KOOLANOOKA - BLUE HILLS
DIRECT SHIPPING IRON ORE (DSO)
MINING PROJECT

Public Environmental Review

EPA Assessment No. 1653

September 2008

KOOLANOOKA/BLUE HILLS DIRECT SHIPPING IRON ORE (DSO) MINING PROJECT

Midwest Corporation

Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. Both electronic and hard copy submissions are most welcome.

The Midwest Corporation Limited Koolanooka / Blue Hills Direct Shipping Iron Ore (DSO) Mining Project covers the mining, processing and transport of iron ore from three established pits in the Koolanooka and Blue Hills Region, Southwest of Geraldton, to a rail siding at Tilley, slightly north of the WA township of Morawa. The project will be conducted within existing pits or in previously disturbed areas as far as practicable to reduce environmental impacts.

In accordance with the *Environmental Protection Act 1986* (EP Act), a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 6 weeks from 22 September 2008, closing on 3 November 2008.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence, subject to the requirements of the *Freedom of Information Act 1992* (FOI Act), and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission.

You may agree or disagree with, or comment on, the general issues discussed in the PER/or the specific proposal. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind.

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER/;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether and the reason why you want your submission to be confidential.

The closing date for submissions is: 3rd November 2008.

The EPA prefers submissions to be made electronically using one of the following:

- the submission form on the EPA's website: www.epa.wa.gov.au/submissions.asp; or
- by email to submissions.eia@dec.wa.gov.au;

Alternatively, submissions can be

- posted to: Chairman, Environmental Protection Authority, Locked Bag 33, CLOISTERS SQUARE WA 6850, Attention: Ann Stubbs or
- delivered to the Environmental Protection Authority, Level 4, The Atrium, 168 St Georges Terrace, Perth, Attention: Ann Stubbs or
- faxed to (08) 6467 5562.

If you have any questions on how to make a submission, please ring the EPA assessment officer, Ann Stubbs on 6467 5409.

Document Status						
Ver No.	**Author**	**Reviewer/s**	**Date**	**Approved for Issue**		
				Name	**Distributed To**	**Date**
7	Elizabeth Congear	Garry Connell	18/09/08	John Kelly	Public Release	22/09/08

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ecologia Environment
1025 Wellington Street
WEST PERTH WA 6005
Phone: 08 9322 1944
Fax: 08 9322 1599
Email: admin@ecologia.com.au
www.ecologia.com.au

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Executive Summary

The Project

Midwest Corporation Limited (Midwest) proposes the Koolanooka/Blue Hills Direct Shipping Iron Ore (DSO) Mining Project (the Project). The Koolanooka mine site is located approximately 160 km south east of Geraldton and 21 km east of Morawa, and the Blue Hills mine site is located 60 km to the east of Koolanooka, Figure 1-1.

The Project involves the recommencement of open pit mining activities at Koolanooka, with similar activities commencing 1.5 years into the project at the Mungada East and Mungada West pits at Blue Hills. This work will involve a maximum of five mining campaigns during the project. These three mines were previously operated by the Geraldton Operations Joint Venture (GOJV) from 1966–1972 as Australia's first export iron ore operations. Most work will be conducted in existing disturbed areas.

Midwest is currently exporting previously mined material from stockpiles at Koolanooka at the rate of 1.0 Mtpa, through the port of Geraldton. The operational workforce of approximately 50 resides in Morawa and Geraldton, providing a significant economic benefit to the region.

Approval of the Project will allow the continuation and expansion of these regional benefits.

The Project involves:

- A minor extension to the south east of the existing open pit at Koolanooka to access haematite iron ore.
- Cutback and deepening of the existing open pits at Mungada East and Mungada West to access haematite iron ore.
- Reopening of the existing haul road between Koolanooka and Blue Hills to allow the transportation in road trains of ore from the Mungada pits to Koolanooka for processing.
- Stockpiling of mined ore at Koolanooka on existing disturbed areas.
- Installation of a crushing and screening plant at Koolanooka (with relocation to Blue Hills 1.5 years into the project life) to blend and process the ore into lump and fine products at the combined rate of up to 2 Mtpa.
- Establishment of infrastructure at Koolanooka and Blue Hills, including an office, two workshops, warehouse and magazine buildings, power, water supply and communications, and an accommodation facility at old Karara Homestead.

Iron ore from the existing operations is currently transported by road to Geraldton. Transition of this transport task from road to rail is well advanced. It is anticipated that from late 2008 onwards, iron ore will be transported 20 km by road to a rail siding at Tilley siding north of Morawa and then loaded onto trains for railing to the Geraldton Port. There the ore will be stockpiled in the existing covered storage facility then loaded onto ships for

export. The Koolanooka/Blue Hills DSO Mining Project is expected to run for up to 5 years, with development scheduled to commence in the second quarter of 2009.

This Public Environmental Review (PER) has been developed by the Midwest Corporation in order to fulfil submission requirements of the Western Australian environmental approvals process.

The implementation of the proposed Project is dependent on successful resolution of any associated issues, through effective application and assessment of environmental approval processes. Baseline surveys and investigations for environmental aspects of the Project are currently being conducted, with management plans for significant aspects of the project to be developed in compliance with regulatory guidelines. Ongoing consultation with regulators, relevant stakeholders and interested members of the public is also being undertaken to incorporate community concerns as part of the assessment process.

The works proposed with this Project will be largely conducted within existing pits and previously disturbed areas. The Project has been designed to minimise environmental impacts and as such all haul roads, waste dumps, ore stockpiles and most infrastructure will be located on previously disturbed land that will require minimal clearance activity. The extension to the south east of the existing open pit at Koolanooka will require the disturbance of 4.46 ha within the Koolanooka System Threatened Ecological Community (TEC), and work at Blue Hills will involve 40.8 ha of vegetation clearance in a proposed conservation reserve. Of the 4.46 ha of TEC disturbance required, it has been calculated that only 2.68 ha will actually involve clearance of vegetation, as a significant portion of the nominated area has already been disturbed by previously approved exploration activities, as demonstrated in Figure 6-13.

The project will require the creation of four waste rock dumps totalling 6.152 million m^3 of waste rock material. This will be comprised of waste rock generated from mining at Koolanooka (1.62M m^3), Mungada East (2.33M m^3) and Mungada West (2.2M m^3)

Potential impacts in implementing the Project include disturbance to flora and fauna, heritage sites, the generation of dust and gases, alteration of visual amenity and social factors, noise and vibration issues, waste material control and influence on surface and ground water bodies. This PER discusses these issues and additionally highlights decommissioning and rehabilitation commitments and discusses issues such as principles of sustainability.

Midwest is aware of other proposed mining operations which if approved will be developed in close proximity to the Midwest operations in the Blue Hills area. Due to significant variations in project timelines of the proposed surrounding developments, Midwest is unable to reasonably assess the cumulative impacts of combined regional developments. Midwest feels that sufficient information is provided in this PER to enable the EPA to conduct their own cumulative impacts assessment on the combined impacts of the proposed projects.

Existing Environment

The Koolanooka study area is located within the Avon-Wheatbelt Bioregion of Australia (Thackaway and Cresswell, 1995), in relatively close proximity to the intersection of the South-Western and Eremaean Botanical Provinces of Western Australia. The study area is located within the Perenjori Botanical District (Beard, 1976c).

The Blue Hills area occurs within the Yalgoo Bioregion on the boundary between the Austin Botanical District of the Eremaean Botanical Province and the Avon Botanical District of the South-Western Botanical Province (Beard, 1990).

Physical Environment

The Koolanooka mine site is at the north-western end of Koolanooka Hills which rise approximately 140 m above the surrounding undulating plain striking north north-west to south south-east for 13 km. These hills are composed of banded iron formations (BIF).

The Blue Hills range also consists of BIF: the ridge line is known as the Windaning Ridge. Dips are generally steep and where the BIF outcrops the topography is often rugged.

The regional area has low topography, with elevations being generally between 250 and 400 m Australian Height Datum (AHD). Prominent ridges such as Koolanooka Hills attain 450 m AHD; highest elevations exceeding 500 m AHD occur in the eastern sector, e.g. at Blue Hills and Mount Mulgine.

Drainage is mainly weak and low-gradient, predominantly to the Mongers Lake palaeodrainage system which passes a few kilometres to the north of Koolanooka Hills and includes the Yarra Yarra Lakes to the west of Carnamah (Rockwater, 2004b).

Koolanooka Spring, an ephemeral creek line is located to the south-east of the Koolanooka pit but to the west of the Mungada pits between two granite hills, draining northwards.Within the Blue Hills region is a Gilgai system located approximately 700 m due south of the Mungada East pit.

Vegetation and Flora

The vegetation associated with the Koolanooka System is described as consisting of several vegetation types (Beard, 1976): Open woodland of Sheoak; Mallee *Eucalyptus ebbanoensis, Acacia acuminata* and *Dodonaea inaequifolia* interspaced with thickets of *Allocasuarina campestris; Acacia acuminata* thicket with *Grevillea stenostachya, Melaleuca cordata, M. nematophylla* and *M. radula; Eucalyptus loxophleba* (York Gum) woodland interspaced with the same thicket, which forms the vegetation pattern on the foot slopes of Koolanooka Hills, while the granite outcrops support mixed *Acacia* spp. (*A. tetragonophylla, A. quadrimarginea* and *A. ramulosa*) (Beard, 1976).

The plant assemblages of the Koolanooka System have been defined as a Threatened Ecological Community (TEC). The vegetation of these areas is dominated by Sheoak and mixed shrub land of *Allocasuarina campestris* (hilltops) and *Acacia exocarpoides* (on granite). The zone of impact at Koolanooka Hills falls within the mapped areas for the

TEC, and makes up a small proportion of this. The Koolanooka Hills TEC covers two areas totalling 5444 ha. The Koolanooka Hills area is 3496 ha and the Perenjori Hills area 1948 ha.

The Blue Hills area falls within the Yalgoo sub-region. The major vegetation types of this sub-region include:

- heath on granite outcrops (*Borya, Thryptomene, Baeckea and Calycopeplus*);
- acacia scrub (*Acacia acuminata, A. ramulosa and A. quadrimarginea*);
- acacia-Melaleuca thicket (*Acacia ramulosa, A. acuminata, Melaleuca uncinata* with variations including *M. nematophylla*);
- scrub with scattered trees (*Acacia ramulosa, A. acuminata, Hakea preissii, Eucalyptus loxophleba, E. oleosa, Callitris columellaris, Bursaria spinosa* and *A. aneura*) and;
- salt flats surrounded by samphire (*Halosarcia* spp., teatree e.g. *Melaleuca* / *Leptospermum*, and *Acacia-Eremophila* scrub).

One Declared Rare Flora (DRF) taxa, *Acacia woodmaniorum,* protected under the Western Australian *Wildlife Conservation Act 1950*, has been recorded in the zone of impact at Blue Hills during the surveys.

No priority flora were recorded within the areas surveyed at Koolanooka. However, the record of the taxon *Acacia sclerosperma* subsp. *sclerosperma* is of interest, as this represents a southerly range extension from its previously known distribution.

Three species of conservation significance were recorded at the Mungada East and Mungada West proposal impact areas. These taxa are *Micromyrtus acuta* (P1), *Micromyrtus trudgenii* (P3) and *Persoonia pentasticha* (P3).

No rare or priority flora have been recored within the existing Mungada Haul road footprint that is proposed to be reinstated.

Fauna

Two species of Commonwealth conservational significance have been recorded within the Koolanooka or Blue Hills regions. These are the Malleefowl (*Leipoa ocellata)* from Koolanooka, Blue Hills and haul road and the Western Spiny-tailed Skink (*Egernia stokesii badia)* from Koolanooka.

Three scheduled species, as listed under the *WA Wildlife Conservation Act 1950,* were recorded at Koolanooka: Malleefowl (*Leipoa ocellata)*, Gilled Slender Blue-tongue *(Cyclodomorphus branchialis)* and the Western Spiny-tailed Skink (*Egernia stokesii badia)*.

Four scheduled species were recorded at Blue Hills: Malleefowl (*Leipoa ocellata);* Peregrine Falcon *(Falco peregrinus);* Major Mitchell's Cockatoo *(Cacatua leadbeateri); and* Gilled Slender Blue-tongue (*Cyclodomorphus branchialis)*.

Two scheduled species were recorded along the Mt Karara/Mungada haul road: Malleefowl (*Leipoa ocellata); and;* Major Mitchell's Cockatoo *(Cacatua leadbeateri).*

A number of migratory species listed under the Environment Protection and Biodiversity *Act (EPBC) 1999* were observed within the Blue Hills and Koolanooka regions, with eight species of migratory conservation significance recorded within the Blue Hills region and 12 species recorded within the Koolanooka region.

Sampling for stygofauna at the existing Koolanooka borefield and in surrounding regional bores yielded only two cosmopolitan copepod stygofauna specimens.

Four phases of troglofauna surveying were conducted for this project. A single troglobitic spider (Family Gnaphosidae) was collected during the survey from outside the TEC cutback impact area and is expected to occur along the entire Koolanooka Range. No additional troglobitic species were recorded.

Heritage

The Aboriginal groups consulted regarding the proposed project are the Widi Mob, Pandawn Descendants, Yamatji Marpla Barna Baaba Aboriginal Corporation and the Amangu Mob.

Two sites of Aboriginal heritage significance have been recorded within the Koolanooka Hills project impact area (DIA 4496 and DIA 5868). Approval to disturb DIA 4496 has been obtained under Section 18 of the Aboriginal Heritage Act 1972 (ref 0321145). It has been determined that DIA 5868 is actually a duplicate of DIA 4496.

Two other sites of Aboriginal heritage significance are found within the local area (DIA 20817 and DIA 20816). Should Midwest's project activities call for these sites to be disturbed a full approval for this work will be obtained through Section 18 of the Aboriginal Heritage Act, 1972 prior to any disturbance.

At Blue Hills, three sites of Aboriginal heritage significance have been recorded near the East Mungada pit; Blue Hills Larger Cave (site ID 20857); Blue Hills Smaller Cave (site ID 20858) and Granite Pavement with rockhole (site ID 20860). If disturbance is required to any of these caves full approval will be gained via a Section 18 approval prior to disturbance.

Lastly, during the reinstatement of the Mt Karara haul road, several heritage sites bordering this location will remain undisturbed as the haul road reinstatement will only involve clearance of up to 3 m in width of predisturbed area on either side of the present road. If disturbance is required to these sites at a later date, full approval will be gained via a Section 18 approval prior to disturbance.

Table S1 Key Characteristics of the Koolanooka / Blue Hills DSO Project (EPA Assessment No. 1653)

Key Aspect	Description
Mining Operations	
Proposed operation commencement	Second Quarter 2009
Project life span	Estimated to be 5 years
Anticipated year of decommissioning	2011-2013
Proposed mine locations	Koolanooka and Blue Hills
Size of ore body	3Mt at Koolanooka, 5.5 Mt at Blue Hills
Ore type	Tightly folded sub vertical haematitic banded ironstone
Ore mining rate	Up to 2 Mtpa
Overburden mining rate	Average 1.7 Mtpa
Total estimated production (processed ore)	1.940 M m^3
Overall stripping ratio (overburden:ore) m^3	2.35: 1 waste:ore
Koolanooka mine pits	
Depth of new sections	350 m AHD
Depth of water table	Approximately 255 m AHD.
Overburden Stockpiles	External dump volume: 1.622 M m^3 in addition to existing dump areas
Topsoil Stockpiles	Where required, but will be stockpiled within waste dump areas as indicated with this PER
Area of new clearing Koolanooka	2.68 ha, with an additional 3.14 ha being impacted within the dust buffer zone area of potential influence.
Area of predisturbed land Koolanooka	38.2 ha (26 ha for west waste dump, 6.6 ha for south waste dump, 5.6 ha for infrastructure)
Mungada East pit details	
Depth of new section	350 m RL AHD. Mining will not proceed below the level of the water table without further approval
Depth of water table	332-337m RL AHD
Overburden Stockpiles	External dump volume: 2.33 M m^3
Mungada West pit details	
Depth of new section	355 m RL AHD. Mining will not proceed below the level of the water table without further approval.
Depth of water table	333-334 m RL
Overburden Stockpiles	External dump volume: 2.2 M m^3
Topsoil Stockpiles	Where required, but will be stockpiled within waste dump areas as indicated with this PER
Area of new clearing Blue Hills	80.3 ha (39.5 ha of this is re-clearing of the regrowth edges of the Mt Karara / Mungada haul road)
Area of predisturbed land Blue Hills	11.7 ha (5.3 ha Mungada West, 6.4 ha Mungada East)
Processing Requirements	
Crushing & Screening	One new semi mobile crushing and screening plant, initially deployed at Koolanooka with relocation after 1.5 years to Blue Hills for the remainder of the project life. Processing capacity of 2 Mtpa rate.
Product characteristics	Average DSO quality threshold of 58% Fe
Mine Site Infrastructure	
Power source	Supplied by diesel generators
Anticipated power requirement	500-1000 kW
Water source	Dust suppression water for Koolanooka and Blue Hills will be sourced from the Koolanooka pit and local Koolanooka bores, water will be trucked from Koolanooka to Blue Hills where necessary.

Key Aspect	Description
	Fresh water will be pumped from a nearby aquifer to the north of the Koolanooka mine site but within Mining Lease M70/1014 and stored on site in a turkey's nest.
Anticipated water requirement	180 kl/day for dust suppression, first at Koolanooka then later at Blue Hills. Also an extra 1000 kl / day will be required for a one year period for the construction of the haul road, and 50 kl of potable water will be required for the combined operation per week.
Anticipated annual water requirement	146.0 Ml pa for dust suppression at Koolanooka then the Blue Hills operation, 365.0 Ml pa for the haul road redevelopment, and 2.6 Ml pa for potable water for the combined workforce.
Ancillary infrastructure	• A 72 person accommodation facility is to be built at Old Karara Homestead; • A small workshop is to be developed both at Koolanooka and Blue Hills, which will include bulk diesel storage in double skinned tanks; • Portable offices, ablutions and a first aid facility are to be developed at both locations; and • Secure explosives magazines at both sites.
Total estimated area of new clearing	82.98 ha, of which: • 2.68 ha is from a TEC* at Koolanooka; • 40.8 ha in the Blue Hills locality; and • 39.5 ha of regrowth on the Mt Karara / Mungada Haul road With an additional 3.14 ha at Koolanooka TEC being within the buffer zone, potential area of influence of dust impacts.
Total estimated area of predisturbed land to be used	49.9 ha, of which: • 38.2 ha covers waste dumps and infrastructure locations at Koolanooka • 11.7 ha in the Blue Hills area covering infrastructure and pit expansion areas.

* TEC = Threatened Ecological Community

Project Characteristics Table Key:

PER - Public Environmental Review	DSO - Direct Shipping Ore
AHD – Australian Height Datum	mm – millimetre
Gl – Gigalitre	Mbcm – Million bank cubic metres
GWh – Giga Watt hour	Mt – Million tonnes
ha – hectares	pa – per annum
km – kilometre	RL – Reduced level
m – metre	t – tonne
Ml - megalitrew	Kl - kilolitres

Potential Impacts and Proposed Management Strategies

Table S2 Key Environmental Factors, Project Impacts and Proposed Management for the DSO Project

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
Ecosystem Integrity and Ecological Sustainability	• Vegetation clearing for mine site	• Maintain the integrity, ecological function and environmental factors associated with the Morawa area. • Ensure, as far as practicable, that the Project meets or is consistent with the sustainability principles in the National Strategy for Ecologically Sustainable Development (Commonwealth 1993)	• National Strategy for Ecologically Sustainable Development (Commonwealth, 1993). • Position Statement No. 6 Towards Sustainability (EPA, 2004). • Guidance Statement No. 55 Implementing Best Practice in Proposals submitted to the EIA Process (EPA, 2003)	• Changes to wider ecosystem function. • Loss of habitat • Inadequate design and management of the Project could result in unacceptable environmental, economic and social impacts. Conversely, economic constraints need to be taken into account in the protection of the environment and social values.	• The Project design and management will be developed along the sustainability principles outlined in the National Strategy for Ecologically Sustainable Development (Commonwealth 1993). • Rehabilitation of disturbed areas to best suit future land use. • Stakeholders will be consulted and engaged in identifying and managing issues of significance.	• An ecologically sustainable operation.
Biodiversity	• The Project is within the Avon-Wheatbelt and Yalgoo Bioregions.	• Avoid adverse impacts on biological diversity, comprising flora and fauna and the ecosystems they form, at the levels of genetic, species, and ecosystem diversity.	• Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002).	• Significant species, communities or habitats could occur within the Project footprint and be impacted by land clearing, construction or operational activities.	• Significant habitats and flora and fauna of conservation significance will be identified and avoided where possible, and/or management strategies implemented to ensure that the conservation status of the communities and species is not materially affected. • Rehabilitation of disturbed areas to best suit future land use.	• No significant loss of biodiversity.

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
Vegetation and Flora	• Clearing for mine site and transport routes.	• Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge. • Minimise the loss and adverse impacts to native vegetation and plant habitats. • Protect Priority Flora species that occur within the proposal area.	• EPA Position Statement No. 2 Environmental Protection of Native Vegetation in WA (EPA, 2000). • EPA Position Statement No. 3. Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002). • EPA Position Statement No. 9 Environmental Offsets (EPA, 2006). • EPA Guidance Statement No. 51. Terrestrial Flora and Vegetation Surveys Environmental Impact Assessment in WA (EPA, 2004). • CALM Policy Statement No 9, Conserving Threatened Species and Ecological Communities (CALM, 1999).	• Clearing of native vegetation. • Disturbance to 4.46 ha and clearing of 2.68ha of the Koolanooka Threatened Ecological Community. 6.26 ha of disturbed land currently exists on Midwest tenements in the Koolanooka TEC due to previous exploration activities and access impacts. This represents 0.13% of the total TEC area at Koolanooka. Proposed Project clearing in the Koolanooka TEC (2.68ha) will represent 0.04 % of the remaining TEC area. • Exacerbation of the current Ruby Dock *(Acetosa vesicaria)* and Patterson's Curse (*Echium plantagineum)* condition and spread of the infestation into other areas. • Impact to DRF *Acacia woodmaniorum* with removal of 84 specimens of at Mungada East and 432 specimens at Mungada East. Total impact of 516 specimens representsan impactapprox 0.65% of the total species population. • Disturbance to 3 priority flora species at Blue Hills, *Micromyrtus acuta* (P1) 14 specimens, *Micromyrtus trudgenii* (P3) approx 1,000 specimens 0.14%, and *Persoonia pentasticha* (P3) 11 specimens. • No rare or priority flora will be impacted at Koolnaooka or along the Mungada Haul Road.	Vegetation Clearing • Although initial mine plans only include clearing in mine pit expansion areas, careful mine site planning may allow for avoidance, minimization and / or offset impacts from required clearing of flora and vegetation, including impacts to flora of conservation interest. • Midwest is committed to addressing the key principals of native vegetation protection as listed in Schedule 5 of the Environmental Protection Act 1986. This will be addressed as part of flora surveys and in the Project Environmental Management System (EMS) and Environmental Management Plan (EMP). • Rare flora baseline surveys have been undertaken for all disturbance areas and locations of any Priority Flora taxa have been incorporated into an Environmental Geographical Information System (GIS) and plotted onto maps. • Impact to priority flora or of flora of conservation significance will be avoided by using information from flora surveys conducted in the area. • Prior to commencement of works, areas to be disturbed will be demarcated in the field by a reference to design/site plans. This will constitute a hold point requiring written approval from the Site Manager prior to disturbance. • Liaison with the Department of Environment and Conservation (DEC) will occur regarding the management of priority and significant flora. • Where appropriate Midwest will prepare and implementing a Threatened Flora Management and Conservation Plan for the Project area to address management of threatened flora impacted by the proposed development. • A two strand wire fence will be erected adjacent the south fold cutback at Koolanooka to restrict access into the Threatened Ecological Community. This fence will be constructed to prevent accidental penetration into the area and will be adequately signposted with warning signs to not	• Clearing of 2.68ha of the TEC at Koolanooka • One DRF species *Acacia woodmaniorum* will be mpacted, loss of 0.65% of total population due to pit excavation. • Three priority flora species recorded at Mungada East and West at Blue Hills will be impacted upon, all very low % impact. • No rare or priority flora will be impacted at Koolnaooka or along the Mungada Haul Road. • With appropriate management as detailed in the EMP, identified priority weed species Patterson's Curse (*Echium plantagineum*) and Ruby Dock (*Acetosa vesicaria*) and will not spread into unaffected areas.

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
					impact the area beyond the fence. • Topsoil and vegetation from all clearance activity will be separately stockpiled in dedicated stockpile areas, with controlled clearance practices concerning soil removal and stockpiling in place. • If required for conservation species preservation, designated "no-entry" sites will be incorporated into a site / project map and communicated to project personnel. • Personnel will be provided with training and tools to assist in their general awareness and understanding of species of conservation significance and in the importance of minimising vegetation clearing and disturbance. • Environmental offsets for necessary clearing of flora and/or vegetation of significance will be investigated and implemented in consultation with stakeholders as discussed in Section 3. • Vehicles and machinery will only use designated tracks/roads: existing roads and tracks will be used in preference to clearing new areas. • Where practicable on tracks, raised blade disturbance will be conducted to minimise vegetation removal. • Vegetation when removed will either be directly placed on rehabilitation areas or mulched and stockpiled for use during later rehabilitation. • Vegetation will not be burnt without written approval of the Site Manager. • Rehabilitation will be undertaken as soon as practicable after land disturbance. Weeds • Weed dispersal will be controlled through establishment of weed hygiene procedures, and with staff being trained on the presence of established weeds within the Project areas, and within the local area. • As Patterson's Curse (**Echium plantagineum*) is a Priority	

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
					1 listed weed under the ARRP Act 1976, Midwest is required to remove and manage the weed during the life of the mine from the areas disturbed due to mining activities. This can be done with appropriate management controls as outlined in the EMP, such as use of appropriate herbicides including Chlorsulfuron, Metsulfuron methyl, Logran® and Glyphosate + 2,4-D ester. • Where practicable, the appropriate herbicide will be applied once Ruby Dock (**Acetosa vesicaria*) is in full foliage and actively growing, and before it sets seed. • If required for management of weed dispersal, designated "no-entry" sites will be incorporated into a site / project map and communicated to project personnel.	
Fauna	• Vegetation clearing for the mine site, crushing and screening plant and associated infrastructure. • Mine site operation and closure.	• Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge. • Minimise the impact to fauna.	• EPA Position Statement No. 3. Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002). • EPA Guidance Statement No. 56. Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (EPA, 2004)	• Loss and degradation of fauna habitat and disturbance to fauna activity patterns through the removal of previously undisturbed and re-growth vegetation. • Species of native fauna of conservation significance have been recorded in the Koolanooka, Blue Hills and the haul road areas: Malleefowl (*Leipoa ocellata*) (a Schedule 1 species under the *Wildlife Conservation Act* and as Vulnerable and a Migratory species under the *Environmental Protection and Biodiversity Conservation Act, 1999)*; and the Western Spiny-tailed Skink (*Egernia stokesii badia*) (a Schedule 1 species under the *Wildlife Conservation Act 1950* and as Endangered under the *Environment Protection and Biodiversity Conservation Act, 1999).* • Three threatening processes were identified as potential impacts arising from the development on invertebrate fauna. With respect to vegetation clearing four impacts were identified, all of which were associated with the	Vertebrate Fauna • Impacts to fauna from vegetation clearing will be minimised by reducing the clearing footprint where possible and conducting staged clearing. • Measures to limit the extent of vegetation clearing will occur e.g. marking clearing limits. • Disturbed areas will be rehabilitated as soon as possible, with ongoing rehabilitation throughout the mine life to facilitate habitat restoration. • Rare fauna baseline surveys have been conducted for all disturbance areas and locations of any fauna of conservation significance will be incorporated into an Environmental Geographical Information System (GIS) and plotted onto maps. • Efforts to avoid impact to individuals and habitats of fauna of conservation significance will be undertaken by using information from fauna surveys conducted in the area. • Liaison with DEC regarding the management of fauna of conservation significance. • Implement operational control procedures, site inductions and employee training programs to protect native fauna from intentional harm, and to appropriately manage injured	• Being reasonably common in the Blue Hills area, Malleefowl (*Leip ocellata*) may be impacted by the proposed development. • It is not expected that implementation of the project will result in significant impact to Short Range Endemic (SRE) species, however a number of potential risks have been identified, as listed in Section 8.2.3.2. • Impacts to stygofauna from th e Project activities are likely to be minimal, according to current survey

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				removal of SRE invertebrate fauna habitat. In all four cases, with the implementation of the suggested controls, the residual risk was calculated to be low. • Similarly the increased risk of dust arising from the proposal could potentially result in damage to SRE fauna habitat via vegetation decline, the implementation of the suggested controls lreduces the residual risk to low. • Lastly, the increased risk of fire resulting in degradation of SRE fauna habitat is considered low, once the suggested controls are implemented. • One specimen of a previously unidentified troglobitic spider was found during troglobitic sampling carried out at Koolanooka and Blue Hills. • Two cosmopolitan copepod specimens have been identified during the Project stygofauna sampling program conducted at Koolanooka borefield. No significant impact is anticipated.	fauna if found. • Wildfire from accidental ignition will be avoided as far as is possible. • Midwest will investigate installing high pitched whistles on the front of road trains working the Blue Hills haul road, in an attempt to scare away fauna and reduce fauna road kills. • Dead trees will be regarded as valuable habitat and will be protected. Collection of firewood from the area will be prohibited. • Rock hollows and overlays in the Blue Hills are important for some fauna and contain historically significant nests of stick-nest rats. Access to these caves by Project personnel will be controlled. • Foundation holes, drill holes and trenches will be covered, fenced, bunded or otherwise capped to prevent fauna entrapment. Where appropriate fauna egress matting will be installed. • Holes and excavations will be inspected regularly for trapped fauna. Uninjured trapped fauna will be released by a competent person with the appropriate DEC permits. • Native fauna will not be captured, taken, fed without the appropriate permits, or harmed. • Domestic pets will not be allowed on the Project footprint. • Feral animals in the area, having adverse impacts on native wildlife, will not be encouraged by site related refuse. • Any death of fauna of conservational significance will be reported to DEC. In addition, to help protect Malleefowl, Midwest will: • become a financial member of the Malleefowl Preservation Society; • record sightings of nests both active and inactive; • limit speeds on haul roads to 90 km /hr;	results, risk assessments and the lack of need for dewatering or newly developed bores. • Impacts to troglofauna from DSO project activities are likely to be minimal, according to current survey results and risk assessments. However one currently unclassified species of significance, a spider, may potentially be impacted by project activities. It should be noted that this species has only been located outside of the proposed impact area at Koolanooka, and likely will exist along the entire Koolanooka range. • Impact to trgolofauna habitat on the Koolonaooka Rnage will be limited to less than 0.05%.

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					• install warning signs as necessary; and record sightings of birds in time/number/location. Short Range Endemics (SRE) The following management items will be implemented to mitigate impacts of the development on SRE fauna • clearing will be restricted to that which is necessary. Clearing boundaries will be defined in the field. • cleared areas will be rehabilitated as soon as practical, southern facing ridge slopes should be avoided where possible. • dust suppression measures will be implemented, including management of road speed on unsealed roads. • a fire prevention strategy will be implemented; and • all vehicles will be fitted with fire extinguishers & all personnel trained in their use. Stygofauna As only two cosmopolitian copepod specimens have been identified during the Project stygofauna sampling program conducted at Koolanooka borefield, and no new bores or dewatering will be required on the project, water abstraction activities related to exploration and proposed mining activities will likely not impact any stygofauna species or communities. However, if new bores do need to be developed at a later stage, then presence for stygofauna populations will be assessed before the new source is utilised on the project. Troglofauna Management of troglobitic species where found to be required, will be completed by a dedicated Troglofauna Management Plan to be developed by Midwest.	
Surface and Groundwater Hydrology	• Mine site operation.	• Minimise impacts to surface & groundwater resources during	• AS 3500: 1 - 2003 Plumbing and Drainage.	• Impacts on groundwater sources from drawdown are unlikely to present an issue on this project, as water demands Koolanooka and Blue Hills, will be met	If the water sources are brought into operation, a monitoring programme will be implemented for each water source. Each program will include monthly pumped volumes, monthly measurement of water levels from operating sources and	• With appropriate management, the potential impacts of the project on

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		mining. • Control and contain contaminated water on site to prevent entry into the natural drainage system and surrounding vegetation. • Maintain the quality and quantity of surface & groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected. • Maintain the integrity, ecological functions and environmental values of the adjacent Gilgai formation at Blue Hills.	• Australian Drinking Water Guidelines (NHMRC, 2004). • DoH (Draft) Guidelines for the Use of Recycled Water in Western Australia. • Australian New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC / ARMCANZ, 2000). • Environmental Water Provisions for Western Australia; Statewide Policy No. 5 (WRC, 2000). • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005). • Guidance No. 40 Management of Mosquitoes by Land Developers (EPA, 2000). • Erosion and Sediment Control Guidelines (IEAust (Qld), 1996). • NSW Department of Conservation and Land Management Urban Erosion and Sediment Control (NSW Department of Land and Water	through sustainable use of established, licensed bores and by the use of water from the Koolanooka pit. At Koolanooka, water sources are already being utilised on the Transportation of Stockpile of Fines project, and similar extraction rates will be required for the DSO proposal activities. Therefore this project is unlikely to cause a significantly larger level of drawdown effect than this area is currently experiencing under current licensing arrangements. This source water will also supply operations at Blue Hills where this is necessary, as water resources identified at Koolanooka (Rockwater, 2007) have been confirmed as being adequate to supply the needs of the full Midwest workforce, whether they are working at Koolanooka or Blue Hills. Water required at Blue Hills for dust suppression will be transported to the site by water truck. • Midwest is the only landholder utilising these sources. With Midwest's compliance with all approval conditions, the likelihood of significant impacts to groundwater sources is considered low. • There is a potential risk of contaminating surface and ground water from hydrocarbon and chemical handling and waste management practices at the mine site. With appropriate management however, the impacts are likely to be negligible.	non-operating bores, monthly water salinity and pH from operating sources, and an annual comprehensive analysis of the groundwater from each source. Additional management measures will include: • Management of hydrocarbon, chemical and waste products on site will be directed by the commitments made in Section 8.8.6 of this PER and in applicable sections of the Project EMP, EMS and Conceptual Closure Plan. • The EMP for construction and operation phases will provide detailed management commitments to minimise the risk of spills and contamination to groundwater, or the Gilgai formation. These commitments include the appropriate installation and use of structures such as vehicle wash down bays, waste hydrocarbon remediation facilities and oil water separators. The EMP will also detail effective measures in the response to contamination events and spillage emergencies. • Pre-existing haul roads and access tracks will be used to minimise interference to natural drainage. • Any new disturbance areas will be located to avoid existing drainage lines and designed for minimal impact on surface drainage as far as practicable. • Drainage of the minor streams and drainage lines that the haul route crosses will be maintained with effective culverts and/or floodways. This aspect will be specifically considered when reshaping the Mt Karara / Mungada Haul Road. • Existing culverts will be re-established where possible under roads, embankments and formations to allow free flow of drainage water and to assist in water shedding from the site. • During high rainfall events the effect of stormwater discharge from the site will be controlled. Adequate drainage will be assured through site structures, stockpiles and roadways.This will negate the possibility of project enhanced flooding, erosion and sedimentation. • Final placement of site waste rock and product stockpiles will consider stormwater flow and drainage in the local	surface and ground waters are likely to be negligible. • Midwest aims to ensure there will be no net/long term adverse impact to surface or groundwater resources in the project area, or to other users and dependent environmental values.

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			Conservation, 1992). • Position Statement No. 4. Environmental Protection of Wetlands (EPA, 2004).		area. In terms of physical water flow, the project will be implemented to have little impact on surface water runoff in the region, however if proven necessary, a sediment trap system will be incorporated into the site design. • The support infrastructure will be designed to ensure the safe storage and handling of all hazardous and waste materials to prevent contamination to the environment. • Landfill and overburden stockpiles will be constructed with sufficient surface to groundwater table distance (with considerations to the hydroconductivity of the geology) to minimise the potential for groundwater contamination. • Appropriate design standards will be applied to allow for the provision of scour protection measures. • Drainage areas will be suitably designed to minimise contamination of surface water. • Cleared vegetation and topsoil will be stockpiled away from watercourses and in discrete stockpiles to avoid any interference to surface flows. • Contaminated water from work areas will be kept separate from clean storm water. • Water interfacing with work areas will be directed to oil water separators. • Rate and volume of groundwater extraction will be in accordance with all licence conditions, including licence to take water # GWL159255(2) issued by the Department of Water for the period 11 July 2008 to 13 July 2013 (Appendix K). • All other groundwater required will be utilised for dust suppression. • Monitoring will be carried out as per water extraction licence conditions. All required water source points are all currently being utilised on the Transportation of Stockpiled Fines project, the drawdown effect created should not be different from the existing licences permit. • If new bores are required to be installed at any area of the	

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					Project, the required approvals and licences will be obtained from the Department of Water, and if necessary, modelling of the effect of use on groundwater flow.	
Dust and Particulates	• General construction activities e.g. blasting and earthworks. • Mining operations such as pit excavation, overburden and waste handling. • Vehicle traffic on access roads and haul roads. • Crushing and screening processes.	The objectives for the management of dust emissions are to: • Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards. • Ensure that expected dust impacts to the Koolanooka TEC area are adequately defined through the nomination of a 50 m buffer zone area of influence. • Minimise dust associated with the construction and operation of the mines. • Minimise exposed surfaces through clearing minimisation, staged clearing and progressive	• EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA, 2000); • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005); and • Air Quality and Air Pollution Modelling Guidance Notes (Department of Environmental Protection WA, 2000). • NSW DEC (2005) Approved methods and guidance for the modelling and assessment of air pollutants in NSW. NSW Environment Protection Authority. • EPA Victoria draft protocol (State Environmental Protection Policy (Air Quality Management) Draft Protocol for Environmental Management – Mining and Extractive Industries, EPA	Mine Sites • All activities conducted during the construction and operation phases of the Project have the potential to generate dust. This includes activities such as clearing, mining, hauling, crushing, screening and stockpiling of the ore. • Localised dust will be generated from the movement of vehicles at the mine sites and from handling of ore. The lay down and loading areas will be unsealed and subject to dusting when dry. The degree of dust generated will depend on the moisture content of the ground surface during ground disturbance and the climatic conditions. • Dust will be generated during the construction period from the earthworks, stripping of the mine site, movement of vehicles and from exposed bare ground. Desktop dust modelling studies has simulated the effect of these activities (Sinclair Knight Mertz Engineering, 2006). • The dust modelling undertaken by SKM, (2006) indicates that in general dust levels at Koolanooka should not become a significant issue. Residences surrounding these operations are many kilometres away and hence should experience little impact. The nearest residential premises to the mine which could be affected by site generated dust plumes is 5 km to the south and 3 km to the west. The property 3 km west of the mine site is leased to Midwest on a long	Midwest intends to keep dust to a minimum during construction and operation of the Koolanooka and Blue Hills mines. Dust management options are outlined below and in the Project EMP. Mine Site • Midwest have committed to the use of water trucks to dampen operational surfaces as necessary and to conduct monitoring and auditing of impacts to the bordering TEC vegetation, as detailed in this PER and the EMP. During construction and operations activities, dust will be minimised by: • using water sprays (where appropriate); • using covered and skirted conveyors at ore transfer points; • sealing of relevant joints and installation of a dust collection system; • ensuring correct equipment design, operational procedures and adequate operator training occurs. The crushing and screening plant at Koolanooka will be fitted with dust suppression and extraction equipment features that may include but are not limited to: • containment apparatus on conveyor transfer points; • belt scrapers on the conveyor belt; • collection trays under the belt plough on the return belt; • dust suppression sprinklers at transfer points and stockpiles; • deluge sprays at the ROM area and the hopper; and • if any infrastructure is required to be moved from its original position once the Project is operational, then dust control equipment will be reinstalled and operated according to the original plant specifications.	• The results of the model indicate that maximum concentrations of TSP likely to be deposited over the TEC will exceed the NSW DEC (2005) standard in some locations. It should be noted however, that concentrations at which vegetation is impacted by dust deposition (SKM, 2006) are not predicted to be exceeded. This will lead to no adverse impact to the TEC flora at Koolanooka or flora at Blue Hills.

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		rehabilitation.	Victoria, 2006) • EPA Victoria draft protocol (State Environmental Protection Policy (Air Quality Management) Draft Protocol for Environmental Management – Mining and Extractive Industries, EPA Victoria, 2006)	term contract for use as exploration offices and the property 5km to the south of the mine is now owned by Midwest. • The most sensitive receptor in the project area is the Koolanooka TEC. SKM's assessment indicates that this receptor should mostly experience impact below the NSW dust emission standard TSP levels (NSW DEC, 2005), and will be below levels which are recognised to cause a health impact to such vegetative species, as demonstrated in vegetative health studies (Doley, 2006). • A further dust modelling report produced for a project in the Windaning Range indicated that dust emissions at Blue Hills were not likely to be a significant issue, The results of the modelling at Windaning Range indicated that the predicted PM10 concentrations resulting from operations would comply with project air quality goals, provided the specific operational controls recommended by the report were adhered to (Heggies, 2006). However in order to ensure that the DSO proposal impacts are adequately represented regarding the aspect of dust, Midwest nominates a 50 m buffer zone surrounding the TEC impact area that will be recognised as an impact area of influence. • An Annual Progress Report on an integrated research program at Koolyanobbing, conducted for Portman Iron Ore Limited (Portman, 2007), clearly demonstrated some key characteristics of dust deposition behaviour over distance from mining	TEC Cutback • The proponent nominates a dust buffer zone of 50 m in width surrounding the cutback disturbance as an area that will likely receive concentrated impact from blasting based dust. They will install dust monitoring equipment along the borders of this buffer zone, for the purposes of determining the actual deposition exhibited across the duration of activities at this site. • Dust monitoring will also be carried out by Midwest with regard to the vegetative health of the TEC area through assessment of these static dust monitoring points and through surveying by qualified botanists. SKM dust modelling indicates that on most days this will not be a significant issue however, Midwest makes a commitment to halt operations during periods of extreme weather conditions. • Midwest would like to highlight that in the proposed cutback area no priority flora has so far been recorded, and this combined with the observations by SKM on the potential for dust deposition impact to plant health being low, Midwest hold the view that any dust health impacts on surrounding vegetation are likely to be low. Additionally the actual area of impact to this vegetation community is small, given that the clearance area is 3.8 ha of the total TEC area of 3500 ha. Roads • Munckton Road and part of the haul road on M70/1013 has been sealed to minimise dust issues generated by heavy haulage. • Lignosulphate binders will be used to surface treat the haul road where necessary. An initial application will be carried out on necessary surfaces with a further application required after 4-6 months. The product to be utilised is PolyCom by Biocentral Laboratories, and technical details of this substance can be found detailed in Technical Appendix 13-6 • Water tankers will be used to moisten areas which have the potential to generate dust, including areas that receive	

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				activity. In an assessment on dust loads on individual plants in October 2006, dust loads were found to rapidly fade with distance, and that at a distance of 50 m (the proposed buffer width for the Midwest DSO PER) dust loads experienced were roughly halved from those adjacent to the actual impact area. When combined with observations by SKM, Midwest believes this demonstrates that the proposed buffer width of 50 m from the TEC cutback area is adequately sized, and dust impacts are unlikely to be a significant vegetative health issue at the point of impact. • Also it should be highlighted that from further correspondence with Portman Iron Ore Limited, it has been observed that the combination of drought and dust impacts on vegetation in this region can amplify vegetative impacts, and that impact loads experienced will be heavily influenced by prevailing winds. Both of these elements will be taken into account when carrying out monitoring and daily mining operations. Roads • Munckton Road and part of the haul road on M70/1013 have been sealed to minimise dust issues generated by heavy haulage. Lignosulphonate binders will be used on the haul road to minimise dust emissions. Dust Suppression • If the Koolanooka pit waters are used for dust suppression they will be blended with bore water with the aim of providing a salinity level of no greater than 5,000 ppm TDS. Currently the	heavy traffic, unsealed roads and access tracks. Project in General The EMP will identify specific management measures to minimise dust generation from all aspects of the project including: • incorporation of dust control measures into project design where dust emissions are significant; • implementation of dust suppression techniques in areas with high dust generating potential, including allocation of a dedicated water truck for this purpose, with a second truck to be utilised if necessary; • water spray from water trucks will be directed away from vegetation where practicable, and combined with blending methods, dust suppression water will not be of an excessive salinity in order to minimise the damage to vegetation health; • minimisation of vegetation clearing; • staged clearing and progressive rehabilitation to minimise exposed areas; • regular inspections to visually assess dust generation; • halting of operations of weather conditions that will generate excessive and uncontrolled levels of dust, particularly within the recognised Threatened Ecological Community. • The commitments within the EMP will be consistent with the amount of dust expected to be generated in various areas of the project and the environmental and social values to be protected in those areas. Midwest will also undertake the following: • vegetation clearing and exposed surfaces will be kept to a minimum wherever practicable. • the performance of dust suppression equipment will be monitored and equipment will be maintained in an effective operating condition;	

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				Koolanooka pit contains a water body measuring about 9,600 m^2 in area and estimated 2 m in depth. The water level is about 285 m AHD and a recent sample has a water salinity of 20,000 mg/LTDS (57% of the salinity of seawater). Calculations for a water body of 2 m depth suggest that the original salinity of the groundwater would be approximately 2,500 mg/L TDS. Given that groundwater inflow does not keep pace with the summer evaporation of 11 mm/d, the rate of inflow into the pit at current water levels is calculated to be less than 110 m^3/d (Rockwater, 2004a). All other water required for dust suppression activities will be sourced from surrounding, licensed bores, and total dust suppression requirements of the general project will be 180 kl / day. An additional 1000 kl / day will be required during the Karara haul road development, which will take approximately one year to complete. • The blending of pit and bore water to reduce the salinity level should ensure no long term salinity issues occur that rehabilitation will not be impeded and damage to surrounding vegetation will be minimised. Midwest will ensure that dust suppression techniques used do not adversely affect bordering vegetation. Use of pit water through such blending will also ensure that a gradual drop in pit water salinity is experienced as these waters will become diluted through groundwater inflow. Water will be transported by truck from Koolanooka sources for dust suppression in the Mungada area.	• where unacceptable dust levels occur, further dust suppression controls will be implemented; • dust suppression methods will be developed in consultation with the DEC to maintain the integrity of neighbouring DEC land if required; and • dust management methods will be audited annually and on an as needs basis.	

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Greenhouse Gas Emissions	• Construction of the mine. • Mine operation	• Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards. • Minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions.	• EPA Guidance Statement No. 12. Guidance Statement for Minimising Greenhouse Gas Emissions (EPA, 2002). • EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA, 2000). • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005). • Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 Series, Australian Greenhouse Office.	• Release of greenhouse gases through combustion of diesel fuel used in equipment, vehicles and detonation of explosives for blasting provision of the Project's power requirements.	• Greenhouse gas emission minimisation will be incorporated into mine planning in accordance with EPA Guidance Statement for Minimising Greenhouse Gas Emissions (2002). • Energy efficient technology will be selected where practicable and energy consumption will be considered as a criterion in equipment selection. • Vegetation clearing will be minimised where practicable, thereby assisting to minimise greenhouse gas emissions from the Project. • Progressive rehabilitation of open areas will result in partial offsets of emissions over the life of the Project. • Atmospheric emissions will not be reported to the National Pollutant Inventory as they do not meet the minimum reporting threshold values.	• The Project will generate minimal greenhouse gases. Amounts produced are below reporting thresholds. • Output of greenhouse gas and other gaseous emissions from the Project will be kept as low as practicable. • Quantity of emissions is below reporting requirements.
Noise and Vibration	• Construction of the mine. • Mine operation. • Blasting at the mine site will be required.	• Minimise the noise and vibration associated with the construction and operation of the proposal. • Protect the amenity of nearby residents from noise and vibration impacts resulting from activities associated with the proposal by	• *Environmental Protection (Noise) Regulations 1997* (Western Australian Government). • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2006). • Statement of Planning Policy Road and Rail	Mining • Mining operations will be undertaken 24 hours a day on a continuous basis. Ore will be loaded onto mine trucks using a hydraulic excavator and haul trucks. Ore will then be loaded into the crushing plant by front end loaders and reloaded into road trains by front end loaders once processed. • Noise modelling will not be undertaken at the Koolanooka mine site as this aspect is not expected to be a significant	All practicable measures will be implemented to minimise noise emissions generated by mining and processing activities. Noise management measures that may be considered include: • design and layout of mine site (eg stockpile locations) to minimise noise emission; • purchase of plant and equipment with reduced sound pressure levels; and • blasting during daylight hours. Management of employee noise exposure will be in compliance with the Mines Safety and Inspection Act & Regulations 1994. This will include engineering plant design	• There will be no adverse impact to the local community from noise or vibration due to the distances of sensitive receptors from the operations areas.

