» Connectivity to other sites / wildlife corridor value; and

» Species or community 'edge of range' values.

If a site forms part of a broader area of significance, then the significance of the broader area also applies to the site, unless there is a valid ecological reason to separate the site from the broader area.

Sites that have an especially high level of regional or local significance are designated as 'high regional' or 'high local' significance respectively.

Habitat Assessment

Floristic and structural features of the vegetation form a habitat type, which provides a set of resources to support a community of fauna species. Habitat types correspond broadly to vegetation communities. Lines drawn around these habitats do not represent rigid boundaries, as many species move between habitats or utilise more than one habitat according to changing conditions or seasons.

The value of a habitat will assist in the final determination of significance. This is determined by a number of features, including:

» Habitat status;

» Size/connectivity;

» Condition;

» Significant species; and

» Other features.

Three categories are used to evaluate habitat value:

High: Ground flora containing a high number of indigenous species; vegetation community structure, ground, log and litter layer intact and undisturbed; a high level of breeding, nesting, feeding and roosting resources available; a high richness and diversity of native fauna species.

Moderate: Ground flora containing a moderate number of indigenous species; vegetation community structure, ground log and litter layer moderately intact and undisturbed; a moderate level of breeding, nesting, feeding and roosting resources available; a moderate richness and diversity of native fauna species.

Low: Ground flora containing a low number of indigenous species, vegetation community structure, ground log and litter layer disturbed and modified; a low level of breeding, nesting, feeding and roosting resources available; a low richness and diversity of native fauna species.

Other habitat features, such as its value as a habitat corridor, or the presence of remnant communities, or unusual ecology or community structure, may also be used to assess habitat quality.

Appendix B

Migratory and Marine Species

Fauna species listed as migratory and/ or marine on the Commonwealth EPBC Act 1999

Key to Table:
√ Listed on the EPBC Act 1999
- Not listed on the EPBC Act 1999
Species listed in bold were recorded from the study area during the present assessment.

Common Name	Scientific Name	Migratory	Marine
Buff-banded Rail	*Gallirallus philippensis*	-	√
Spotless Crake	*Porzana tabuensis*	-	√
Purple Swamphen	*Porphyrio porphyrio*	-	√
Australian Pelican	*Pelecanus conspicillatus*	-	√
Whiskered Tern	*Chlidonias hybridus*	√	√
Caspian Tern	*Sterna caspia*	√	√
Silver Gull	*Larus novaehollandiae*	√	√
Masked Lapwing	***Vanellus miles***	√	
Double-banded Plover	*Charadrius bicinctus*	√	√
Black-fronted Dotterel	*Elseyornis melanops*	√	-
Black-winged Stilt	*Himantopus himantopus*	√	√
Common Sandpiper	*Actitis hypoleucos*	√	√
Sharp-tailed Sandpiper	*Calidris acuminata*	√	√
Pectoral Sandpiper	*Calidris melanotos*	√	√
Australian Painted Snipe	*Rostratula benghalensis*	√	√
Latham's Snipe	*Gallinago hardwickii*	√	√
Australian White Ibis	*Threskiornis molucca*	-	√
Straw-necked Ibis	*Threskiornis spinicollis*	-	√
Great Egret	*Ardea alba*	√	√
Cattle Egret	*Ardea ibis*	√	√
Cape Barren Goose	*Cereopsis novaehollandiae*	√	√
Australian Wood Duck	*Chenonetta jubata*	√	-
Black Swan	*Cygnus atratus*	√	-
Australian Shelduck	*Tadorna tadornoides*	√	-
Pacific Black Duck	*Anas superciliosa*	√	-
Plumed Whistling-duck	*Dendrocygna eytoni*	√	
Cotton Pygmy-goose	*Nettapus coromandelianus*	√	
Chestnut Teal	*Anas castanea*	√	-
Grey Teal	*Anas gracilis*	√	-
Australasian Shoveler	*Anas rhynchotis*	√	-
Pink-eared Duck	*Malacorhynchus membranaceus*	√	-
Freckled Duck	*Stictonetta naevosa*	√	-
Hardhead	*Aythya australis*	√	-
Blue-billed Duck	*Oxyura australis*	√	-
Musk Duck	*Biziura lobata*	√	√