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		ensuring the noise and vibration levels meet statutory requirements and acceptable levels.	Transport Noise (WAPC, 2005). • AS2670:2001 Evaluation for human exposure to whole body vibration. • AS2436-1981 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'.	issue. The distance of the two homesteads closest to the mining operations (3 km and 5 km) does not warrant noise modelling as they are uninhabited. One of these residences is leased for use by Midwest. Mining activity is currently conducted on the DSO Fines Project, and any noise created by this proposal will be similar to the existing noise, although it is noted that blasting activities have not yet commenced at this site. • Noise modelling is not required at the two Mungada pits as the nearest residences are a significant distance away. Road Transport • Ore will be transported from Blue Hills to the Koolanooka site via the upgraded existing Mt Karara/Mungada Haul Road and then along existing roads and heavy haulage routes to Tilley Siding The use of the Mt Karara/Mungada Haul Road for transportation of ore from Blue Hills to the gazetted Shire Road (Mungada Road) will require the haul road to be returned to its original width to accommodate haulage trucks. • The transport route follows gazetted roads as defined in the Road Traffic Act 1974 therefore no noise amelioration is required. The noise from the heavy haulage trucks propulsion and braking systems will comply with the EPA Draft Guidance Statement for EIA No 14 (Version 3) Road and Rail Transportation Noise.	solutions to minimise noise generation and / or propagation, on-going monitoring of noise exposure levels, use of personal protective equipment, and appropriate operational practices. Midwest will also undertake the following: • noise will be considered in plant and equipment selection and appropriate construction methods; • low-noise equipment will be used wherever possible; and • silencers, mufflers and noise barriers will be used where necessary.	
Waste Rock & Topsoil Stockpiles	• Excavation of	• Ensure that waste rock is placed and	• Environmental Notes on Mining Waste Rock	Waste Rock Stockpiles	Waste Rock	• Disposal of waste rock will not

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
	mine pit. • Construction of waste dumps.	managed to negate or control impacts to surface water flow and groundwaters, and ensure there are no long-term impacts on the surrounding environment. • Clearly identify potentially acid generating material, selectively handle this material and store the material so that acid leachate is not generated. • Stockpile topsoil effectively for later use in rehabilitation.	Dumps (DoIR, 2001). • Environmental Notes on Mining Acid Mine Drainage (DoIR, 2006). • Mine Void Water Issues in WA (WRC, 2003). • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005).	• Waste rock stockpiles produced by the project (haematite and detrital ore) are expected to amount to 1.7 million tonnes per year with the majority being produced at Koolanooka. The haematite ore at Koolanooka has very low sulphur content and contains no pyritic shales. The assessed total sulphur in the haematite ore is 0.149%. • Given the low sulphur content of the ore and the lack of any observable issues at existing waste rock stockpiles generated from previous mining over thirty years ago, the potential for acid generation is unlikely. This position is supported by the results of the National Association of Testing Authorities (NATA) accredited Chemistry Centre of WA who used the suspension peroxide oxidation combined acidity and sulphate method (SPOCAS) to asses samples obtained from all three pits (WA Chemistry Centre, 2006) (See Technical Appendix 13.3). Assessment confirmed that all samples were within guideline values and no treatment was recommended. • The waste rock generated by the project will be stockpiled on land which has been previously cleared where this is possible. The waste may also be used for construction purposes (e.g. road base material and construction of bunds), where the material is suitable for this purpose. • At Koolanooka waste rock will be backfilled into the existing pit and / or will be added onto the existing waste dumps to the west and south of the South Fold cutback, Figure 4.2. This area has been significantly disturbed by	• Overburden stockpiles will be planned and constructed in compliance with the Environmental Notes on Mining Waste Rock Dumps (DoIR, 2001), and the Guidelines for Mining Proposals in Western Australia (DoIR, 2006). • Overburden stockpiles will be constructed with a rounded footprint to conform with surrounding natural landforms. • If overburden stockpiles are placed near drainage channels they will be monitored and rock armoured or culvert channelled if necessary to prevent scouring and erosion. • Windrows will be used along the crest of slopes to prevent erosion of the slopes. Toe windrows will be used to contain eroded material if needed. • Waste dump design will consider the physical nature of material and landform stability, chemical nature of waste materials, associated pollution prevention, integration into surrounding landscape and revegetation issues. For example, waste rock dumps will be set well back from pit edges. Design criteria for waste dumps: • maximum height 25 m above natural ground level at the structure site; • 8 metre wide berms every 10 metre of height; • berms to be sloped at 5º into body of dump; • berms to have cross bunds placed every 30 m; and • top surface and berms will have bunds. • Some waste material will be used to improve the formation and revegetation of historic waste dumps to improve their aesthetic appeal. • Although production of sulphidic waste rock is unlikely, strategies will be implemented where necessary, to manage potential acid forming materials through encapsulating in neutralising material or clay. • Waste rock rehabilitation requirements will be discussed	produce any additional environmental impact to that which already exists at Koolanooka and Blue Hills. • Existing landscape values will be retained and pre-exiting disturbed areas in poor vegetative condition will be enhanced by rehabilitation and revegetation.

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
				previous operations. • At Mungada East, waste rock will be addedonto the existing dump to the west and south of the pit, and at Mungada West, waste rock will be added to the east and to the south of the existing waste dump on the eastern flank of the pit, Figure 4.3 .The dumps at Mungada will be designed to form extensions to the existing waste landforms and will be shaped to fit in smoothly with existing natural ridgelines. These extensions will cover areas that had been cleared during previous mining activities, andwill constitute the majority of the project clearance required in the Blue Hills area. Topsoil Stockpiles • Topsoil stockpiling is expected to occupy only small areas, as a portion of the project area is already cleared of vegetation and there are some areas of minimal topsoil naturally available. As far as possible topsoil will be placed directly onto areas ready for revegetation, but where stockpiling is necessary this will be conducted on the toe of designated waste dump areas (Figure 4.2 & Figure 4.3) and will comply with all commitments made in this PER and the project EMP. If suitable topsoil material for revegetation purposes cannot be obtained in sufficient quantity for revegetation purposes, Midwest will source suitable material from existing waste dumps, or other predisturbed locations, that do not require vegetation clearance.	further in the Closure Plan for this project. Topsoil • A plan will be prepared showing all areas requiring topsoil removal prior to commencement of stripping. • The top 150 mm of topsoil will be stripped prior to land disturbance, wherever it is present and safely accessible. • Where practicable, topsoil will not be stripped when wet as this can lead to compaction and loss of soil structure. • Where little topsoil exists and rehabilitation is required, suitable material will be sourced from previously disturbed and cleared areas. Additionally, the entire length of the haul road requires it to be pre-striped for it to be reinstated. Some of the topsoil material obtained will be made available for use in other topsoil poor locations. • Topsoil will be applied as soon as possible to areas being rehabilitated. If stripped topsoil exceeds rehabilitation requirements, excess topsoil will be stockpiled for later use. • Topsoil stockpiles will be constructed (no higher than 2 m) and managed to preserve its biological activity. • Stockpiles will be scarified to encourage germination and seed bank enrichment during this time. • To minimise airborne dust from topsoil stockpiles /or areas from where topsoils are sourced, non-saline water will be applied when required. Surfaces will be monitored to ensure crusting does not inhibit seed germination. A vegetative cover will assist in reducing wind erosion. Borrow pits and quarries • Materials required for road base will sourced from waste rock material that is suitable for this purpose, and / or from the cleared 3 m verge alongside the haul road, where suitable materials are present. If a dedicated burrow pit is required at a later date then the appropriate approvals will be obtained disturbances. • where possible, borrow pits and quarries will be located behind physical terrain and/or vegetation belts or otherwise	

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					in areas that would reduce their visual impact. None are currently planned in this proposal; • where possible, borrow pits and quarries will not be located in areas where their presence would impact on surface drainage patterns; • where possible, trees and heavy stands of vegetation will be avoided; • where possible, each borrow pit and quarry will not exceed 1 ha in surface area. • access to borrow pits and quarries will be from a single track only; • the removal of borrow material will be limited to inside the designated borrow pit area; • drainage and erosion control structures will be developed around the pit to control the impact of substantial rainfall events; • the maximum final depth of borrow pits and other small excavation structures will be 2 metres from the maximum reasonably expected groundwater level; and • borrow pits and quarries will be rehabilitated as soon as possible after use, and will be landscaped to best fit into the existing environment.	
Asbestos	• Based on a review of the exploration and mining data no asbestiform minerals have been observed in the Koolanooka or Blue Hills. As such,	• Based on examination of exploration & mining activities from the surrounding regional area, no asbestiform minerals have been associated with the types of deposits proposed to be	• Asbestos Management in Mining, DOCEP • Management of Asbestos in Mining Operations, DOIR 2001.	Asbestiform minerals can be present: • in ultramafic mineral assemblages; • in iron ore deposits where there has been tight folding of the mineral sequence; and • where Banded Iron Formations (BIF) have been altered and have metamorphosed. None of these conditions are expected to be present at Koolanooka or Blue Hills.	In the unlikely event that asbestiform minerals are encountered during mining operations, this hazard will be managed by implementing the Midwest "Fibrous Minerals Procedure", with reference to the guidelines Asbestos Management in Mining, DOCEP, and Management of Asbestos in Mining Operations, DOIR 2001. Planning • Employees will assess the potential for ultramafic rocks being intersected, especially serpentinites and sheared fine-grained tremolite-talc rocks.	• It is viewed by Midwest that the discovery ofwith asbestos ore materials is extremely unlikely, as this material has not been observed at this site at any time in the past, during mining and exploration

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	asbestiform minerals are not anticipated to present a risk to safe mining operations. • This section of the PER will fully discuss the potential for asbestos impacts on the project and suitable management actions, in the unlikely event that asbestiform materials are discovered within the DSO proposal area. Additionally, the EMP, EMS and CP will detail consideration of asbestos material management.	mined and therefore no associated risks regarding safe tourism access to the areas are anticipated.		Asbestiform minerals have not been observed or logged in historical or recent diamond drill core from either deposit. Reverse circulation (RC) drilling produces percussion drill chips and no asbestiform minerals have not been geologically logged from drilling either deposit. Previous mining operations at both the Koolanooka and Blue Hills sites by WMC in the late 1960s to the early 1970s similarly do not record any occurrence of asbestiform minerals in either the ore or waste products extracted. For the above reasons, it is improbable that asbestiform minerals will occur either at Koolanooka or Blue Hills, confirmation of the absence of asbestiform minerals would require mining of the entire site.	• Employees will refer to the regional-asbestos/fibrous-mineral location plan to identify units predisposed to this type of mineral occurrence, and will check with the Environmental Officer or Senior Geologist if in doubt. Midwest will ensure the drilling contractors • have a suitable cyclone (especially for RAB rigs) on site to firmly fit plastic sample bags; • that water injection systems are provided and operating; • that suitable lengths of chimney or outer return hoses that are being used to divert dust away from drill work and sampling areas; and • that appropriately rated dust masks are available and are worn. Programme Midwest personnel should: • brief the contactors of the potential danger when fibrous minerals are encountered before and during the programme; • plan drilling and work areas so that minimum dust exposure is experienced; • act if dust levels are deemed unacceptable, (close down the rig if necessary); • report all fibrous materials to the Senior Geologist and OS&H Officer; • ensure adequate supply of plastic sample bags are available to use when required; • ensure that appropriate rated dust masks are available and worn at every stage of the programme including drilling, sieving and sampling; and • ensure that disposable paper coveralls are an available and worn by the drill crew and field staff when fibrous materials are expected. Rehabilitation and Disposal	activities.

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					• Rehabilitation of the bagged samples is to be determined on the location and extent of fibrous minerals encountered in the drilling by the Project Geologist, Environmental Officer and OS&H Officer. • Bagged fibrous mineral samples are to be disposed of at the nominated disposal site. Action on disposal and rehabilitation of non bagged samples will be dependant upon an assessment of the drill site location and quantity of fibrous materials. Sample Despatch • Assay laboratories must be informed of the presence of fibrous materials in the samples on the accompanying sample submission documentation. Sample bags must be clearly marked with "Caution – Asbestos" flagging.	
Solid, Hazardous and Liquid Wastes	• Construction and operation of mine site.	• Reduce the volume of waste through product selection, reuse and recycling. • Ensure that waste is contained and isolated from groundwater and surface water, and that storage, treatment or collection of waste does not result in long term impacts on the surrounding environment. • Ensure all site generated waste is removed by a licenced contractor and disposed of in the Morawa Shire landfill or other appropriate facility.	• Water Quality Protection Guidelines No. 10 Mining and Mineral Processing Above-ground fuel and chemical storage (Department of Water, 2000). • Australian Standard 1940-2004: The storage and handling of flammable and combustible liquids. • EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005). • *Explosives and Dangerous Goods Act 1961*. • *Explosives and Dangerous Goods*	Construction and operation activities associated with the mine will generate waste materials and will require the transport, storage and handling of hydrocarbons and chemicals. If not adequately handled, stored or disposed of these materials can contaminate local soil, groundwater or surface waters. Contamination can arise from the escape of leachate containing hydrocarbons, chemicals, elevated nutrients, or heavy metals. Visual amenity may be impacted by inadequately managed waste and feral animals may be encouraged forage in the area. Types of waste generated by the Project include the following: • domestic waste; • recyclable products; • waste oils, greases and lubricants;	General Waste • No onsite waste disposal will be undertaken during this Project, and domestic and construction waste will be minimised through reuse and recycling where appropriate. General waste will be managed by a licensed contractor and removed from site for disposal in an approved landfill. • Consideration will be given to the best design and operation of short term waste storage facilities to be used by the waste removal contractor. Storage facilities will be designed to minimise infiltration of water, formation of leachates, and distribution of litter by wind and water, and will include effective fire management. A Bellan Cage will be utilised to prevent the spread of windblown litter on site. More details on the specifics of short term waste management will be provided in the Project EMP. • Waste production will be audited periodically to identify new opportunities for reduction, re-use and recycling.Used tyres will be stored in accordance with Part VI of the Environmental Protection Act 1986 Regulations. These commitments will also be provided in the EMP for this project. • Sewage and grey water from the mine operations will be treated on-site using approved septic tank and leach drain	The management of general and hazardous waste is expected to result in negligible environmental impacts.

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
		• Minimise the environmental impacts of hydrocarbons, chemicals (solvents, cleaning fluids etc.) and explosives through appropriate storage, handling and disposal.	*(Explosives) Regulations* 1963. • Guidance Note S301, Storage of Dangerous Goods Licensing and Exemptions (DoIR, 2004). • Dangerous Goods (Transport) (Road and Rail) Regulations 1999 (Government of Western Australia). • Australian Code for the Transport of Dangerous Goods by Road and Rail (National Road Transport Commission and ACTDG, 2005). • Used Tyre Strategy for Western Australia (Waste Management Board, 2005). • Australian Standard 1768–2003, Lightning Protection. • Australian Standard 2187.0–1998, Explosives-Storage, Transport and Use - Part 0: Terminology. • Australian Standard 2187.1–1998, Explosives-Storage, Transport and Use - Part 1: Storage. DEC – Contaminated Sites Management Series –	• organic debris including vegetation; • general refuse including waste metal, cardboard and packaging; • sewage; and • inert waste including excess fill.	systems. • Liquid effluent generated at the site including oils and water from the workshop will be managed in accordance with relevant legislation. Hazardous Substances • During construction and operations, hazardous substances will be stored according to the requirements of Australian Standard 1940. Storage of bulk fuel will be in above ground tanks within bunded, impermeable enclosures, or in double skinned tanks. • Hazardous substance management, including procedures for the correct handling, storage, spill management and clean up will be incorporated in the Project EMP. Spill response equipment will be located in the vicinity of work areas, with site personnel trained in spill response management. • Refuelling, workshop and vehicle wash down areas will be constructed to prevent discharge of spills, leaks or wastes: drains, bunds or oil / water separators will be fitted where appropriate. • Storage of explosives will be in a remote magazine in accordance with the Explosives and Dangerous Goods Act 1961 and Explosives and Dangerous Goods (Explosives) Regulations 1963. • Hazardous waste and spilled hazardous materials will be removed from site by a licensed contractor for disposal in an approved facility in accordance with the requirements of the controlled waste regulations. Midwest will also undertake the following: Bulk Hydrocarbon Storage Facilities • Bulk hydrocarbons containers will be stored and managed in accordance with Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids (AS 1940-1993). • Containers that are self bunded (double skinned) will be protected against collision by equipment and/or vehicles by	

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			Bioremediation of hydrocarbon-contaminated soils in Western Australia, October 2004. • DEC – Contaminated Sites Management Series – Bioremediation of hydrocarbon-contaminated soils in Western Australia, October 2004.		the placement of appropriate barriers or bollards. • Containers that are not self bunded will be contained in secondary facilities with impervious floors and bunds. These facilities will have a capacity to contain 110% of the volume of the largest tank or 25% of the total volume stored in the compound. • Containers will be appropriately labelled as required by the relevant legislation. • Areas adjacent to secondary storage facilities will be contoured to drain away from the facilities. • Water or other liquids that collect in the storage facilities will be removed and treated. This is to maintain the containment capacity and integrity of the facility. Minor Storage • Drums and small containers of hydrocarbon products will be stored upright with fitted lids, in secondarily contained facilities. • Storage facilities will have impervious floors and bunds, with a capacity to contain 110% of the volume of the largest container or 25% of the total volume stored in the compound. • Drums and containers will be checked regularly for signs of corrosion and leaks. • Containers will be labelled as required by the relevant legislation. Spills • Spill response equipment will be readily accessible in each work area to enable quick response to spills. As a minimum, spill response equipment will be located at fuel storage and transfer facilities, work areas, near open water bodies, and at maintenance workshop areas. • Spills will be controlled at the source, contained and cleaned up as soon as they occur. Contaminated material will be removed and bio-remediated (if biodegradable) or	

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					disposed at a licensed facility. • In the event of spills, environmental management will require internal and external reporting and incident analysis and described within the project EMS and EMP. Decision matrices will be developed to determine which types of incidents and impacts require reporting and the appropriate reporting timeframes. These will be defined in the Environmental Management Plan and Environmental Management Systems documents. • Personnel will be trained and competent in spill management. Waste Disposal • Storage of waste oil on site will be in accordance with the Dangerous Goods Regulations 1992. • Waste oil on site will be managed in accordance with the bulk storage and / or minor storage management requirements described above. • Where practicable, waste materials will be minimised by reuse and recycling. • Oily waste materials (filters, rags, spill clean up materials) will be segregated from general waste, contained and disposed of off site at a licensed facility. Bioremediation Facility • Soil and biodegradable materials contaminated by hydrocarbons will be disposed in a designated site for bioremediation in accordance with the Environmental Protection Authority Guidelines for Oil Farming of Oily Wastes. • The bio-remediation facility will be vertically separated from the groundwater table. • Materials in the facility will be placed at depths of less than 30 cm, aerated through periodic tilling and kept moist to encourage bacterial activity. • Remediated materials will have residual levels of hydrocarbons determined in conjunction with DEC.	

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					Materials containing acceptable levels of hydrocarbons will be used for rehabilitation activities. • Management of remediated soils will take place in accordance with the current DEC guideline 'Bioremediation of hydrocarbon-contaminated soils in Western Australia, October 2004' Workshop / Servicing Areas • Where practicable, a dry workshop policy will be implemented. Spills will be picked up by absorbent materials. • Vehicles and mobile equipment will be washed down on a concrete surface that drains to a sump. Oils and sediments will be separated from the wash down water, prior to the water being re-used on site. Explosives • Explosives will be stored in a magazine registered and licensed in accordance with the Explosives and Dangerous Goods Act 1961 and the Explosives and Dangerous Goods (Explosives) Regulations 1963 and in accordance with Australian Standard 1768–2003, Lightning Protection, Australian Standard 2187.0–1998, Explosives - Storage, Transport and Use -Part 0: Terminology, Australian Standard 2187.1–1998, Explosives -Storage, Transport and Use -Part 1: Storage. • Spills of nitrate based explosives will be removed by hosing with water .The potential for spillage of these products is extremely unlikely as use of these products will be carefully and tightly managed, and the only opportunity for spillage is during explosive hole charging, which is done directly by hose from an external contractor's truck to each explosives hole. These materials will not be required to be stored on site, and as such spillage of these materials is highly unlikely. Housekeeping and General Wastes • Waste will be segregated into general waste, recyclable wastes and hazardous waste.	

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					• Waste receptacles will be available at the appropriate locations to enable waste segregation and containment. • Practices implemented in relation to waste generation will include, the minimal production of waste through efficient designs, reduction of materials required, and reuse/recycling of waste materials. • As a minimum, batteries and scrap metal will be recycled. • Where possible, recyclable waste will be removed by a contractor to a recycling facility. • General waste will be removed to the Morawa Shire landfill facility or other approved location, by a contractor. • Waste will be secured against wind blown litter and animal foraging by use of a Bellan Cage. • Littering will be prohibited. • Work areas will be kept neat and tidy. • On decommissioning of a work area, non-permanent structures and facilities will be removed and disposed of appropriately in accordance with the Conceptual Closure Plan for this Project. Sewerage • Septic tanks and leach drains will be constructed and maintained in accordance with Department of Health and Local Council and DEC requirements. Fire • All employees and contractors will undergo site environmental induction training that includes bushfire prevention and emergency response procedures. • Select site personnel will undergo advanced training in fire suppression. • Fire breaks will be established around the site in agreement with the Fire and Emergency Services Authority (FESA) and the DEC. • Mobile plant and light vehicles will be equipped with	

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					appropriate fire suppression equipment that complies with relevant Australian Standards and staff will be trained in its use. • Internal hot work permits will be required for work that has the potential to create ignition sources. Hot works will not occur within 3 m of vegetation without a prior hazard assessment and written approval from the Site Manager. • Fire extinguishing equipment will be available at each work area where hot works occur and will be maintained in accordance with Australian Standards.	
Social & Cultural Environment	• Mine site construction	• Avoid disturbance to cultural and heritage sites. • Ensure compliance with relevant legislation including the *Heritage of Western Australia Act 1990* and the *Aboriginal Heritage Act 1972*. • Respect the rights of all land owners.	• EPA Guidance Statement No. 41. Assessment of Aboriginal Heritage (EPA, 2004). • Guidelines for Consultation with Indigenous People by Mineral Explorers (DoIR, 2004).	Indigenous Heritage Koolanooka Mine site • Approval to disturb previously recorded Aboriginal Heritage site DIA 4496 has been obtained under Section 18 of the Aboriginal Heritage Act 1972. DIA site 5868 has been determined to be a duplicate of the site DIA 4496. • Permission for the disturbance to Aboriginal Heritage site DIA 4496 was applied for once the Company's mining licences had been granted. This covers the entire length of the Koolanooka Hills. Under Section 18(3) of the Aboriginal Heritage Act 1972, Midwest has been granted consent by the Minister for Indigenous Affairs to use its mining leases to "undertake mining operations through an extension of the existing open pit operations." This consent was granted to Midwest in December 2003 and is contingent on meeting the various obligations and responsibilities under the Aboriginal Heritage Act 1972 (Appendix J). • Two other sites of Aboriginal Heritage are found within the local area (DIA 20817 and DIA 20816), as these sites	Indigenous Heritage • Aboriginal community representatives and elders will be consulted as part of the planning process for mining and construction activities. Management plans will be discussed and agreed upon. • The locations of existing registered sites will be taken into account to minimise and avoid where possible, impacts to Aboriginal sites. Registered sites will not be removed, damaged or altered without Section 18 approval from the Minister of Indigenous Affairs, under the Aboriginal Heritage Act 1972. • Any new significant sites identified during ethnographic and archaeological survey or construction will not be removed, damaged or altered without approval under Section 18 of the Aboriginal Heritage Act 1972. Midwest will undertake management of Aboriginal Heritage sites by: • completing a full assessment for the presence of Heritage sites; • consulting with appropriate custodians throughout the Project; • gaining approval for any intended impact on heritage areas; • establishing appropriate exclusion zones, with fencing and signage of these areas if required;	• Significant sites identified from the Aboriginal Sites register and from ethnographic and archaeological surveys and construction will not be removed, damaged or altered without approval under Section 18 of the *Aboriginal Heritage Act 1972.*

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				are remote from the project they are not expected be impacted. • To date no Aboriginal groups have made objections to the granting of the Mining Leases or to previous mining operations in the area. Blue Hills Mine site • If the proponent needs to disturb the observed archaeological sites at this location (small cave (DIA 20858) and large cave (DIA 20857)), Midwest will obtain consent from the Minister for Indigenous Affairs under Section 18 of the Aboriginal Heritage Act 1972 prior to any such activity occurring. Mt Karara/Mungada Haul Road • The Project will not impact on Aboriginal Heritage sites in regard to the Mt Karara/Mungada haul road, as only a 3 m wide pre-cleared roadside verge will be impacted at this location, and no haul road realignment will occur. The re-establishment of this haul road will not impact on any areas of new vegetation and will not impact on any potential aboriginal heritage. Non-Indigenous Heritage • The Project will not impact on the heritage values of the Koolanooka Hills area.	• training the workforce and contractors on any relevant heritage requirements; • establishing a dedicated heritage management plan if required, discussing heritage considerations within the site EMP; • reporting potential heritage areas or artefacts if encountered during the Project; • ensuring disturbance to sites is in accordance with conditions of any Section 18 approvals; • demarking sites requiring protection on the ground if appropriate, and on site maps. Exclusion zones around these sites will be established and communicated to personnel; • ensuring employees and contractors complete a site induction prior to commencement of work. The induction will inform personnel of nearby sites (if appropriate) and their legal obligations to protect sites and/or disturb sites according to approved procedures; • ensuring employees and contractors will promptly report the identification of any Aboriginal sites in the vicinity of the operations. Where sites are identified, they will be avoided; and • employing qualified anthropologists/archaeologists to assess sites as circumstances dictate and require. Non-Indigenous Heritage • As the Koolanooka mine is listed in the Morawa Heritage Inventory, Midwest has photographed the site prior to the commencement of earthworks. Photographs of the mine will also be taken at completion of mining activities to continue the photographic record of the site. Archiving of the photographic record will be determined in consultation with the Shire of Morawa. • Midwest has established a local Community Development Fund in Morawa which aims to support local business ventures and the community in general. As part of this undertaking Midwest and contractor contracts for the	

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					Project will include a local employment clause. • Midwest will also endeavour to fulfil the desired social outcomes of the Morawa Shire Council and Shire of Perenjori, concerning the local areas influenced by this Project. This includes consideration of accommodation, transport, small business use, servicing, and local education and training options. • Midwest will, where possible and feasible, support local business for services and supplies. This may include the establishment of a temporary revegetation nursery in Morawa, and the use of local workshop options for fleet vehicle servicing requirements. Public Access • Public notices will be sent out prior to disruption or temporary closure of roads and public access. • Communication channels for public comments and complaints will be established and maintained. These channels will be made known to the community. • Any existing fences and tracks affected by activities will be restored. • Where practicable alternative access will be established for temporary disruptions to recreational use / access. • Public access to the site will be restored at the completion of activities. • The Mt Karara / Mungada Road will remain available to all road users at all times, subject to compliance with the Midwest Traffic Management Plan. • Public notices will note the expected length of closure and anticipated re-opening of closed areas. • During the operational phase of the project no public access issues are anticipated. • A management plan will manage access to site during mining activities, in particular blasting.	

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Visual Amenity, Landform and Geo-conservation	• Mine construction	• Minimise the Project impacts with regard to community use and access to significant environmental features. • Ensure landscape values are considered and measures are adopted to reduce the visual impacts of the Project. • Maintain and protect any significant landscape and geo-heritage values and maintain the integrity, ecological functions and environmental values of the soil and landform.	• EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005). • WA Planning Commission Statement of Planning Policy No. 2, Environment and Natural Resource Policy (WAPC, 2004).	• The Project will not result in an unacceptable degree of change or degradation to the broader natural environment and ecological processes of which it is a part. • The Project will have a minimal impact on the anthropocentric or (geo) heritage values of the BIF.	• At both mining areas, impact will be minimised by ensuring clearing only occurs in approved areas and overburden stockpiles are located in an area that minimises any impact to visual amenity or prominent drainage lines, and that stockpiles are shaped to blend in with local landforms. At Koolanooka, Midwest make the commitment that existing waste dumps will be reshaped where possible to better consider aesthetic concerns at this minesite. Considerations of final landform will be incorporated into the project Closure Plan. This document will be made available to stakeholders for comment as part of the EIA process. • Roads and other infrastructure will be designed and located in order to minimise long term impacts on the area's future status and use as a conservation reserve. Infrastructure removal and rehabilitation of the site to final land use in line with future land use requirements will be carried out upon closure. • Computer generate depictions of the final landforms of the areas on completion of the Project have been included.These are provided as Plates 8.1 through to 8.6.	• There will likely be no significant impact to the geo-heritage or anthropocentric values of the Koolanooka / Blue Hills area, after waste dumps are blended appropriately into surrounding ridgelines and rehabilitation has been successfully conducted upon closure.
Mine Planning Decommissioning and Rehabilitation	• Decommissioning of the mine site	• Ensure that rehabilitation achieves a long term safe, stable and functioning landform which is consistent with the surrounding landscape and other environmental values. • Fulfil commitments	• AMEC Mine closure Guidelines (AMEC, 2000). • Strategic Framework for Mine Closure (ANZMECC, 2000). • Mine Closure Guideline for Minerals Operations in WA. (DoIR, 2000). • Mine Void Water	• At Koolanooka ore will be excavated from areas that have already been disturbed or partially mined but which are external to the existing pit. The South Fold Orebody will be excavated from a cut back to the immediate south-southeast of the old pit with ore being transported to the plant site via a combination of existing and new haul roads. • Operations at the Mungada East & Mungada West pits at Blue Hills will be	• A full Closure Plan (Appendix 13.26) has been developed to comply with the AMEC Mine Closure Guidelines (2000) and ANZMEC/MCA Strategic Framework for Mine Closure (2000), to return the mine site to a self-sustaining ecosystem that is consistent, as far as possible, with the natural surrounding area. All activities will be adequately financed, implemented and monitored to achieve the agreed targets. • Decommissioning will comprise the safe dismantling and removal of infrastructure, the appropriate disposal of waste materials and the impacted areas returned as closely as possible to their pre-disturbed state. Where the removal of	• At Koolanooka, rehabilitation will result in a safe, stable landform with revegetation consistent with the adjacent TEC and blending into the surrounding landscape. • There will be no introduction of

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
		made to stakeholders and regulators regarding closure outcomes.	Issues in WA (WRC, 2003). • Guidance Statement No 6: Rehabilitation of Terrestrial Ecosystems (EPA, 2006). • Guidelines on Safety Bund Walls Around Abandoned Open Pits. (DME, 1997). • Mine Closure and Completion. (DITR, 2006).	returned and connected to Koolanooka through re-instating the existing Mt Karara / Mungada Haul road.	non-visible infrastructure or features that have been incorporated into the natural landscape may cause environmental damage, then their retention will be discussed with the relevant authorities at the time. • Formation of waste rock stockpiles will be performed progressively over the project's duration, taking into account desirable final landform and rehabilitation requirements. The predicted waste dump layouts for Koolanooka, Mungada East and Mungada West are provided in Figures 8-2, 8-3 and 8-4 respectively. Waste dumps from previous mining will also be reformed, where feasible. Specifically, the Northern Waste dump alongside the public access road will be reshaped, and be rehabilitated with regard to erosion issues. • rehabilitation will occur progressively where possible as disturbed areas are no longer utilised. Upon the completion of mining, should Midwest not undertake further operations all sites impacted by the project will be rehabilitated. Rehabilitation activities will include; • re-establishment of stable landform with erosion protection for long term stability. • ripping of compacted areas and on contours of slopes; and • spreading of vegetation debris to return organic matter to the area and provide supplementary seeding with appropriate species. Seed stock will be gathered in 2007 - 2008, pre-clearance, to provide an effective provenance seed-set for use during rehabilitation practices. • The rehabilitation programme will include development of completion criteria to indicate the state when rehabilitation can be considered self sustaining. Closure considerations will include assessment and remediation of contaminated sites, ongoing placement of waste materials to improve the form of existing waste dump areas, and the rehabilitation of all project disturbed areas, including exploration drill pads and tracks. • Additionally a suitable pit abandonment strategy will be developed and detailed in the Closure Plan. This will take into account that the area will revert to a tourist destination	weeds or diseases to the TEC area or new rehabilitation areas. • At Blue Hills, disturbed areas will be rehabilitated to blend with the surrounding landscape and revegetation will aim at providing a vegetation complex similar to the pre-existing complex.

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
					after closure. This strategy will also incorporate the needs of the local shire and DOCEP for safe tourism access. Midwest will also undertake the following: • Temporary infrastructure will be removed, divested or otherwise disposed of appropriately. • Soils contaminated with hydrocarbons will be removed and bioremediated. • Borrow pits and other excavations, other than the iron ore pits, will have surfaces battered to an angle of 15º or less. The maximum final depth of borrow pits and other small excavation structures will be 2 metres from the maximum reasonably expected groundwater level. • Disturbed areas will be land formed to achieve free draining status and blend in with the surrounding environment. • Pre-existing drainage networks will be re-established. • Erosion and sedimentation will be minimised by the construction of erosion control berms, bunds or contour banks as appropriate. • Windrows that interfere with natural drainage will be breached as a minimum, and completely removed as appropriate. • Compacted surfaces no longer required for operations will be contour ripped or scarified to promote water penetration and the catchment of seed. • Disturbed areas will be progressively rehabilitated as far as possible. • Topsoil (100 mm if available) or a suitable growth medium and vegetation (if available) will be spread over the area. • Where required, native provenance seeds will be used to enhance revegetation. • Hygiene requirements will be maintained during rehabilitation; • Weed infestations will be controlled by physical or	

Environmental Factor	Relevant Project Component	Environmental Management Objectives	Applicable Standards	Potential Impacts	Environmental Management & Mitigation	Predicted Outcome
					chemical means. • Rehabilitated areas will be sign-posted and protected from disturbance. • Areas where revegetation is not initially successful will receive remedial attention e.g. remedial seeding with local provenance seed. Waste dumps will be constructed to blend with the surrounding landscape and have the following structural criteria: • maximum height 25 m above natural ground level at the structure site; • 8 metre wide berms every 10 metre of height; • berms to be sloped at 5º into body of dump; • berms to have cross bunds placed every 30 m; and • top surface and berms to have bund along the crest.	

Environmental Management Commitments

Table S3 DSO Project Environmental Management Commitments

Commitment Number	Topic	Actions	Objectives	Timing	Seek Advice From
1	Project Construction and Operation	Prior to construction and operations, a Project Environmental Management Plan (EMP) will be developed. The plan will set out procedures to minimise and manage the environmental impacts of construction and operation activities.	Provide a framework for continual improvement and minimise risk of impacts from construction.	Prior to construction / operations.	DEC, DoW, DIA, DoIR
2	Project Construction and Operation	The Environmental Management Plan will be implemented during construction and operation, and communicated to Project personnel through training and induction sessions	Ensure continual improvement and minimise risk of impacts from construction.	Commencement of construction / operations.	
3	Project Construction and Operation	The Environmental Management Plan will be developed in accordance with the Project Environmental Management System (EMS).	Provide a framework for continual improvement and minimise risk of impacts.	Planning. Prior to construction.	DEC
4	Project Construction and Operation	Midwest will appoint an Environmental Manager to oversee and implement all environmental requirements contained within the DSO PER, EMP and EMS on the DSO project.	Allocate DSO management responsibility to an environmental professional	Prior to construction	DEC
5	Vegetation and Flora	As a component of the Project EMP there will be management procedures implemented at Blue Hills for the protection of priority flora, developed in consultation with the DEC, prior to mine and infrastructure construction works. The plan will set out procedures to maintain the abundance, diversity, distribution and conservation status of threatened flora species.	Ensure flora species are adequately managed.	Prior to mine and infrastructure construction works.	DEC
6	Vegetation and Flora	The boundary between the TEC and impact areas will be fenced prior to construction and operation to avoid inadvertent impact.	Preservation of mine site vegetation for conservation purposes.	Prior to construction and throughout the life of the mine.	DEC
7	Terrestrial Fauna	As a component of the Project EMP there will be management procedures implemented at Koolanooka and Blue Hills for the protection of Malleefowl, developed in consultation with the DEC, prior to mine and infrastructure construction works. The plan will set out procedures to maintain the abundance, diversity, distribution and conservation status of Malleefowl.	Ensure fauna species are adequately managed.	Prior to mine and infrastructure construction works	DEC
8	Surface Water Hydrology	Drainage structures will be designed and constructed to minimise alterations to offsite surface drainage patterns, resulting in no offsite turbidity impacts for the	Adequately manage surface water hydrology.	Life of mine.	DoW

Commitment Number	Topic	Actions	Objectives	Timing	Seek Advice From
		Gilgai formation to the south of the Mungada pits.			
9	Air Quality - Dust	Assessment of the affect of dust on the health of TEC flora will be undertaken prior to construction/operation and monitoring of impact will continue throughout the life of the Project as required by Regulatory Authorities.	Determine the nature and extent of dust effects on TEC flora	Prior to mine and infrastructure construction works and throughout the life of the Project.	DEC
10	Waste Rock Management	The Closure Plan, detailing waste rock management, will be implemented.	Maintain a Conceptual Mine Closure Plan.	Throughout life of mine	DEC and DOIR
11	Asbestos Management	Midwest will comply with all commitments provided in the Midwest "Fibrous Minerals Procedure", the DSO PER and its supporting documents, concerning management of asbestos materials.	Comply with Midwest Fibrous Minerals Procedure and supporting documents	Throughout life of mining	DoIR and DOCEP
12	Waste (Solid, hazardous and liquid)	Procedures for the issues raised in Section 8 will be detailed in the Project EMP.	Adequately manage the removal and disposal of Project related waste.	Throughout life of Mine	DEC
13	Social and Cultural Environment	Midwest will consult with traditional owners and obtain their consent to disturb any new Aboriginal Heritage sites discovered in the Project disturbance area. Midwest will obtain approvals relevant to the *Aboriginal Heritage Act 1972* for disturbance to heritage sites.	Ensure that no heritage sites are disturbed without consent or a permit.	Prior to disturbance of heritage sites.	DIA,
14	Social and Cultural Environment	Midwest will photograph the Koolanooka mine area prior to disturbance and provide the photographs to Morawa Shire for archiving..	Ensure heritage values of the area are protected.	Prior to construction	DIA
15	Decommissioning and Rehabilitation	A Closure Plan has been developed in alignment with AMEC Mine Closure Guidelines (2000) and ANZMEC/MCA Strategic Framework for Mine Closure (2000). During the life of mine, the plan will be reviewed and updated as required to ensure information remains current.	Maintain a Conceptual Mine Closure Plan	Throughout life of mine.	DEC and DoIR
16	Decommissioning and Rehabilitation	A Final Mine Closure Plan will be developed in consultation with the DEC and DoIR. The plan will define appropriate closure criteria necessary for the establishment of safe landforms and self sustaining ecosystems, and set out procedures for monitoring in order to meet compliance with the closure criteria.	Establish safe landforms and self sustaining ecosystems post closure	Twenty-four months prior to mine closure.	DEC and DoIR

1.0 INTRODUCTION

1.1 BACKGROUND

Midwest Corporation Limited (Midwest) proposes the Koolanooka/Blue Hills Direct Shipping Iron Ore (DSO) Mining Project (the Project). The Koolanooka mine site is located approximately 160 km south east of Geraldton and 21 km east of Morawa, and the Mungada East & Mungada West mine site is located 60 km to the east of Koolanooka (Figure 1-1).

The project involves the recommencement of open pit mining activities at Koolanooka, with similar activities commencing 1.5 years into the project at the Mungada East and Mungada West pits at Blue Hills. This work will involve a maximum of five mining campaigns during the project. These mines were previously operated by the Geraldton Operations Joint Venture (GOJV) from 1966–1972 as Australia's first export iron ore operation. Most work will be conducted in existing disturbed areas.

The Project involves:

- a minor extension to the south east of the existing open pit at Koolanooka to access haematite iron ore;
- cutback and deepening of the existing open pits at Mungada East and Mungada West to access haematite iron ore;
- reopening of the existing haul road between Koolanooka and Blue Hills to allow the transportation in road trains of ore from the Mungada pits to Koolanooka for processing;
- installation of crushing and screening plant initially at Koolanooka, then approximately 1.5 years into the project life, relocation at Blue Hills to blend and process the ore into lump and fine products at a rate of up to 2 Mtpa; and
- the establishment of infrastructure at both locations, including accommodation, office, workshop, warehouse and magazine buildings, power and water supply, and communications.

The Koolanooka/Blue Hills DSO Mining Project is expected to run for a period of up to 5 years, with development scheduled to commence in the second quarter of 2009.

Midwest is currently exporting previously mined material from stockpiles at Koolanooka at the rate of 1.0 Mtpa, through the port of Geraldton. The operational workforce of approximately 50 resides in Morawa, providing a significant economic benefit to the region.

Approval of the Koolanooka/Blue Hills DSO Mining Project will allow the continuation and expansion of these regional benefits.

Iron ore from the existing operations is currently transported by road to Geraldton. The transition of transport from road to rail is underway. It is anticipated that from the November 2008 onwards, iron ore will be transported 20 km by road to Tilley rail siding north of Morawa and then loaded onto trains for transport to the Geraldton Port. The Tilley Siding Ore Transport Facility has received EPA approval following a separate EPA referral and as such, is beyond the scope of this PER. At Geraldton Port the ore will be stockpiled in the existing covered storage facility then loaded for export.

Midwest is currently exporting previously mined material from stockpiles at Koolanooka (Mining Proposal 4888, approved by the Department of Industry and Resources (DoIR) 21/12/2005) and site and port infrastructure is already approved and in operation.

The Koolanooka/Blue Hills DSO Mining Project was referred to the EPA under Section 38 of the *Environmental Protection Act 1986* in September 2006. The EPA will formally assess the Project on the basis of the potential environmental impacts of the Project and has set the level of assessment as a Public Environmental Review (PER) (Assessment No 1653). The public review period for this PER has been set at 6 weeks.

In 2004, an earlier version of this project was referred to the Department of Environment, Water, Heritage and the Arts (DEWHA) and it was determined that work at Koolanooka was not considered to be a Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* (Referral No 2004/1886) (Appendix A). However, as this assessment was limited at the time to the Koolanooka operation the referral did not consider activities in the Blue Hills. As such the current form of the DSO project has been re-referred to DEWHA (Referral No 2007/3809), with the finding that the proposal is now a Controlled Action, and Commonwealth Assessment will be facilitated as a bilateral agreement through the WA state assessment process.

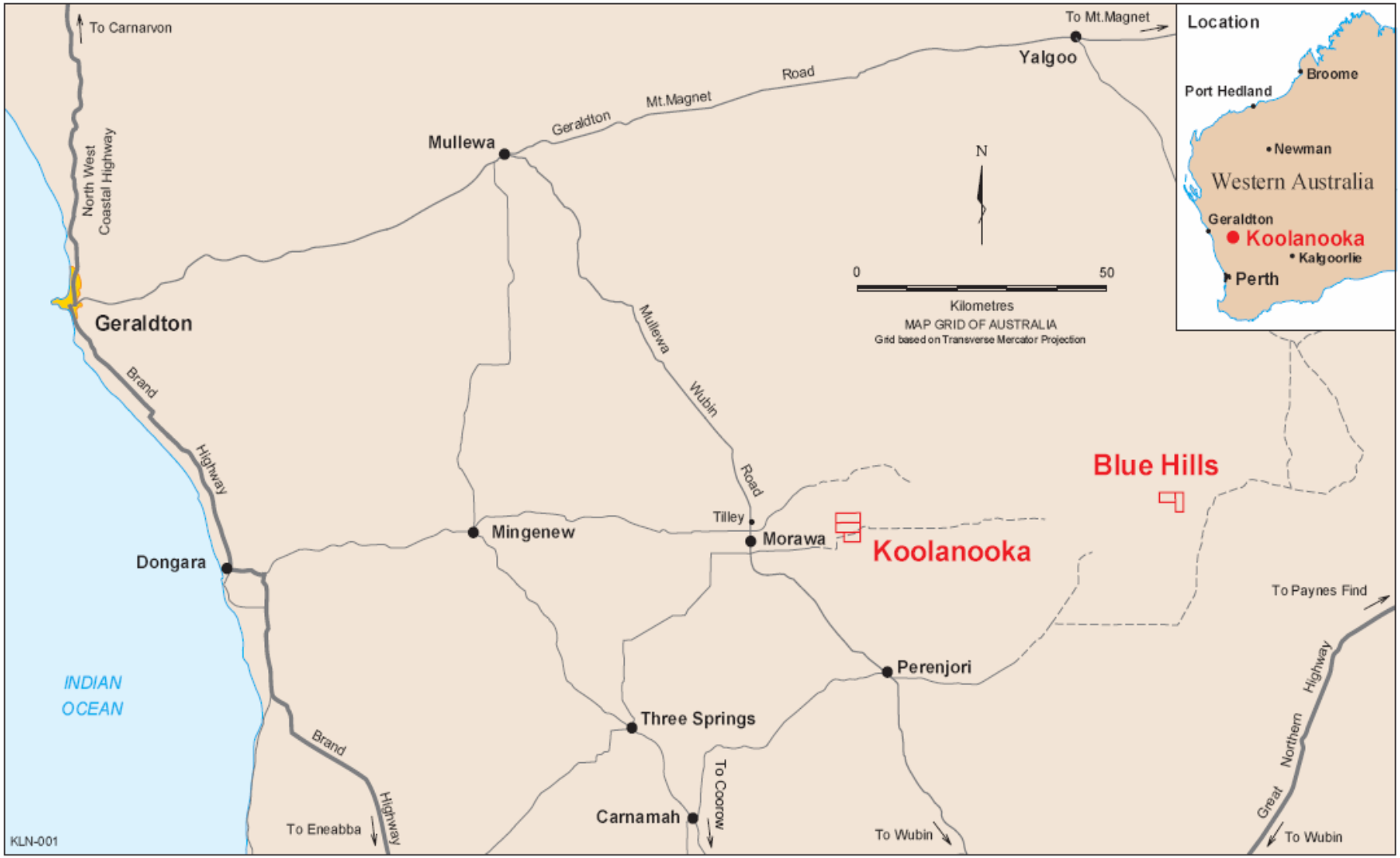


Figure 1-1 Regional Location

1.2 IDENTIFICATION OF PROPONENT

The proponent for the Project is Midwest Corporation Limited (Midwest). Midwest will own, operate and manage the Project. Contact details are:

Midwest Corporation Limited

Address	Contact
Midwest Corporation Limited ACN: 009224800 Suite 2, 32 Kings Park Road WEST PERTH 6005 Phone: + 61 (0) 8 9226 2033 Fax: + 61 (0) 8 9226 3388 *www.midwestcorp.com.au*	Point of Contact: Mr Bryan Oliver Chief Executive Officer Email: *info@midwestcorp.com.au*

ecologia Environment (*ecologia*) has been engaged by Midwest to facilitate the environmental approval process. *ecologia's* role is to:

- represent the proponents when liaising with government and public stakeholders;
- provide advice to Midwest on the environmental requirements for the Project approvals process;
- undertake selected environmental impact assessment studies;
- provide specialist technical advice on selected environmental matters; and
- prepare and facilitate documentation required for the environmental approvals process.

The environmental manager and key contact for this proposal is:

Director: Garry Connell
ecologia Environment
1025 Wellington Street
WEST PERTH WA 6005
Telephone: +61 (0) 8 9322 1944
Fax: +61 (0) 8 9322 1599
Email: *garry.connell@ecologia.com.au*

Midwest has engaged a range of specialists as part of the Project's feasibility study team, outlined in Table 1-1.

Table 1-1 Composition of Project Team

Project Aspect	Technical Advisors
Bore field and hydrogeological investigations	**Rockwater Pty Ltd** 76 Jersey St JOLIMONT WA 6014 Telephone: +61 8 9284 0222
Vegetation and Flora Terrestrial Fauna Short Ranged Endemics Stygofauna Troglofauna	***ecologia* Environment** 1025 Wellington St WEST PERTH WA 6005 Telephone: +61 8 9322 1944
Dust	**Sinclair Knight Mertz Pty Ltd** 7th Floor Durack Centre 263 Adelaide Terrace PERTH WA 6001 Telephone: +61 8 9268 4400
Soil Testing	**WA Chemistry Centre** 125 Hay St EAST PERTH 6004 Telephone: +61 8 9222 3177
Heritage Consulting	**Australian Interaction Consultants** **Suite 1, 211 Main Street** **Osborne Park 6017** Telephone: +61 8 9440 0500
Archaeological Survey	**Western Heritage Research** 2/ 13 Brookman St KALGOORLIE WA 6430 Telephone: +61 8 9091 1300
Noise	**VIPAC Engineers and Scientists Ltd** 5/324 Great Eastern Highway ASCOT WA 6104 Telephone: +61 8 9277 3335
Gaseous Emissions	**Kewan Bond Pty Ltd** Suite 7, 4-6 Adelaide St FREMANTLE WA 6010 Telephone: +61 8 9335 8860

The Project tenement details of relevance are listed in

.

Table 1-2 Tenement Details

Lease	Holder	Area (ha)	Date Granted
M70/1012 (Koolanooka)	Midwest Corporation Ltd	598	18/12/98
M70/1013 (Koolanooka)	Midwest Corporation Ltd	899	18/12/98
M70/1014 (Koolanooka)	Midwest Corporation Ltd	899	18/12/98
G70/158 (Koolanooka)	Midwest Corporation Ltd	9.719	23/01/92
G70/159 (Koolanooka)	Midwest Corporation Ltd	9.812	23/01/92
M59/595 (Blue Hills)	Midwest Corporation Ltd	598.71	19/01/05
M59/596 (Blue Hills)	Midwest Corporation Ltd	598.66	24/04/05
L59/62 (Blue Hills Haul Road)	Midwest Corporation Ltd	559.00	21/09/06

1.3 DOCUMENT STRUCTURE AND PURPOSE

This PER has been prepared according to Part IV Division 1 of the *Environmental Protection Act 1986* for proposals of local or regional significance that raise a number of significant environmental factors. The EPA has decided that this proposal should be subject to a formal public review period, set at 6 weeks. During this time, the public, stakeholders and other interested groups are invited to submit comments on the proposed Project to the EPA. On completion of the public review period, the proponent will prepare a document containing their response to the submissions. The EPA will then complete its assessment of the Project and will submit its report and recommendations to the Minister for the Environment on the environmental acceptability of the proposal, as well as any environmental conditions which should apply if the proposal proceeds.

The EPA's report will be published in the form of a Report and the public may appeal to the Minister against the recommendations or content of the report. The Minister for the Environment will assess any appeals received and ultimately determine whether or not the Project can proceed. If the Minister determines that the Project can proceed, legally binding conditions, detailing the environmental requirements within which the proponent will have to comply, may be set pursuant to Section 45 of the *Environmental Protection Act 1986.*

Preparation of this document has been undertaken in accordance with the 'Guidelines for Preparing a Public Environmental Review / Environmental Review and Management Programme' (EPA, 2004). This PER has been structured to clearly delineate the environmental characteristics, impacts and proponent's responsibilities of the proposal.

1.4 PROJECT SCOPE AND TIMING

This PER presents the environmental implications associated with the Project and also describes the types and extent of investigations that have been conducted to further address these issues. The Project components are:

Koolanooka Mine:

- Expansion of the existing pit, including a minor footprint increase of 4.46 ha for the south fold cutback, and a total previously cleared area disturbance of 38.2 ha with an additional 3.14 ha being impacted within the dust buffer zone, area of influence. Of the 4.46 ha of Threatened Ecolgical Community (TEC) disturbance required, it has been calculated that only 2.68 ha will actually involve clearance of vegetation, as a significant portion of the nominated area has already been disturbed by previously approved exploration activities, as demonstrated in Figure 6-13.
- A semi mobile crushing and screening facility, deployed at project commencement and in place for 1.5 years to process the DSO ore deposits, 1.9 ha of which is on previously disturbed land.
- Portable offices, ablutions, workshop and a first aid facility, 3.7 ha on previously disturbed areas.
- Generation of waste dumps to the west (26 ha) and south (6.6 ha) of the main pit.

- Installation of bulk diesel storage areas to store 100,000 L volume of fuel, on previously disturbed areas.
- Installation of diesel generators producing 500–1000 kW of power, to be stored on previously disturbed areas.

Blue Hills Mine:

- Expansion of Mungada East and West Pits including increase areas of waste dumps. The total area of new disturbance is 40.8 ha, and previously cleared disturbance is 11.7 ha.
- A small workshop to service the Blue Hills operation and portable offices, ablutions and a first aid facility (1 ha).
- Re-deployment of the Koolanooka crushing and screening facility 1.5 years into the project life to process the DSO ore deposits, 1.9 ha of which is on previously disturbed land.
- Midwest is in consultation with the DEC regarding the development of a new work camp at Old Karara Homestead.
- Reinstatement of the existing haul road connecting the Mungada pits with Koolanooka. This will involve re-clearing an estimated 39.5 ha of previously disturbed vegetation 3 metres wide on both sides of the road.

The timing of the proposed development is dependent on the successful resolution of outstanding issues and the environmental approval processes. The anticipated timeline for the major elements of the environmental approval process is outlined in Table 1-3.

Table 1-3 DSO Mining Proposal and Assessment Schedule

Tasks	Completion / Release / Approval Date
Submission of revised scoping document	10th January 2007
EPA Service Unit advice on scoping document	15th January 2007
EPA meeting introduction to the proposal and scoping document. Delegation to EPA chairman for final acceptance	25th January 2007
Final scoping document accepted by EPA Chairman on incorporation of any issues raised	30th April 2007
Submission of draft PER document to EPA Services Unit for review	4th April 2007
EPA Service Unit advice on draft PER	7th June 2007
Proponent response to EPA Service Unit incorporating advice on draft PER	25th June 2007
Submission of second draft PER document to EPA Services Unit for review	16th October 2007
EPA Service Unit advice on second draft PER	21st November 2007
Submission of third draft PER document to EPA Services Unit for review	21st August 2008
Signoff on PER for public review by EPA	17th September 2008
Public review period commenced.	22nd September 2008

2.0 ENVIRONMENTAL IMPACT ASSESSMENT

2.1 ENVIRONMENTAL APPROVALS PROCESS

2.1.1 Legislative Framework

The Project is subject to compliance with both Federal and State legislation during construction and operation phases. Environmental legislation relevant to the Project includes:

Table 2-1 Applicable Legislation

Legislation	Responsible Government Agency
Commonwealth Legislation	
Environment Protection and Biodiversity Conservation Act 1999	Department of Environment, Water, Heritage and the Arts
Native Title Act 1993	National Native Title Tribunal
State Government Legislation	
Aboriginal Heritage Act 1972	Department of Indigenous Affairs
Agricultural and Related Resources Protection Act 1976	Department of Agriculture Western Australia
Bush Fires Act 1954	Bush Fires Board
Conservation and Land Management Act 1984	Department of Environment and Conservation
Contaminated Sites Act 2003	Department of Environment and Conservation
Dangerous Goods Safety Act 2004	Department of Consumer and Employment Protection
Environmental Protection Act 1986	Department of Environment and Conservation
Explosives and Dangerous Goods Act 1961	Department of Consumer and Employment Protection
Health Act 1911	Department of Health
Heritage of Western Australia Act 1990	Heritage Council of Western Australia
Metropolitan Water Supply, Sewerage and Drainage Act 1909	Department of Health
Mining Act 1978	Department of Industry and Resources
Mines Safety and Inspection Act 1994	Department of Consumer and Employment Protection
Soil and Land Conservation Act 1945	Department of Agriculture Western Australia
Water and Rivers Commission Act 1985	Department of Water
Waterways Conservation Act 1976	Department of Water
Wildlife Conservation Act 1950	Department of Environment and Conservation

2.1.2 State Assessment Process

The Western Australian *Environmental Protection Act 1986* (the Act) states that where a development proposal is likely to have a significant effect on the environment, the proposal may be referred to the Environmental Protection Authority (EPA) for a decision on whether or not it requires formal assessment under the Act, and, if it is to be assessed, the level of assessment.

Based on the information in the referral for the Project, the EPA determined that the likely environmental impacts are sufficient to warrant formal assessment of the proposal under the Act. The level of assessment for the proposal was set as a Public Environmental Review

with a 6 week public review period. No appeals were lodged against the EPA's decision on the level of assessment.

An Environmental Scoping Document was prepared consistent with the requirements of Section 6.1 of the Environmental Impact Assessment (EIA) (Part IV Division 1) Administrative Procedures 2002, to provide a framework for the formal environmental assessment of the Project. This document detailed the scope of the proposal within the Project and provided a summary of the existing Project environment, potential environmental impacts, proposed management responses, proposed scope of works for environmental investigations, stakeholder consultation programme and Project timeline. The Environmental Scoping Document was submitted to the EPA on the 10 January 2007 and approved on 30th April 2007.

Baseline surveys and investigations for environmental aspects of the Project have been conducted, with management plans for significant aspects of the Project developed in compliance with regulatory guidelines. Ongoing consultation with regulators, relevant stakeholders and interested members of the public is also being undertaken to include community concerns as part of the assessment process.

This PER will act as an EIA document on the Project and with associated management plans will be advertised and released for public comment. The EPA will consider all comments received during the public review period from government agencies and the public and provide copies of submissions to the proponents for their response. Following completion of the public review period, the proponents will prepare a document containing a summary of submissions and the proponent's response to the submissions. The EPA will then complete its assessment of the Project and submit its report and recommendations on the proposal to the Minister for the Environment.

Appeal rights exist on the EPA's recommendations which are advertised. Appeals will be assessed by the Minister for the Environment. If the Minister determines that the Project can proceed, legally binding conditions dictating the environmental requirements with which the proponents must comply may be set pursuant to Section 45 of the *Environmental Protection Act 1986*. These conditions will then be released as a Ministerial Statement.

Once ministerial approval has been granted, the proponent of the Project will obtain approvals from DEC to construct key infrastructure under Part V of the *Environmental Protection Act 1986.*

A Works Approval will be applied for and an environmental licence obtained for the construction and operation of the crushing and screening plant. All activities at the site will require licensing as a prescribed premises under Part V of the *Environmental Protection Act 1986,* Regulations 1987 Schedule 1 (processing or beneficiation of metallic or non-metallic ore: premises on which 50,000 tonnes or more per year of metallic or non-metallic ore is crushed, ground, milled or otherwise processed). The installation of mobile crushing and screening plant will require a licence under S52 of the *Environmental Protection Act* 1986, in order to operate.

Additionally, after State Ministerial approval has been granted, the proponents of the Project will obtain other State approvals as required. These approvals include but are not limited to:

- Mining Proposal to be submitted to the Department of Industry and Resources (DoIR) for activities subject to compliance with the *Mining Act* 1978;
- approval to disturb Aboriginal sites to be applied for under Section 18 of the *Aboriginal Heritage Act 1972*; and
- permits under the *Rights in Water and Irrigation Act* 1914.

2.1.3 Commonwealth Assessment Process

In 2004, an earlier version of this project was referred to the Department of Environment, Water, Heritage and the Arts(DEWHA) and it was determined that work at Koolanooka was not considered to be a Controlled Action under the *Environmental Protection and Biodiversity Conservation Act 1999* (Referral No 2004/1886) (Refer to Appendix A). However, as this assessment was limited at the time to the Koolanooka operation the referral did not consider activities in the Blue Hills. As such, the current form of the DSO project has been re-referred to DEWHA (Referral No 2007/3809), with the finding that the proposal is now a Controlled Action, and thus Commonwealth Assessment will be facilitated as a bilateral agreement through the WA state assessment process.

2.2 PRINCIPLES OF ENVIRONMENTAL PROTECTION

Amendments to the *Environmental Protection Act 1986* (Section 4a) require that the EPA take into account the following principles in the assessment of development proposals:

2.2.1 Precautionary Principle

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by:

- careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and
- an assessment of the risk-weighted consequences to various options.

2.2.2 Principle of Intergenerational Equity

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

2.2.3 Principle of Conservation of Biological Diversity and Ecological Integrity

Conservation of biological diversity and ecological integrity should be a fundamental consideration.

2.2.4 Principles of Improved Valuation, Pricing and Incentive Mechanisms

Environmental factors should be included in the valuation of assets and services, including:

- The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.
- The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.
- Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those responses to environmental problems.

2.2.5 Principle of Waste Minimisation

All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.

Midwest has embraced the EPA's principles of environmental protection as part of Project engineering and design. The environmental objective of the Project's design, in order of priority, is to:

- completely avoid the impact if possible;
- substitute with a lesser impact;
- include rehabilitation and engineering solutions to reduce the degree and risk of impact;
- design operational controls and emergency response around reduction of impact consequences; and
- provide environmental offsets for the impact.

Further demonstration of this approach is described in this PER document. The application of principles of environmental protection to the Project includes consideration of alternative designs for the Project, the extent of environmental investigations being proposed, the level of stakeholder and community consultations and the commitment to environmental awareness training of all personnel involved in the construction and operation phases of the Project. The current responses to the expectations of these principles are summarised in Table 2-2. The DEC will be consulted on advice for preservation and / or conservation projects to which the proponent can contribute as primary and secondary offsets to Project impacts. Specific offset possibilities have been raised and discussed later in this PER.

In addition, the proponent has developed and will implement an Environmental Management Plan (EMP) for this Project, within the framework of an Environmental Management System (EMS). The EMS will provide a systematic process for ensuring compliance with legal requirements, minimisation of environmental impacts, and continual improvement in environmental performance.

Lastly, Midwest has also committed to appointing an environmental professional to implement all environmental requirements contained within the DSO PER, EMP and EMS if this project is approved. This person will be directly responsible for the environmental performance of the Midwest operations located within the Midwest region, and this role will be based inGeraldton

Table 2-2 Principles of Environmental Protection for the Koolanooka/Blue Hills DSO Mining Project

Principle	Relevant Yes/No	Consideration of Principle	Addressed Yes / No
1) **The Precautionary Principle** Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by – a) careful evaluation to avoid, where practicable, serious or irreversible damages to the environment; and b) an assessment of the risk-weighted consequences to various options.	Yes	Sufficient knowledge is able to be obtained to address proposed potential environmental impacts.	Yes
(2) **The Principles of Intergenerational Equity** The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	Yes	Greenhouse emissions will not be long term and are insignificant with respect to EPA Guidance Statement No 12. Vegetation clearing and loss of biodiversity is expected to be at a minimum on this project, due to a small impact footprint and that disturbed areas are used where possible, including the reinstatement of pre-existing pits. Mine closure will be conducted to ensure that disturbed areas are fully rehabilitated to resemble the original composition. The risks to threatened & restricted species have been assessed within this proposal and are not expected to be significant. Loss of habitat will be minimised and returned to species of conservation or concern once rehabilitation has been completed. Landscape scale impacts will be most evident with respect to waste dump development and pit expansion, the design of waste dumps has taken into account the need to blend such structures into the existing environment and has also considered the adequate flow of local drainage channels.	Yes

Principle	Relevant Yes/No	Consideration of Principle	Addressed Yes / No
(3) **The Principle of the Conservation of Biological Diversity and Ecological Integrity** Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Yes	The Project will result in new clearing of a small area of TEC (2.68 ha) immediately abutting existing disturbance to the Koolanooka Hills, plus 40.8 ha of new clearing abutting the pits at the Blue Hills. Appropriate flora and fauna surveys have been undertaken and rehabilitation commitments have been made.	Yes
(4) **Principles in relation to Improved Valuation, Pricing and Incentive Mechanisms** a) Environmental factors should be included in the valuation of assets and services. b) The polluter pay principle – those who generate pollution and waste should bear the cost of containment, avoidance and abatement. c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. d) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those responses to environmental problems.	Yes	The only ongoing pollution expected on this Project is waste disposal. Midwest will dispose of site wastes in an appropriate manner. However, no incentive structures / market mechanisms are applicable to this Project.	Yes
(5) **The Principle of Waste Minimisation** All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Yes	This will be clearly addressed in the Project EMS and EMP.	Yes

3.0 STAKEHOLDER ENGAGEMENT

3.1 STAKEHOLDER CONSULTATION PROGRAM

Midwest has been in consultation with key regulatory groups, non-government agencies and the Morawa and Perenjori communities since the beginning of feasibility studies. Concerns raised during consultation have been taken into consideration in this document.

3.1.1 Public and Non-Government Organisation Consultation

A number of methods have been used to engage the public on the proposed Project, depending on the issue or information required. The following community and environmental groups have been invited to public meetings or consulted with directly on the relevant aspects of the DSO Koolanooka / Blue Hills Project.

- Conservation Council of WA (Perth).
- Wildflower Society of WA.
- Native Title claimants.

A public meeting was held in Morawa on 22 June 2004, with Project information presented to the 75 people who attended. Strong community support for the reopening of Koolanooka mine was demonstrated at this meeting.

Two further consultation meetings have been held, one in Morawa on 6 December 2006, and one in Perenjori on 7 December 2006. During these consultation meetings Project information was presented to the communities and the public were given an opportunity to raise queries or concerns. Details of the Morawa and Perenjori meetings were advertised in the local papers (the *Morawa Community Scene* and the *Perenjori and District Bush Telegraph*) which were distributed throughout the Morawa and Perenjori areas. In addition, a Project brochure with a comment sheet was mail dropped to post office boxes in the town areas prior to the public meetings. 24 people were present at the Morawa public meeting, where a Powerpoint presentation of the Project scope was given by Midwest and *ecologia*. There was positive support from members of the community who encouraged the economic and employment growth that would be associated with the Project. There was little public attendance at the Perenjori public meeting.

Midwest has also undertaken ongoing consultation and liaison with the Shires of Morawa and Perenjori. Two local council special sessions were held on 6 and 7 December 2006 respectively, to discuss the Project scope. The Shires of Morawa and Perenjori support the recommencement of operations at the mine site. Other issues raised included benefits to the town and district and alternative employment opportunities.

A briefing session similar to the public meetings in Morawa and Perenjori was held in Perth on 24 January 2007. Invitees to this meeting included representatives from government agencies and non-government organisations (NGOs), including the Conservation Council of WA and the Wildflower Society. Discussions revolved around the scope of Project works and the types of investigations being conducted.

Additional project public briefing sessions were held at Morawa on 27 May 2008 and Perenjori on 28 May 2008 with approximately 65 and 40 attendees respectively.

3.1.2 Landowner Consultation

Midwest has undertaken ongoing consultation and liaison with the landowners in the vicinity of the mine site. Issues raised by the landowners related to management of surface water runoff and continuation of water supplies. Midwest has committed to ensuring that any changes in surface water runoff resulting from the proposal will not adversely impact surrounding land, and that should there be any impact on water supplies, the company will amend the impact.

As required by the *Mining Act*, 1978, Midwest is entering into agreements with each of the landowners that own freehold land subject to Mining Leases owned by Midwest.

3.1.3 Regulator Consultation

Briefings, meetings and discussions have been held with a range of state and regional agencies and advisory bodies. Discussions have been held with:

- Department of Environment and Conservation (DEC Perth).
- Department of Environment and Heritage (DEWHA, Canberra).
- Department of Indigenous Affairs (DIA, Perth).
- Department of Industry and Resources (DoIR, Perth).
- Department of Planning and Infrastructure (DPI, Perth).
- Department of Premier and Cabinet (DPC, Perth).
- Environmental Protection Authority (EPA, Perth).
- Environmental Protection Authority Services Unit (EPASU, Perth).

These agencies have been involved in Project discussions and invited to comment on relevant aspects of the scope and adequacy of investigation methodologies. Accordingly, Midwest has refined and expanded the scope of environmental investigations.

Midwest will continue consultation with regulators throughout the Project planning, construction and operation to ensure that issues regarding the Project are managed appropriately.

Specific consultation undertaken with agencies and individuals is detailed in Table 3-1.

Table 3-1 Project Consultation

Stakeholder Group	Date	Stakeholder Contact	Issues raised	Midwest Response
DEC and EPASU	Various	Joe Grehan, Nick Wolfrey, Tim Gentle, Ann Stubbs, James Pederick.	Initial kick-off meetings, discussion on received feedback, resolution of cumulative impacts expression with Gindalbie and offsets.	PER has been amended according to the requirements issued by these agencies.
DEC Midwest Region	Various	Danielle Eyres, Beth MacKernan	Discussions on the flora and fauna species of the region, flora and fauna surveys undertaken and conservation significant species present.	Midwest has developed fauna and flora management outlined in Sections 8.1 & 8.2 of this PER.
DoW	Various	Annaliesha Sullivan	Project aspects and issues relating to water use and supply	Project water use has been defined.
DoIR	Various	Tammie Webb, Ana Mesquita and Eugene Bouwhuis	Discussion of project description and related issues	Midwest has considered all feedback from DoIR personnel in forming this PER and related supporting documents.
Shire of Morawa	6/12/2006 7/12/2006	CEO and President of the Shire of Morawa	Full discussion of project requirements and potential issues	Midwest has considered all feedback from the Shire of Morawa in forming this PER and related supporting documents.
Public Meeting - Morawa	24/06/2004	75 attendees	Full discussion of project requirements and potential issues	Midwest has considered all feedback from this public forum in forming this PER and related supporting documents.
Public Meeting - Morawa	6/12/2006	24 attendees	Full discussion of project requirements and potential issues	Midwest has considered all feedback from this public forum in forming this PER and related supporting documents.
Shire of Perenjori	7/12/2006	Full council meeting	Full discussion of project requirements and potential issues	Midwest has considered all feedback from the Shire of Perenjori in forming this PER and related supporting documents.
Public Meeting - Perenjori	7/12/2006	1 attendee	Full discussion of project requirements and potential issues	Midwest has considered all feedback from this public forum in forming this PER and related supporting documents.
Conservation Council and Wildflower Society	Early Dec 2006, 24/01/2007	Chris Talentyre and Brian Moyle	Full discussion of project requirements and potential issues	Considered feedback from these NGO's when developing this PER
Native Title Claimant and other Indigenous stakeholders	19-21/3/ 2007 3/4/2007	The Widi Mob, Pandawn Descendants, Yamatji Marlpa Barna Baaba Aboriginal Corporation, Amangu Mob.	No issues raised with the DSO project to date	Heritage issues have been defined as required.

One of the main concerns raised by the DEC during this process was related to the cumulative impact of proposed project on the Koolanooka System Threatened Ecological Community. Midwest has reviewed the potential impact on the 5419 ha system and has concluded that it is not feasible to reduce the proposed 4.46 ha impact on the TEC, as this remains a very small percentage of the total TEC area. Of the 4.46 ha of TEC disturbance required, it has been calculated that only 2.68 ha will actually involve clearance of vegetation, as a significant portion of the nominated area has already been disturbed by previously approved exploration activities, as demonstrated in Figure 6-13. A further 6.26 ha of disturbed TEC listed land currently exists on Midwest tenements at Koolanooka due to previous exploration activities and access impacts, and such predisturbed areas will be utilised in preference to new clearance (Plate 3-1).

Plate 3-1 Koolanooka Mine circa 1966

4.0 PROJECT DESCRIPTION

Midwest proposes to develop the Project to mine and process up to 2 Mtpa of hematite iron ore suitable for direct shipping for export. The Project involves the recommencement of mining from the existing Koolanooka open mine pit. This involves the development of a small shallow pit to the immediate south east of the existing open pit (Figure 4-2**)**. Then 1.5 years after commencement at Koolanooka, the project workforce will move to work at Blue Hills. This will entail cutbacks and depth extension of the already existing Mungada East and Mungada West pits (Figure 4-3). The full scope of this work will be carried out in a total of up to five mining campaigns during the project.

A semi mobile crushing and screening facility for the processing and blending of the various types and grades of DSO will be established initially at Koolanooka then relocated 1.5 years after commencement to the Blue Hills site. High grade Banded Iron Formation (BIF) ore from the Blue Hills operation will be transported to Tilley Siding and blended with the screened detrital lump fraction from Koolanooka to achieve an average DSO quality threshold of 58% Fe.

Export product will be transported from Koolanooka along existing roads to a rail siding at Tilley, near Morawa, where it will be loaded onto trains and transported by rail to the Geraldton Port for export.

The use of the Mt Karara/Mungada Haul Road for transportation of ore from Blue Hills to the gazetted Shire Road (Mungada Road) will require the haul road to be returned to its original width to accommodate haulage trucks.

To re-establish the haul road, construction materials will need to be sourced from the haul road surrounds and borrow pits. If borrow pits are required to supply project needs then the relevant approvals will be obtained prior to any disturbance, and will be sourced from local pre-cleared areas wherever posible. This is in addition to grading the existing road formation and removing regrowth from the side table drains and road formation shoulders.

The Project is expected to run for a period of up to 5 years, with development scheduled to commence in the first quarter 2009.

4.1 MINING

Conventional open pit mining techniques will be utilised at Koolanooka and Blue Hills. This involves drilling and blasting, excavation, stockpiling, loading and hauling. The complete proposal activities will be carried out in a series of up to 5 mining campaigns.

4.1.1 Koolanooka

Re-commencement of mining at Koolanooka will start with the establishment of access to the South Fold cut-back area (Figure 4-2). Mining of this reserve is expected to take 12-18 months and will commence from the 400 m RL AHD for a projected 50 m to the 350 m RL contour.

Figure 4-2 provides a plan view of the Project area and Figure 4-4 provides a cross section of the South Fold pit.

The South Fold orebody will be excavated from a cut back to the immediate south of the old pit with ore being transported to the plant site via a combination of existing and new haul roads.

The South Fold orebody outcrops at the top of the unmined hill to the immediate south southeast of the existing Koolanooka Pit. The haematitic BIF outcrops extensively and in these areas there is very little residual soil, if any, requiring stockpiling since mineralisation extends to the natural surface.

At Koolanooka waste rock will be managed by a combination of backfilling into the original pit, and through generating two main waste dump areas over previous disturbed old waste dump locations, one to South of the TEC cutback, the other to the west of the existing pit (Figure 8-2). The waste dump areas will only be developed on previously disturbed locations and will only involve clearance of regrowth vegetation.

The total disturbance footprint will be 4.46 ha, with an additional 3.14 ha being impacted within the dust buffer zone area of influence. Of the 4.46 ha of TEC disturbance required, only 2.68 ha will actually involve clearance of vegetation, with the remainder utilising previously disturbed area, as demonstrated in Figure 6-13.

4.1.2 Blue Hills

A plan view of the Blue Hills Mining Project area is provided at Figure 4-3. Geotechnical criteria are based on parameters established from the existing open pits, which have been stable for over 30 years. For the pit optimisations in both Mungada East and West, an overall slope angle of 45^{o} was used (Figure 4-5 and Figure 4-6).

Practical pit designs were generated from the optimised pit shells. Haul ramps within the pits are 18 m wide with a 1:9 ratio gradient designed to cater for medium size mining equipment and 85 t class trucks, operating in a single lane. It is anticipated that all material will require drill and blast. Broken ore and waste will be loaded using hydraulic excavators in backhoe configuration. Mining will be conducted in 5 m benches to maximise ore extraction.

At Mungada East, waste rock will be dumped to the west and south of the pit and existing dumps (Figure 8-3) and at Mungada West, waste rock will be dumped to the east and south east of the pit and over the existing waste dump (Figure 8-4). The dumps will be shaped to form extensions to the existing waste landforms. Much of these extensions will cover areas that were previously cleared during historical mining activities. Ore will be transported by a typical mining fleet to run of mine (ROM) pads adjacent to the existing pits on previously disturbed ground. From there it will be transported by triple road train to Koolanooka.

The total new clearing required at Mungada East is 18.8 ha and at Mungada West is 22 ha giving a total of 40.8 ha.

4.2 ORE PROCESSING

Hematite ore will be trucked by existing haul roads to a mobile crushing and screening plant located close to the site of the original crushing circuit at Koolanooka. Relocation of the mobile crushing and screening unit will be conducted 1.5 years after commencement of operations at Koolanooka to a location to the east of the Mungada west waste dump, and south of the pit itself. The full scope of this work will be carried out in a maximum of five mining campaigns during the project. Using only dry screening techniques, the ore will be separated into lump ore (-32 mm +8 mm) and fine ore (-8 mm +3 mm). The two products will be stockpiled on existing cleared land near the crushing and screening plant for transport. Figure 4-1 details the processing method.

High grade BIF ore from Blue Hills will be blended with product from Koolanooka to achieve an average DSO quality threshold of 58% Fe. Ore processing will also be conducted at Blue Hills.

No chemicals or reagents will be used in the processing of the haematite ores.

It is not anticipated that acid mine drainage will be an issue for material handling and management as existing waste rock dumps around the two sites from previous mining activities do not demonstrate any evidence of sulphidic material or acidic discharge. This issue is discussed further in Section 8.7 of this PER.

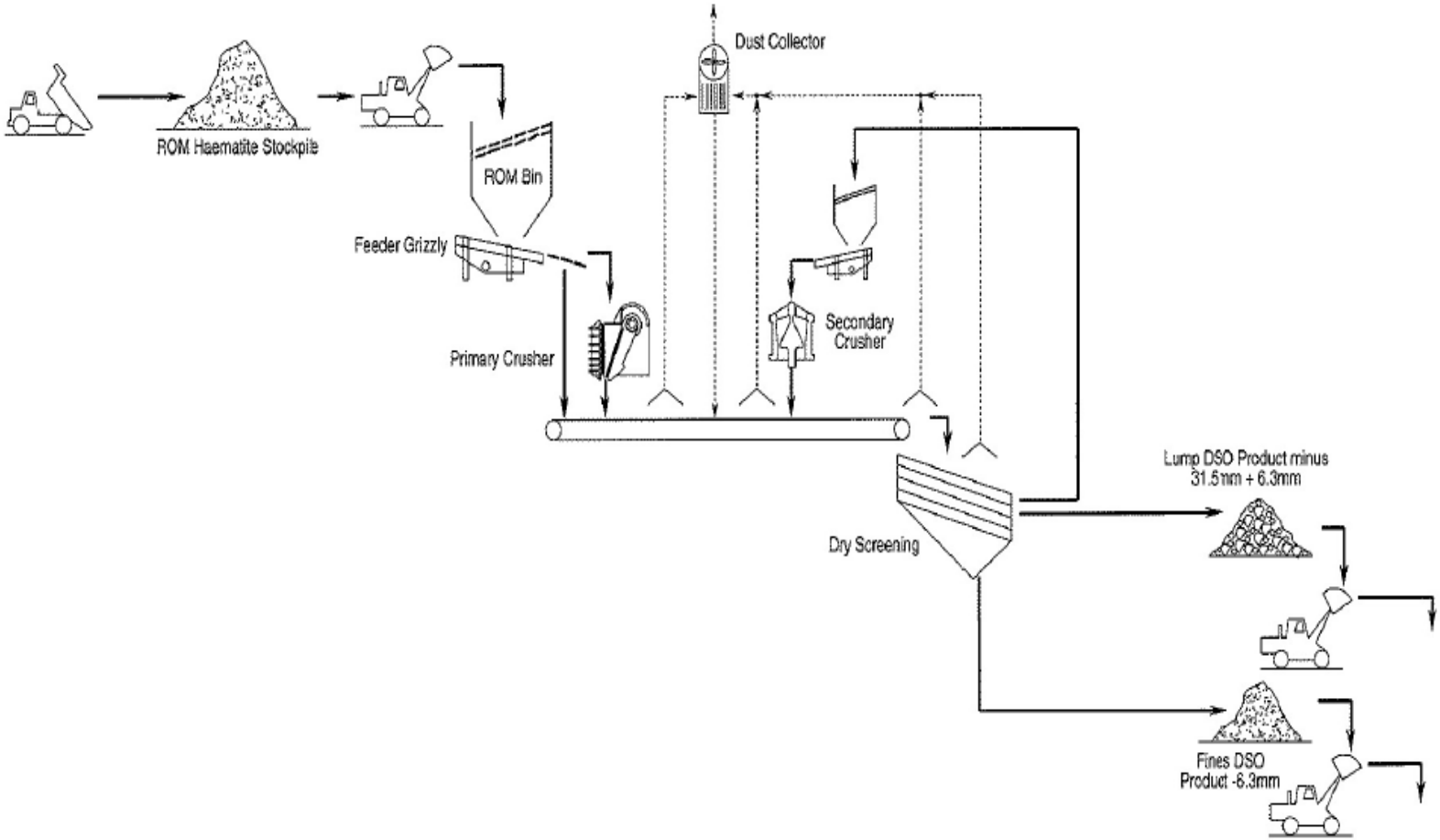


Figure 4-1 Ore Processing Flow Diagram

4.3 WATER REQUIREMENTS

The production of DSO lump and fine products is a dry process involving crushing and screening only. However, water will be required to control dust at the crushing and screening plant. Approximately 180 kl/day will be required for dust suppression on the DSO project, with an additional 1000 kl/day being required during the construction of the haul road, which should occur over a one year period from Q1 2009. An additional 50 kl/week of potable water will be required by the combined workforce. This requirement will be met by groundwater from local bores in the fractured BIF and quartzite strata and from the existing pit waters from the Koolanooka pit. These waters will be blended wherever possible before use to reduce total salinity concentration to acceptable levels for dust suppression activities.

For dust suppression at Blue Hills and for use during construction of the haul road, all water required will be trucked from Koolanooka sources, which are adequate to provide for the full activities of the Midwest mining crew. As demonstrated in the latest water resource assessment by Rockwater (Rockwater, 2007), identified bore sources at Koolanooka are capable of producing in excess of 240 kl/day, with an additional 110 kl/day expected to be available from the Koolanooka pit. Also an open sump near Koolanooka will allow for additional water supply once licensed, estimated to be in excess of 200 kl/day. The location of all water sources to be utilised by Midwest has been provided in Figures 4.8 and Figure 4.9. Details of pumping tests completed on these bores to determine sustainable draw have been summarised in Rockwater's report (Rockwater, 2007), and monitoring management of water quality and water table depth are discussed in Section 8.3 of this PER document.

For any new bores requiring to be developed at a later stage, Midwest Corporation will apply for the appropriate licensing from the Department of Water, for both bore construction and for groundwater extraction, before commencing abstraction.

Regarding dust suppression infrastructure, an existing turkey's nest at Koolanooka and its associated water piping supply infrastructure, will be utilised for dust suppression activities on the DSO project, if this is approved. Currently this turkey's nest is being utilised to service the activities of the ongoing the Transportation of Stockpiled Fines project at Koolanooka.

Potable water only for the Koolanooka facilities will be obtained from Water Corp and water supplies for the Karara camp will be obtained from groundwater at Karara.

The Mt Karara to Mungada haul road will require dust suppression to protect local vegetative health and to maintain the integrity of the road itself, following re-instatement. Saline waters will be used for road construction in preference to fresh waters, and the freshest waters will be used as preference for dust suppression. Lignosulphate binders will be used to surface treat the haul road, minimising the need for ongoing watering of this road by reducing the frequency of watering required. Although such binders will require re-application irregularly, a process which itself will require the use of water, water savings using these products will substantially outweigh the level of increased usage due to re-application. An initial application will be carried out on necessary surfaces and a further application will be required after 4-6 months. The name of the product that to be utilised is PolyCom by Biocentral Laboratories, technical details of this substance are provided in Appendix 13-6.

This proposal does not include pit depth extensions below the water table for East and West Mungada, and hence there will be no dewatering activity at these pits. If mining is proposed below the water table at a later date, an amendment will be applied for.

4.4 SUPPORT FACILITIES AND RESOURCE REQUIREMENTS

4.4.1 Power

Electrical power required for the crushing and screening circuit and associated infrastructure at Koolanooka and Blue Hills will be approximately 500-1000 kW. This is below the threshold requiring licensing and will be supplied by a portable diesel fuelled power generator(s), maintained and operated by contractors. Diesel for the generators will be stored on site in double skinned fuel tanks.

Power supply to the Karara camp will be supplied from an onsite generator.

4.4.2 Buildings

At Koolanooka, portable offices, ablutions, workshop and a first aid facility are located adjacent to the DSO plant site on pre-existing concrete pads, which were the foundations of the previous administration infrastructure. At these locations, only the clearance of regrowth vegetation will be required.

A workshop facility, with site office, ablutions with crib huts attached, will be established on site at Blue Hills. An explosive magazine storage area will also be installed.

4.4.3 Sewerage & Waste Disposal

A septic tank and leach drain toilet block currently exists on the Koolanooka site. Approval for this has been granted by the Shire of Morawa. Additional ablution facilities will be built at the Karara camp site and at Mungada with the standard Department of Health and Shire permits and DEC licencing for these facilities having been obtained by Midwest.

With the exception of water utilised for dust suppression there will be nil discharge of dewatering effluents to the environment.

4.4.4 Fuel & Explosives Facilities

All site bulk fuel materials will be stored in the workshop location area at Koolanooka, as indicated in Figure 4-2. It is the intention of Midwest to provide best practice hydrocarbon management on this Project.

Diesel fuel for the power generator(s) will be stored in tanks capable of holding four weeks supply, approximately 100,000 L. Storage of the diesel tanks will be in double skinned tanks adjacent to the generators, each of which is expected to have a separate tank holding a day's supply of fuel.

The double skinned tanks used for diesel storage will fulfil the requirements of the Australian Standard for storage and handling of flammable and combustible liquids (AS1940).

Lubricating oil for the process plant equipment will be stored in 200 litre drums in a bunded section of the workshop/stores building or on self bunded trays.

Explosives will be stored in dedicated explosives magazines at both sites, away from infrastructure. The magazines will be registered and licensed in accordance with the *Explosives and Dangerous Goods Act 1961* and the Explosives and Dangerous Goods (Explosives) Regulations 1963 and Australian Standard 1768–1991, Lightning Protection, Australian Standard 2187.0–1998, Explosives — storage, transport and use — Part 0: Terminology, Australian Standard 2187.1–1998, Explosives — storage, transport and use — Part 1: Storage.

4.4.5 Process Reagents and Chemicals

Neither reagents nor chemicals will be utilised during ore processing activities during the project.

4.5 PRODUCT SHIPMENT

Crushed ore will be transported in triple road trains from the crushing plant at Mungada West to Tilley Siding. Ore currently transported by road from Koolanooka to Geraldton uses trucks with two trailers with a total length of 27.5m. In future, 36.5 m long trucks with three trailers will be used to haul ore from Koolanooka to Tilley Siding, located approximately 2 km north of Morawa on the existing WestNet rail network. Due to significant inconvenience and cost, not all road haulage trucks and train carriages will have their loads covered with tarpaulins. From Tilley Siding, ore will be railed in 3,000 t unit trains to Geraldton Port. Minimal dust lift off impacts are expected from this activity, due to the significant weight of processed iron ores, the short and remote distance of transport from Blue Hills to Tilley, and the proposed use of water for dust suppression of ore stockpiles at the various locations.

Once at Geraldton Port, the ore is to be stockpiled inside Midwest's storage shed in order to minimise dust generation. The shed is owned by Midwest and located on land adjacent to Berth 4. This facility is currently in use for the Fines Project (NOI 4888). Ore will be unloaded from the trains and loaded onto ships by conveyors with a dust management system including dust extractors incorporated at transfer points. Commencement of the Project will coincide with the phasing out of current operations conducted for the Fines Project. Operations at Geraldton Port will be managed by Geraldton Port Authority as part of their Environmental Licence issued under Part V of the *Environmental Protection Act 1986*.

The transport of DSO product is similar to that previously assessed by DoIR (in NOI No. 4888) entitled *Addendum to the Transportation of Stockpiled Fines Koolanooka Iron Ore Mine to Geraldton Port* (ATA, 2004), with the exception of the use of combined road and rail haulage.

Other documents of relevance to this proposal include:

- Notice of Intent (4888) for the transportation of stockpiled fines from Koolanooka;
- Geraldton Port Authority Works Approval 4150;

- Licence to Operate 4275/9 for the Port of Geraldton;
- Commercial Goods Vehicle Licence for bulk transport of ore; and
- Road Train Permit Agreement with the Shire of Morawa.

4.6 WORKFORCE

4.6.1 Workforce numbers

The project at Koolanooka will have a direct operational workforce of up to 40 people, with management and technical support provided by 5 Midwest staff. An additional 40 people will be employed in related services such as train loading, transport, accommodation, and maintenance.

The Koolanooka workforce will be housed in Morawa in a combination of accommodation options, and will travel to site daily via Munckton Road.

The Blue Hills workforce will comprise a team of approximately 30 – 70 operational personnel, to be housed in a proposed accommodation complex adjacent to the Old Karara Homestead on Karara Station as shown in Figure 4-7. This camp will initially provide accommodation for up to 12 exploration personnel, then expand to accommodate a further 60 people during the mining phase. Campaign mining between Koolanooka and Blue Hills will mean that only one camp is used at a time.

4.6.2 Rosters

All personnel will work 12 hour shifts on a nominal 2 weeks on, 1 week off roster. Fatigue management is a major concern in the mining industry and all steps possible will be taken to minimise its impact on health and safety, including the minimising of commuting time.

It is anticipated that staff will working at Koolanooka will fly into Morawa and those working at Blue Hills will be flown into either Perenjori or Rothsay.

4.6.3 Timeframe

It is anticipated that construction of the Karara accommodation complex will commence soon after PER approval, estimated to be early 2009. The mining project is planned to operate for approximately 5 years. At completion of mining, it is intended to completely dismantle and remove the accommodation complex from Old Karara, however, Midwest would be prepared to discuss with DEC the possibility of leaving some units in place for DEC's use. Decommissioning and rehabilitation of the area will be carried out in conjunction with DEC.

4.6.4 Site Selection

The principal rationale for locating the camp within 15 km of the Blue Hills mining operations is safety as this distance is considered acceptable for commuting from a risk management perspective. Alternative accommodation locations in the towns of Perenjori or Morawa would require up to one hour travel each way per shift. Midwest is concerned

about fatigue from working 12 hours shifts and safety implications of the interaction of light vehicles and road trains on the haul road, together with driving into the sun while commuting to and from Morawa.

Farming and pastoral activities have now ceased at the site, and regrowth of native vegetation is starting to take place. Using areas that have been previously cleared for camp construction, landfill and the sewerage treatment plant is considered preferable to constructing a camp near the Blue Hills mining operations that would require additional clearing of virgin bushland. The proposed camp at Karara will be located on a Midwest exploration lease which will negate issues associated with land tenure. Because the camp would be located 15 km from the mining activities at Mungada, the issues relating to dust or noise would be from road train and light vehicle traffic. Management of noise and dust will be carried out according to Midwest's Environmental Management Plan.

Potable water is also available in this location from an existing well and should be adequate to supply the camp (Rockwater 2007).

Other options for accommodation that can effectively and safely service the Blue Hills area are limited. The closest available camp that has been developed nearby is operated by the company Gindalbie, however this camp is at maximum capacity. The camp is located on Mt Karara and it is likely that it will be moved to make way for the Karara Magnetite Project, should the project be approved. Extension of the Gindalbie camp would require a major upgrade to the sewage treatment system and further clearing of bushland to accommodate extra accommodation units.

If accommodation for the Poject was located in Perenjori or Morawa, increased traffic may increase the risk of deaths to native fauna.

4.6.5 Camp Location

The proposed location of the camp is shown in Figure 4.7. The location avoids old rubbish dumps, the piggery, and waste dumps associated with the piggery. The rubbish dumps and piggery were defined and surveyed during a site visit with the resident DEC managers Peter and Julie Woodhead.

The proposed location is several hundred metres from the old homestead and is situated in the corner of an old paddock which was previously cleared for agricultural purposes. It is also away from the main drainage path which is from the north-east.

4.6.6 Traffic Management

The proposed camp location will be accessible from both the Blue Hills to Koolanooka haul road and the Karara to Perenjori road which passes the site. General public traffic will be routed into the camp from the Perenjori road, while mine site traffic will be routed onto the haul road. Roads to be constructed will be properly constructed including required sheeting and drainage.

A traffic management plan will be developed to ensure that traffic flow can be managed safely including:

- two way radio protocols;
- a pit permit system for access to haul road;

- clearly signposting public and mine access;
- inductions for anyone needing to use haul road;
- synchronising shift change traffic with haul truck servicing; and
- mine traffic and public traffic keeping separate as far as practicable.

Roads and tracks will be managed by:

- upgrading the access track to this location to a reasonable standard;
- drainage issues associated with the homestead fence line draining onto the access track will be considered and managed;
- any erosion on tracks and roads as a result of natural sheet flow drainage patterns will be minimised by ensuring that camp construction and installation will not inhibit stormwater flow or contribute to erosion.

Traffic management and roads will be managed in cooperation with DEC.

4.6.7 Water Supply

Water consumption for the Karara Camp has been estimated at 280 litres per person per day. This equates to a daily requirement of 22.4 kl for the 80 person camp.

Potable water is available from several bores and a well in the vicinity of the old Karara Homestead. The tank at the South Italian Bore is considered to have heritage value and will not be disturbed. This tank will be used by DEC and others for fire fighting purposes, weed control, and the trapping of feral goats. Further water exploration is planned in the area to further define the existing water sources. The appropriate licences will be obtained from the Department of Water (DoW) should any futher supply sources be required. As a last resort, Midwest will consider water transported from other sources such as standpipes in either Perenjori or Morawa.

Local water supplies may need to be treated by a solar powered reverse osmosis plant to ensure that the quality of water meets the relevant standards.

4.6.8 Infrastructure

Infrastructure requirements for the establishment of this accommodation complex will be determined by strategic site planning from both the Midwest Camp Engineer and a landscape architect.

This assessment will include the location of refuse sites and will define wastewater and sewerage treatment and disposal. To this end, a fully developed site plan will be submitted to DEC for approval before commencing construction.

Landfill and waste water are subject to Part V of the EPA regulations. The waste water plant will require licencing as the capacity of the camp will exceed 60 people. Best practice will be adopted for water disposal, including disposing of grey water and black water separately. Waste water will be reused wherever possible, rather than relying entirely on evaporation. The location for the landfill and sewerage treatment plant is intended to be on the north side of the haul road, as shown on Figure 4.7.

Landfill will incorporate a Bellan cage in order to minimise the spread of windblown rubbish and also to prevent animals foraging. Further information about the Bellan cage is available at: http://www.environlotech.com.au/Page2.htm

Accommodation units will be designed using best environmental practice including solar hot water systems, double glazing, and insulation to R2.5. Units will have verandas, and will be orientated to minimise the effects of solar radiation. Although this location does not require cyclone rated buildings, it is likely that the accommodation units will be constructed to Cyclone Rating D. The accommodation units and the complex will be constructed to the relevant Australian Standards and building codes. A Development Application will be submitted to Perenjori Shire for consideration and approval.