Common Name	Scientific Name	Migratory	Marine
Brown Goshawk	*Accipiter fasciatus*	√	√
Wedge-tailed Eagle	*Aquila audax*	√	-
Whistling Kite	***Haliastur sphenurus***	√	√
Black Kite	***Milvus migrans***	√	
Black-shouldered Kite	*Elanus axillaris*	√	-
Nankeen Kestrel	***Falco cenchroides***	√	
Brown Falcon	*Falco berigora*	√	-
White-bellied Sea-eagle	*Haliaaetus leucogaster*	√	√
Swift Parrot	*Lathamus discolor*	-	√
Sacred Kingfisher	*Todiramphus sanctus*	-	√
Pallid Cuckoo	*Cuculus pallidus*	-	√
Fan-tailed Cuckoo	*Cacomantis flabelliformis*	-	√
Horsfield's Bronze-Cuckoo	*Chrysococcyx basalis*	-	√
Fork-tailed Swift	*Apus pacificus*	√	√
White-throated Needletail	*Hirundapus caudacatus*	√	√
Rainbow Bee-eater	*Merops ornatus*	-	√
Black-faced Monarch	*Monarcha melanopsis*	√	-
Welcome Swallow	*Hirundo neoxena*	-	√
Tree Martin	*Hirundo nigricans*	-	√
Rufous Fantail	*Rhipidura rufifrons*	√	√
Satin Flycatcher	*Myiagra cyanoleuca*	√	√
Flame Robin	*Petroica phoenicea*	-	√
Magpie-lark	***Grallina cyanoleuca***	-	√
Black-faced Cuckoo-shrike	***Coracina novaehollandiae***	-	√
Rufous Songlark	*Cincloramphus mathewsi*	√	-
Clamorous Reed Warbler	*Acrocephalus stentoreus*	√	√
Golden-headed Cisticola	*Cisticola exilis*	√	-
Regent Honeyeater	*Xanthomyza phygria*	√	-
Silvereye	*Zosterops lateralis*	-	√
Little Raven	*Corvus mellori*	-	√

Appendix C

Anabat results

Data received for analysis

One compressed folder ("Moranbah Anabat") containing 139 Anabat sequence files, of which 121 contained recognisable bat calls. File names indicate that all calls were recorded on the night of 10th May, 2006.

Call identification standard

Call identification was based on keys for south-eastern Queensland (Reinhold *et al.* 2001) and the Top End of the Northern Territory (Milne 2002), as well as the author's reference call collection from central and southern Queensland.

Data summary

The majority of bat calls recorded from this survey were of excellent quality – strong signals, with clear and well-defined call structure – thus allowing a high degree of reliability in identification of the species present.

Table 1. Summary of species recorded at Moranbah, 10th May, 2006.

Species are listed as present with a code for the highest level of confidence achieved in call identification:

A	Definite	one or more calls where absolutely no doubt about identification of bat
B	Probable	most likely the species named; low probability of confusion with other species that use similar calls.

Species	Common name	Reliability of ID
Chaerephon jobensis	Northern Freetail Bat	A
Mormopterus species 2	Eastern Freetail Bat	A
Chalinolobus gouldii	Gould's Wattled Bat	A
Chalinolobus nigrogriseus	Hoary Wattled Bat	A
Chalinolobus picatus	Little Pied Bat	A
Scoteanax rueppellii	Greater Broad-nosed Bat	B
Vespadelus troughtoni	Eastern Cave Bat	A

As shown in the above table, all but one species (*S. rueppellii*) was identified as definitely present during the recording session.
S. rueppellii was identified from a single, brief call that showed only some of the frequency and pulse-shape characteristics of the species. The call was somewhat erratic, with inconsistent pulse-shape and frequency, and it is possible that this call was an anaomolous one from *C. gouldii*.

References

Milne, D.J. (2002). *Key to the Bat Calls of the Top End of the Northern Territory.* Technical Report No. 71, Parks and Wildlife Commission of the Northern Territory, Darwin.

Reinhold, L., Law, B., Ford, G. and Pennay, M. (2001). *Key to the bat calls of south-east Queensland and north-east New South Wales.* Department of Natural Resources and Mines, Brisbane.

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