Midwest commits to installing a sustainable, environmentally friendly accommodation complex, including native landscaping integrated into the natural surroundings to produce an aesthetically pleasing but functional complex.

DEC proposed that this camp option be assessed within the PER and feedback from initial discussions on this option raised a number of concerns, which Midwest has addressed below.

Safety and public liability issues associated with the old shearing shed, homestead and outbuildings will be managed by:

- completely demolishing and burying the old dwelling which contains asbestos and is unsafe;
- completely demolishing and burying the other outbuildings which are badly dilapidated;
- repairing the shearing shed to a standard suitable for public access and incorporating it into a local interpretative trail; and
- demolition of other buildings will be carried out according to relevant regulations and guidelines.

The camp will be developed to suit the public recreational access needs of this area, including any access requirements for a public heritage trail. Opportunities for visitor access and accommodation at the camp may be explored and developed between Midwest and DEC should the demand for overnight accommodation increase.

Midwest has contacted the Shires of Perenjori and Morawa regarding the social / heritage values of the buildings at this site (in particular the heritage values of the shearing shed). It is considered that it would be worthwhile including the shearing shed as part of an area wide interpretative trail. Midwest is prepared to contribute to the establishment of this trail should the Koolanooka/Blue Hills DSO project receive approval.

Midwest commits to the following initiatives and solutions to be carried out as part of the Karara camp development.

- A Camp Management Plan will be developed which will manage camp associated issues including limiting access to buildings and other areas through provision of security fencing where required. Midwest will have an environmental manager responsible for the implementation of this management plan.
- Midwest will carry out regular assessment and management of noxious weeds outbreaks. Midwest acknowledges that DEC has spent time and money killing off

noxious weeds (in particular Paterson's Curse) and note the concern that soil disturbance will stimulate further outbreaks.

- The location of the piggery and rubbish dumps has been defined. The planned location of the camp avoids these sites and is shown on Figure 4.7.
- An Environmental Management Plan (similar to Tilley Siding) will be developed and implemented to manage noise and dust.

Due to the above reasoning the proponent believes that the establishment of this camp adjacent to the old Karara homestead provides the most suitable option for accommodation to service this component of the DSO project.

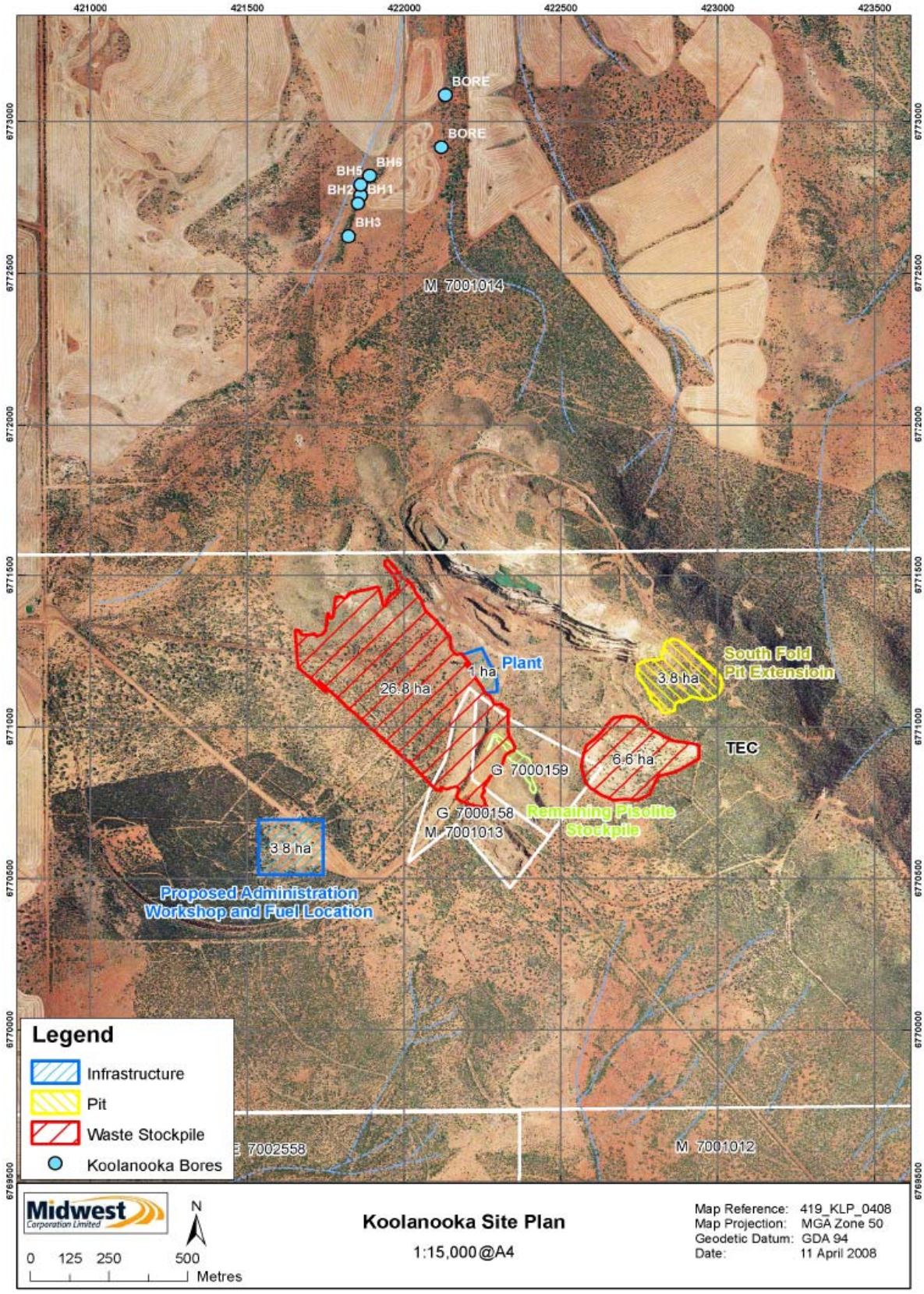


Figure 4-2 Koolanooka Site Plan

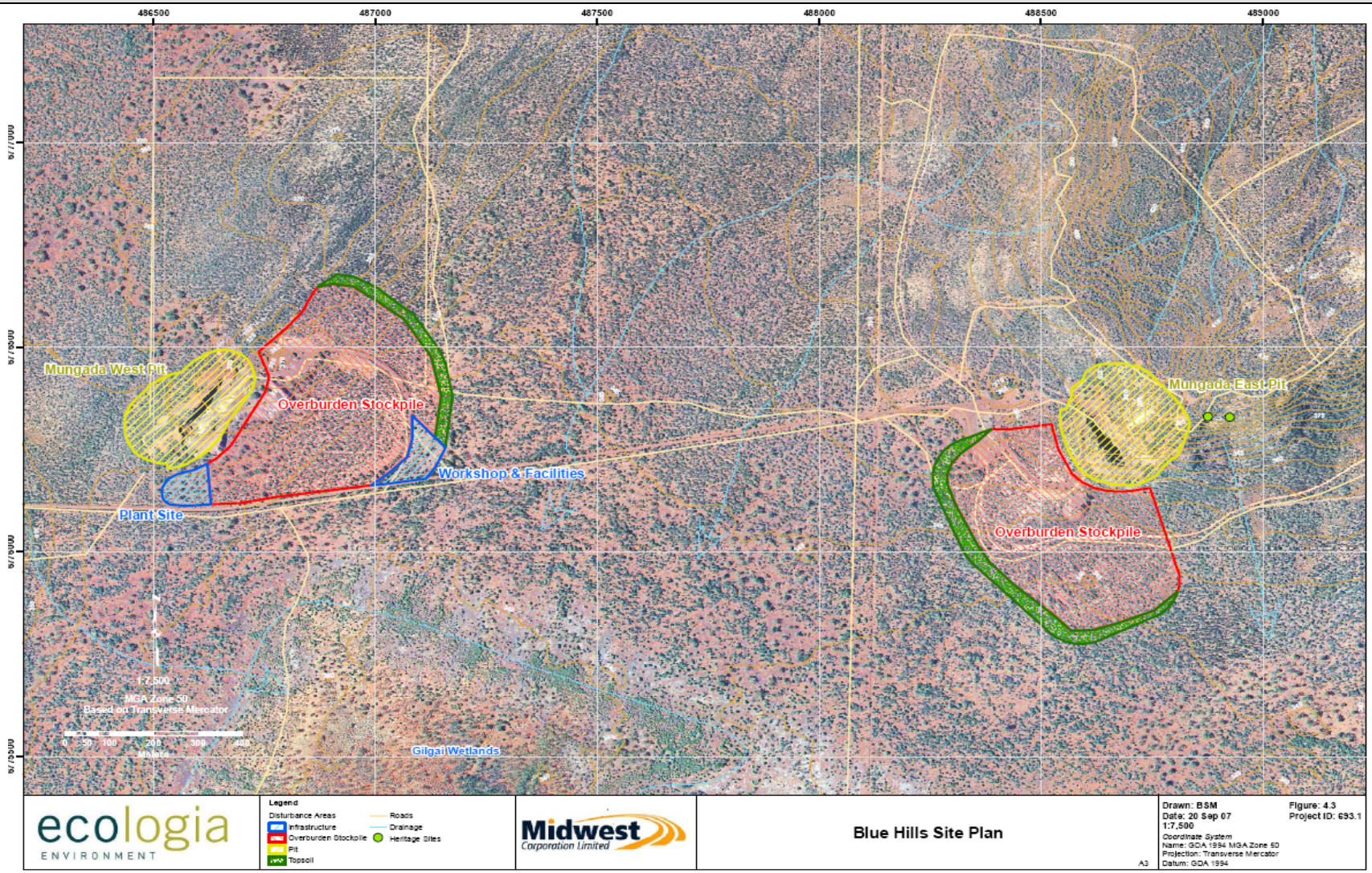


Figure 4-3 Mugunda East and West Site Plan

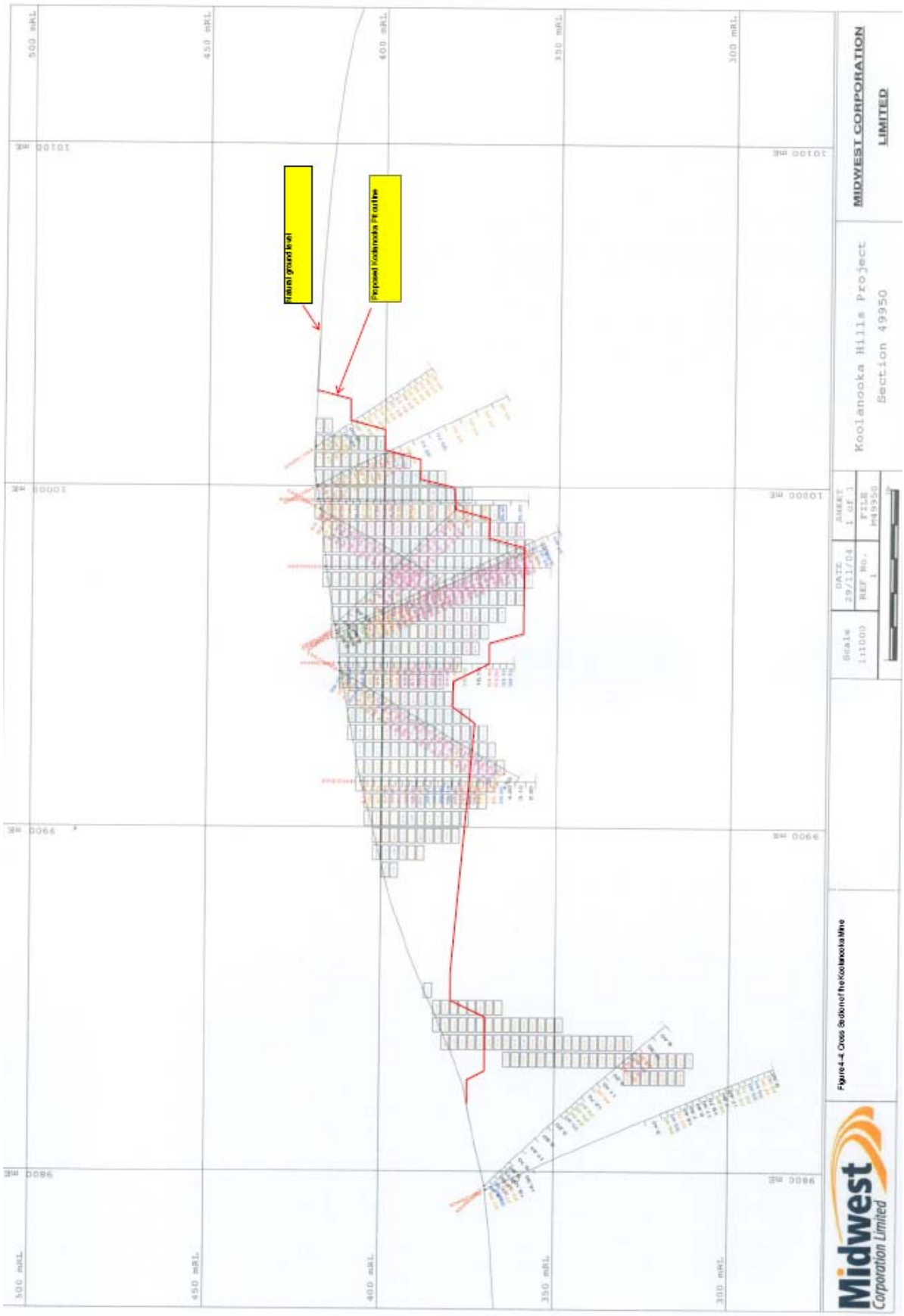


Figure 4-4: Cross Section of the Koolanooka Mine – South Fold Pit

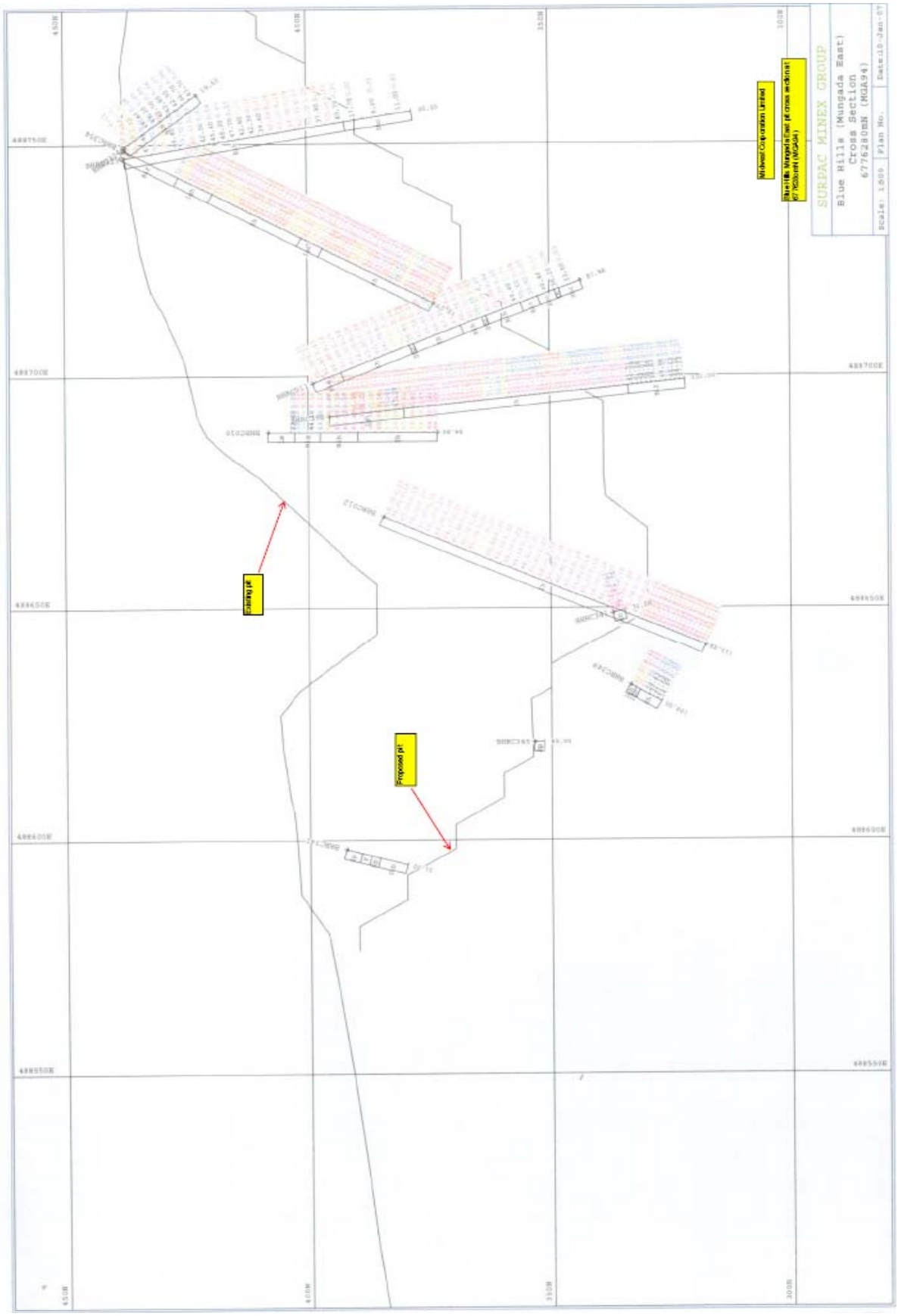


Figure 4-5: Cross Section of the Mungada East Mine

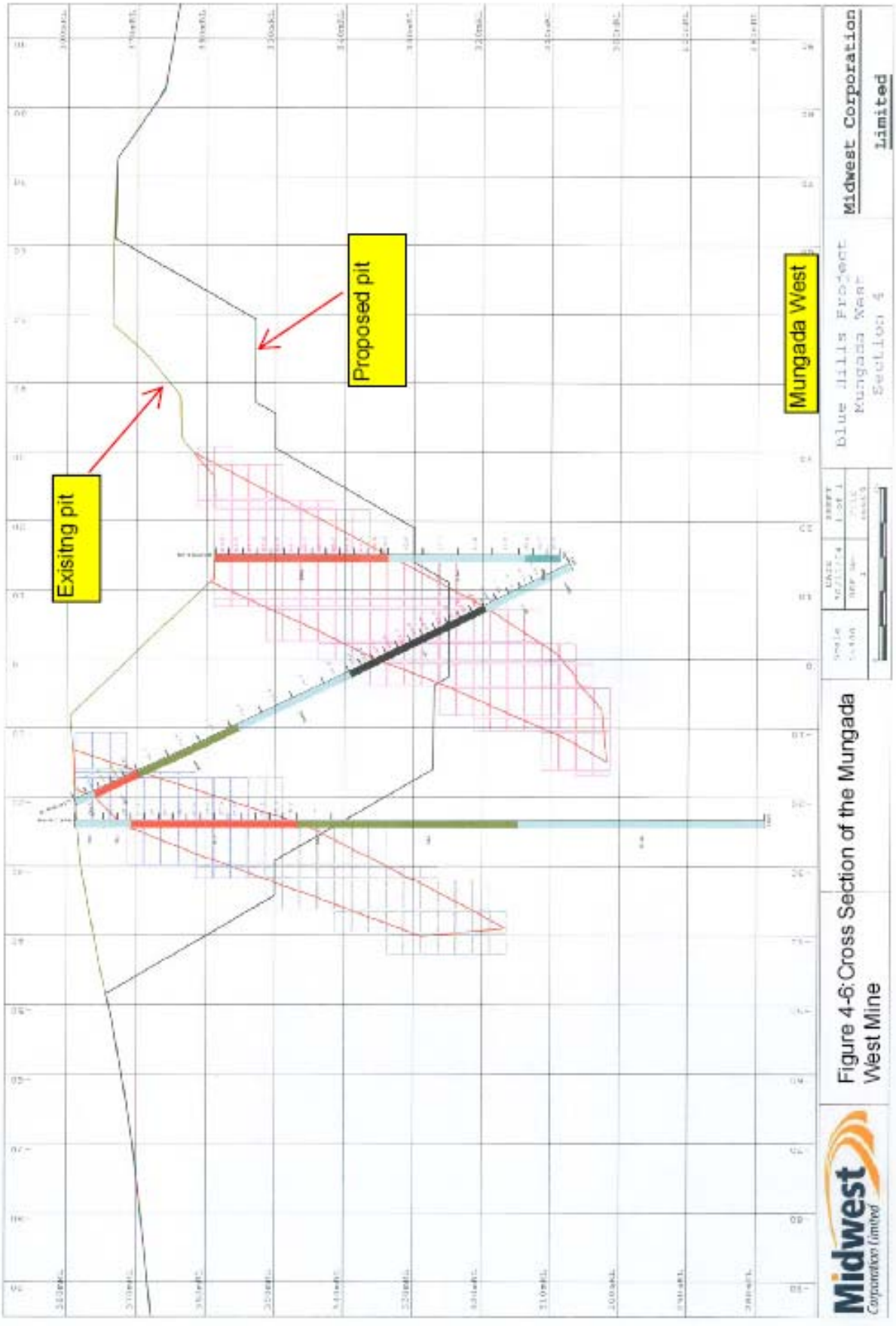


Figure 4-6: Cross Section of the Mungada West Mine

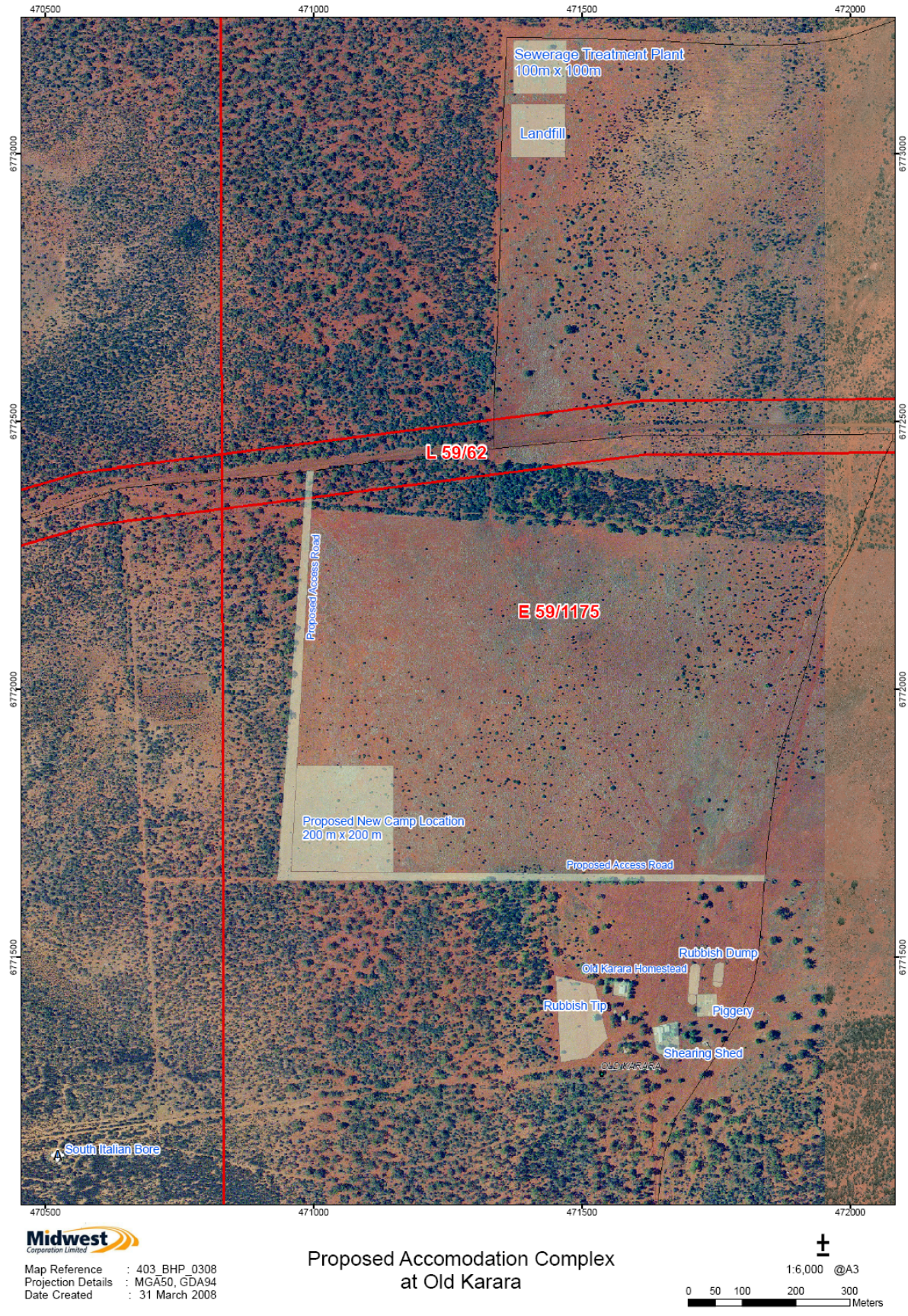


Figure 4-7 Proposed Accomodation Complex at Old Karara

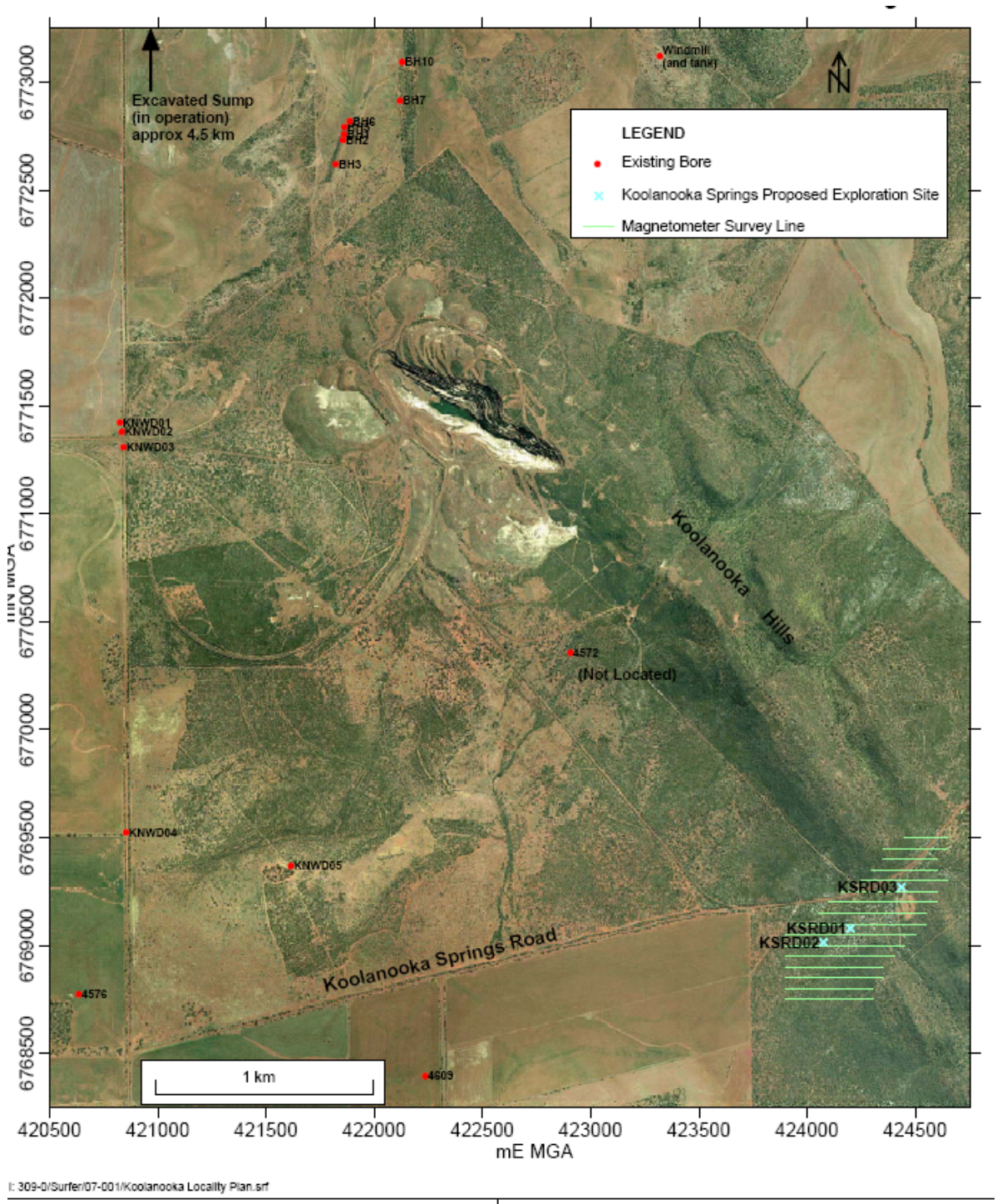


Figure 4-8 Location of existing bores at Koolanooka

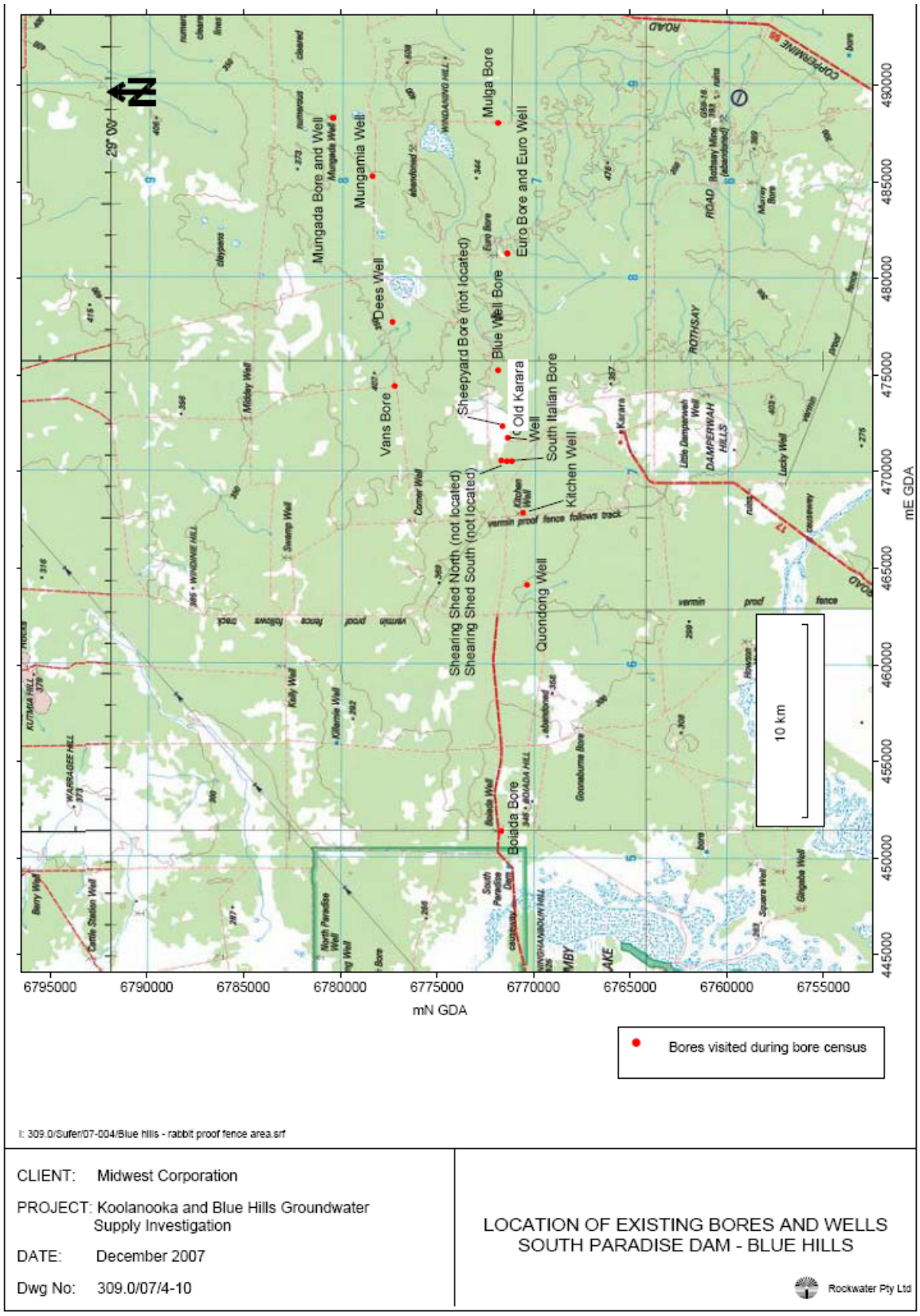


Figure 4-9 Location of existing bores at Blue Hills

5.0 PROJECT JUSTIFICATION

Iron ore was previously mined from Koolanooka and Blue Hills in the late 1960s-early 1970s.

Midwest is currently exporting previously mined material from existing stockpiles at Koolanooka at the rate of 1.0 Mtpa, through the port of Geraldton. An operational workforce of approximately 50 resides in Morawa and Geraldton, providing a significant economic benefit to the region.

The mines are well located, serviced by good quality all weather roads (bitumen and compacted gravel) and close to infrastructure. The town of Morawa is located 21 km to the west and the Port of Geraldton is approximately 160 km from the Koolanooka mine site (Figure 1-1).

The project has been designed to minimise environmental impacts, and utilises pre-disturbed areas wherever possible. Haul roads, waste dumps, ore stockpiles and infrastructure will all be located on previously disturbed land. Open cut access to the haematite ore adjacent to the existing pit at Koolanooka will require only 2.68 ha of addiotnal vegetation to be cleared, although the area is classified as having high conservation value and is part of a TEC. An additional 3.14 ha will be potentially impacted within the dust buffer zone area of influence. Additional predisturbed land will also be used, 5.6 ha for plant development and infrastructure and 32.6 ha forming overburden waste dumps.

40.8 ha of proposed conservation reserve vegetation will require clearing at the Blue Hills area and roughly 11.7 ha of previously disturbed land will be converted into pit areas. Additionally, 39.5 ha of regrowth vegetation will require clearing to repair the Mt Karara / Mungada Haul road to a functional state.

Other locations for project infrastructure were not compared for suitability against this proposal, as the works proposed for this Project will be mostly conducted within pre-existing pits and on sites that were previously disturbed. This restricts options to project layout flexibility but reduces further environmental impacts.

If the Project is not developed, the potential impacts listed in Section 8 will not occur, however, the potential social and economic benefits generated for the Midwest District and Morawa, including diversification of employment opportunities at a time of regional drought, will not be realised.

6.0 REGIONAL SETTING AND EXISTING ENVIRONMENT

6.1 GENERAL

6.1.1 Koolanooka

The Koolanooka mine site is located within the Shire of Morawa approximately 160 km east south-east of the Port of Geraldton (Figure 1-1). Surrounding lands covered by the project mining leases are generally held freehold by local farmers and pastoralists.

The mine site is at the north-western end of Koolanooka Hills, which rise approximately 140 m above the surrounding undulating plain striking north north-west to south south-east for 13 km. These hills are composed of BIF, which is preferentially resistant to erosion.

The Koolanooka mine site was previously mined from 1966 to 1972 as part of the Geraldton Operations Joint Venture (GOJV) and a large proportion of the land north of Koolanooka Springs Road has been previously disturbed (Plate 3-1).

The plains surrounding Koolanooka Hills are generally used for agriculture, predominantly wheat and sheep farming.

6.1.1.1 Land tenure

The mining and processing at Koolanooka will occur on Mining Lease 70/1013 and Mining Lease 70/1014. The whole of the existing and proposed disturbance occurs on private land Lot 1 which is owned by Midwest Corporation Ltd.

The export ore will be trucked along Munckton Road and Morawa-Yalgoo Road, both vested in the Shire of Morawa, to General Purpose Leases (G)70/221 and 70/213. Ore handling operations on these tenements are subject to a separate Mining Proposal which has been submitted to the Department of Environment and Conservation and the Department of Industry and Resources for assessment.

6.1.2 Blue Hills

The Blue Hills mines are located on Karara Station within the Shire of Perenjori approximately 220 km east of Geraldton and 60 km east of Koolanooka (Figure 1-1). The Blue Hills range consists of BIF, similar to the Koolanooka Hills; the name given to this ridge line is Windaning Ridge. Dips are generally steep and where the BIFs outcrop the topography is often rugged.

Exploration was conducted for iron ore deposits in the area in the 1960s and 1970s and two high grade iron ore deposits, Mungada East and Mungada West, were mined between 1970 and 1972. Records show that the Mungada West mine still contained high grade ore when mining ceased following the fulfilment of the supply contracts then in place.

The area surrounding Blue Hills was formerly a pastoral lease, but is now CALM Purchased Lease (CPL) 16 (Karara Station) vested with the Conservation Commission, and is under direct management by the Department of Environment and Conservation. The entire area encompassing Karara Station, combined with other nearby CALM purchased stations (Lochada, Kadji Kadji and Warriedar) is proposed to form one contiguous Conservation Park. Karara station is 109,291 ha in size, and includes Windaning Hill and the Blue Hills Range.

6.1.2.1 Land tenure

Mining, infrastructure areas and overburden stockpiles at the Mungada East and West pits will occur on Mining Lease (M) 59/595 with a small ingress into M 59/596. M 59/595 and M 59/596 overlay CPL 16.

The haul road on Miscellaneous Licence 59/62 (Mungada to Koolanooka) overlies CPL 16 at its eastern end and continues onto CPL 23 at its western end. It then continues west onto State Timber Reserve 2, Vacant Crown Land (VCL 12727) and into TEC 359Shb01. At its western end it connects directly with the Mungada public road vested in the Shire of Morawa. The haul route then continues along the Koolanooka Spring Road to Fallon Road from which it enters the Koolanooka mine site and processing area.

6.2 CLIMATE

The climate in the Koolanooka / Blue Hills area is semi-arid with a mean annual rainfall of approximately 335 mm. Annual evaporation is 2,315 mm and far exceeds the annual rainfall of 335 mm. Monthly average rainfall and temperatures recorded at Morawa, 21 km to the west of the mine site are illustrated in Figure 6-1 which shows that the average monthly rainfall peaks during winter months.

Wind roses for Morawa demonstrate that the wind regime is highly seasonal (Figure 6-2). During summer, morning wind speeds of 11 km/hr to 30 km/hr from the north-east and south-east prevail, shifting to the south and south-west in the afternoon. During the winter months, winds abate to generally less than 10 km/hr, with less distinctive wind patterns. The combination of high wind speeds and high temperatures during summer produces elevated evaporation rates. Prevailing ambient dust levels are extremely high in these conditions

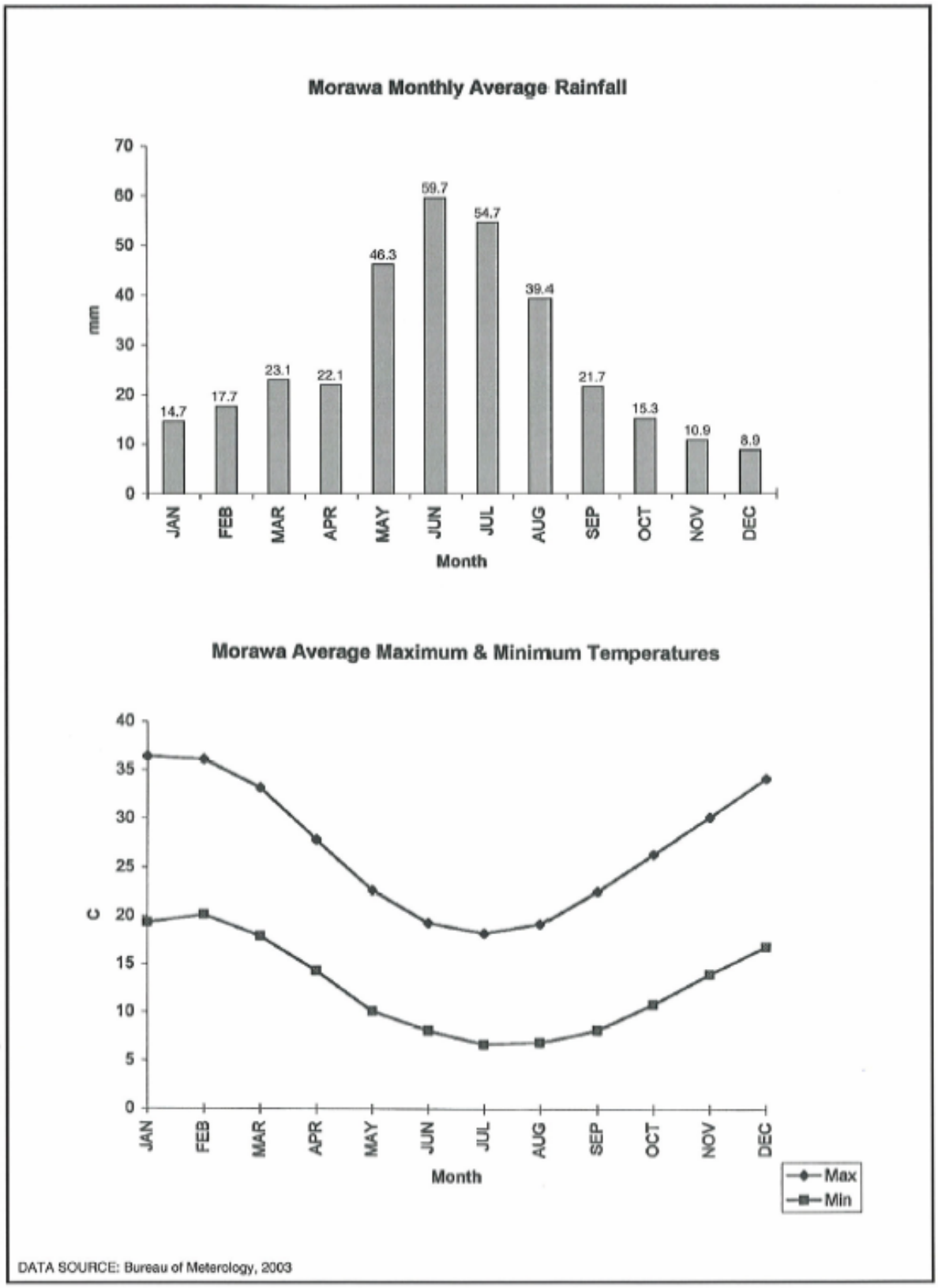


Figure 6-1 Rainfall and Temperature of the Koolanooka / Blue Hills Area

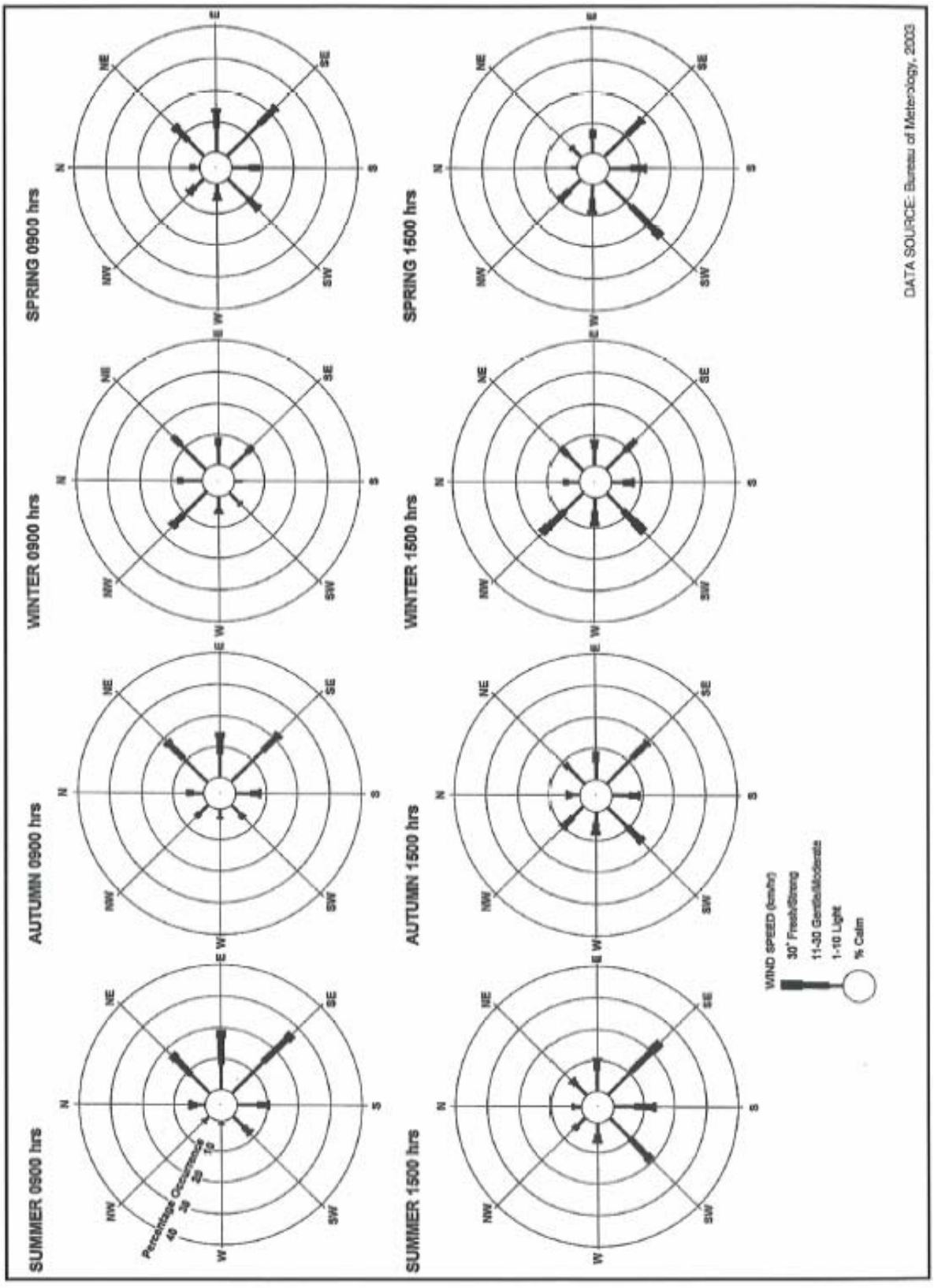


Figure 6-2 Wind Regime of the Koolanooka / Blue Hills Area

6.3 BIOREGIONS

The Koolanooka System is in the Greenough Region within the Irwin Botanical District. This botanical district is in the southern Murchison Region of the South-western Botanical Province (Beard, 1976a).

The Koolanooka study area is located within the Ancient Drainage subregion (AW1) of the Avon-Wheatbelt bioregion of Australia (Thackway and Cresswell, 1995) (Figure 6-3), in relatively close proximity to the intersection of the South-western and Eremaean Botanical Provinces of Western Australia. The study area is located within the Perenjori Botanical District (Beard, 1976c).

The Avon Wheatbelt is an area of active drainage dissecting a Tertiary plateau in Yilgarn Craton and is characterised by Proteaceous scrubheaths, rich in endemics, on residual lateritic uplands and derived sandplains, and mixed eucalypt, *Allocasuarina huegeliana* and Jam-York Gum woodlands on Quaternary alluvials and eluvials. Within this bioregion, AW1 is an ancient peneplain with low relief and a gently undulating landscape. There is no connected drainage; salt lake chains occur as remnants of ancient drainage systems that now only function in very wet years. Lateritic uplands are dominated by yellow sandplain. The total area of the subregion is 6,566,022 ha: most of which has been cleared of natural vegetation.

Figure 6-3 Interim Biogeographic Regionalisation for Australia (IBRA): Bioregions of the Project area.

The Blue Hills occur within the Yalgoo Bioregion on the boundary between the Austin Botanical District of the Eremaean Botanical Province and the Avon Botanical District of the South-west Botanical Province (Beard, 1990), hence it is an interzone between South-western Bioregions and Murchison (Figure 6-3). It is characterised by low woodlands to open woodlands of Eucalyptus, Acacia and Callitris on red sandy plains of the Western Yilgarn Craton and southern Carnarvon Basin. The latter has a basement of Phanerozoic sediments. The vegetation consists of Mulga, Callitris-E. s*alubris*, and Bowgada open woodlands and scrubs on earth to sandy-earth plains in the western Yilgarn Craton. The subregion is particularly rich in ephemerals. The subregional area is 4,858,849 ha, of which 11.6 % is vested in reserves.

Processes threatening these regions include loss of fauna habitat due to land clearing for the purpose of agriculture, grazing, the introduction of predatory exotic fauna species and introduced diseases. Weed proliferation, loss of biodiversity and the increased incidence of extensive wildfires caused by climate change and/ or inappropriate fire regimes are also threatening processes in the region. A major threatening process, rising saline groundwater, is unmanaged within the subregions.

6.4 GEOLOGY AND SOILS

Geologically, the area lies within the Yilgarn Craton of mainly crystalline Archaean rocks. The Koolanooka mine lies about 50 km east of the Darling Fault which separates the Yilgarn Craton from sedimentary rocks of the Perth Basin to the west. The Yilgarn Craton in the exploration areas comprises mainly granitoid rocks containing enclaves of older metamorphosed and folded supracrustal sedimentary, mafic and volcanic rocks. The older rocks include BIF which generally forms prominent linear ridges that protrude from the comparatively flat areas that are underlain by granitoid rocks. The surface of the Archaean rocks has been weathered so that fresh rock may be overlain by 100 m or more of weathered material.

Archaean rocks are commonly overlain by a Cainozoic veneer comprising sand, silt and clay of aeolian, alluvial, colluvial and lacustrine origins, and a discontinuous lateritic hardpan. Minor valley calcrete and silcrete occur in places. In some areas the sediments have been variously reworked by aeolian and alluvial processes (Rockwater, 2006).

6.4.1 Koolanooka

The major land system covering the Koolanooka mine site is the Koolanooka land system.

The Koolanooka land system comprises the Koolanooka Hills, a range of rolling to very steep low hills with gently inclined foot slopes, which have been extensively cleared for agriculture. The system comprises a complex of Archaean and Proterozoic rocks. Soils are rocky or stony and commonly shallow, grading to red gravely loams.

6.4.2 Blue Hills

The main Land Systems in close proximity to the Blue Hills mine site are the Tallering, Yowie and Pindar Land Systems (Payne *et al*, 1998).

The Tallering Land System is characterised by prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks. The soils of the hill slopes and ridges are shallow red earths and stony red earths with smaller areas of red clayey sands with ferruginous gravel found on the stony and gravely plains.

The Yowie Land System dominated by loamy plains, has soils of variable depth red clayey sands, hardpan loams and red earths on hardpan. Smaller areas of variable depth red clayey sands with ferruginous gravel over hardpan and deep red earths and juvenile alluvial deposits occur on the gravely plains and narrow drainage tracts of the land system.

The Pindar Land System is associated with loamy plains surrounded by sandplain. Soils of the loamy plains are deep and shallow red earths on hardpan and occasionally shallow red clayey sands on hardpan. The soils of the sand sheet areas are deep red clayey sands.

6.5 TOPOGRAPHY AND SURFACE DRAINAGE

The regional area has low topography, with elevations being generally between 250 and 400 m AHD. Prominent ridges such as Koolanooka Hills attain 450 m AHD (about 100 m above plain level); highest elevations exceeding 500 m AHD occur in the eastern sector, e.g. at Blue Hills and Mount Mulgine.

Drainage is mainly weak and low-gradient, predominantly to the Mongers Lake palaeodrainage system which passes a few kilometres to the north of Koolanooka Hills and includes the Yarra Yarra Lakes to the west of Carnamah (Rockwater, 2004b).

6.5.1 Koolanooka

The previous mining operations are clearly visible from the plains to the west of the Koolanooka Hills. The existing Koolanooka mine site has been used as an informal lookout and picnic area, and drainage across the Koolanooka area is shown in Figure 6-4.

Koolanooka Spring, a near surface, ephemeral creek line that relies on recent rainfall is located 4 km to the south east of the Project between two granite hills, draining northwards. There is no surface water or flow in the dry months of the year. The spring is reported to carry water in wet seasons, which is attributed to the seepage of local rainwater through the soil and weathered bedrock from adjacent hills and slopes onto the gully floor (Rockwater, 2004a).

6.5.2 Blue Hills

The Blue Hills form some of the highest elevations in the area, exceeding 500 m AHD in a series of eastern ranges.

There is an ephemeral Gilgai formation, approximately 700 m south of the west Mungada pit. This area has been previously identified as a Gilgai formation, rather than a classic wetland.

It is not anticipated that the Project will influence this feature as it is located well away from the existing pit, and is separated from the pits by the Mt Karara / Mungada haul road. Additionally, hydrocarbon and waste management at the East and West Mungada pits will fully adhere to commitments made in Section 8..9.4 of this PER and in the associated project EMP. Through effective implementation of these measures, Midwest will avoid any potential impacts of hydrocarbons and waste from entering this area.

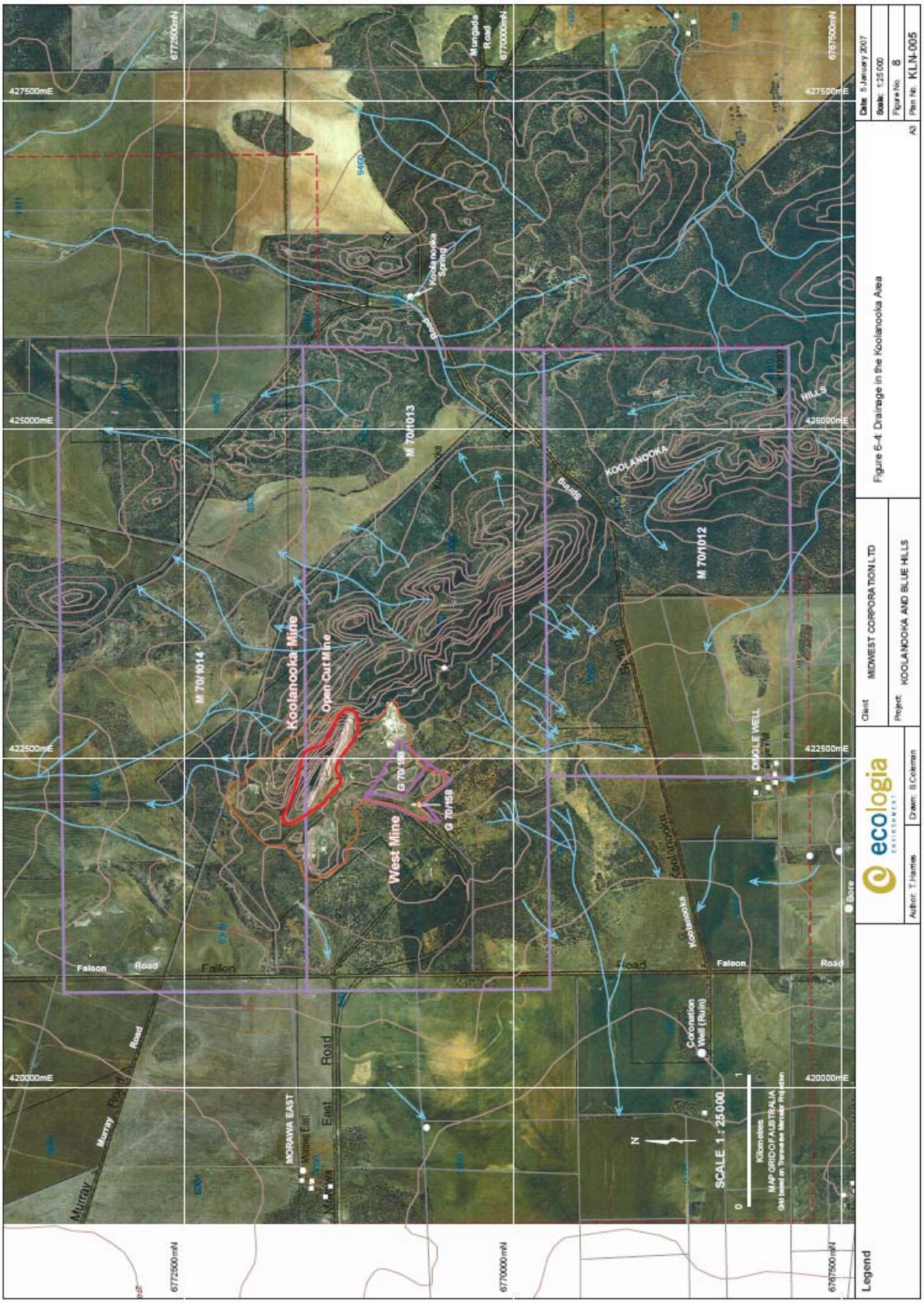


Figure 6-4 Drainage in the Koolanooka Area

6.6 HYDROLOGY

Within the Yilgarn bedrock area, many bores and wells exist that provide farm water supplies. In most cases, rates of supply are quite low (to provide stock watering) and salinity in the range 2,000 to 5,000 mg/L TDS. Fresh groundwater is uncommon, generally being associated with hilly areas. High rates of water supply may be available from the Proterozoic-age chert and dolomite of the Moora Group, which are located near and east of the Darling fault.

The major surface-water palaeodrainage that locally contains playas such as Mongers Lake, Mullewa Lake and Yarra Yarra Lakes would have an associated palaeochannel (buried channel) containing hypersaline groundwater. Palaeochannel sand aquifers, generally at depths of 50 to 100 m, are relatively high yielding but none has been tapped in the present area because there is no use for the high-salinity water, however, one has been test-drilled in the vicinity of Yarra Yarra Lakes (Yesertener, 1999). In times of flood, the palaeodrainage carries surface water southwards to Moora; in normal years the lakes are local surface-water and groundwater sinks.

Small, brackish/saline groundwater supplies characterise the fault block of Permian and Archaean rocks between the Darling and Urella Faults.

6.6.1 Koolanooka

The regional ground water level generally occurs at around 255 m AHD. Annual evaporation far exceeds annual rainfall, however some minor subsurface recharge does occur during intense rainfall events.

The existing Koolanooka pit is reported to have been used for water when it was operated by Western Mining Corporation. Groundwater in the bottom of the existing pit is saline but personal communication with ex WMC employees suggests inflowing groundwater during previous mining operations was relatively fresh (Johnston, pers com., 2004). The pit currently contains a water body measuring about 9,600 m^2 in area and an estimated 2 m in depth. Water level is about 285 m AHD. A recent sample has a salinity of 20,000 mg/L TDS (57% of the salinity of seawater). Calculations of salinity for a water body of 8 m depth suggests that the original salinity of the groundwater would have been about 2,500 mg/L TDS. Given that groundwater inflow does not keep pace with the summer evaporation of about 11 mm/d, the rate of inflow into the pit at current rates is calculated to be less than 110 m^3/d (Rockwater, 2004b).

Pit dewatering will not be required as the proposed extensions to the Project excavation on the Koolanooka pit will not proceed below the water table. The South Fold orebody is effectively a cut-back to the south-east of the existing pit and the lowest level of the proposed pit will be approximately 68 m above the free standing water table in the pit and 95 metres above the known in-ground groundwater table. Water from the existing pit will be used for site dust suppression and for watering of the haul roads. No water will be pumped or discharged off site.

Small quantities of low-salinity groundwater occur in overburden, mainly weathered granitic rock, up to about 2 km west of the pit and at other locations along Fallon Road. It appears to have originated from run-off from the Koolanooka Hills and is tapped by several

farm windmills. While the salinity of 1,100 mg/L TDS is favourable, the available quantity is probably inadequate by itself for the Midwest operation.

Approximately 180 kl/day will be required for dust suppression on the DSO project, with an additional 1000 kl / day being required during the establishment of the haul road, which should occur for a one year period from early 2009. An additional 157 kl / week of potable water will be required for the combined workforce. This requirement will be met by groundwater from local bores in the fractured BIF and quartzite strata, from the existing pit waters in the bottom of the Koolanooka pit and from the Karara camp area. These waters will be blended if necessary before use to reduce total salinity concentration to acceptable levels for dust suppression activities.

For dust suppression at Blue Hills and for use during construction of the haul road, all water required will be transported by truck from Koolanooka sources. As demonstrated in the most recent water resource assessment by Rockwater (Rockwater, 2007), identified bore sources at Koolanooka are capable of producing in excess of 240 kl/day, with an additional 110 kl/day expected to be available from the Koolanooka pit. Once licensed, an open sump at Koolanooka will allow for additional water supply, and this is estimated to be in excess of 200 kl/day. The location of all water sources to be utilised by Midwest has been provided in Figures 4.8 and 4.9. Details of pumping tests completed on these bores to determine sustainable draw have been summarised by Rockwater (Rockwater, 2007), and monitoring management of water quality and water table depth are discussed in Section 8.3 of this PER document.

For any new bores requiring development at a later stage, Midwest Corporation will obtain licenses from the Department of Water, for bore construction and for groundwater extraction, before usage of such sources commence.

Potable water for the Koolanooka facilities and the Karara camp will be obtained from the Water Corporation standpipe in Morawa, and from the existing well at Karara.

6.6.2 Blue Hills

The BIF strata in the main Midwest tenements at Blue Hills show broad folds additional to the tight along-strike folds common in many BIF-metasediment belts. At the Mungada pits the strata dip and plunge into the escarpment, therefore bores would need to be located on cross-cutting faults or down-dip of the escarpment, i.e. on relatively high ground.

All water requirements for the Blue Hills area will be brought in by truck from Koolanooka sources.

6.7 VEGETATION AND FLORA OVERVIEW

The results of recent vegetation and flora surveys at Koolanooka and Blue Hills, completed by ATA, *ecologia* Environment and Bennett Environmental Consulting, are presented below, along with the results of other associated survey work that has been undertaken previously in or adjacent to these areas.

6.7.1 Regional Vegetation

6.7.1.1 Koolanooka Vegetation

Beard's (1976) vegetation classification of Western Australia, the is commonly used to assist with the description of regional vegetation. The Koolanooka System is included in Beard's Greenough Region within the Irwin Botanical District and this botanical district is in the southern Murchison Region of the Southwestern Botanical Province (Beard, 1976a).

The vegetation associated with the Koolanooka System is described as consisting of several vegetation types (Beard, 1976a). Vegetation Type 1 comprises open woodland of Sheoak (referred to by Beard, 1976, by the synonym *Casuarina huegeliana* [*Allocasuarina huegeliana*], however this is treated as cf. (interpreted as) *Allocasuarina acutivalvis* in a recent report by Meissner and Caruso (2006), as there are no WA Herbarium records of *A. huegeliana* for Koolanooka Hills). Vegetation Type 2 comprises the mallee *Eucalyptus ebbanoensis, Acacia acuminata* and *Dodonaea inaequifolia* interspaced with thickets of *Allocasuarina campestris* (referred to by Beard, 1976, by the synonym *Casuarina campestris*). Vegetation Type 3 comprises *Acacia acuminata* thicket with *Grevillea stenostachya, Melaleuca cordata, M. nematophylla* and *M. radula* and Vegetation Type 4 comprises *Eucalyptus loxophleba* (York Gum) woodland interspaced with the same thicket, which forms the vegetation pattern on the foot slopes of Koolanooka Hills, while the granite outcrops support mixed *Acacia* spp. (*A. tetragonophylla, A. quadrimarginea* and *A. ramulosa*) (Beard, 1976a).

Five plant assemblages of the Koolanooka System are listed as Threatened Ecological Communities (TECs) by the Department of Environment and Conservation (DEC). Beecham (2001) lists the TECs as: *Allocasuarina campestris* shrub over red loam on hill slopes; shrubs (such as *Acacia* spp.) and emergent mallees on shallow red loam over massive ironstone on steep rocky slopes; *Eucalyptus ebbanoensis* subsp. *ebbanoensis* mallee and *Acacia* spp. scrub with scattered *Allocasuarina huegeliana* (c.f. *Allocasuarina acutivalvis*, see above) over red loam and ironstone on the upper slopes and summits; *Eucalyptus loxophleba* woodland over scrub on the foot slopes; and, mixed *Acacia* spp. scrub on granite.

The combined Koolanooka Hills TEC occurs over two areas totalling 5419 ha (M. Morley, DEC, pers.comm. 18th Dec 2006), which is 25 ha less than the 5444 ha stated in the Koolanooka Interim Recovery Plan (Hamilton-Brown, 2000), see Figure 6.6. As it is unclear where the area reduction has occurred, calculations of the percentage of the TEC to be impacted by the project are based on the areas given in the literature and not that stated by the DEC.

The plant assemblages of the Koolanooka System TEC are split into two occurrences, one at Perenjori Hills and the other at Koolanooka Hills. The land area of Koolanooka Hills that will be impacted by the project is 4.46 ha which constitutes 0.13% of the Koolanooka Hills TEC (Table 6-1) or 0.08% of the total TEC area of the Plant Assemblages of the Koolanooka System. The Koolanooka mine is located in the northern portion of Koolanooka Hills and covers 1665 ha of the Koolanooka Hills TEC occurrence. It is estimated that of this original TEC area, 20% remains untouched (i.e. 333 ha). The remaining undisturbed occurrence is on Crown land (2783 ha), while 380 ha is freehold land, none of which is fenced to prevent grazing (Hamilton-Brown, 2000). Eighty nine percent of the plant

assemblages of the Koolanooka System remain, and this includes the TEC at Perenjori Hills (Hamilton-Brown, 2000).

Table 6-1 Threatened Ecological Communities Impact Table

Restricted Communities Impact Table					
TEC – Koolanooka System	Land Status	Condition	# Total known Koolanooka System TEC occurrences	Estimated Area (ha)	Proposed impact (%)
Koolanooka Hills	Private land, Leasehold and Crown Land	Slightly modified	1	3496	0.13%
Perenjori Hills	Private land	Moderately modified	1	1948	0%

(Areas from Hamilton-Brown, 2000).

6.7.1.2 Blue Hills Vegetation

Blue Hills is close to the Irwin Botanical District and the Austin Botanical District Boundary, therefore it lies in the South-western Interzone, a marginal area in the southern Murchison Region, which is particularly rich in ephemerals. (Beard, 1976a).

In Beard's (1976) vegetation classification, Blue Hills occurs in the Yalgoo Subregion of the Austin Botanical District within the Eremaean Botanical Province. The Yalgoo Subregion is a transitional area from the Eremaean Province where the vegetation is mostly Eremaean in character but with slight variation due to an increase in rainfall.

The major vegetation types of the Yalgoo Subregion include:

- heath on granite outcrops (Borya, Thryptomene, Baeckea and Calycopeplus);
- acacia scrub (Acacia acuminata, A. ramulosa and A. quadrimarginea);
- acacia-Melaleuca thicket (Acacia ramulosa, A. acuminata, Melaleuca uncinata with variations including M. nematophylla);
- scrub with scattered trees (*Acacia ramulosa, A. acuminata, Hakea preissii*, *Eucalyptus loxophleba, E. oleosa, Callitris columellaris, Bursaria spinosa* and *A. aneura*) and;
- salt flats surrounded by samphire (Halosarcia spp., teatree e.g. *Melaleuca* / *Leptospermum*, and *Acacia-Eremophila* scrub).

The vegetation of the Yalgoo Subregion becomes lower and denser towards the South-western Botanical Province as *Acacia aneura* (mulga - adapted to intermittent rainfall) begins to disappear and is replaced by other *Acacia* species.

In the inland part of the Yalgoo Subregion the vegetation consists of:

- mixed Acacia scrub with scattered *A. aneura* on the plains;
- scrub of *A. ramulosa / A. acuminata* on the hills;
- *A. ramulosa / A. murrayana* on the sand-plains at higher levels;
- scrub of *A. sclerosperma / A. eremaea* with *Atriplex* and *Maireana* on lower-lying flats;
- stony hills with *Acacia ramulosa* and *A. acuminata* dominant and joined by *A. quadrimarginea and A. stereophylla*; and
- understorey vegetation including *Allocasuarina campestris, Melaleuca uncinata* and *Thryptomene australis*.

Adjacent to Rothsay in the south of the Yalgoo Subregion, steep ridges of Archaean metamorphic banded ironstone rocks occur. These formations are covered with shrublands of *Acacia quadrimarginea* and *A. acuminata* with a dominant presence of *A. ramulosa, Casuarina* sp. and *Melaleuca uncinate,* sometimes with scattered *Eucalyptus loxophleba* and *Allocasuarina dielsiana* (syn. *Casuarina dielsiana* referred to by Beard, 1976a).

The valleys in this part of the Yalgoo Subregion (adjacent to Rothsay where steep ridges trend SW-NE) are populated by *Acacia* scrub with scattered trees, whereas in the south-west of the region the valleys are mapped as eucalypt woodland. Various prominent hills and ranges remain to be described, however, the vegetation of Tallering Peak (a massif of banded ironstone and jaspilite) in the northwest of the subregion has been described as sparslely vegetated with shrubs of *Acacia quadrimarginea, A. ?coolgardiensis, Eremophila leucophylla, Thryptomene johnsonii,* a smaller *Baeckea* or *Thryptomene* sp. and *Ptilotus obovatus* (Beard, 1976a). However at Beard's scale of 1:100 000 little difference was noted between communities on granitoids and metamorphic sedimentary rocks (Markey & Dillon, 2006).

More broadly, the Austin Botanical District is characterised by mulga (*Acacia aneura*) low woodland on the plains, shrubs on the hills, and *Eucalyptus* species and *Triodia basedowii* on the sand plains (ATA, 2004a).

No Threatened Ecological Communities (TECs) occur within the Interim Biogeographic Regionalisation for Australia Yalgoo bioregion, (which corresponds to Beard's Yalgoo Subregion), however vegetation surveys undertaken to date have been limited with no regolith mapping available (Desmond and Chant, 2001).

6.7.2 Koolanooka Hills Project Area - Vegetation

6.7.2.1 Vegetation Previously Described for the Koolanooka Hills Project area

In 2003 a vegetation and flora survey of Midwest's lease area in the Koolanooka Hills was undertaken by ATA. A total of 220 taxa, belonging to 117 genera and 43 families, were recorded from the Koolanooka Hills study area. This total included 207 native and 13 introduced or non-endemic species. The dominant plant families recorded were Asteraceae (26 taxa), Mimosaceae (21 taxa), Myrtaceae (21 taxa) and Poaceae (19 taxa) (ATA, 2004b).

The vegetation of the project area, was described in ATA's report as closed tall shrub dominated by *Acacia assimilis* subsp. *assimilis*, *Allocasuarina campestris* and *Melaleuca filifolia* over herbland of mixed species and bare rock (ATA, 2004), see Figure 6.5.

A 2005 flora survey by DEC of the Koolanooka & Perenjori Hills recorded a total of 238 taxa, of which 217 were native and 21 were weed species (Meissner and Caruso, 2006). The dominant families were Asteraceae (39 species, 3 weeds), Myrtaceae (21), Poaceae (21 species, 11 weeds), Mimosaceae (19) and Chenopodiaceae (11). Eight priority species, five undescribed species and five taxa of interest were found during this survey. Five community types (one with two sub-types) were identified with differences attributed to changes of landform type and soil fertility. Five endemic species were identified, three of which were collected for the first time in this area (Meissner & Caruso, 2006).

While the indicator species for each community type are tabulated in this report, the different vegetation community types are not described.

6.7.2.2 Vegetation of the Current Koolanooka Hills Survey Area

Vegetation recorded during *ecologia*'s survey of the proposed impact area at Koolanooka Hills comprised the following types:

Vegetation type 1 (Plate 6-1) **:** Moderate upper hill slope to hill ridge, consisting of:

- *Allocasuarina acutivalvis subsp. prinsepiana / Acacia acuminata* in open to moderately dense tall shrubland;
- open to moderately dense *Acacia exocarpoides / Melaleuca fulgens subsp. fulgens / Daviesia hakeoides subsp. hakeoides* (sometimes *Acacia tetragonophylla / Comesperma volubile / Melaleuca radula*); and
- open medium shrubs.

Vegetation type 2 (Plate 6-2) **:** Steep to moderate hill slope, consisting of:

- *Allocasuarina acutivalvis subsp. prinsepiana / Calycopeplus paucifolius* scattered to sparse tall shrubs,
- *Acacia sclerosperma subsp. sclerosperma / Dodonaea inaequifolia* open to scattered medium to low shrubs

Neither of these vegetation types matched exactly those described in the ATA report (2004) or DEC's (2006) reports on the vegetation of Koolanooka.

Plate 6-1:Koolanooka Hills Vegetation Type 1

Plate 6-2:Koolanooka Hills Vegetation Type 2

6.7.3 Blue Hills Project Area - Vegetation

6.7.3.1 Vegetation Previously Described for the Blue Hills Project area

In 2004 a vegetation survey was undertaken by Bennett Environmental Consulting for ATA. Fifty-three vascular families, 126 genera and 212 taxa were recorded during the survey. This included 205 native and seven introduced or non-endemic taxa. The dominant families were Asteraceae, Mimosaceae, Poaceae, Chenopodiaceae and Myrtaceae (Bennett Environmental Consulting, 2004).

A vegetation map of the area was produced and the location of the project clearance areas has been superimposed on this map (Figure 6-7).

The vegetation of the immediate project impact area was mapped as comprising the following communities:

- tall shrubland of *Acacia* species typically dominated by *Acacia ramulaosa* subsp. *ramulosa* over a low open shrubland dominated by *Philotheca sericea* over an open herbland of annual daisies and/or bare ground (**Figure 6-7**, **Arr**);
- tall open scrub of mixed species typically *Allocasuarina acutivalvis* subsp. *prinsepiana*, *Calycopeplus pauciflorus*, *Malaleuca nematophylla* and *Acacia* species over a very open herbland/grassland or BIF rocks (**Figure 6-7**, **ApCp**);
- open shrub mallee of *Eucalyptus ewartiana* over a tall open scrub of *Acacia ramulosa* subsp. *ramulosa* over an open herbland of annual daisies and/or bare ground (**Figure 6-7**, **Ew**);
- low woodland to low open forest of *Eucalyptus loxophleba* subsp. *loxophleba* over a low shrubland often dominated by Chenopodiaceae over a very open herbland and bare ground (**Figure 6-7**, **B**);
- tall open scrubland of mixed species typically *Acacia assimilis* var. *assimilis* and *Melaleuca nematophylla* over a low open shrubland to open low heath of *Ptilotus obovatus* var. *obovatus* over a herbland of annual daisies (**Figure 6-7**, **AaPo**);

- tall shrubland of *Acacia ramulosa*, *Acacia burkittii*, *Melaleuca leiocarpa* and *Melaleuca uncinata* over a herbland of annual daisies and/or bare ground (**Figure 6-7**, **Mu**); and
- degraded areas, mined previously (**Figure 6-7**, **Deg**).

The vegetation of Blue Hills was described briefly by Bamford (2004) while undertaking a fauna survey in 2004. The Banded Iron Formation (BIF) and some granite landforms were found to support a shrubland and low woodland of Acacia, Allocasuarina and Myrtaceae plants growing in generally shallow, rocky-loam soils. The foothills, rocky-loam slopes and rocky outcrops support a tall shrubland of Narrow-leaf Mulga, *Acacia ramulosa* var. *linophylla* [syn. *Acacia linophylla*]. In this shrubland, emergent eucalypts also occur close to the foothills and in other low-lying areas where water may concentrate.

In 2005 the DEC undertook a vegetation survey of the central Tallering Land System specifically targeting hills and ridges of BIF between Mt. Gibson and Tallering Peak. Surveyed areas included Mt. Karara, Jasper Hill, Windaning Hill and its associated ridge (Windaning Ridge) and Tallering Peak. Nearly all of this area is covered by mining and exploration tenements. During this survey 414 taxa were recorded from 69 families, four of which were hybrids and 26 were introduced species. Of these, 12 taxa were of conservation significance and four were newly recorded taxa for the Yalgoo bioregion. Several significant range extensions were reported, including a new population of a Priority 1 species *Millotia dimorpha.* Nine unnamed taxa were collected, several of which are being considered for priority listing (Markey & Dillon, 2006).

Eight community types were recorded by Markey and Dillon (2006), of which three were further divided into distinctive sub-types. Community types near or at the Windaning Ridge areacomprise community type 1a, distributed from Mt. Karara to Mingar Hill and east of Warriedar Hill, which is distinguished from type 1b (widespread occurrence on hillslopes and isolated hills and ridges) by its relatively species poor status.

Indicator species for community type 1a include *Acacia* aff. *coolgardiensis* (A. Markey & S. Dillon 3313) and *Acacia sibiana* in the dominant stratum, over shorter shrubs; *Aluta aspera* subsp. *hesperia, Eremophila forrestii* subsp. *forrestii, Philotheca desertii* subsp. *desertii* and *Hemigenia* sp. Cue. *Cheilanthes adianthoides* is a characteristic rockfern groundcover species.

Indicator species for community type 1b include *Eremophila latrobei* subsp. *latrobei, Philotheca serica, Prostranthera magnifica* and *Cheilanthes adianthoides*.

Community type 2 is most relevant as it occurs on the western slopes of Windaning Ridge, near the old Mungada mine site. This community type is described as consisting of a range of shrublands and thickets over an understorey rich in shrubs and is said to be species rich (Markey & Dillon, 2006) with an average of 60 taxa per quadrat, where annuals contributed about half this number. Significant indicator species of this community type include *Allocasuarina acutivalvis*, *Melaleuca nematophylla*, *Grevillea paradoxa* and *Acacia sibiana* over low shrubs of *Aluta aspera* subsp. *aspera, Eremophila latrobei, Eremophila forrestii* and *Xanthosia bungei.* Taxa in two groups (of the eight identified from the larger survey area) were restricted to Mt. Karara and Windaning Ridge and included the new species *Acacia* sp. Karara (C. Godden 14) (P2) found on Windaning Ridge (Markey & Dillon, 2006).

The DEC's community type 3 also occurs within the area, on the plateau at the top of Windaning Ridge as well as at Badja Station. This community consists of sparse shrublands on the crests and moderately steep slopes of BIF, siltstones and chert. It is a moderately rich

community with an average of 22 taxa per quadrat. Indicator species include two Priority Flora, *Micromyrtus trudgenii*(P3) and *Calytrix uncinata* Craven (P3).

Also within the Windaning Ridge locality is the DEC's community type 4a, which is found on the east facing steep cliffs of Windaning Ridge as well as at Mt. Karara and Pinyalling Hill. It is noted to be a very species rich community with an average of 55 taxa per quadrat, again comprising mostly annual species. Indicator species include *Calycopeplus pauciflorus, Dodonaea petiolaris, D. viscosa* and *Cheilanthes* spp. The DEC considers the depauperate patches described from previous surveys of the lower Windaning slopes to be a subset of the surrounding vegetation but still harbouring species of conservation significance e.g. *Micromyrtus cuensis* J.W.Green ms (P1) (Markey & Dillon, 2006).

Between June and September 2006 Woodman Environmental Consulting surveyed the vegetation of the area between Mt. Karara and Mungada Ridge. They reported 508 plant taxa occurring in the surveyed area from 72 families and 202 genera (Woodman 2006b). However, this total was a combination of the results of previous surveys with those of the DEC's survey of the area.

Woodman's statistical analysis resulted in three vegetation super groups which were divided into 13 groups and further divided into 17 sub-groupings and 21 floristic community types (FCT); Super Group 1 comprised *Eucalyptus* woodlands and *Acacia* shrublands on flat outwash and valley areas with no exposed rock, while Super Group 2 comprised woodlands and shrublands on rocky BIF or other substrates from lowerslopes to crests, and Super Group 3 comprised *Acacia* shrublands with emergent *Eucalyptus* spp. on midslopes with lateritic gravels (Woodman, 2006b).

Of Woodman's 21 mapped FCTs the following occur around the Mungada East and West pit:

FCT 1a) Open woodland of *Eucalyptus loxophleba* subsp. *supralaevis* with open shrubland dominated by *Acacia tetragonophylla* and *A. obtecta* over chenopod species including *Sclerolaena diacantha* and *Rhagodia drummondii* on flats and drainage depressions (FCT 1a occurs in a mosaic with FCT 2).

FCT 2) Open woodland of *Eucalyptus loxophleba* subsp. *supralaevis* and/or *E. striaticalyx* subsp. *striaticalyx* over shrubland of mixed species including *Acacia erinacea, Eremophila pantonii* and *Senna stowardii* over mixed species including *Sclerolaena fusiformis* and *Scaevola spinescens* on flats and rocky lowerslopes with ironstone gravels.

FCT 4) Scrubland dominated by *Acacia ramulosa* var. *ramulosa* over sparse mixed species on flats and slopes. An indicator species for FCT4 is *Monachather paradoxus* and recorded within this community type are *Acacia acanthoclada* subsp. *glaucescens* (P3), *Cryptandra imbricata* and *Persoonia pentasticha* (P3) and the new taxa *Calotis* aff. *cuneifolia* (A. Markey & S. Dillon 3447) and *Drummondita* aff. *microphylla* (R. Cranfield 8586 A).

FCT 17) Shrubland of *Acacia* species dominated by *A. sibina* and *A.* aff. *coolgardiensis* (A. Markey & S. Dillon 3447), with *Melaleuca hamata* and/or *M. leiocarpa* and emergent *Eucalyptus ewartiana* on flats. *Persoonia pentasticha* (P3), *Acacia* aff. *coolgardiensis* (A. Markey & S. Dillon 3313) and *Drummondita* aff. *microphylla* (R. Cranfield 8586 A) were also recorded within this community type (FCT 17 occurs in a mosaic with FCT 4).

FCT 12) Shrubland of *Acacia* species including *Acacia assimilis* subsp. *assimilis, A ramulosa* var. *ramulosa, A. exocarpoides* and *A, sibina* over mixed species, including *Hibbertia arcuata, Calycopeplus paucifolius, Grevillea obliquistigma* subsp. o*bliquistigma* on flats to mid-upperslopes with ironstone gravel. Other species recorded in FCT 12 include *Acacia woodmaniorum* (DRF), *Micromyrtus cuensis* J.W.Green ms (P1), *Micromyrtus trudgenii*(P3), *Rhodanthe collina* (P1) and new taxa *Acacia* aff. *coolgardiensis* (A. Markey & S. Dillon 3313), *Acacia* sp. Karara (C. Godden 14) (P2), *Calotis* aff. *cuneifolia* (A. Markey & S. Dillon 3447), *Drummondita* aff. *microphylla* (R.J. Cranfield 8586A) and *Lepidosperma* sp. Karara BIF (A. Markey & S. Dillon 3468).

FCT 13) Dense shrubland of *Allocasuarina acutivalvis* subsp. *prinsepiana* with *Melaleuca nematophylla* over *Grevillea paradoxa, Xanthosia bungei* and *Lepidosperma* sp. Karara BIF (A. Markey & S. Dillon 3468) on mid-upperslopes on BIF. Along with *Acacia woodmaniorum* (DRF), *Micromyrtus trudgenii*(P3), *Millotia dimorpha* (P1) and *Rhodanthe collina* (P1) and new taxa *Acacia* sp. Karara (C. Godden 14) (P2), *Drummondita* aff. *microphylla* (R.J. Cranfield 8586A) and *Lepidosperma* sp. Karara (H.Pringle 3865).

6.7.3.2 Vegetation of the Current Blue Hills Survey Area

Vegetation recorded during *ecologia*'s survey of the proposed impact area at Blue Hills comprised the following types:

Table 6-2 Vegetation of the Blue Hills Survey Area

SITE	VEGETATION & HABITAT
Gentle to moderate hill slope	
E02, E06.	*Melaleuca nematophylla* / *Acacia ramulosa* var. *ramulosa* (sometimes *Acacia aulacophylla*) open low woodland to medium shrubland, over *Acacia exocarpoides* / *Dodonaea viscosa* subsp. *spatula* / *Micromyrtus trudgenii*(P3) open medium shrubs (Plate 6-3) (This vegetation type occurs within Woodman's FCT 12.)
Moderate hill slope	
W03, W05, E03, QW13, QW03, QW04, QE02.	*Acacia ramulosa* var. *ramulosa* (sometimes with scattered to open *A. aneura* var. *argentea / A. aneura* var. *major)* scattered low trees, over *Calycopeplus paucifolius* / *Micromyrtus trudgenii*(P3) tall shrubland, over sparse to open *Melaleuca nematophylla*, over open *Philotheca* ?*sericea* open low shrubs (also sometimes *P. brucei* subsp. *brucei* / *Acacia* ?*coolgardiensis* subsp. *coolgardiensis / Drummondita microphylla*) over sparse *Eremophila latrobei* subsp. *latrobei* dwarf shrubs (Plate 6-5) (This vegetation type occurs within Woodman's FCT4.).
E01	*Melaleuca nematophylla* / *Dodonaea viscosa* subsp. *spatulata* and *Micromyrtus* sp. Warriedar moderately dense tall shrubland, over *Acacia woodmaniorum* (DRF) / *Drummondita microphylla* shrubs over herbs, ferns, mosses and lichens (Plate 6-7) (This vegetation type occurs within Woodman's FCT 13 but without the dominant *Allocasuarina acutivalvis*

SITE	VEGETATION & HABITAT
	subsp. *prinsepiana*.)
E05, QE08, QE09	*Acacia ramulosa* var. *ramulosa or Calycopeplus paucifolius* / *Dodonaea petiolaris* open to moderately dense medium tall shrubland, over mixed shrubs (Plate 6-9) (This vegetation type occurs in Woodman's FCT 4; at one of these sites, *Persoonia pentasticha* (P3) was recorded in this vegetation type – along with *Micromyrtus* sp. Warriedar.)
QE01, QE06, QE12, QW08, QW11.	Moderately dense *Acacia ramulosa* var. *ramulosa or Acacia ramulosa* var. *linophylla low trees,* sometimes over moderately dense *Grevillea obliquistigma* subsp. *obliquistigma* high shrubs, over sparse mixed low shrubs, dominated by *Ptilotus obovatus* var. *obovatus.*
QW05, QE03	Open *Acacia ramulosa* var. *ramulosa* / *Acacia ramulosa* var. *linophylla* / *Acacia aneura* var. *argentea* low trees, over sparse mixed medium shrubs, over moderately dense to dense *Aluta aspera* subsp. *hesperia* medium and low shrubs.
QE07	Moderately dense *Acacia aulacocarpa* tall shrubs, over moderately dense mixed medium shrubs dominated by *Philotheca brucei* subsp. *brucei*, over open mixed low shrubs dominated by *Philotheca brucei* subsp. *brucei* / *Philotheca sericea*.
QE05	Sparse *Acacia ramulosa* var. *linophylla* low trees, over open *Acacia ramulosa* var. *linophylla* high shrubs, over open *Philotheca sericea* low to medium shrubs.
QW06	Scattered outcropping *Melaleuca hamata* low trees, over moderately dense *Acacia ramulosa* var. *ramulosa* high shrubs, over sparse *Philotheca deserti* subsp. *deserti* low shrubs.
Hillcrest to moderate upper hill slope	
W06	*Melaleuca nematophylla* / *Acacia assimilis* subsp. *assimilis* moderately dense tall shrubland over other mixed shrubs (Plate 6-11). (This vegetation type occurs loosely within Woodman's FCT 12, but with *Melaleuca nematophylla* and Bennett's AaPo).
Steep hill crest to rocky outcrop	
W04, QW14	*Acacia ramulosa* var. *ramulosa* / *Acacia assimilis* subsp. *assimilis* / *Acacia acuminata* open medium shrubland, over *Philotheca ?sericea* and other open low shrubs (Plate 6-10). (This vegetation type occurs loosely within Woodman's FCT 12, but with *Acacia acuminata*.)

SITE	VEGETATION & HABITAT
Moderate to gentle rocky ridge crest/hill crest	
E04	*Allocasuarina acutivalvis* subsp. *prinsepiana* / *Melaleuca nematophylla* / *Calycopeplus paucifolius* moderately dense tall shrubland (Plate 6-8). (This vegetation type occurs loosely within Woodman's FCT 13.)
Undulating plain / Footslope	
W02, W08, QE04, QW12, QW01, QW09.	*Eucalyptus loxophleba* subsp. *supralaevis* open medium woodland, over *Acacia assimilis* subsp. *assimilis* (sometimes *Acacia obtecta* or *Acacia ramulosa* var. *ramulosa*) over *Ptilotus obovatus* var. *obovatus* / *Dodonaea inaequifolia* (or sometimes mixed chenopods) dwarf shrubs (Plate 6-4). (This vegetation type occurs loosely within Woodman's FCT 1a and FCT 2.)
W01, W07, QW07, QW10, MH(01), SH.	*Acacia ramulosa* var. *ramulosa* (sometimes with open *Acacia burkittii* and sparse *Melaleuca leiocarpa* / *Exocarpos aphyllus*) sparse to open tall shrubland, over scattered *Hakea recurva* subsp. *recurva* low to tall shrubs, over sparse *Hibbertia arcuata* / *Philotheca brucei* subsp. *brucei* / *Philotheca sericea* / *Dodonaea inaequifolia* / dwarf shrubs (sometimes ?*Waitzia* sp. and *Ptilotus obovatus* var. *obovatus* herbs and shrubs) (Plate 6-6). (This vegetation type occurs loosely within Woodman's FCT 4.)
QE10	Sparse *Eucalyptus ewartiana* medium mallee trees, with open *Acacia ramulosa* var. *ramulosa* / *Acacia ramulosa* var. *linophylla* high shrubs, over scattered *Ptilotus obovatus* var. *obovatus* low shrubs.
QE11	Scattered *Acacia aneura* var. ?*argentea* medium trees, over open *Acacia ramulosa* var. *linophylla* / *Grevillea obliquistigma* subsp. *obliquistigma* low trees, over sparse *Calycopeplus paucifolius* high shrubs, over open *Aluta aspera* subsp. *hesperia* medium shrubs.
QW02	Dense *Acacia coolgardiensis* subsp. *effusa* medium tall trees over moderately dense *Eremophila clarkei* and *Drummondita microphylla* medium shrubs.

Plate 6-3: Blue Hills – Gentle to moderate hill slope

Plate 6-4: Blue Hills – undulating plain

Plate 6-5: Blue Hills – moderate hill slope

Plate 6-6: Blue Hills – undulating plain

Plate 6-7: Blue Hills – moderate hill slope

Plate 6-8: Blue Hills – moderate to gentle rocky ridge crest/hill crest

Plate 6-9: Blue Hills – moderate hill slope

Plate 6-10: Blue Hills – steep hill crest to rocky outcrop

Plate 6-11: Blue Hills – hill crest to moderate upper hill slope

6.7.4 Sampling Adequacy

6.7.4.1 Koolanooka Sampling Adequacy

The flora and vegetation survey was conducted using *EPA Guidance Statement No. 51: Guidance for the Assessment of Environmental Factors: Terrestrial flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004), and the survey methods produced quadrat-based quantitative data.

Two 20 m x 20 m quadrats (chosen to be representative of the vegetation present) were intensively surveyed for all vascular flora species present. Any plant species not present in the quadrats but observed while traversing the area were collected opportunistically.

The quadrat size used is that recommended for the area to be impacted. The area to be surveyed at the Koolanooka mine site was relatively small, only 4.46 ha, and due to the limited area, few vegetation types were encountered. The mine site survey area was revisited a second time and sampling adequacy is therefore considered to be sufficient.

6.7.4.2 Blue Hills Sampling Adequacy

Mungada East and West were surveyed several times using the same methods mentioned above. Seventeen quadrats were assessed at Mungada East and 24 at Mungada West. In addition the whole of the proposed impact areas at both sites were surveyed for Priority Flora.

Data from previous consultants' surveys and DEC surveys were accessible and used to further describe the vegetation types in the area surveyed by *ecologia*.

6.7.5 Previous Survey Results for the Project Area

6.7.5.1 Koolanooka Hills

ATA recorded 220 taxa during its survey of Koolanooka Hills and of the road and rail areas within the Midwest mining leases. This number included 117 genera from 43 families, 13 of which were weed species (ATA, 2004b).

DEC, during its survey of the Koolanooka and Perenjori Hills, recorded 237 taxa from 53 families, of which 21 were weeds (Meissner & Caruso, 2006).

6.7.5.2 Blue Hills

Bennett recorded 212 taxa, during a survey of Blue Hills and the surrounding Karara Station. This included 126 genera from 53 families, seven of which were weed species (Bennett, 2004).

During the 2004 DEC survey of the Central Tallering Land System, which includes Blue Hills, a total of 414 vascular flora taxa, from 69 families, was recorded, and this total included four hybrids and 26 introduced species (Markey & Dillon, 2006).

Woodman's 2006 survey results, combined with previous Woodman surveys and results from DEC's survey of the central Tallering Region (Markey & Dillon, 2006), give a total of 72 families, 202 genera and 508 taxa, of which 25 were weed (introduced) species (Woodman, 2006b).

6.7.5.3 Koolanooka - Mungada Haul Road

Woodman conducted flora survey and plant community mapping of the Mungada haul road for the GindalbieHematite Project (Woodman, 2006a). Two hundred and six vascular plant taxa, including seven introduced taxa, were recorded during flora surveys of the Mt Karara / Mungada Haul Road undertaken in 2004 and 2005 (Woodman, 2006a).

6.7.6 Current Survey Results for the Project Area

6.7.6.1 Koolanooka Hills

Forty-five taxa from 25 families and 35 genera were recorded during *ecologia's* Koolanooka survey (Appendix G, Table G-1). Of these taxa, one was identified to family level only, one to a query genus level and one to a query species within a known genus; two weed species were recorded during the survey.

6.7.6.2 Blue Hills

Ninety-four taxa from 34 families and 52 genera were recorded during *ecologia*'s survey at Mungada East (Appendix G, Tabel G-2). Of these taxa, one was identified to family level

only and two were confirmed to genus level only; four alien (weed) species were recorded during the survey.

Eighty-three taxa from 29 families and 43 genera were recorded during *ecologia's* survey of Mungada West (Appendix G, Table G-3), and of these taxa, one was identified to family level only, and seven were confirmed to genus level; no introduced (weed) species were recorded during the survey.

6.7.7 Flora of Conservation Significance

Environment Protection and Biodiversity Conservation Act 1999

At a National level, flora is protected under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act 1999). The Act lists species that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependent, Extinct or Extinct in the Wild (for definitions of categories, see Appendix E Table E-1).

Four species of nationally threatened flora have been recorded in the vicinity of the Koolanooka Hills project area (Dept of the Environment and Water Resources, 2007); *Eremophila viscida* (Rare), *Halosarcia bulbosa* (Rare), *Eucalyptus synandra* (Rare) and *Eremophila nivea* (Rare). The first two taxa were recorded by ATA in an earlier survey of the area (2004b). (Appendix F, Table F - 1)

One species of nationally threatened flora is known from the vicinity of the Blue Hills project area (Dept of the Environment and Water Resources, 2007); *Eucalyptus synandra* (Rare) is known from along Emu Fence Road on Karara Station (Woodman, 2006b). (Appendix F, Table F-1).

None of these EPBC listed flora species were collected during the current Koolanooka and Blue Hills surveys.

Threatened Ecological Communities

Threatened Ecological Communities are defined as:

'*naturally occurring biological assemblages that occur in a particular type of habitat the sum of species within ecosystems and, as a whole, provide many of the processes that support specific ecosystems an provide 'ecological services.*' (DEC, 2003).

Changes to the landscape and native habitat as a result of human activity have placed many endemic species and unique habitats at risk. The Australian Government mechanism for national environment protection and biodiversity conservation is the Environment Protection Biodiversity and Conservation (EPBC) Act (1999).

The EPBC Act 1999 provides for:

- Identification and listing of threatened species and Threatened Ecological Communities.
- Development of Recovery Plans for listed species and ecological communities.
- Recognition of Key Threatening Processes; and, where appropriate.
- Reduction of these processes through Threat Abatement Plans.

No nationally-listed TECs have been recorded within the project area.

Wildlife Conservation Act, 1950 (Western Australia)

Declared Rare Flora (DRF) is also protected under the Western Australian Wildlife conservation (Rare Flora) Notice 2005 of the *Wildlife Conservation Act 1950*. The notice lists flora taxa that are extant and considered likely to become extinct or rare. These taxa area legally protected and their removal or impact to their surroundings cannot be conducted without ministerial approval obtained specifically on each occasion for each population.

Five species of state threatened flora have been recorded in the vicinity of the Koolanooka Hills project area (Appendix F, Table F-1) (Wildlife Conservation (Rare Flora) Notice 2008). *Eremophila viscida* (Rare) and *Halosarcia bulbosa* (Rare) were recorded by ATA (2004b). *Eucalyptus synandra* (Rare) and *Eremophila nivea* (Rare) have been recorded near Morawa (FloraBase, 2008). *Eremophila rostrata* has been recorded at Perenjori (ATA, 2006b; FloraBase, 2006). *Acacia woodmaniorum* (Rare) is present in the Mungada Ridge and Blue Hills area (Woodman 2006b).

Acaia woodmanorium (DRF) has been recorded during the current survey of the proposal development area at Mungada East and Mungada West pits.

The Western Australian Department of Environment and Conservation (DEC) also maintains a list of taxa which are considered to be poorly known, uncommon, or under threat, but for which there is insufficient justification on the basis of known distribution and population sizes for inclusion on the DRF schedule. These are classified as Priority Flora. The Declared Rare Flora and the four ranks of Priority Flora are defined by specific criteria (Appendix E, Table E-2).

One state-listed TEC has been recorded within the survey areas – the Koolanooka Hills System TEC, which is listed as Vulnerable (Beecham, 2001).

6.7.7.1 Priority Flora recorded previously within or near the survey area

DEC listed Rare and Priority Flora have been recorded during previous surveys undertaken at both Koolanooka Hills and Blue Hills.

Koolanooka Hills

One hundred and sixty two Rare and Priority taxa are known to occur in the Avon-Wheatbelt 1 Sub-bioregion (NRM Agencies, 2003) and 30 Declared Rare (DRF) and Priority Flora species have been recorded previously in the vicinity of Koolanooka Hills, (Appendix F Table F-1).

A survey of Koolanooka Hills and the road and rail areas within the Midwest mining leases (ATA, 2004a) found two DRF taxa, *Eremophila viscida* and *Halosarcia bulbosa*, and five Priority Flora taxa; *Baeckea* sp. Three Springs (M.E. Trudgen 5368) (P2), *Acacia acanthoclada* subsp. *glaucescens* (P3)*, *Frankenia glomerata* (P3), *Grevillea stenostachya* (P3) and *Persoonia pentasticha* (P3). This previous survey encompassed a much larger area including the plains to which *Eremophila viscida* and *Halosarcia bulbosa* (DRF) are restricted.

The following eight Priority Flora were recorded during the DEC's survey of Koolanooka and Perenjori Hills; *Melaleuca barlowii* (P1), *Millotia dimorpha* (P1), *Rhodanthe collina* (P1), *Baeckea* sp. Perenjori (J.W. Green 1516) (P2), *Stenanthemum poicilum* (P2), *Acacia acanthoclada* subsp. *glaucescens* (P3)*, *Gunniopsis rubra* (P3) and *Persoonia pentasticha* (P3) (Meissner and Caruso, 2006).

* Prioirty rankings listed above are those indicated in the reports cited and they have not been changed to reflect the current listings. However the following changes apply under the current listing.

- *Acacia acanthoclada* subsp. *glaucescens* (P3) is no longer a priority taxa

Blue Hills

One hundred and six Rare and Priority taxa are known to occur in the Yalgoo bioregion (FloraBase, 2006) and 31 Declared Rare (DRF) and Priority Flora species have previously been recorded in the vicinity of Blue Hills (Appendix F, Table F-2).

Blue Hills, as well as the surrounding Karara Station, was surveyed by Bennett (Bennett Environmental Consulting, 2004). Two Priority Flora taxa were recorded on hill slopes, in particular on BIF rocks, and these were; *Cryptandra imbricata* (P3)* and *Persoonia pentasticha* (P3). (It is probable that *Stenanthemum poicilum* (P2) was also recorded but the specimen had no reproductive material necessary for full taxonomic confirmation.)

During the DEC's 2005 survey of the central Tallering Land System the following six Priority Flora were found; *Austrostipa blackii* (C.E. Hubb.) S.W.L. Jacobs & J. Everett (P3), *Calytrix uncinata* Craven (P3), *Gunniopsis rubra* Chinnock (P3), *Micromyrtus cuensis* J.W. Green ms (P1)*, *Millotia dimorpha* P.S. Short (P1) and *Polianthion collinum* Rye [syn. *Genus* sp. Yalgoo (J.M. Ward s.n. 11/7/1999)] (P1)*. Current Priority Flora lists also include *Acacia woodmaniorum* (DRF) and *Acacia* sp. Karara (C. Godden 14) (P2) which were collected during DEC's 2005 survey.

A number of surveys have been conducted in the vicinity of Blue Hills which included Midwest leases across Blue Hills (including Mungada Ridge) but also south, west and north-west of Mt. Karara (Woodman, 2004, Woodman, 2006b). At Mungada Ridge the following Priority Flora were identified; *Chamelaucium* sp. Yalgoo (Y Chadwick 1816) (P1), *Grevillea subtiliflora* (P1), *Gunniopsis divisa* (P1), *Hydrocotyle* sp. Warriedar (PG Wilson 12267) (P1), *Melaleuca barlowii* (P1), *Micromyrtus cuensis* ms (P1)*, *Micromyrtus* sp. Warriedar (S Patrick 1879A) (P1)*, *Millotia dimorpha* (P1), *Rhodanthe collina* (P1), *Acacia* sp. Karara (C. Godden 14) (P2)*, *Acacia woodmaniorum* (P2)*, *Stenanthemum poicilum* (P2), *Acacia acanthoclada* subsp. *glaucescens* (P3)*, *Austrostipa blackii* (P3), *Cryptandra imbricata* ms (P3)*, *Grevillea globosa* (P3), *Grevillea scabrida* (P3), *Persoonia pentasticha* (P3), *Polianthion collinum* [syn. Genus sp. Yalgoo (JM Ward s.n. 11/7/1999)] (P3) and the new taxa *Acacia* aff. *coolgardiensis*, *Calotis* aff. *cuneifolia* (A. Markey & S. Dillon 3447) (recommended for Priority listing), *Drummondita* aff. *microphylla* (recommended for Priority listing) and *Lepidosperma* sp. Karara BIF (A. Markey & S. Dillon 3468).

*Prioirty rankings listed above are those indicated in the reports cited and they have not been changed to reflect the current listings. However the following changes apply under the current listing.

- *Cryptandra imbricata* (P3) is no longer a priority taxa.
- *Micromyrtus cuensis* J.W. Green ms (P1) = *Micromytrus acuta.*
- *Polianthion collinum* Rye [syn. *Genus* sp. Yalgoo (J.M. Ward s.n. 11/7/1999)] (P1) is now P3
- *Micromyrtus* sp. Warriedar (S Patrick 1879A) = *Micromytrus trudgenii* Rye (P1)
- *Acacia* sp. Karara (C. Godden 14) = *Acacia karina* (P2)

- *Acacia woodmaniorum* now a Declared Rare Flora (DRF)
- *Acacia acanthoclada* subsp. *glaucescens* is no longer a priority taxa

6.7.7.2 Rare and priority flora recorded within the current survey areas

The distributions of the conservation significant taxa found within the project footprint during *ecologia*'s survey and some of their biological characteristics are discussed below.

Koolanooka Hills

No Rare or Priority Flora taxa were recorded during the survey of the proposed impact area at Koolanooka Hills.

Blue Hills

Four conservation significant taxa were recorded during *ecologia*'s surveys of the proposed mining disturbance areas at Blue Hills (Appendix H). The regional distribution of these species is detailed in locality maps, available as Appendix L.

Acacia woodmaniorum **(DRF)** (Mimosaceae) is a species that appears to be restricted to the Blue Hills area. This species is described below by an adapted version of that provided by Bruce Maslin (*Acacia* specialist) for the Holotype specimen (PERTH 07414897) at the Western Australian Herbarium.

A. woodmaniorum is an intricately branched prickly harsh shrub 1-1.5 (-2) m tall. The bark is grey and slightly rough. The new shoots are red when first initiated. The branchlets are light green or yellow at extremities, the decurrent phyllodes are glaucous and more or less lightly pruinose. The marginal nerve of phyllodes is red (young), ageing to yellow. Three spines occur on angles of the free portion of the phyllodes, and are pale red when young, aging to brown. The dead decurrent phyllodes are grey and persist on branches below living crown. The peduncles are often ringed red and the wattle flowers are yellow.

The individuals of *A. woodmaniorum* that were recorded by *ecologia* have fitted the above descriptions (Plates 6-12 & 6-13).

Plate 6-12: ***Acacia woodmaniorum*** **(DRF)**

Plate 6-13: ***Acacia woodmaniorum*** **(DRF)**

Micromyrtus acuta Rye **(P1)** (Myrtaceae) (formerly *Micromyrtus* sp. Murchison M. E. Trudgen 2229)

Micromyrtus acuta is a rounded shrub growing to 0.5 – 2.5 m high (Plates 6-14). The leaves are tiny (up to 3 mm long and 1 mm wide) and shaped like a tear drop (wide at one end and narrow at the other). It produces small white flowers from around July to September and occurs on a number of different substrates, including ironstone.

Plate 6-14: *Micromyrtus acuta* (P1)

Micromyrtus trudgenii **(P3) (**Myrtaceae**)** is an erect, open and straggly weeping shrub growing to 0.5 – 2 m tall. This species has small, linear-oblong leaves that tend to grow in dense clusters and then fall as they begin to age. The shrub produces yellow flowers, which have been noted in July and September. The flowers are small and tubular with five lobes and are cream to yellow in colour (Plates 6-15 & 6-16).

Plate 6-15: *Micromyrtus trudgenii* (P3)

Plate 6-16: *Micromyrtus trudgenii* (P3)

Persoonia pentasticha **(P3)** (Proteaceae) is an erect, spreading shrub growing to between 0.4 to 1.8 m in height. The flowers are yellow and are produced from August to November. It grows on sandy loam at the base of granite outcrops (Plates 6-17 & 6-18.).

Plate 6-17: *Persoonia pentasticha* (P3)

Plate 6-18: *Persoonia pentasticha* (P3)

[Descriptions by the Western Australian Herbarium, Department of Environment and Conservation. Text used with the permission of DEC FloraBase website: (http://florabase.calm.wa.gov.au/help/copyright). Accessed on Thursday, 05 December 2006].

Flora having potential conservation significance

Koolanooka Hills

One taxon of potential conservation significance was recorded during *ecologia's* surveys of Koolanooka Hills.

Two specimens of *Acacia sclerosperma* subsp. *sclerosperma* were collected and these records mark a southerly range extension within the Avon Wheatbelt Region. The taxon is also found in the Pilbara, Gascoyne, Carnarvon, Murchison, Geraldton Sandplains and Yalgoo IBRA Regions as well as in the north of the Avon Wheatbelt.

During the DEC's 2005 survey of the Koolanooka and Perenjori Hills, five new and undescribed species were recorded; *Acacia* sp. Koolanooka Hills falcate (R. Meissner and Y. Caruso 84), *Caesia* sp. Koolanooka Hills (R. Meissner and Y. Caruso 78), *Dodonaea* sp. Koolanooka Hills (R. Meissner and Y. Caruso 17), *Drummondita* sp. Koolanooka Hills (R. Meissner and Y. Caruso 69) and *Lepidosperma* sp. Koolanooka (K. Newbey 9336). Five taxa of interest were also found during this survey which included; *Acacia* aff. *declinata, Hibbertia* aff. *exasperata, Eucalyptus ebbanoensis* subsp. *glauciramula, Labichea lanceolata* subsp. *brevifolia* and *Tetraria* aff. *capillaris.*

Blue Hills

Lepidosperma sp. Blue Hills, a species of potential conservation significance, was recorded during *ecologia's* survey of Blue Hills – at Mungada East.

Nine new taxa were recorded during DEC's 2005 survey of the area: *Acacia* aff. *coolgardiensis, Acacia woodmaniorum* (DRF), *Acacia* sp. Karara (C. Godden 14) (recently listed as a P2 taxon), *Calotis* aff. *cuneifolia, Drummondita* aff. *microphylla, Eremophila* cf. *platycalyx* (A. Markey & S. Dillon 3337), *Eremophila* sp. (A. Markey & S. Dillon 3338), *Lepidosperma* sp. Karara (H. Pringle 3865)(now *Lepidosperma* sp. Blue Hills), *Prostanthera* aff. *campbellii* and the new hybrids, *Cheilanthes* cf. *lasiophyllum* x *sieberi* (first hybridisation of this genus in WA) and *Senna glutinosa* subsp. *chatelainiana* x *charlesiana* (A. Markey & S. Dillon 3413) (Markey & Dillon, 2006). Woodman (2006b) recorded a possibly undescribed species of *Prostanthera* sp. as well as the possible new taxa, *Acacia* aff. *subsessilis* and *Grevillea* aff. *zygoloba.*

6.7.8 Introduced Flora

Priority weeds that are, or have the potential to become, pests to agriculture can be declared formally under the Agriculture and Related Resources Protection Act 1976. Weeds listed under the Act are listed with a coded definition of the requirements for control. Five Priority groupings are used, and more than one Priority may be placed on a weed species (see Appendix E, Table E-3 for definitions of codes).

6.7.8.1 Introduced Flora Previously Recorded Within the Current Survey Area

Koolanooka Hills

During the ATA survey (2004b) the following 13 weed species were found on Midwest leases; **Avena barbarta, *Bromus diandrus, *Bromus hordeaceus, *Chenopodium murale, *Echium plantagineum* (a Priority 1 weed was found around the mine site), **Ehrharta calycina, *Eragrostis curvula, *Erodium botrys, *Hypochaeris glabra, *Pennisetum setaceum, *Pentaschistis airoides, *Rumex vesicarius and *Sonchus oleraceus* (ATA, 2004b).

DEC recorded 22 weed taxa during the survey of Koolanooka and Perenjori Hills and the following 19 weed taxa were found at Koolanooka Hills; **Acetosa vesicaria, *Arctotheca calendula, *Avena fatua, *Brassica tournefortii, *Bromus madritensis, *Bromus rubens, *Ehrharta longiflora, *Cuscuta epithymum, *Hypochaeris glabra, *Lamarckia aurea, *Mesembryanthemum nodiflorum, *Pentaschistis airoides subsp. airoides, *Petrorhagia dubia, *Rostraria pumila, *Silene nocturna, *Sisymbrium erysimoides, *Sonchus oleraceus, *Vulpia bromoides and *Vulpia muralis* (Meissner & Caruso, 2006).

Blue Hills

During the Bennett (2004) survey of Blue Hills the following ten weed species were recorded in the surrounding area: **Bromus hordeaceus*, **Bromus rubens*, **Erodium botrys*, **Hypochaeris glabra, *Malva parviflora*, **Medicago minima* var. *minima*, **Mesembryanthemum nodiflorum*, **Sonchus oleraceus*, **Stellaria media* and **Rostraria pumilio.*

Woodman (2006b) recorded 25 weed plant taxa from 'the project area' however most of these taxa were recorded by Markey and Dillon (2006) after a good rainfall season in 2005. The taxa recorded were **Anagallis arvensis, *Arctotheca calendula, *Brassica tournefortii, *Bromus rubens, *Cleretum papulosum* subsp. *papulosum, *Corchorus* sp., **Cuscuta epithymum, *Echium plantagineum* (Priority 1 weed), **Ehrharta longiflora, *Erodium cicutarium, *Galium aparine* (Priority 1/Priority 2 weed for entire state), **Hypochaeris glabra, *Lamarckia aurea,* ?*Malva parviflora, *Medicago minima, *Mesembryanthemum nodiflorum, *Pentaschistis airoides, *Rostraria pumila, *Silene nocturna, *Sonchus oleraceus, *Spergula pentandra, *Urospermum picroides, *Ursinia anthemoides, *Vulpia muralis* and *Vulpia myuros* var. *myuros*.

More specifically, the DEC survey of the central Tallering Land System recorded the following 14 weed taxa at Windanning Ridge; **Arctotheca calendula, *Brassica tournefortii, *Cleretum papulosum subsp. papulosum, *Cuscuta epithymum, *Ehrharta longiflora, *Galium aparine* (Priority 1/Priority 2 weed for entire state), **Hypochaeris glabra, *Lamarckia aurea, *Pentaschistis airoides, *Silene nocturna, *Sonchus oleraceus, *Urospermum picroides, *Ursinia anthemoides, *Vulpia muralis* and *Vulpia myuros* var. *myuros*.

6.7.8.2 Introduced Flora Recorded Within the Current Survey Area

Koolanooka Hills

No Priority weeds were recorded within the Koolanooka Hills proposed impact area surveyed by *ecologia*. However, two environmental weeds, Common Sowthistle (**Sonchus oleraceus*) and Ruby Dock (**Acetosa vesicaria*) were recorded.

Blue Hills

One Priority weed **Echium plantagineum* (Priority 1 weed) (Hussey *et al.*, 1997) was found at the Mungada East area of Blue Hills on disturbed areas on lower slopes near the old mining pit. In addition to this, three environmental weeds were recorded in the area: False Cleavers (**Galium spurium)* and False Hairgrass (both **Pentaschistis airoides* subsp. *airoides* and **Pentaschistis airoides*).

**Echium plantagineum* (Patterson's Curse; Plate 6-19), the Priority 1 weed at Mungada East, is described as an erect annual or biennial herb growing from 0.1 m to 1 m high. The plants flower from September to January and the flowers can range in colour from blue or purple to pink or white. The plant is a weed of roadsides, vacant lands and disturbed grounds (FloraBase, 2007). As **Echium plantagineum* is a Priority 1 weed Midwest is required to remove and manage the weed and the appropriate management controls are outlined in Table E-3, Appendix E.

Further information in regards to herbicide use for weed control can be found on the Department of Agriculture and Food website at:

No Priority or environmental weeds were recorded during the current survey of the proposed impact area at the Mungada West area of Blue Hills.

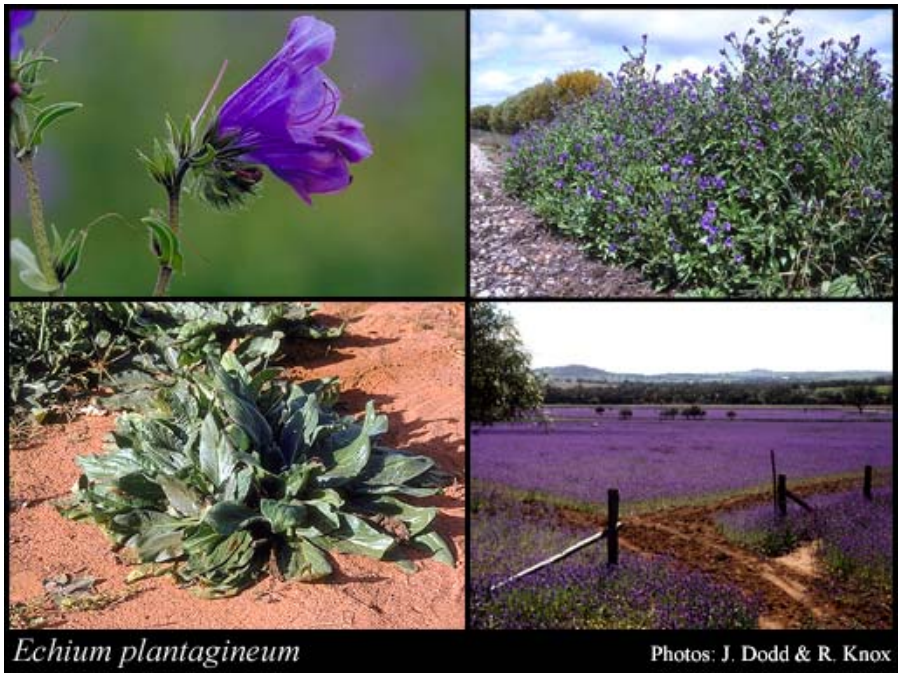


Plate 6-19: *Echium plantagineum* (Priority 1 weed) (FloraBase, 2006). Photography by R.Knox & J. Dodds. Image used with the permission of the Western Australian Herbarium, Department of Environment and Conservation (http://florabase.calm.wa.gov.au/help/copyright). Accessed on Thursday, 16 November 2006.

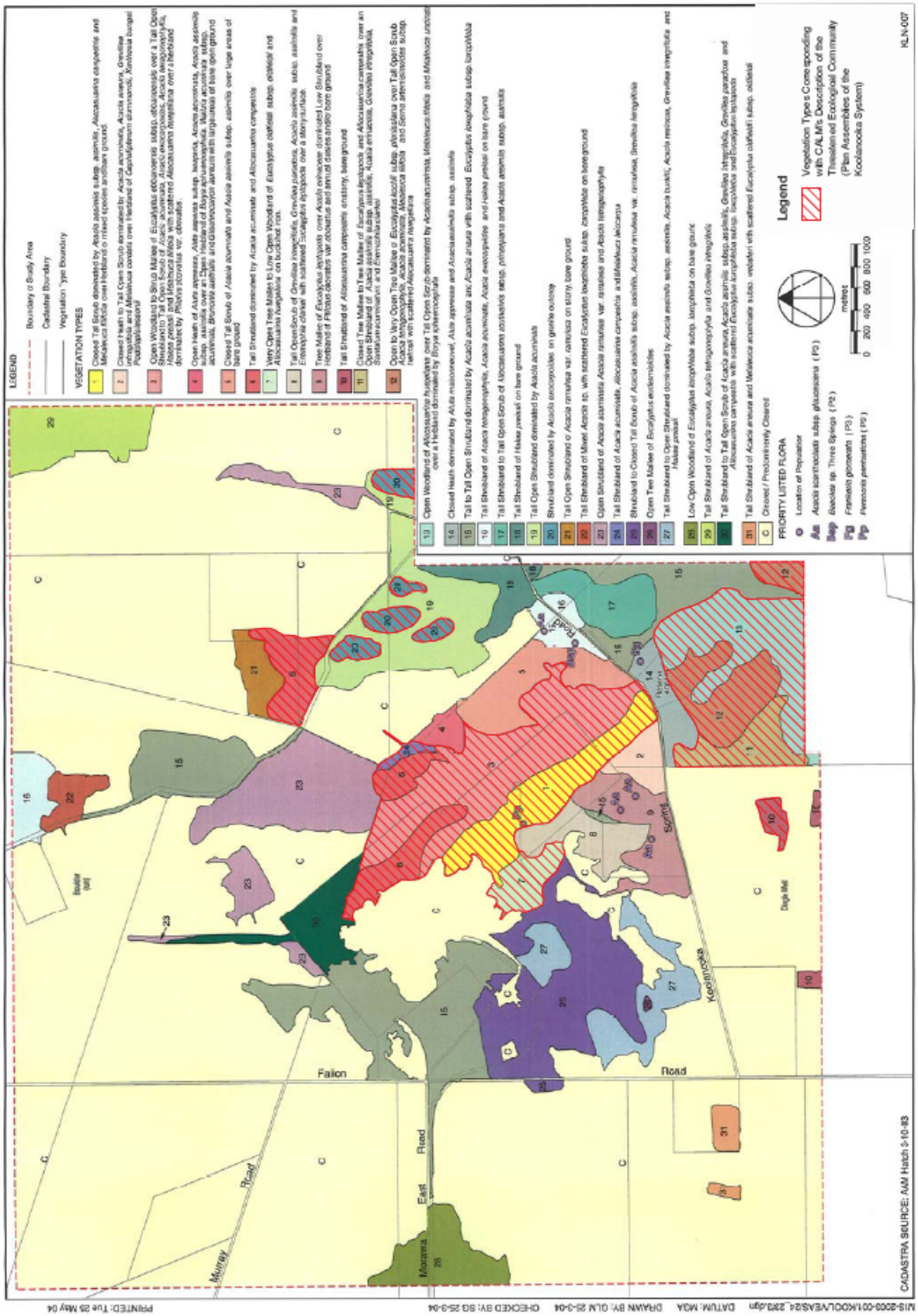


Figure 6-5: Vegetation Types Corresponding with CALM's Description of the TEC

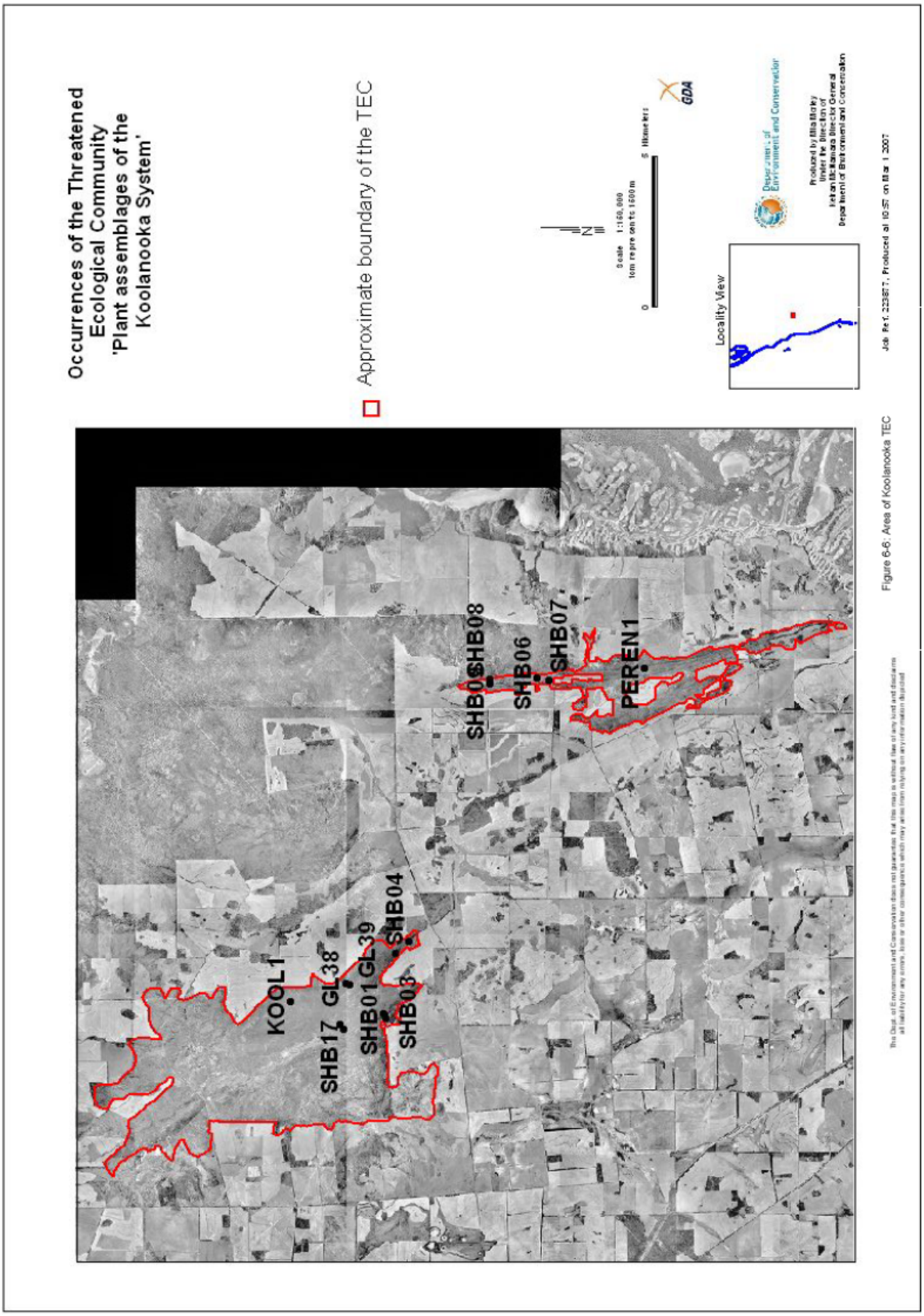


Figure 6-6: Area of Koolanooka TEC

Figure 6-6 Koolanooka TEC

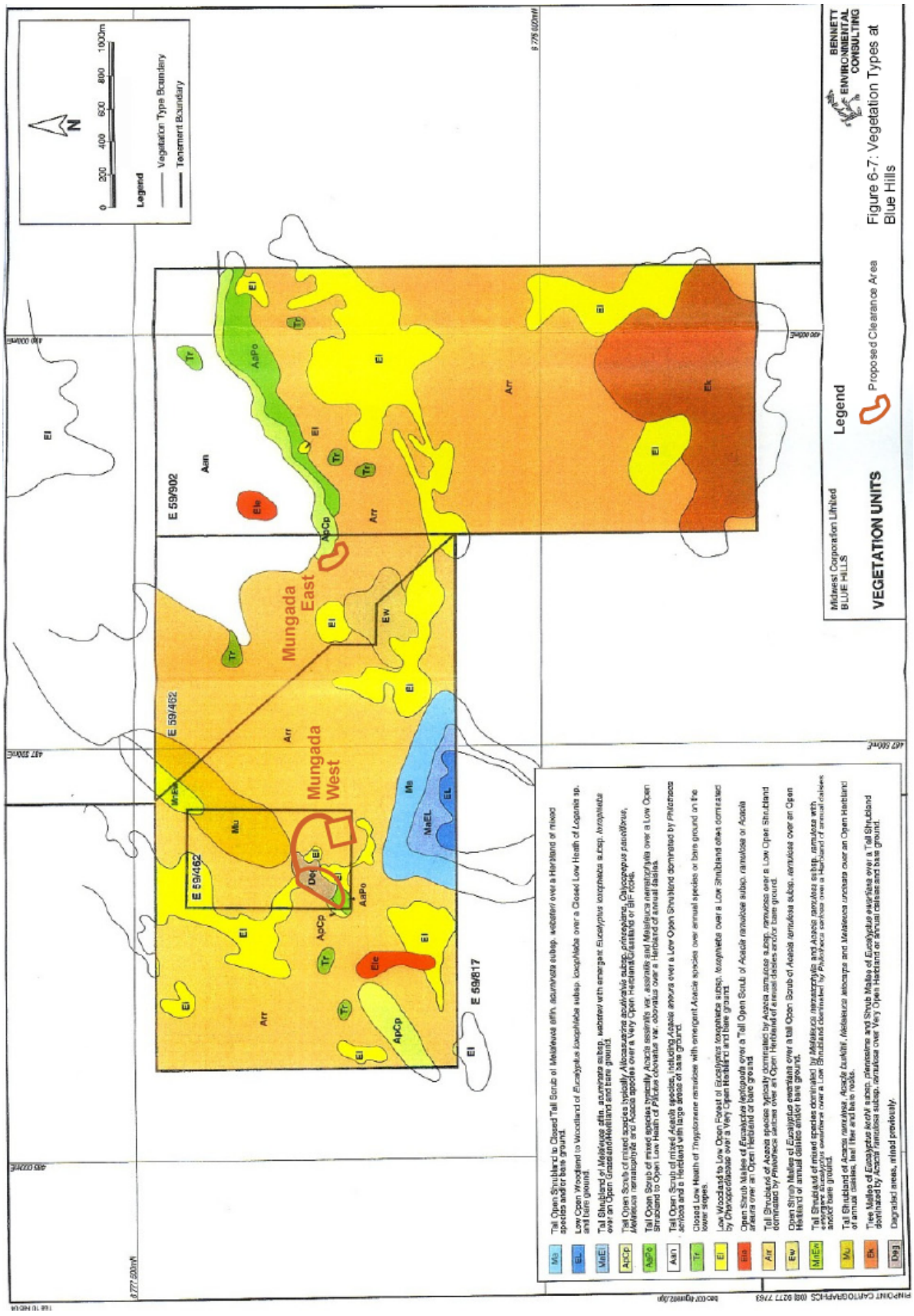


Figure 6-7 Vegetation Types at Blue Hills (Bennett, 2004).

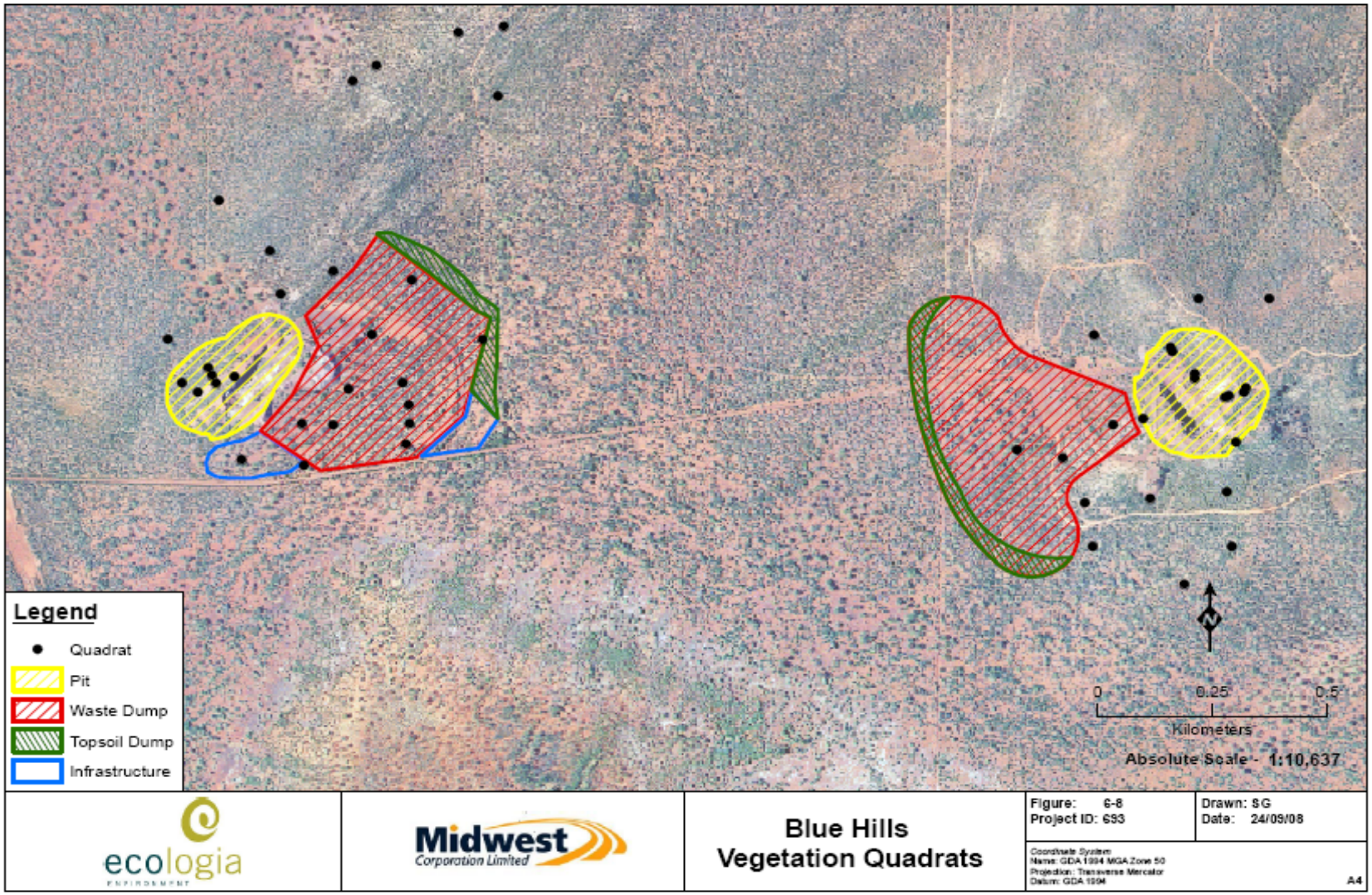


Figure 6-8 **Blue Hills Quadrat Survey Areas**

6.8 FAUNA

6.8.1 Vertebrate Fauna Community at Koolanooka

Two vertebrate fauna surveys have been conducted in the Koolanooka region, one in 1996 and the other in 2004 (Alan Tingay & Associates 1996, ATA Environmental 2004). An additional survey of the proposed pit area was also conducted by *ecologia* in 2007. A combined total of 123 species was recorded during these surveys, comprising ten species of native mammal, 79 bird species, 21 reptile species, one amphibian and six introduced species (Table 6-3). ATA fauna trapping locations for this survey have been provided as Figure 6-9.

Table 6-3 Summary of Fauna Data for Koolanooka Poject Area

Koolanooka	Total	Native mammals	Introduced mammals	Reptiles	Amphibians	Birds
Alan Tingay & Associates (1996)	77	7	5	10	1	54
ATA Environmental (2004)	95	6	6	26	0	57
Combined	123	10	6	21	1	79

Ten native mammal species from six families have been recorded from the Koolanooka region (Alan Tingay & Associates 1996, ATA Environmental 2004). Three of four species of bat recorded at Koolanooka (Gould's Wattled Bat *Chalinolobus gouldii*, Southern Forest Bat *Vespadelus regulus* and the White-striped Freetail-bat *Tadarida australis*) were recorded during the 1996 survey, while Finlayson's Bat *Vespadelus finlaysoni* alone was recorded during the 2004 survey (ATA Environmental 2004).

There was evidence that the Short-beaked Echidna *Tachyglossus aculeatus* was present within all habitat types surveyed in the Koolanooka region during the 1996 survey, and scratchings were found opportunistically during the 2004 survey (Alan Tingay & Associates 1996, ATA Environmental 2004).

Seventy nine (79) species of bird from 34 families were recorded from the Koolanooka region (Alan Tingay & Associates 1996, ATA Environmental 2004). The families which were represented by the greatest number of species were Meliphagidae (Honeyeaters) with 10 species and Acanthizidae (Thornbills and allies) with six species.

In total, 21 reptile species from seven families were recorded in the Koolanooka region (Alan Tingay & Associates 1996, ATA Environmental 2004). The families represented by the greatest number of species were Scincidae (Skinks) with 11 species and Gekkonidae (Geckoes) with six species.

As the 1996 survey was conducted during June, a number of reptile species were unlikely to be detected due to reduced reptile activity during the colder months (Alan Tingay & Associates 1996). The 2004 survey was conducted during summer (February), and as such any species missed due to weather conditions during the 1996 survey are likely to have been recorded (ATA Environmental 2004); this is reflected in the higher reptile diversity of the later survey (Table 6-3).

Bynoe's Gecko *Heteronotia binoei* was the most widespread of the reptile species recorded during the 1996 and 2004 surveys. This species was recorded at six of the 11 sites during the 1996 survey and at four of the five sites during the 2004 survey.

Only one amphibian species was recorded in the Koolanooka region, the Orange-crowned Toadlet *Pseudophryne occidentalis.* This species was detected opportunistically near Koolanooka Spring during the 1996 survey (Alan Tingay & Associates 1996).

Six feral mammal species were recorded from the Koolanooka region (Alan Tingay & Associates 1996, ATA Environmental 2004). These comprised the Goat **Capra hircus,* Fox **Vulpes vulpes,* Cat **Felis catus*, Rabbit **Oryctolagus cuniculus,* House Mouse **Mus musculus* and Black Rat **Rattus rattus.*

Rabbits and the house mouse were present in all habitat types, goats were evident around rocky slopes and hilltops, and the fox was primarily detected on plains; although this species is likely to occur throughout all habitats.

6.8.2 Vertebrate Fauna Community at Blue Hills

Two vertebrate fauna surveys have been conducted in the Blue Hills region; the first was at Blue Hills (Bamford Consulting Ecologists 2004) and the second examined the fauna of the Mungada and Karara areas (Bamford Consulting Ecologists 2006a). Due to the close proximity of Mungada and Karara to Blue Hill, they are included here. A combined total of 135 species was recorded across the two surveys, and an overview of the species richness of each is given in Table 6-4, below.

Table 6-4 Summary of Fauna Data for Blue Hills Project Area

Blue Hills	Total	Native mammals	Introduced mammals	Reptiles	Amphibians	Birds
Bamford Consulting Ecologists (2004)	67	8	4	21	1	33
Bamford Consulting Ecologists (2006)	125	12	4	34	2	73
Combined	135	13	6	38	2	75

Thirteen mammal families were present, six of which were of introduced mammals only. Two mammals may have been present based on observed evidence: Mitchell's Hopping Mouse (*Notomys mitchelli*) and a bat suggested to be in the genus *Vespadelus*. These were unconfirmed and are not included in the totals above. The family with the most species was the bat family Vespertillionidae, with four species recorded.

In the 2004 survey, species richness of birds recorded in the Blue Hills region was low with 33 species of bird from 15 families recorded. It was hypothesised that because of the low rainfall received in the previous years, many nomadic and migrant species were not present in the area (Bamford Consulting Ecologists 2004). This was increased considerably to a total of 75 species following surveys of surrounding areas (Table 6-4). The most speciose families were the Pardalotidae (pardalotes and allies) with 9 species, Meliphagidae (honeyeaters) with 7 species and Artamidae (woodswallows and allies) with 6 species. All five potential members of the family Pachycephalidae (whistlers and allies) were recorded.

Twenty-one reptile species from six families were recorded in the Blue Hills region (Bamford Consulting Ecologists 2004), and an additional 17 species were recorded from Mungada and Karara (Bamford Consulting Ecologists 2006a). The families represented by the greatest number of species were Scincidae (skinks and allies) with 12 species and Gekkonidae (geckoes) with eight species. Five members of the goanna family, Varanidae, which could potentially occur in the area were recorded.

Two amphibians were recorded, the Desert Trilling Frog, *Neobatrachus* aff. *centralis* was recorded from the Blue Hills region (Bamford Consulting Ecologists 2004) and the Western Toadlet, *Pseudophryne occidentalis* (Bamford Consulting Ecologists 2006a).

6.8.3 Additional surveys in the Koolanooka/Blue Hills area

A search for conservation significant fauna was conducted by *ecologia* Environment within the Koolanooka and Blue Hills (Mungada East and West) pit extension footprints in January 2007. The extension zones were extensively searched for evidence of conservation significant fauna including Malleefowl, Western Spiny-tailed Skink and the skink *Cyclodomorphus branchialis*. Two experienced zoologists traversed the extension area in multiple lines 10 m apart running parallel to the slope of the hillside. Microhabitats likely to harbour conservation significant skinks were surveyed using standard herpetological techniques, including raking leaf litter and searching in cracks, crevices and under bark. Malleefowl mounds were also searched for. The search lasted approximately 60 minutes and yielded no evidence of the presence of conservation significant fauna and little habitat suitable for either skink.

6.8.4 Vertebrate Fauna Community of the Mt Karara/Mungada Haul Road

A report on the fauna of the haul road joining Mt Karara/Mungada to Koolanooka lists 276 species as potentially occurring, comprising eight amphibians, 69 reptiles, 168 birds and 31 mammals (Bamford Consulting Ecologists 2006b). The authors note that the high potential diversity of the haul road is a result of it bridging a transition between the south-west and inland biogeographic zones. The potential bird list is increased by an additional 32 waterbirds based on the presence of wetlands, in particular Wheelamby Lake which is crossed by the road approximately 25 km east of Koolanooka.

A search for conservation significant fauna was conducted by *ecologia* Environment in January 2007 following acceptance of the methods of the survey by DEC. The survey zone included those areas of haul road that had become overgrown by vegetation and are required to be cleared to restore the haul road to its original width.

Conservation significant fauna recorded included four individual Malleefowl (*Leipoa ocellata*) and one Malleefowl mound, as well as two groups of Major Mitchell's Cockatoos (*Cacatua leadbeateri*) containing 15 and nine individuals respectively. Additionally, White-browed Babbler (south-western race *Pomatostomus superciliosus ashbyi*) and Crested Bellbird (southern race *Oreoica gutturalis gutturalis*) were frequently encountered along the length of the haul road. The results of the survey are summarised in Table 6-5 .

Table 6-5 Results of the Significant Fauna Survey Undertaken by *ecologia* in January 2007

Name	Scientific Name	Conservation status	Record type	Date & Time
Malleefowl	*Leipoa ocellata*	Vulnerable, Schedule 1	Sighting, 1 individual	29/1, 16:45
Malleefowl	*Leipoa ocellata*	Vulnerable, Schedule 1	Sighting, 1 individual	29/1, 16:25
Malleefowl	*Leipoa ocellata*	Vulnerable, Schedule 1	Sighting, 1 individual	30/1, 08:30
Malleefowl	*Leipoa ocellata*	Vulnerable, Schedule 1	Sighting, 1 individual	30/1, 20:15
Malleefowl	*Leipoa ocellata*	Vulnerable, Schedule 1	Mound recorded	30/1, 20:15
Major Mitchell's Cockatoo	*Cacatua leadbeateri*	Schedule 4	Sighting, 15 individuals	30/1, 19:10
Major Mitchell's Cockatoo	*Cacatua leadbeateri*	Schedule 4	Sighting, 9 individuals	30/1, 19:15

6.8.5 Rare and Specially Protected Fauna

Fauna species that have been formally recognised as rare, threatened with extinction, or as having high conservation value are protected by law under Commonwealth and State Legislation. At the national level, fauna are protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC ACT).

Within Western Australia rare fauna are listed under the *Western Australian Wildlife Conservation Act 1950: Wildlife Conservation (Specially Protected Fauna) Notice 2006.* International agreements include the Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA), which covers migratory species of avifauna, particularly transequatorial waders. Species listed under these agreements are covered under the EPBC ACT 1999 *Migratory Species*.

Species Protected by International Agreements

The Rainbow Bee-eater (*Merops ornatus)* was the only migratory species listed under the EPBC Act 1999 to be observed within the Blue Hills and Koolanooka regions (Table 6-6).

Table 6-6 Migratory species Listed Under the EPBC ACT 1999

Fauna Species	Common name	Koolanooka	Blue Hills
Birds			
Family Meropidae			
Merops ornatus	Rainbow Bee-eater	✓	✓

Environment Protection and Biodiversity Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* contains a list of species that are considered Critically Endangered, Endangered, Vulnerable, Conservation Dependant, Extinct or Extinct in the Wild. Categories relevant to fauna recorded at Blue Hills or Koolanooka are defined in Appendix G.

Two species of Commonwealth conservation significance (as listed under the EPBC Act 1999) have been recorded within the Koolanooka or Blue Hills regions (Table 6-7)

Table 6-7 Conservation significant species listed under EPBC Act 1999

Fauna Species	Common name	EPBC Status	Koolanooka	Blue Hills	Haul Road
Birds					
Leipoa ocellata	Malleefowl	Vulnerable	✓	✓	✓
Reptiles					
Egernia stokesii badia	Western Spiny-tailed Skink	Endangered	✓	-	-

Malleefowl *Leipoa ocellata* (Vulnerable)

Malleefowl are large, ground dwelling birds that rarely fly unless alarmed. This species builds distinctive nests that comprise a large mound of soil/rock covering a central core of leaf litter. They are generally monogamous.

A freshly moulted Malleefowl *Leipoa ocellata* wing feather was collected and an inactive mound was located during the 1996 Koolanooka survey (Alan Tingay & Associates 1996). During the 2004 survey, six inactive Malleefowl mounds were located at Koolanooka, one of which was with the project impact area (ATA Environmental 2004).

Bamford Consulting Ecologists (2006a; 2008) reported that Malleefowl were common in the Blue Hills area, and one inactive and one active mound were found to be located within the proposed waste dump impact area at East Mungada (Figure 6-10). Malleefowl also appear to be common along the Karara/Mungada haul road, as four individuals and one active mound adjacent to the haul road were recorded during a survey by *ecologia* in January 2007, located within the impact area.

Western Spiny-tailed Skink *Egernia stokesii badia* (Endangered)

The Western Spiny-tailed Skink was recorded during the 2003 survey of the Koolanooka region (ATA Environmental 2004). Ten individuals were found in two colonies. The first colony was found under tin and debris near a farmhouse. Six females, one male and one dead skink were found. A second colony of two skinks (one male and one unsexed) was found near a second farmhouse. This colony was located under tin and in a large hollow eucalypt. This skink generally occurs in semi-arid scrubs and woodlands, sheltering in hollow logs and log piles, under the bark of trees and in the cracks of granite boulders and can survive in woodlands as small as 1 ha (How, Dell & Robinson, 2003). Both colonies were found in degraded areas with tin and abandoned car bodies surrounding farmhouses, which were surrounded by large eucalypts and considerable amounts of hollow fallen timber, ideal habitat for Western Spiny-tailed skinks (ATA Environmental 2004).

Western Spiny-tailed skinks have not been found at Blue Hills, Karara or Mungada (Bamford Consulting Ecologists 2004, 2006) and were not found along the fringes of the Mt Karara/Mungada haul road despite comprehensive searches by *ecologia* in 2007.

WA Wildlife Conservation Act

Classification of rare and endangered fauna under the WA Wildlife Conservation (Specially Protected Fauna) Notice 2006(2) of the *WA Wildlife Conservation Act 1950* recognises four distinct schedules.

For the purposes of the Act, all taxa of the fauna —

(a) specified in Schedule 1, being fauna that is rare or likely to become extinct, are declared to be fauna that is in need of special protection;

(b) specified in Schedule 2, being fauna that is presumed to be extinct, are declared to be fauna that is in need of special protection;

(c) specified in Schedule 3, 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 in need of special protection; and

(d) specified in Schedule 4, are declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in paragraphs (a), (b) and (c).

Three scheduled species, as listed under the WA Wildlife Conservation Act 1950, were recorded at Koolanooka (Table 6-8). Four scheduled species were recorded at Blue Hills, while two were recorded along the Mt Karara/Mungada haul road (Table 6-8).

Table 6-8 Scheduled Species Recorded at Blue Hills or Koolanooka

Fauna Species	Common name	Status	Koolanooka	Blue Hills	Haul Road
Birds					
Leipoa ocellata	Malleefowl	Schedule 1	✓	✓	✓
Falco peregrinus	Peregrine Falcon	Schedule 4	-	✓	
Cacatua leadbeateri	Major Mitchell's Cockatoo	Schedule 4	-	✓	✓
REPTILES					
Cyclodomorphus branchialis	Gilled Slender Blue-tongue	Schedule 1	✓	✓	-
Egernia stokesii badia	Western Spiny-tailed Skink	Schedule 1	✓	-	-

Peregrine Falcon Falco peregrinus (Schedule 4)

Breeding peregrines were recorded from the Blue Hills area during October 2006 (Bamford Consulting Ecologists 2006a).

Major Mitchell's Cockatoo Cacatua leadbeateri (Schedule 4)

Pairs and single birds were seen daily at Blue Hills over eucalypt woodlands near the Karara and Mungada ridges, suggesting that they were nesting in hollows in the area (Bamford Consulting Ecologists 2006a). A further two groups of 15 and 9 individuals were seen along the haul road flying above eucalypt woodland on Lochada station during the rare fauna search conducted by *ecologia* in 2007.

Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Schedule 1)

A single Gilled Slender Blue-tongue was recorded opportunistically in the Koolanooka region in 2003 (ATA Environmental Consultants 2004). Although the precise location of this observation was not recorded by ATA, it is understood that this siting was not made within the nominated impact area at Koolanooka. They have also been recorded at Blue Hills at Mungada ridge (Bamford Consulting Ecologists 2004) and Karara ridge (Bamford Consulting Ecologists 2006). All records were from rocky areas, despite published information suggesting that they occur on heavy red soils (Wilson and Swan 2003).

DEC Priority Fauna

Species on the DEC Priority Fauna List include those removed from the *WA Wildlife Conservation Act 1950* and other species known from only a few populations or in need of monitoring. Five Priority Codes are recognised as defined in Table 6.9.

Table 6-9 CALM Priority Fauna Categories

Category	Definition
P1	Taxa with few, poorly known populations on threatened lands
P2	Taxa with few, poorly known populations on conservation lands
P3	Taxa with several, poorly known populations, some on conservation lands
P4	Taxa in need of monitoring
P5	Taxa that are conservation dependent (i.e. their conservation status is dependent on ongoing active management)

White-browed Babbler (western wheatbelt race *Pomatostomus superciliosus ashbyi*, Priority 4) and Crested Bellbird (southern race *Oreoica gutturalis gutturalis*, Priority 4) were frequently encountered along the length of the haul road and were recorded in all surveys at Koolanooka and Blue Hills (Table 6-10). Each species appears to be common in all areas. *P. s. ashbyi* occurs in the south-west of Western Australia, south of a line roughly between Jurien Bay and Hopetoun. The birds present in the study area may therefore not all be the wheatbelt race, but are likely to be transitional with the non-significant northern race, *P. s. superciliosus* (Bamford Consulting Ecologists 2006a). Similarly, *O. g. gutturalis* occurs from near Geraldton on the west coast, through the wheatbelt to the southern coast of Western Australia east of Esperance. The birds present may therefore be transitional with the non-significant northern race, *O. g. pallescens* (Bamford Consulting Ecologists 2006a).

Table 6-10 DEC Priority Species Recorded at Blue Hills or Koolanooka

Fauna Species	Common name	Status	Koolanooka	Blue Hills	Haul Road
Birds					
Pomatostomus superciliosus ashbyi	White-browed Babbler	Priority 4	✓	✓	✓
Oreoica gutturalis gutturalis	Crested Bellbird	Priority 4	✓	✓	✓

6.8.6 Invertebrates

6.8.6.1 Short Range Endemics

It is anticipated that Short Range Endemic (SRE) fauna potentially carry a low impact from implementation of the Project. This has been discussed with the WA Museum and the University of Western Australia, have indicated a that a reduced need survey of the area would be acceptable.(Dr Mark Harvey, pers com 2006 and Barbara Main, pers com 2006 respectively).

A Project risk assessment has been conducted on potential impact on SREs at both Koolanooka and Blue Hills (ecologia, 2007b): this indicates that there is a low risk of impact to SREs, particularly concerning three Wildlife Protection Act 1950 Schedule 1 species that may potentially occur in the impact area. These are three trap door spider species known from the north-eastern agricultural/ Midwest region:

- *Idiosoma nigrum* Main 1952;
- *Aganippe castellum* (Idiopidae) Main, 1986; and
- *Kwonkan eboracum* (Nemesiidae) Main, 1983.

ecologia Environment also conducted a sampling series to SREs in this location from early to mid 2007 (Technical Appendix 13-10). In total, one hundred and seventeen potential SRE specimens were recorded during the survey. These individuals represented six classes, 12 families, 17 genera and 21 species of invertebrates. Although SRE status could not be determined for some of the species collected (pseudoscorpion, snails and some mygalomorph spiders), none of the species are likely to be restricted to the 3.8 ha of Koolanooka Threatened Ecological Community (TEC) that is expected to be impact upon by the Project (M. Harvey, pers. comm. 2006). In addition, the listed Schedule 1 trap-door spider species *Aganippe castellum*, *Idiosoma nigrum* and *Kwonkan eboracum* were not found within the project impact area, although *I. nigrum* was found nearby at Karrara station.

Three processes were identified as potential impacts on invertebrate fauna arising from the project development. Four impacts were identified, with respect to vegetation clearing, all of which were associated with the removal of SRE invertebrate fauna habitat. An increased risk of dust arising from the proposal could potentially result in damage to SRE fauna habitat via vegetation decline and, the potential of increased risk of fire resulting in degradation of SRE fauna habitat.

A risk assessment was undertaken to determine potential impacts arising from the project on invertebrate fauna, and the residual impacts following the implementation of management strategies detailed within this report. In all cases, the residual risk was calculated to be low, following the implementation of controls. See section 8.2 for further details regarding potential impacts and management actions on SRE fauna.

6.8.6.2 Stygofauna

Stygofauna will likely be a minimal issue on this Project. Pit dewatering is not required and none of the three new pit extensions will proceed below the water table. The Koolanooka pit waters will be utilised for dust suppression: however this activity is currently occurring within the existing Transportation of Stockpiled Fines project, and as such this source is

already disturbed. It is Midwest's intention where possible to use only pre-existing bores for water supply, and hence provide low potential impact. If new bores are installed for use on this Project, and the water quality and salinity is conducive to supporting stygofauna populations, then Midwest will conduct stygofauna sampling on these bores prior to operation.

A risk assessment was conducted on the groundwater quality of the DSO project area (*ecologia*, 2007c). The final report described local groundwaters as having a low salt content which was suitable for stygofauna harbourage.This combined with neutral pH conditions of the groundwaters investigated at Koolanooka and Blue Hills to date, suggest that any additional aquifers which show the kind of yields required for the project, are all likely to require stygofauna surveys. *ecologia Environment* conducted a sampling series on established local bores, which yielded only two cosmopolitan copepod stygofauna specimens (Appendix 13.29).

6.8.6.3 Troglofauna

Based on site inspections of the proposed impact areas by zoologists, geologists and environmental scientists, there is no evidence of cavities open to the surface in the proposal impact area, and only minimal cavities have been encountered during test drilling. It is considered extremely unlikely that impacts to troglofauna will be significant on this Project.

In order to determine wether the proposed impact areas are devoid of troglofauna of significance, a multiphase trap baited sampling for troglofauna was conducted on site. Four phases of troglofauna surveying were conducted for this project. The first phase of sampling occurred in February to March 2007 and was designed to be a pilot study for the project. A second phase of sampling was carried out in December 2007 to February 2008. A single troglobitic spider was collected opportunistically during the second phase of sampling. Two more phases of sampling were undertaken to determine the abundance and distribution of this troglobitic spider as well as to sample for the presence of other troglobitic species within the project impact areas (phase three :March – May 2008, phase four: June – July 2008). However, no additional troglobitic species were recorded during these phases.

The one specimen of a new, previously unencountered species of troglobitic spider was collected opportunistically during the initial surveying exercise (ecologia, 2007d). It should be noted that this troglobitic spider was found outside the TEC cutback impact area, and it is expected to occur along the entire Koolanooka range from which it was sampled. Further troglobitic sampling was subsequently carried out at Koolanooka and Blue Hills but no troglobitic invertebrate fauna were collected from the additional phases of surveying. The troglobitic spider was not recovered again (Appendix 13.30). It is recognised that given the troglobitic spider is a predatory species it is highly likely that other troglobitic fauna must be present in the Koolanooka Range as prey species.

In order to quantify the proposed impact of the Project on the potential troglofauna habitat, it has been calculated that 1.7 M m^3 will be impacted over the indicated impact area of 4.46 ha. As the potential troglofauna habitat in the greater TEC area is approximately 3.5 billion m^3 over 3,500 ha of TEC, the loss of habitat resulting from the Project impact is not expected to be significant.

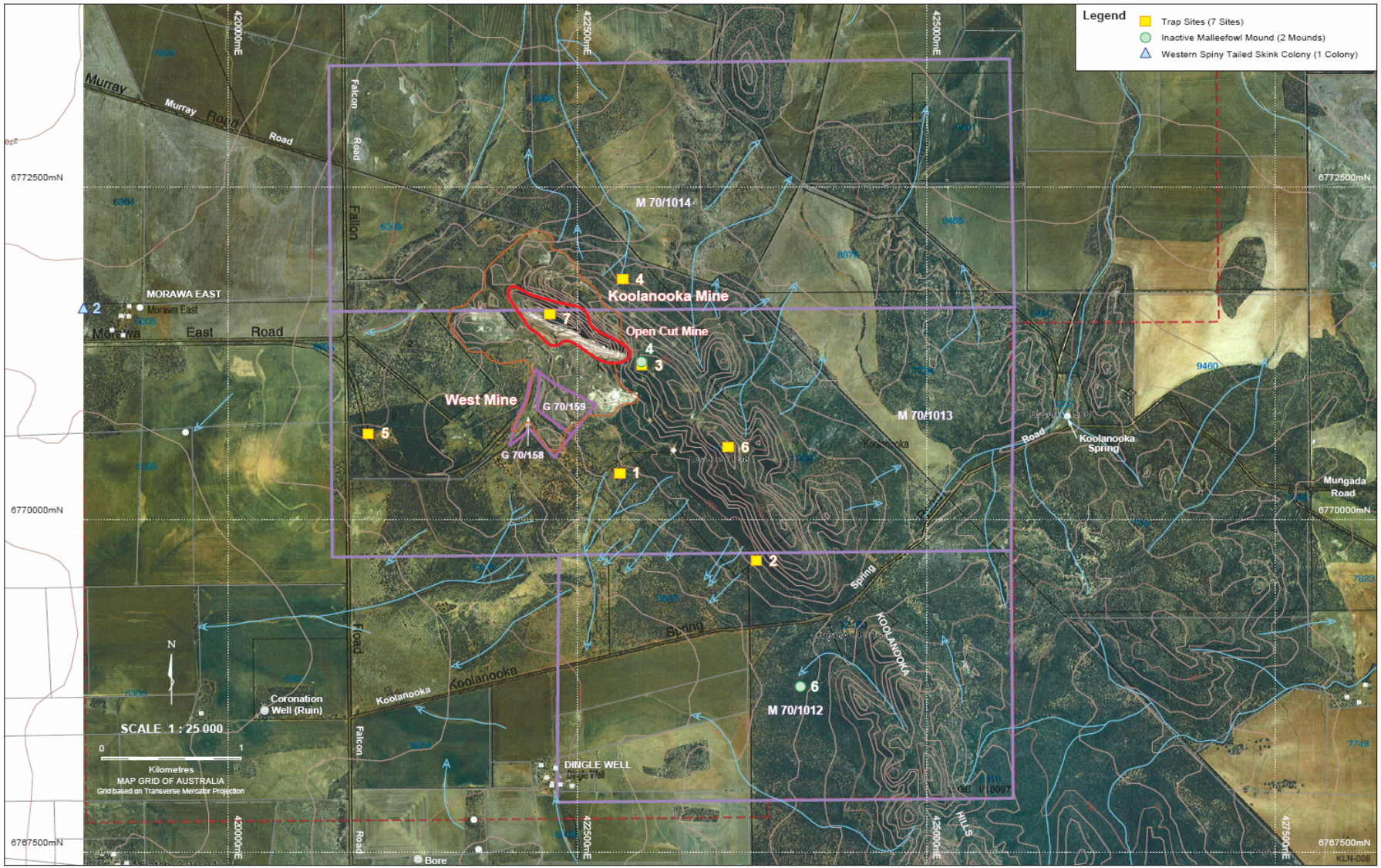
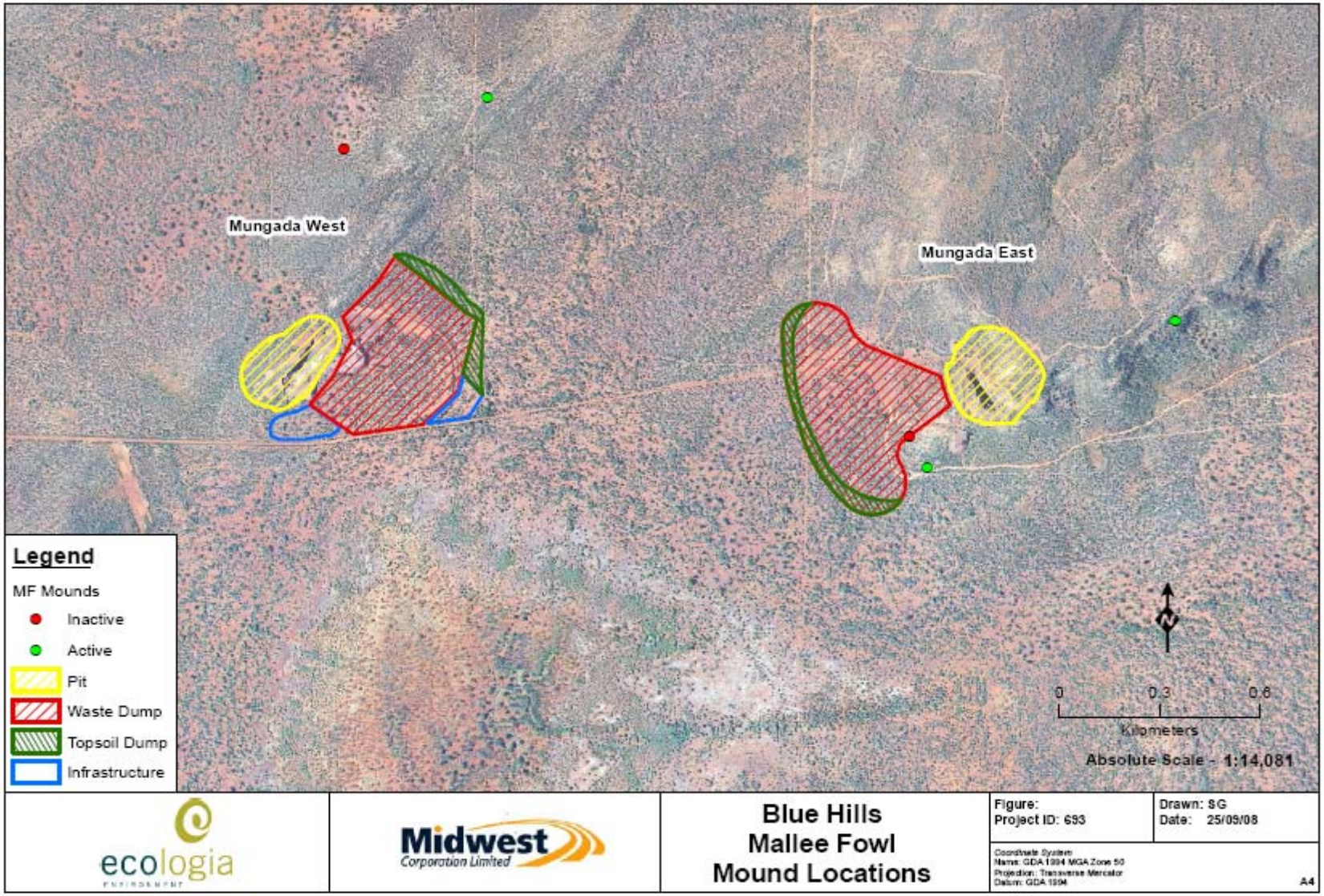


Figure 6-9 Fauna Trapping Locations


Mungada West
Mungada East
Legend
MF Mounds
Inactive
Active
Pit
Waste Dump
Topsoil Dump
Infrastructure
N
0
0.3
0.6
Kilometers
Absolute Scale - 1:14,081
ecologia
Midwest Corporation Limited
Blue Hills
Mallee Fowl
Mound Locations
Figure:
Project ID: 693
Drawn: SG
Date: 25/05/08
Coordinate System:
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994
A4

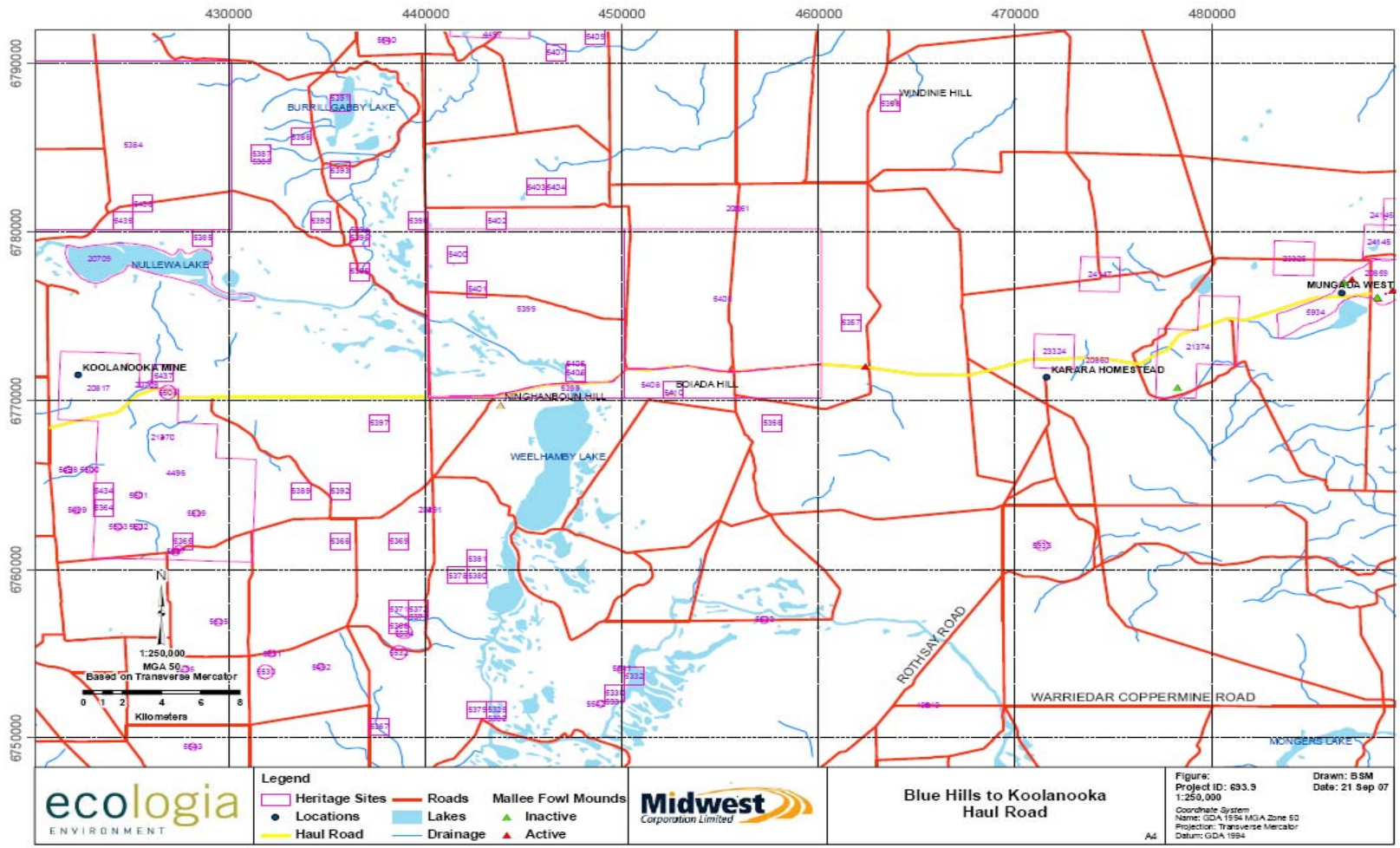


Figure 6-11 Blue Hills to Koolanooka Haul Road

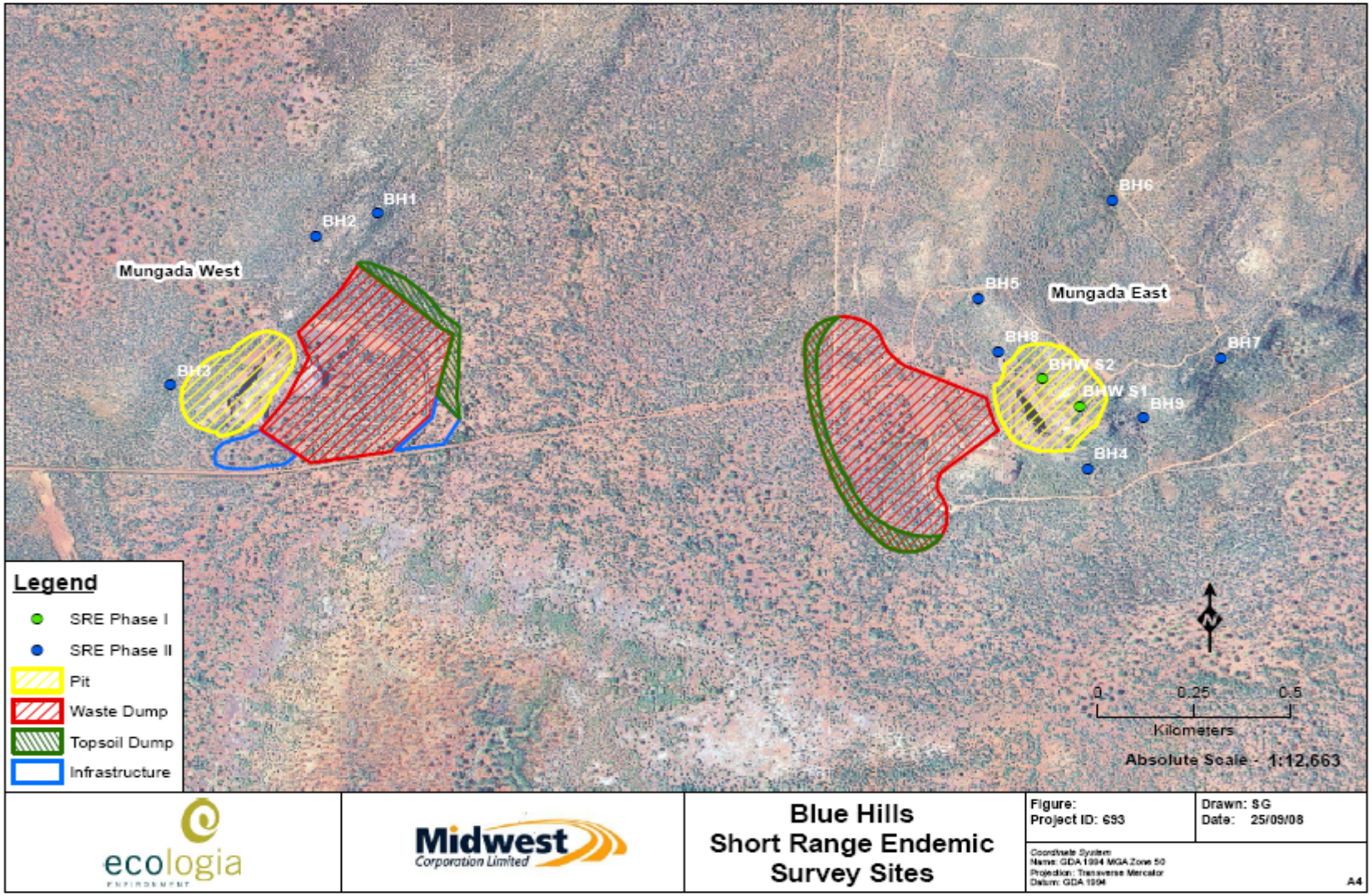


Figure 6-12 Blue Hills Short Range Endemic Survey Sites

Figure 6-13 TEC cutback area and associated 50m buffer zone

6.9 SOCIAL AND CULTURAL ENVIRONMENT

6.9.1 Koolanooka

Koolanooka Iron Ore Mine produced the first commercial export of iron ore from Western Australia and had a significant socio-economic impact on the town of Morawa during the 1960s. The mine is listed in the Morawa Heritage Inventory, with the recommendation that, should the mine ever be re-opened, the site would be photographed prior to the commencement of earthworks. This requirement has been fulfilled by Midwest. The existing Koolanooka mine site has a lookout and picnic area for the general public. The lookout will remain open over the duration of the mining works. Additionally Midwest commit to leaving a "historic mining trail" of previous mine workings for future tourism ventures.

There are no other known sites of cultural significance on or near the mine site.

Two unoccupied residences are located in relatively close proximity to the Koolanooka mine. The first residence is located approximately 5 km to the south and is owned by Midwest. The second residence is located on Munckton Road 3 km to the northwest of the mine and is leased to Midwest.

There are two native title claims covering the area, which are by the Widi Mob (unregistered) WAG6193/98 (WA97/072) and the Pandawn (unregistered) WAG0043/98 (WC96/083). Midwest has consulted the Native Title Claimants and is determined to maintain a good working relationship with affected aboriginal groups, who have to date, had no objection to the continuation of mining activities.

Two other claimant groups potentially have an interest in this area, the Amangu people WC04/2, and the Yamatji Marpla Barna Baaba Aboriginal Corporation. Midwest is currently in discussion with these groups with regard to the specifics of this Proposal.

Two previously recorded sites of Aboriginal heritage significance are located within the Koolanooka Hills project impact area (DIA 4496 and DIA 5868), as determined by ethnographic and archaeological studies (O'Connor, 1996, Quatermaine, 1996). The extent of these sites has been poorly defined and do not include the full extent of the Koolanooka Hills. Approval to disturb DIA 4496 has been obtained under Section 18 of the *Aboriginal Heritage Act 1972* (ref 0321145), and DIA 5868 has been determined a duplicate of DIA 4496. Evidence of the Section 18 clearance is provided in the PER in Appendix J.

Two other sites of Aboriginal Heritage significance (DIA 20817 and DIA 20816) were identified in a heritage study undertaken in 2003 (Hames Consultancy Group, 2003). Should Midwest project activities deem that theses sites may be impacteds activities, approval for this work will be obtained through Section 18 of the Aboriginal Heritage Act, prior to any disturbance. Local Aboriginal groups to date have had no objection to mining operations taking place at Koolanooka.

6.9.2 Blue Hills

In June 2005, Midwest Corporation Ltd commissioned Western Heritage Research Pty Ltd archaeologist Wayne Glendenning to conduct an archaeological survey of the Morawa Rail Siding and Blue Hills haul road. The archaeological survey was undertaken in July 2005 (Western Heritage Research, 2005).

The areas inspected included the Blue Hills haul road from approximately 488694E / 6776370N to approximately 488480E / 6776000N; the Morawa Siding project from approximately 403759E / 6771509N to approximately 420859E / 6771309N and a 500 m area surrounding the existing mines at Blue Hills.

The archaeological survey found no new archaeological sites. However, three previously recorded sites were inspected: Blue Hills Larger Cave (site ID 20857); Blue Hills Smaller Cave (site ID 20858) and Granite Pavement with rockhole (site ID 20860).

The two cave sites are located near the existing mine at Mungada East (large cave: 488861E 6776319N) (smaller cave: 488808E; 6776319N), if disturbance is required to either of these caves full approval will be gained via a Section 18 of the Aboriginal Heritage Act, prior to disturbance. The Granite Pavement with rockhole site is located adjacent the proposed Blue Hills haul road at 474185E; 6772394N and will not be impacted by site activities.

6.9.3 Mt Karara/Mungada Haul Road

The Mt Karara/Mungada haul road was assessed as part of the archaeological survey undertaken in July 2005 by Western Heritage Research. No new archaeological sites were located during this survey.

During reinstatement of the Mt Karara haul road several heritage sites bordering this location will remain undisturbed. The haul road reinstatement will only involve clearance of 3 m of predisturbed area on either side, to the pre-existing haul road shoulder. If disturbance is required to these sites at a later date, full approval will be gained via a Section 18 of the Aboriginal Heritage Act, prior to disturbance.

7.0 ENVIRONMENTAL SUSTAINABILITY AND OFFSETS

7.1 SUSTAINABILITY

The Western Australian Government has released a Sustainability Strategy for Western Australia: *Hope for the Future: the Western Australian State Sustainability Strategy* (Government of Western Australia, 2003). The strategy includes a vision for the State's mining industry and some key actions are:

- Work towards the assessment of projects using sustainability criteria.
- Foster local community involvement, particularly Aboriginal communities, pastoralists and local shires.
- Establish a transparent process to enable community awareness of the day-to-day regulatory system for the resources industry.
- Implement strategies that support the use of local employment in mining ventures, particularly using regional centres as employment hubs and encourage mining companies to maximise their purchasing of goods and services within the mine regions.

Following changes to the *Environmental Protection Act 1986*, the EPA now requires all formal environmental impact assessments to address the principles of sustainability. The application of the principles of sustainability to the Project is summarised in Table 2.2.

While the Project involves the mining of a finite resource and the use of fuel resources that may one day be depleted, the Project will be planned, constructed, operated and decommissioned in a manner that meets the principles of sustainability. Midwest, in managing impacts across the triple bottom line of Social, Economic, and Environmental concerns, will address sustainability principles in a number of ways including:

- establishing sustainability principles in purchasing and contracting;
- ensuring efficient energy and water use;
- minimising waste and encouraging recycling; and
- providing for industry and community partnerships.

Management commitments in relation to these principles have been provided within the EMP and Closure Plan.

Midwest Corporation has also embraced the EPA's principles of environmental protection as part of the Project's engineering and design. The environmental objective of the Project's design, in order of priority, is to:

- completely avoid the impact if possible;
- substitute with a lesser impact;
- include rehabilitation and engineering solutions to reduce the degree and risk of impact;
- design operational controls and emergency response around reduction of impact consequences; and

- provide primary environmental offsets for the impact.

Investigations have been conducted by Midwest on all aspects of the Project to gather baseline data and to determine the types and degree of the environmental impacts of the Project. Agreement from relevant agencies was obtained for the investigation methods as part of the proposal's consultation process.

Several opportunities for impact avoidance and minimisation have been identified and implemented as part of the proposal's design phase. These have been described in previous sections of this document and include:

- design of mine plan to consider final landform design, conservation and rehabilitation needs;
- use of Koolanooka pit waters for dust suppression to reduce the volume required to be extracted from established bore fields;
- use of rail transport as required under the Transport Co-ordination Act;
- selection of site disturbance areas to best avoid clearance of vegetation; and
- improvement to rehabilitation and aesthetic quality of previously created waste dumps.

7.2 OFFSETS

Midwest will seek to provide appropriate environmental offsets for residual impacts that can not be avoided. Selection of environmental offsets will be in accordance with recommendations contained in the EPA Position Statement No 9 – Environmental Offsets, and with EPA Guidance Statement No 19 – Environmental Offsets, and will be determined by Midwest with further advice from the DEC. The decision framework for the use of environmental offsets (EPA, 2006) is outlined in Figure 7-1**.**

Midwest is open to discussion regarding offsets for the 4.46 ha of Project disturbance on the Koolanooka TEC, the 3.14 ha being potentially impacted within the dust buffer zone area of influence, the disturbance to priority species within the proposed conservation area at Mungada. However, Midwest does not believe that other project impacts warrant offset consideration. Possible contributing offsets acceptable to Midwest include:

- research or conservation funding for DEC related management in the local area;
- involvement with rehabilitation projects in farmland areas near the mine site or Shire of Morawa; and
- direct assistance with control of feral goats (by reduction programs or fencing), other feral species and weed eradication programs.

There is the potential for Midwest to support and collaborate with local and regional bodies, such as the regional natural resource management body, the Northern Agricultural Catchment Council. As the Project area falls within the Yarra Yarra subregion, Midwest has the capability to participate in the activities of the subregional group of this body.

A number of other projects such as Hidden Treasures (DEC) and Bush Brokers (WWF) are operating in the area to identify and protect areas of conservational significance. Midwest is will consider contributing to identified projects as part of a negotiated offsets agreement.

To enable Midwest to accurately determine the required scale of offsets required, the final offset package will not be considered until all public comment and feedback related to the project has been received.

An indication of the scale of offset associated with this DSO proposal can be found in the EPA GS19. In this a new road was developed from Tom Price to Karratha via the Millstream – Chichester National Park. This development also affected TEC areas, similar to the effects of this DSO project and offsets applied in this case included rehabilitation of nearby disturbed areas, the development and repair of fencelines, and funding of weed control initiatives.

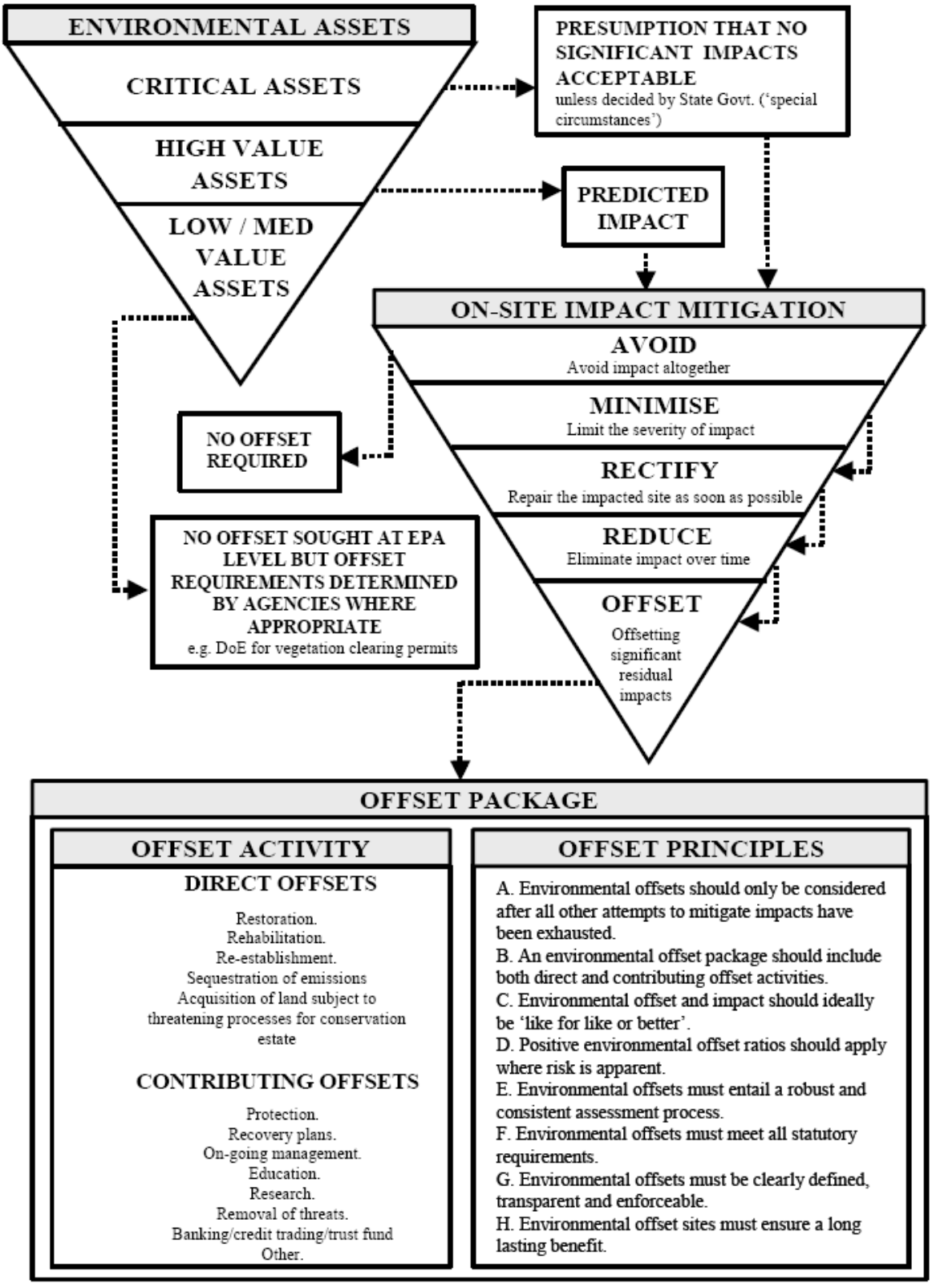


Figure 7-1 : Decision Framework for the use of Environmental Offsets.

8.0 POTENTIAL ENVIRONMENTAL IMPACTS AND MANAGEMENT

The management of environmental impacts associated with the proposal is based on a risk management framework aligned to Australian Standard 4360. This involves the identification of activities that may result in environmental impacts, implementing controls to reduce the risk of these impacts occuring, and monitoring the effectiveness of controls.

The procedures for risk control and reduction of the impact will be documented in the Midwest Project Environmental Management Plan (EMP) and communicated to all Project personnel through appropriate training. As the construction and operation phases of the proposal differ in scale and type of impacts, separate management plans will be developed and implemented. Additionally, all contractors will be required to adhere to environmental conditions stipulated within DSO mining and crushing contracts.

An Environmental Management System (EMS) aligned with the international standard ISO 14001 will also be developed and implemented for the Project. This will enable the Project to systematically comply with legal requirements, identify and control environmental risks, provide adequate and appropriately competent resources for environmental management, monitor performance and correct non-conforming situations. This process is also designed to promote continual improvement in performance.

Midwest has also committed to appointing an environmental professional to implement all environmental requirements contained within the DSO PER, EMP and EMS if this project is approved. This person will be directly responsible for the environmental performance of the Midwest operations located within the Midwest region, and this role will be based in Geraldton.

Management measures that are being proposed to minimise the potential impacts of the proposal are summarised in the Environmental Management Summary (Table S2). Management Commitments are summarised in Table S3.

Commitment 1: Prior to construction and operations, a Project Environmental Management Plan (EMP) will be developed. The plan will set out procedures to minimise and manage the environmental impacts of construction and operation activities.

Commitment 2: The Environmental Management Plan will be implemented during construction and operation, and communicated to Project personnel through training and induction sessions.

Commitment 3: The Environmental Management Plan will be developed in accordance with the Project Environmental Management System (EMS).

Commitment 4: Midwest will appoint an Environmental Manager to oversee and implement all environmental requirements contained within the DSO PER, EMP and EMS on the DSO project.

8.1 VEGETATION AND FLORA

Extension of the three existing pits for the project will require minor vegetation clearance. However, all infrastructure will be placed on previously cleared or disturbed areas.

Two areas of conservation sensitivity are present within the proposed Project area: the DEC managed Karara pastoral lease at Blue Hills and the TEC bordering the Koolanooka mine pit. The proposed vegetation clearance associated with this Project has been minimised as much as possible.

8.1.1 Management Objectives

The objectives for the management of flora and vegetation are to:

- Maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and the improvement in knowledge.
- Minimise the loss of and adverse impacts to native vegetation and plant habitats.
- Protect Rare and Priority Flora species that occur within the proposal area.

8.1.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- EPA Position Statement No. 2 Environmental Protection of Native Vegetation in WA (EPA, 2000).
- EPA Position Statement No. 3. Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002).
- EPA Position Statement No. 9 Environmental Offsets (EPA, 2006).
- EPA Guidance Statement No. 51. Terrestrial Flora and Vegetation Surveys Environmental Impact Assessment in WA (EPA, 2004).
- CALM Policy Statement No 9, Conserving Threatened Species and Ecological Communities (CALM, 1999).

8.1.3 Potential Impacts

8.1.3.1 Clearing

Koolanooka

The development of the project will result in the clearing of 2.68 ha of vegetation immediately adjacent to the existing Koolanooka pit, and a further 3.14 ha being impacted within the dust buffer zone area of influence. Of the TEC vegetation disturbance required, it has been calculated that only 2.68 ha will actually involve cleance of vegetation, as a significant portion of the nominated area has already been disturbed by previous approved exploration activities, as demonstrated in Figure 6-13. No clearing will be required for the waste dumps, processing area, temporary offices, workshop and ablutions block.

The vegetation type to be cleared for the extension of the existing open cut pit comprises closed tall scrub dominated by *Acacia assimilis* subsp. *assimilis, Allocasuarina campestris* and *Melaleuca filifolia* over herbland of mixed species and bare ground. This vegetation type is one of the vegetation types comprising the Koolanooka System TEC, which has been classified as vulnerable by the WA Threatened Ecological Communities Scientific Committee. This vegetation system covers an area of 5419 ha and is naturally restricted to the two known existing occurrences at Koolanooka Hills and the nearby Perenjori Hills, south east of Koolanooka Hills (CALM, 2003). This can be viewed in Figure 6-6.

A total of 6.26 ha of disturbed land currently exists on Midwest tenements in the Koolanooka TEC, due to previous exploration activity and access impacts (Figure 6-6). As the Koolanooka TEC area is 5419 ha, the previous disturbance represents 0.12 % of the total TEC area. The proposed Project clearing of TEC vegetation (4.46 ha) represents only 0.06 % of the remaining TEC area (Figure 8-1).

Blue Hills

Clearing at Blue Hills comprises 11.7 ha of predisturbed clearance for pit extensions, 18.8 ha of clearing for the East Mungada waste dump and topsoil stockpile, and 22 ha of clearing for the West Mungada waste dump and topsoil stockpiling area.

Koolanooka – Mungada Haul Road

Clearing of regrowth along both sides of the haul road from Mungada to Koolanooka is required to facilitate road trains and general mining traffic. The potential clearing is estimated at 39.5 ha (66 km x 3 m each side of the road).

8.1.3.2 Declared Rare Flora

Koolanooka Hills

No Declared Rare Flora taxa, protected under the Environment Protection and Biodiversity Act 1999 or the WA *Wildlife Conservation Act 1950*, were recorded during the current survey of the proposed zones of impact at Koolanooka Hills.

Blue Hills

Acacia woodmaniorum (DRF) is present within the propsed impact foot pring of both the Mungada East and Mungadad West pit areas. A total of 516 specimens are required to be eamove to allow developem of the two pit areas (Table 8-1). This represents an impact of 0.65% to the species total known population of 79,050 specimens in the Mungada – Blue Hills area (Woodman 2007). The waste dump design for East Mungada has been significantly modified to avoid impact to *A. woodmaniorum* that are present outside the orebody pit area but in close proximity (Figure 8-1b).

8.1.3.3 Priority Flora

The regional conservational significance and the likely impact (as a percentage) to known populations of Priority Flora and flora of interest at and in the vicinity of the proposed mine areas are considered below (Table 8-1). All the proposed impacts represent minimal (< 1%) impact to the species populations as a whole within the Blue Hills - Mungada area. The

exception is *Persoonia pentasticha* (P3) for which the proposed impact may represent approx 3.6%. However this is considered to be an overestimate as there is less accurate populations estimates available for this species.

Koolanooka Hills

No Priority Flora taxa were recorded from within the current survey area at Koolanooka Hills. However, the record of the taxon *Acacia sclerosperma* subsp. *sclerosperma* is of interest, as this represents a southerly range extension from its previously known distribution, in the Pilbara, Gascoyne, Carnarvon, Murchison, Geraldton Sandplains and Yalgoo and northern Avon Wheatbelt IBRA bioregions.

Blue Hills

Three Priority flora species were recorded at both the Mungada East and Mungada West survey areas at Blue Hills: *Micromyrtus acutas* (P1), *Micromyrtus trudgenii* (P3) and *Persoonia pentasticha* (P3).

The locations of individual specimens of these Priority Flora taxa have been plotted in the local Mungada project area (Table 8-1 8-1b). The distributions of recorded regional populations have been already mapped for most of these taxa by Gindalbie (Woodman, 2006b) and these are included as Appendix H.

Koolanooka - Mungada Haul Road

Three Priority flora species have been recorded by Woodman (2007) along the Koolanooka – Mungarda haul road. No of these species will be impacted by the proposed reinstatement of the pre-existing haul road formation.

8.1.3.4 Threatened Ecological Communities

The plant assemblages of the Koolanooka Hills System have been defined as a TEC (Vulnerable). The vegetation of these areas is dominated by sheoak and mixed shrubland of *Allocasuarina campestris* (hilltops) and *Acacia exocarpoides* (on granite). The zone of impact at Koolanooka Hills falls within the mapped areas for the TEC, and makes up a small proportion of this. The plant assemblages of the Koolanooka Hills TEC occur over two areas totalling 5419 ha (M. Morley DEC pers. comm.). Hamilton-Brown (2000) states that the Koolanooka Hills area is 3496 ha and the Perenjori Hills area 1948 ha; using these areas to calculate proposed impact percentages, 0.12% of the Koolanooka Hills TEC or 0.06% of the total TEC area of the Plant Assemblages of the Koolanooka System will be impacted (as the area at Koolanooka Hills proposed for clearance is 4.46 ha). Eighty-nine percent of the plant assemblages of the Koolanooka System (Koolanooka hills and Perenjori Hills) remain and much of the earlier loss is from the footslopes of the Koolanooka Hills and southern Perenjori Hills (Hamilton-Brown, 2000).

8.1.3.5 Reserves in the Area

No TECs are listed as occurring at Blue Hills. While pastoral activity has taken place on the lands within the Yalgoo bioregion since the latter half of the 19th Century, Karara, Lochada and Warriedar pastoral leases were purchased by the DEC between 2000 and 2004 (Markey and Dillon, 2006). These pastoral leases are currently listed as conservation estate under the

proposed Karara Conservation Reserve. The pastoral lease area for Karara is 109,291 ha, and the additional leases purchased for conservation purposes at Lochada and Warriedar Stations are 114,581 ha and 72,219 ha respectively; this gives a total of 296,091 ha in the proposed Karara Conservation Reserve.

The Blue Hills project area comprises two component land systems: Tallering (prominent ridges and hills of banded ironstone, dolerite and sedimentary rocks) and Yowie (extensive nearly level plains with sandy surfaces) (Payne *et al.* 1998). Mungada East and Mungada West comprise both of these land systems. The hills and ridges of the Tallering Land System are arranged, more or less, linearly, often with less than 5 km separating the different mapped areas of this land type. The arrangement reflects a distinct geomorphological history in the formation of these rocky hills and ridges. Both the Tallering and Yowie Land Systems are expressed on Lochada, Warriedar and Karara Stations which are in the Karara Conservation Reserve.

The areas of the Tallering and Yowie Land Systems are 329 km^2 and 9,189 km^2 respectively (Payne *et al*., 1998) and the area of land proposed for clearing at Mungada East and Mungada West is 52.5 ha. As only a small portion of the land to be cleared occurs in the larger, Yowie Land System impact calculations will be presented based on the Tallering Land System only, 52.5 ha of 329 km^2 equates to 0.16% of the Tallering Land System. Of this area 11.7 ha has been cleared previously and the remainder (40.8 ha) is to be newly cleared. Therefore the proportion of the Tallering Land Ssystem proposed to be newly cleared is 0.12%. However, as noted above, the Yowie Land System component has not been included in these calculations the actual impact on the vegetation of the Tallering Land System will be lower than this 0.16%.

8.1.3.6 Conservationally Significant Taxa Recorded at Both Areas from a Number of Surveys and Potential Project Impacts on these Taxa

A summary of taxa of conservation significance, as defined under the federal *EPBC Act 1999* and the WA state *Wildlife Conservation Act 1950*, identified at the survey sites (Koolanooka Hills, Mungada East and Mungada West footprints) is presented in Table 8.1. The numbers of plants known outside the footprint, and the approximate percentage of known plants to be impacted by the project are also presented in Table 8.1. The exact number of individual plants per population is not indicated in all records on FloraBase and an average number of plants have been taken based on numbers of plants in populations that are included on FloraBase.

No Priority Flora taxa were recorded at the Koolanooka area surveyed.

The greatest impact at Blue Hills will be to *Persoonia pentasticha* (P3) at an estimated combined impact of 3.6%; all other estimated impacts fall significantly below 1% of the local populations.

8.1.3.7 Weeds

Koolanooka

Two environmental weeds, Common Sowthistle (**Sonchus oleraceus*) and Ruby Dock (**Acetosa vesicaria*) were recorded. Ruby Dock is a problem species with a High risk rating as an environmental weed (CALM, 1999) in the area. The development of the Project has the potential to exacerbate the current problem by spreading the infestation to other areas.

Blue Hills

The Priority 1 weed, Patterson's Curse (**Echium plantagineum*) (Hussey *et al.*, 1997) has been identified near the Mungada East old mining pit on disturbed areas on lower slope areas. The development of the project has the potential to exacerbate the current problem by spreading the infestation to other areas. In addition to the Priority weed, Patterson's Curse, two environmental weeds were recorded in the area; **Galium spurium* and **Pentaschistis airoides* subsp. *airoides*.

8.1.3.8 Cumulative Impacts

Midwest is aware of other proposed mining operations which if approved will be developed in close proximity to the Midwest operations in the Blue Hills area. Due to significant variations in project timelines of the proposed surrounding developments, Midwest is unable to reasonably assess the cumulative impacts of combined regional developments. Midwest feels that sufficient information is provided in this PER to enable the EPA to conduct their own cumulative impacts assessment on the combined impacts of the proposed projects.

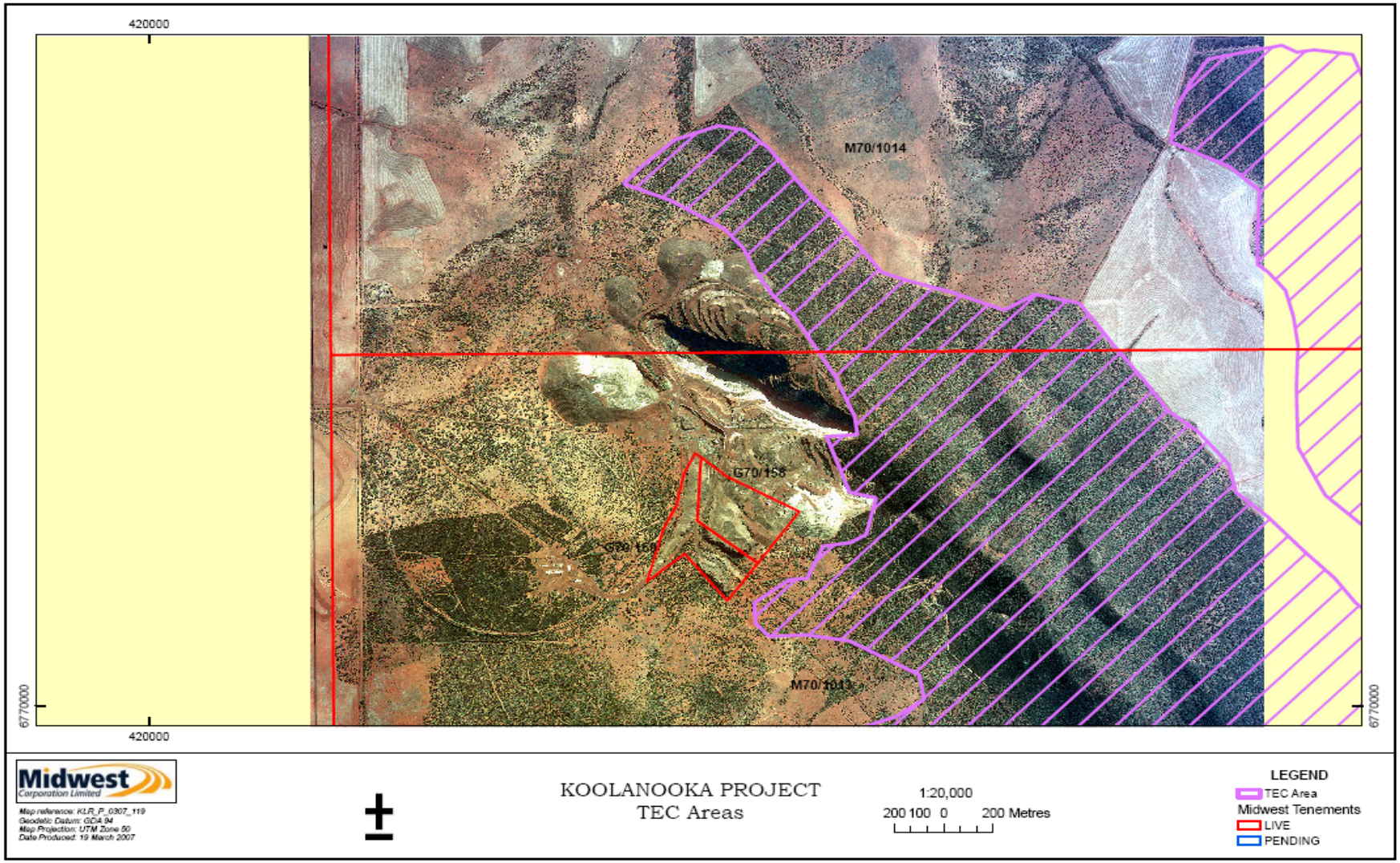


Figure 8-1 TEC Cumulative Impacts

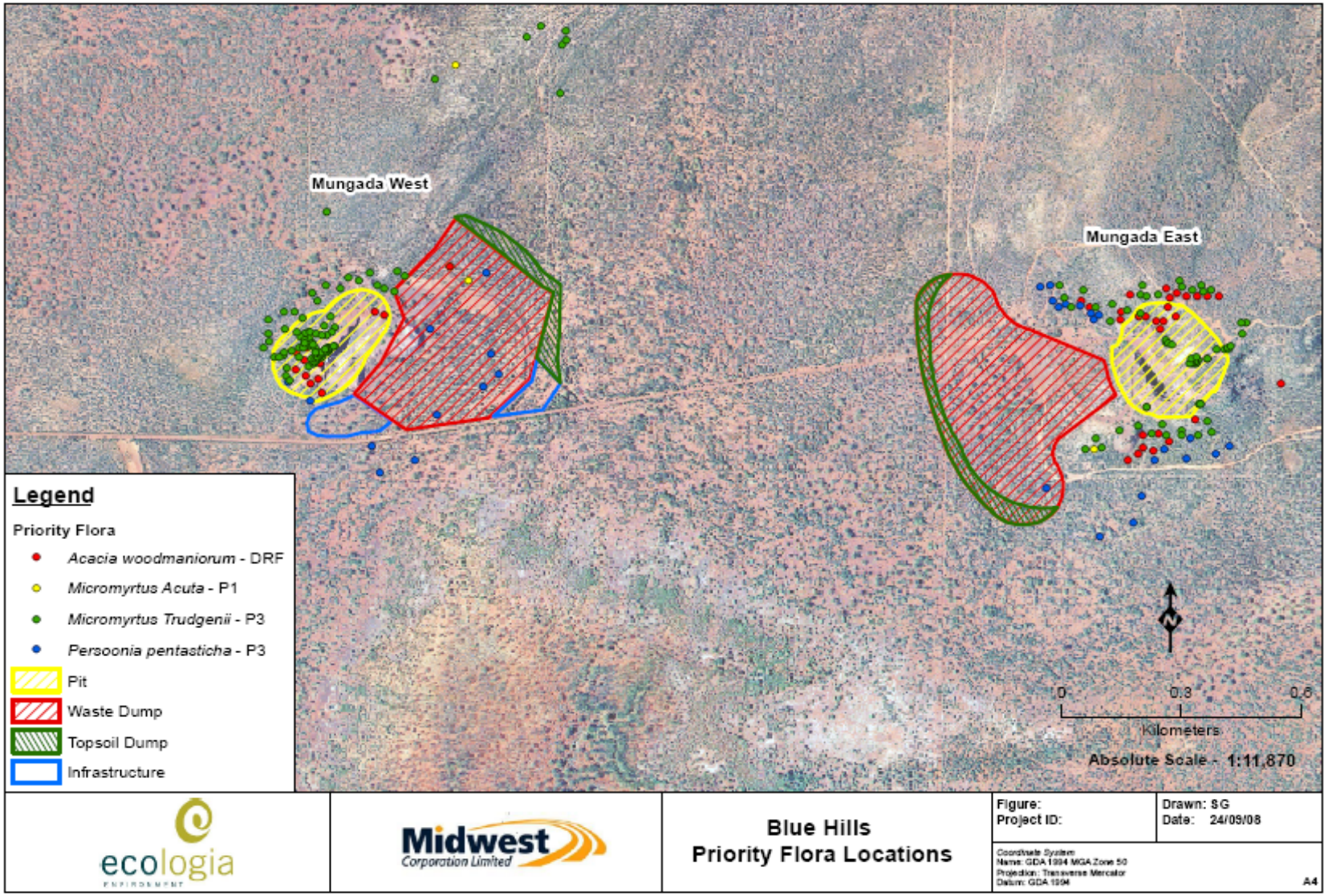


Figure 8-2 Rare and Prioity flora impacts at Mungada East and Mungada West

Table 8-1 **The populations of flora of conservational significance recorded in the Midwest Corporation Ltd project areas surveyed at Koolanooka and Blue Hills and the likely impact on these taxa due to proposed clearing of those areas.**

Flora Species	Cons. code	Number of Plants found in Mungada - Blue Hills area	Total number known plants outside impact area	Number of plants in Proposal impact area	Percentage of known plants to be Impacted
Koolanooka					
No Rare or Priority Flora taxa recorded					
Mungada West					
Acacia woodmaniorum	DRF	79,050	79,050	84	0.1%
Micromyrtus acuta	P1	205,673	205,673	10	0.005%
Micromyrtus trudgenii	P3	664,968	710,838	404	0.06%
Persoonia pentasticha	P3		308	6	1.95%
Mungada East					
Acacia woodmaniorum	DRF	79,050	79,050	432	0.55%
Micromyrtus acuta	P1	205,673	205,673	4	0.002%
Micromyrtus trudgenii	P3	664,968	710838	596	0.08%
Persoonia pentasticha	P3		308	5	1.62%
Lepidosperma sp. Blue Hills	New species	653,675	1,239,776	2	<0.001%
Blue Hills combined Proposal impacts					
Acacia woodmaniorum	DRF	79,050	79,050	516	0.65%
Micromyrtus acuta	P1	205,673	205,673	14	0.007%
Micromyrtus trudgenii	P3	664,968	710,838	1,000	0.14%
Persoonia pentasticha	P3		308	11	3.57%
Lepidosperma sp. Blue Hills	New species	653,675	1,239,776	2	<0.001%

8.1.4 Management & Mitigation

8.1.4.1 Clearing

- Initial mine plans only include clearing in mine pit expansion areas, however, careful mine site planning may allow for avoidance, minimisation and / or offset impacts from required clearing of flora and vegetation, including impacts to flora of conservation interest.
- Midwest is committed to addressing the key principals of native vegetation protection as listed in Schedule 5 of the Environmental Protection Act 1986. This was addressed as part of flora surveys and in the Project EMS and EMP.
- Rare Flora baseline surveys have been undertaken for all disturbance areas and locations of any Priority Flora taxa have been incorporated into an Environmental Geographical Information System (GIS) and plotted onto maps.
- Impact to Priority flora or of flora of conservational significance will be avoided by using information from flora surveys conducted in the area.
- Prior to commencement of works, areas to be disturbed will be demarcated in the field by a reference to design/site plans. This will constitute a hold point requiring written approval from the Site Manager prior to disturbance.
- Liaison with the DEC will occur regarding the management of Priority and Significant flora.
- Where appropriate Midwest will prepare and implement a Threatened Flora Management and Conservation Plan for the Project area to address management of Threatened Flora impacted by the proposed development.
- A two strand wire fence will be erected adjacent the South fold cutback at Koolanooka to restrict access into the Threatened Ecological Community. This fence will be constructed to prevent accidental penetration into the area and will be adequately signposted with warning signs to not impact the area beyond the fence.
- Topsoil and vegetation from all clearance activity will be separately stockpiled in dedicated stockpile areas, with controlled clearance practices concerning soil removal and stockpiling in place.
- If required for conservation species preservation, designated “no-entry” sites will be incorporated into a site / Project map and communicated to Project personnel.
- Personnel will be provided with training and tools to assist in their general awareness and understanding of species of conservation significance and in the importance of minimising vegetation clearing and disturbance.
- Environmental offsets for necessary clearing of flora and/or vegetation of significance will be investigated and implemented in consultation with stakeholders as discussed in Section 7.2.
- Vehicles and machinery will only use designated tracks/roads: existing roads and tracks will be used in preference to clearing new areas.
    - Where practicable on any temporary clearance required, raised blade disturbance will be conducted to minimise vegetation removal.

- Vegetation when removed will either be directly placed on rehabilitation areas or mulched and stockpiled for use during later rehabilitation.
- Vegetation will not be burnt without written approval of the Site Manager.
- Rehabilitation will be undertaken as soon as practicable after land disturbance.

8.1.4.2 Weeds

- Weed dispersal will be controlled through establishment of weed hygiene procedures, and with staff being trained on the presence of established weeds within the Project areas, and within the local area.
- As Patterson's Curse (**Echium plantagineum*) is a Priority 1 listed weed under the ARRP Act 1976, Midwest is required to remove and manage the weed during the life of the mine from the areas disturbed due to mining activities. This can be done with appropriate management controls as outlined in the EMP, such as use of appropriate herbicides including Chlorsulfuron, Metsulfuron methyl, Logran® and Glyphosate + 2,4-D ester.
- Where practicable, the appropriate herbicide will be applied once Ruby Dock (**Acetosa vesicaria*) is in full foliage and actively growing, and before it sets seed.
- If required for management of weed dispersal, designated "no-entry" sites will be incorporated into a site / Project map and communicated to Project personnel.

8.1.5 Predicted Outcome

8.1.5.1 Clearing

Koolanooka

At Koolanooka a total of 2.68 ha of new clearing is required for the Koolanooka Pit South Fold cutback and an additional 3.14 ha may be impacted within the dust buffer zone area of influence. Of the 4.46 ha of TEC area disturbance required, it has been calculated that only

2.68 ha will actually involve cleance of vegetation, as a significant portion of the nominated area has already been disturbed by approved exploration activities, as demonstrated in Figure 6-13.

No Declared Rare Flora taxa, protected under the *Western Australian Wildlife Conservation (Rare Flora) Notice* 2006, priority flora or flora of conservation significance were recorded during the current survey of the proposed zones of impact at Koolanooka Hills.

Blue Hills

One DRF and three Priority flora species recorded at Mungada East and West at Blue Hills will be impacted upon, (see Table 8.1 and Figure 8-1b).

Clearing at Blue Hills comprises 11.7 ha of predisturbed clearance for pit extensions, 18.8 ha of clearing for the East Mungada waste dump and topsoil stockpile, and 22 ha of clearing for the West Mungada waste dump and topsoil stockpiling area.

Koolanooka - Mungada Haul Road

Clearing of regrowth along both sides of the haul road from Mungada to Koolanooka is required to facilitate road trains and general mining traffic. The potential clearing is estimated at 39.5 ha (66 km x 3 m each side of the road).

No DRF or Priority flora will be impacted.

8.1.5.2 Weeds

With appropriate management as detailed in the EMP, identified priority weed species Patterson's Curse (*Echium plantagineum)* will not spread into unaffected areas.

8.1.6 Environmental Management Commitments

Commitment 5: As a component of the Project EMP there will be management procedures implemented at Blue Hills for the protection of priority flora, developed in consultation with the DEC, prior to mine and infrastructure construction works. The plan will set out procedures to maintain the abundance, diversity, distribution and conservation status of threatened flora species.

Commitment 6: The boundary between the TEC and impact areas will be fenced prior to construction and operation to avoid inadvertent impact.

8.2 FAUNA

8.2.1 Management Objectives

The objectives for management of terrestrial fauna are to:

- Maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
- Minimise the impact to fauna.

8.2.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- EPA Position Statement No. 3. Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA, 2002).
- EPA Guidance Statement No. 56. Terrestrial Fauna Surveys for Environmental Impact Assessment in WA (EPA, 2004).

8.2.3 Potential Impacts

8.2.3.1 Vertebrate Fauna

Koolanooka Mine site

A number of species of vertebrate fauna with conservational significance have been recorded from the greater Koolanooka area; however none will be directly impacted by the proposed Project disturbance footprint.

Previous studies identified several conservation significant species with the potential to occur in the Koolanooka area. These were the Malleefowl *Leipoa ocellata*, Slender-billed Thornbill *Acanthiza iredalei iredalei*, Carnaby's Black-Cockatoo *Calyptorhynchus latirostris*, Peregrine Falcon *Falco peregrinus*, Bush Stone-curlew *Burhinus grallarius*, Hooded Plover *Charadrius rubricollis*, White-browed Babbler (*Pomatostomus superciliosus*), Crested Bellbird (*Oreoica gutturalis*), Western Spiny-tailed Skink *Egernia stokesii badia*, the Gilled Slender Blue-tongue *Cyclodomorphus branchialis* and two invertebrates, the Tree Stem Trapdoor Spider *Aganippe castellum* and Minnivale Trapdoor Spider (*Teyl* sp.). Of these, five have been recorded at or near Koolanooka, the Malleefowl, White-browed Babbler, Crested Bellbird, Western Spiny-tailed Skink and Gilled Slender Blue-tongue.

Malleefowl *Leipoa ocellata* (Vulnerable, Schedule 1)

The Malleefowl is listed as a Schedule 1 species under the *Wildlife Conservation Act 1950* and as Vulnerable and a Migratory species under the *Environmental Protection and Biodiversity Conservation Act 1999.* Six Malleefowl mounds were located within the greater study area during the 2003 fauna survey (ATA Environmental 2004) and Malleefowl were also present during the early survey (Tingay, 1996), see Figure 6.11. All mounds were inactive, one of which lies within the project impact area, and there was no evidence of

Malleefowl being present within the study area during the 2003 or 2007 fauna surveys. The project will not affect the conservation status or significantly affect the distribution of the species at Koolanooka.

White-browed Babbler south-western race *Pomatostomus superciliosus ashbyi* (Priority 4)

White-browed Babblers were recorded during both surveys at Koolanooka and are common in the area. Whether they were the significant subspecies *P. s. ashbyi* or the non-significant northern subspecies *P. s. superciliosus* is unknown, but the change between subspecies is clinal and occurs in the region (see Section 6.8.5). The species is widespread and common in the Koolanooka area and will not be significantly impacted by the proposed mine development.

Crested Bellbird southern race *Oreoica gutturalis gutturalis* (Priority 4)

Similar to the White-browed Babbler, the clinal transition between non-significant northern populations and significant southern populations occurs in the Koolanooka region, and the birds observed at Koolanooka during both surveys were not identified to subspecies level. It is therefore likely that some were the southern significant subspecies *O. g. gutturalis*. However, because the species is widespread and relatively common at Koolanooka and in the surrounding region, it is unlikely to be significantly affected by mining.

Western Spiny-tailed Skink *Egernia stokesii badia* (Endangered, Schedule 1)

Two colonies of the Western Spiny-tailed Skink (*Egernia stokesii badia*), classified as Schedule 1 under the *Wildlife Conservation Act 1950* and as Endangered under the *Environment Protection and Biodiversity Conservation Act, 1999*, were recorded adjacent to the proposed Project area during the fauna survey in degraded areas with tin and abandoned car bodies surrounding farmhouses. Although it is recognised that this species has experienced a marked decline within this region (How, Dell & Robinson, 2003), the population will not be impacted by the project. Searches within the extension footprint yielded no individuals of this species, nor any habitat suitable for it.

Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Vulnerable, Schedule 1)

A single individual of Gilled Slender Blue-tongue *Cyclodomorphus branchialis* was captured opportunistically at Koolanooka by ATA Environmental (2004). No other detail was given in this report regarding this capture, but it is assumed that the species inhabits rocky ridges similar to those captured at Blue Hills. Extensions to the mining pit at Koolanooka could potentially impact this species if present; however, no *C. branchialis* were located during a survey of the extension area by *ecologia* staff in 2007 and it is therefore unlikely that any adverse impact to this species will result.

Migratory bird species

A migratory bird species listed under the *Environmental Protection and Biodiversity Conservation Act 1999* was observed in the study area commonly known as the Rainbow Bee-eater. It is unlikely that mining activity will substantially modify, destroy or isolate an area of important habitat for this migratory species, or seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of this species.

The proposed clearing of 2.68 ha of vegetation for the Project is unlikely to have a material impact on fauna habitat.

Blue Hills Mine site

Several species of conservation significance were recorded at Blue Hills. These were Malleefowl, Peregrine Falcon, Major Mitchell's Cockatoo, White-browed Babbler, Crested Bellbird and Gilled Slender Blue-tongue.

Malleefowl *Leipoa ocellata* (Vulnerable, Schedule 1)

The Malleefowl is listed as a Schedule 1 species under the *Wildlife Conservation Act 1950* and as Vulnerable and a Migratory species under the *Environmental Protection and Biodiversity Conservation Act 1999.* Eighty-one mounds of varying activity were located within a search area of 429 ha surrounding Blue Hills by Bamford Consulting Ecologists (2006a). The majority were old or very old (greater than 20 years since last work). Six active mounds were located; one at Blue Hills, three at Mungada and two at Terrapod. Three were assessed as recently used. Overall, about 11% of the mounds located were active or recently used. The overall density of active mounds was approximately 1 per 100 ha (1/km^2). There was a bias toward mounds on slopes, with fewer on ridges, and most mounds (90%) were found on gravely or stony soils. In addition to these, 31 other mounds have been located previously (Bamford Consulting Ecologists 2006a).

Malleefowl are present within the region and impacts may occur when vegetation is cleared or disturbed by site activities. One active mound exists within the intended clearance area alongside the Blue Hills haul road (Figure 6-10) and four live birds were also opportunistically sighted, and one active and one inactive mound exist within the area designated for waste dump material at East Mungada (Figure 6-9).

White-browed Babbler south-western race *Pomatostomus superciliosus ashbyi* (Priority 4)

White-browed Babblers were recorded during surveys at Mungada and Karara and are common in the Blue Hills area. Whether they were the significant subspecies *P. s. ashbyi* or the non-significant northern subspecies *P. s. superciliosus* is unknown, the change between subspecies is clinal and occurs in the region (see Section 6.8.5). The species is widespread and common in the region and will not be significantly impacted by the proposed mine development.

Crested Bellbird southern race *Oreoica gutturalis gutturalis* (Priority 4)

The clinal transition between non-significant northern populations and significant southern populations occurs in a wide belt incorporating Koolanooka, the haul road and the Blue Hills area, as discussed in Section 6.8.5. As in the Koolanooka surveys, the birds observed during the Blue Hills surveys were not identified to subspecies level. It is therefore likely that some were the southern significant subspecies *O. g. gutturalis*. Again, because the species is widespread and relatively common at Blue Hills and in the surrounding region, it is unlikely to be significantly affected by mining activity.

Gilled Slender Blue-tongue *Cyclodomorphus branchialis* (Vulnerable, Schedule 1)

Two individuals were captured, on at Mungada and one at Karara. The species is noted as inhabiting rocky habitat by Bamford Consulting Ecologists (2006a). Extensive searches did not yield any further individuals.

Extensions to the mining pits at Mungada East and West could potentially impact this species if present; however, no *C. branchialis* were located during a survey of the extension

areas by *ecologia* staff in 2007 and it is therefore unlikely that the species will be impacted significantly.

Peregrine Falcon *Falco peregrinus* (Schedule 4)

A breeding record from a ridge (undisclosed to prevent poaching) suggests that the Blue Hills area is an important area for this species. Nest sites are typically on shallow ledges in areas of steep, near vertical exposed rock, and the nest site appeared to be well used. Current expansion plans are unlikely to impact areas suitable for use by nesting peregrines; however, disruption caused by human activity may have an impact on the species' choice of nesting site. The current proposal may therefore negatively impact this species.

Major Mitchell's Cockatoo *Cacatua leadbeateri* (Schedule 4)

Pairs and single birds were seen daily at Blue Hills over eucalypt woodlands near the Karara and Mungada ridges, suggesting that they were nesting in hollows in the area during the 2006 survey (Bamford Consulting Ecologists 2006a), despite not being seen during the 2004 survey. A further two groups of 15 and nine individuals were seen along the haul road flying above eucalypt woodland on Lochada station during the rare fauna search conducted by *ecologia* in 2007. According to Bamford Consulting Ecologists (2006a), Karara and Lochada stations were known to be popular with poachers targeting the eggs and chicks of this species, suggesting that the region is a known breeding area.

Clearing of large, hollow-bearing eucalypts, particularly salmon and river gums, could reduce the potential for nesting in this species.

Koolanooka - Mungada Haul Road

The haul road has a high potential diversity as a result of it bridging the transition between the south-west and inland biogeographic zones. The rare fauna survey included those areas of haul road that had become overgrown by vegetation and are required to be cleared to restore the haul road to its original width. Four species of conservation significance were recorded during the survey, Malleefowl, Major Mitchell's Cockatoo, White-browed Babbler and Crested Bellbird.

Malleefowl *Leipoa ocellata* (Vulnerable, Schedule 1)

The Malleefowl (*Leipoa ocellata*) is listed as a Schedule 1 species under the *Wildlife Conservation Act* and as Vulnerable and a Migratory species under the *Environmental Protection and Biodiversity Conservation Act, 1999.* Four individuals were seen in two evenings during a rare fauna survey of the 55 km haul road corridor by *ecologia* in 2007. The birds were not clustered, being evenly spread from near Koolanooka in the west to Lochada station in the east, and an active or recently used mound was discovered alongside the haul road on Lochada station. They were most active during the late evening. The mound was within the regrown portion of the previous haul road and appeared to have been modified from a spoil heap. Although no other mounds were observed alongside the haul road, this activity may be repeated elsewhere and due caution when widening existing tracks will need to be employed.

The most significant threat to Malleefowl along the haul road is vehicle strikes, particularly in the late evening when they are most active. However, given the wary nature of Malleefowl and their ability to quickly move away from danger, vehicles strikes are unlikely.

Major Mitchell's Cockatoo *Cacatua leadbeateri* (Schedule 4)

Two groups of 15 and nine individuals were seen along the haul road flying above eucalypt woodland on Lochada station during the rare fauna search conducted by *ecologia* in 2007.

This species is unlikely to be affected by the restoration of the haul road, because large, hollow bearing eucalypts did not occur in the previous haul road's footprint. Additionally, these cockatoos generally fly above the canopy at higher levels than a passing light vehicle or truck and are therefore unlikely to fall victim to vehicle strikes.

White-browed Babbler south-western race *Pomatostomus superciliosus ashbyi* (Priority 4)

White-browed Babblers were recorded during biological surveys of the Koolanooka, Blue Hills and haul road areas and were common along the haul road. Whether they were the significant subspecies *P. s. ashbyi* or the non-significant northern subspecies *P. s. superciliosus* is unknown, but the change between subspecies is clinal and occurs in the region (see Section 6.8.5). The haul road restoration involves clearing the overgrown strip of previous haul road adjacent to the existing roadway, which does not seem to have had an effect on this species. It is therefore unlikely that the restoration will result in any impact to this species.

Crested Bellbird southern race *Oreoica gutturalis gutturalis* (Priority 4)

The clinal transition between non-significant northern populations and significant southern populations occurs in a wide belt incorporating Koolanooka, the haul road and the Blue Hills area, as discussed previously. Crested Bellbirds were not identified to subspecies level during the rare fauna survey of the haul road restoration area, but were common and frequently encountered. It is therefore likely that some were the southern significant subspecies *O. g. gutturalis*. Again, because the species is widespread and relatively common at Koolanooka, Blue Hills and along the haul road, and because it is not currently negatively impacted by the existing road, the road restoration should not significantly affect this species.

8.2.3.2 Short Range Endemics

It is anticipated that Short Range Endemic (SRE) fauna potentially carry a low impact from implementation of the Project. This has been discussed with experts from WA Museum and the University of Western Australia, who indicated that a reduced need for survey of the area would be acceptable (Dr Mark Harvey, pers com 2006 and Barbara Main, pers com 2006 respectively).

A Project risk assessment has been conducted on potential impact on SREs at both Koolanooka and Blue Hills (ecologia, 2007b): this indicates that there is a low risk of impact to SREs, particularly concerning three Wildlife Protection Act 1950 Schedule 1 species that may potentially occur in the impact area. These are three trap door spider species known from the north-eastern agricultural/ Midwest region:

- *Idiosoma nigrum* (Idiopidae) Main 1952;
- *Aganippe castellum* (Idiopidae) Main, 1986; and
- *Kwonkan eboracum* (Nemesiidae) Main, 1983.

ecologia Environment conducted a sampling series to SREs in this location from early to mid 2007 (Appendix 13-30). In total, one hundred and seventeen potential SRE specimens were recorded during the survey. These individuals represented six classes, 12 families, 17 genera and 21 species of invertebrates. Although SRE status could not be determined for some of the species collected (pseudoscorpion, snails and some mygalomorph spiders), none of the species are likely to be restricted to either the 2.68 ha of Koolanooka Threatened Ecological Community (TEC) or the areas at Mungada East and Mungada West that is expected to be impact upon by the Project (M. Harvey, pers. comm. 2006). In addition, the listed Schedule 1 trap-door spider species *Aganippe castellum*, *Idiosoma nigrum* and *Kwonkan eboracum* were not found within the project impact area, although *I. nigrum* was found nearby at Karrara station.

The approximate 39.5 ha of naturally revegetated haul road to be cleared is considered unlikely to harbour SRE taxa and thus this part of the proposal is unlikely to impact significantly on SRE taxa.

8.2.3.3 Stygofauna

Stygofauna may occur in groundwater within suitable substrate such as limestone strata and paleochannels within the Midwest/Yilgarn area. In order to determine the potential impact to subterranean aquatic fauna (stygofauna), Midwest commissioned *ecologia* Environment to undertake stygofauna surveys February 2007 and March 2008 (Appendix 13.29). The Koolanooka Springs Road borefield comprised eight bores suitable for stygofauna sampling. As four of these contained pumps which were used to supply water for exploration purposes during phase one of surveying at the time, only the four remaining bores were sampled at Koolanooka during the first phase of sampling in February 2007. During the second phase in March 2008, seven bores were sampled within the Koolanooka Borefield and a single bore was sampled at Tilley Siding. In addition, four bores /wells were sampled regionally in order to assess the regional significance of the results within the project impact areas.

Stygofauna sampling took place in three stages:

1. Description of the physical parameters of the bore;
2. Measurement of a number of physico-chemical parameters using a 90 FL multi-parameter meter from water bailed using sterile single use bailers; and
3. Stygofauna sampling following the methods recommended by the Department of Environment and Conservation (DEC).

Phase 1 yielded no stygofauna, while Phase 2 yielded two specimens of a stygobitic copepod from the genus *Microcyclops.* One of these specimens was collected within the Project area, and the other specimen was collected in a regional well approx. 70 km away from the Project area. The species identity could not be confirmed as both specimens were immature, however, based on the location of the Project area, the specimens are likely to belong to a cosmopolitan species *Microcyclops varicans*.

Only established bores and pit waters will be utilised for water supply at Koolanooka - water which is already in use for current operations. As the current survey very limited stygofauna presence, this water contains little risk that its use will impact on significant stygofauna populations. Similarly, as excavation of both the East and West Mungada pits will not extend below the water table, no dewatering will be required at this location, and hence no interference to stygofauna populations is expected to occur from these sources.

Given that no dewatering of the aquifer within the project area is required and specimens were found approximately 70 km apart, both inside and outside of the impact area, no significant impact from the Project is expected to occur on the species.

8.2.3.4 Troglofauna

In order to confirm that impact areas are devoid of troglofauna of significance, a multi-phase trap baited sampling for troglofauna was conducted on site. One specimen of a new, previously unencountered species of troglobitic spider was collected opportunistically during the initial surveying phase (*ecologia*, 2007d). It should be noted that this troglobitic spider was found outside the TEC cutback impact area, and is expected to occur along the entire Koolanooka range from which it was sampled. Further troglobitic sampling was subsequently carried out at Koolanooka and Blue Hills but no troglobitic invertebrate fauna were collected from the additional phases of surveying. The troglobitic spider was not recovered again (Appendix 13.30).

In order to quantify the proposed impact of the Project on the potential troglofauna habitat, it has been calculated that 1.7 M m^3 will be impacted over the indicated impact area of 4.46 ha. As the potential troglofauna habitat in the greater TEC area is approximately 3.5 billion m^3 over 3,500 ha of TEC, the loss of habitat resulting from the Project impact is not expected to be significant.

8.2.4 Management & Mitigation

8.2.4.1 Vertebrate Fauna

- Impacts to fauna from vegetation clearing will be minimised by reducing the clearing footprint where possible and conducting staged clearing.
- Measures to limit the extent of vegetation clearing will occur e.g. marking clearing limits.
- Disturbed areas will be rehabilitated as soon as possible, with ongoing rehabilitation throughout the mine life to facilitate habitat restoration.
- Rare fauna baseline surveys have been conducted for all disturbance areas and locations of any fauna of conservational significance will be incorporated into an Environmental Geographical Information System (GIS) and plotted onto maps.
- Efforts to avoid impact to individuals and habitats of fauna of conservation significance will be undertaken by using information from fauna surveys conducted in the area.
- Liaison with DEC regarding the management of fauna of conservation significance.
- Implement operational control procedures, site inductions and employee training programs to protect native fauna from intentional harm, and to appropriately manage injured fauna if found.
- Wildfire from accidental ignition will be avoided as far as is possible.

- Midwest will investigate installing high pitched whistles on the front of road trains working the Blue Hills haul road, in an attempt to scare away fauna and reduce fauna road kills.
- Dead trees will be regarded as valuable habitat and will be protected. Collection of firewood from the area will be prohibited.
- Rock hollows and overlays in the Blue Hills are important for some fauna and contain historically significant nests of stick-nest rats. Access to these caves by Project personnel will be controlled.
- Foundation holes, drill holes and trenches will be covered, fenced, bunded or otherwise capped to prevent fauna entrapment. Where appropriate fauna egress matting will be installed.
- Holes and excavations will be inspected regularly for trapped fauna. Uninjured trapped fauna will be released by a competent person with the appropriate DEC permits.
- Native fauna will not be captured, taken, fed or harmed without the appropriate permits.
- Domestic pets will not be allowed on the project footprint.
- Feral animals in the area, having adverse impacts on native wildlife, will not be encouraged by site related refuse.
- Any death of fauna of conservation significance will be reported to DEC.

In addition, to help protect Malleefowl, Midwest will:

- become a financial member of the Malleefowl Preservation Society;
- record sightings of nests both active and inactive;
- limit speeds on haul roads to 90 km /hr;
- install warning signs as necessary; and
- record sightings of birds in time/number/location.

8.2.4.2 Short Range Endemics

The following management items are recommended to mitigate impacts of the development on SRE fauna;

- clearing should be restricted to that which is necessary. Clearing boundaries should be defined in the field.
- cleared areas should be rehabilitated as soon as practical, southern facing ridge slopes should be avoided where possible.
- dust suppression measures should be implemented, including management of road speed on unsealed roads.
- a fire prevention strategy should be implemented; and
- all vehicles should be fitted with fire extinguishers and all personnel trained in their use.

8.2.4.3 Stygofauna

As only two cosmopolitan copepod stygofauna specimens have been collected during the Koolanooka Blue Hills DSO Project stygofauna sampling program conducted at Koolanooka borefield, and no new bores or dewatering will be required on the project, water abstraction activities related to exploration and proposed mining activities is not likely to significantly impact any stygofauna species or communities. However, if new bores do need to be developed at a later stage, then presence for stygofauna populations will be assessed before the new source is utilised on the project.

8.2.4.4 Troglofauna

Should management of troglofauna be required, it will be completed by a dedicated Troglofauna Management Plan to be developed by Midwest.

8.2.5 Predicted Outcomes

8.2.5.1 Vertebrate Fauna

Koolanooka

A number of species of vertebrate fauna with conservational significance have been recorded from the general Koolanooka area; however none will be significantly impacted by the proposed project disturbance footprint.

Blue Hills

Being reasonably common within the area, Malleefowl may be impacted by the clearing associated with the proposed project, through habitat removal and vehicle strikes.

It is not expected that the Peregrine Falcon (*Falco peregrinus)* and Major Mitchell's Cockatoo (*Cacatua leadbeateri)* will be significantly impacted by the Project.

Other priority species in the area such as *Pomatostomus superciliosus ashbyi, Oreoica gutturalis gutturalis* and *Cyclodomorphus branchialis* will not be significantly impacted by the Project as they are either widespread in the area or these species have not been recorded within the proposed disturbed area.

Haul Road

It is not expected that any priority species will be significantly impacted by the proposed expansion of the haul road, however one active Malleefowl mound on the road edge will be removed and vehicle strikes may occur.

8.2.5.2 Short Range Endemics

It is not expected that implementation of the project will result in significant impact to SRE species, however a number of potential risks have been identified, as listed in Section 8.2.3.2.

8.2.5.3 Stygofauna

Impacts to stygofauna from DSO project activities are likely to be minimal, according to current survey results, risk assessments and the lack of need for dewatering or newly developed bores.

8.2.5.4 Troglofauna

Impacts to troglofauna from DSO project activities are likely to be minimal, according to current survey results and risk assessments. However one currently unclassified species of significance, a spider, may potentially be impacted by project activities. It should be noted that this species has only been located outside of the proposed impact area at Koolanooka, and is likely to exist along the entire Koolanooka Range.

8.2.6 Environmental Management Commitments:

Commitment 7: As a component of the Project EMP there will be management procedures implemented at Koolanooka and Blue Hills for the protection of Malleefowl, developed in consultation with the DEC, prior to mine and infrastructure construction works. The plan will set out procedures to maintain the abundance, diversity, distribution and conservation status of Malleefowl.

8.3 SURFACE AND GROUNDWATER HYDROLOGY

8.3.1 Management Objectives

The objectives for management of surface and groundwater are to:

- Minimise impacts to surface and groundwater resources during mining.
- Control and contain contaminated water on site to prevent entry into the natural drainage system and surrounding vegetation.
- Maintain the quality and quantity of surface and groundwater so that existing and potential environmental values, including ecosystem maintenance, are protected.
- Maintain the integrity, ecological functions and environmental values of the adjacent Gilgai formation at Blue Hills.

8.3.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- AS 3500: 1 - 2003 Plumbing and Drainage.
- Australian Drinking Water Guidelines (NHMRC, 2004).
- DoH (Draft) Guidelines for the Use of Recycled Water in Western Australia;
- Australian New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC / ARMCANZ, 2000).
- Environmental Water Provisions for Western Australia; Statewide Policy No. 5 (WRC, 2000).
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005).
- Guidance No. 40 Management of Mosquitoes by Land Developers (EPA, 2000).
- Erosion and Sediment Control Guidelines (IEAust (Qld), 1996).
- NSW Department of Conservation and Land Management Urban Erosion and Sediment Control (NSW Department of Land and Water Conservation, 1992).
- Position Statement No. 4. Environmental Protection of Wetlands (EPA, 2004).

8.3.3 Potential Impacts

Impacts on groundwater sources from drawdown are unlikely to present an issue on this project, because at both Koolanooka and Blue Hills, water demands will be met through sustainable use of established, licensed bores and by the use of water from the Koolanooka pit. At Koolanooka, water sources are already being utilised on the Transportation of Stockpile of Fines project, and similar extraction rates will be required for the DSO proposal activities. Therefore this project is unlikely to produce a significantly higher level of

drawdown effect than the area is currently experiencing under current licensing arrangements. This source water will also supply operations at Blue Hills where this is necessary, as water resources identified at Koolanooka (Rockwater, 2007) have been confirmed as being adequate to supply the needs of the full Midwest workforce, whether they are working at Koolanooka or Blue Hills. Water required at Blue Hills for dust suppression will be transported to the site by water truck.

As Midwest is the only landholder utilising these sources and is compliant with all approval conditions, the likelihood of significant impacts to groundwater sources is considered low.

There is a potential risk of the contamination of surface and ground water from hydrocarbon and chemical handling and waste management practices at the mine site. With appropriate management however, the impacts are likely to be negligible.

8.3.4 Management & Mitigation

If the water sources are brought into operation, a monitoring programme will be implemented for each water source. Each program will include monthly pumped volumes, monthly measurement of water levels from operating sources and non-operating bores, monthly water salinity and pH from operating sources, and an annual comprehensive analysis of the groundwater from each source. Additional management measures will include:

- Management of hydrocarbon, chemical and waste products on site will be directed by the commitments made in Section 8.8.6 of this PER and in applicable sections of the Project EMP, EMS and Conceptual Closure Plan.
- The EMP for construction and operation phases will provide detailed management commitments to minimise the risk of spills and contamination to groundwater, or the Gilgai formation. These commitments include the appropriate installation and use of structures such as vehicle wash down bays, waste hydrocarbon remediation facilities and oil/water separators. The EMP will also detail effective measures in response to contamination event and spillage emergencies.
- Pre-existing haul roads and access tracks will be used to minimise interference to natural drainage.
- Any new disturbance areas will be located to avoid existing drainage lines and designed for minimal impact on surface drainage as far as practicable.
- Drainage of the minor streams and drainage lines that the haul route crosses will be maintained with effective culverts and/or floodways. This aspect will be specifically considered when reshaping the Mt Karara / Mungada Haul Road.
- Existing culverts will be re-established where possible under roads, embankments and formations to allow free flow of drainage water and to assist in water shedding from the site.
- During high rainfall events the effect of stormwater discharge from the site will be controlled. Adequate drainage will be assured through site structures, stockpiles and roadways. This will negate the possibility of project enhanced flooding, erosion and sedimentation.

- Final placement of site waste rock and product stockpiles will consider stormwater flow and drainage in the local area. In terms of physical water flow, the project will be implemented to have little impact on surface water runoff in the region, however if proven necessary, a sediment trap system will be incorporated into the site design.
- The support infrastructure will be designed to ensure the safe storage and handling of all hazardous and waste materials to prevent contamination to the project area.
- Landfill and overburden stockpiles will be constructed with sufficient surface to groundwater table distance (with considerations to the hydroconductivity of the geology) to minimise the potential for groundwater contamination.
- Appropriate design standards will be applied to allow for the provision of scour protection measures.
- Drainage areas will be suitably designed to minimise contamination of surface water.
- Cleared vegetation and topsoil will be stockpiled away from watercourses and in discrete stockpiles to avoid any interference to surface flows.
- Contaminated water from work areas will be kept separate from clean storm water.
- Water interfacing with work areas will be directed to oil water separators.
- Rate and volume of groundwater extraction will be in accordance with all licence conditions, including licence to take water # GWL159255(1) issued by the Department of Water for the period 28 September 2005 to 27 September 2010 (Appendix K).
- Monitoring will be carried out as per water extraction licence conditions. All required water source points are currently being utilised on the Transportation of Stockpiled Fines project, the drawdown effect created should not be different from the existing licences permit.
- If new bores are required to be installed in any area of the Project, the required approvals and licenses will be sought from the Department of Water, and if necessary, modelling of the effect of use on groundwater flow.

8.3.5 Predicted Outcome

With appropriate management, the potential impacts of the project on surface and ground waters are likely to be negligible.

Midwest aims to ensure no net/long term adverse impact to surface or groundwater resources in the project area, to other users or dependent environmental values.

8.3.6 Environmental Management Commitments

Commitment 8: Drainage structures will be designed and constructed to minimise alterations to offsite surface drainage patterns, resulting in no offsite turbidity impacts for the Gilgai formation to the south of the Mungada pits.

8.4 DUST & PARTICULATES

8.4.1 Management Objectives

The objectives for the management of dust emissions are to:

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.
- Ensure that expected dust impacts to the Koolanooka TEC area are adequately defined through the nomination of a 50 m buffer zone area of influence.
- Minimise dust associated with the construction and operation of the mines.
- Minimise exposed surfaces through clearing minimisation, staged clearing and progressive rehabilitation.

8.4.2 Applicable Standards and Guidelines

- EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA, 2000).
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005).
- Air Quality and Air Pollution Modelling Guidance Notes (Department of Environmental Protection WA, 2000).
- NSW DEC (2005) *Approved methods and guidance for the modelling and assessment of air pollutants in NSW*. NSW Environment Protection Authority.
- EPA Victoria draft protocol (State Environmental Protection Policy (Air Quality Management) Draft Protocol for Environmental Management – Mining and Extractive Industries, EPA Victoria, 2006)

There are no regulatory guidelines for dust deposition prescribed for use in WA. Regulation of dust impacts have instead focused on the impacts of inhalable particulate matter (PM_{10}) on human health and on the nuisance value of total suspended particulate matter (TSP).

8.4.3 Potential Impacts

8.4.3.1 Mine Sites

All activities conducted during the construction and operation phases of the Project have the potential to generate dust. This includes activities such as clearing, mining, hauling, crushing, screening and stockpiling of the ore.

Localised dust will be generated from the movement of vehicles at the mine sites and from handling of ore. The lay down and loading areas will be unsealed and subject to dusting when dry. The degree of dust generated will depend on the moisture content of the ground surface during ground disturbance and the climatic conditions.

Dust will be generated during the construction period from the earthworks, stripping of the mine site, movement of vehicles and from exposed bare ground. Desktop dust modelling

studies has simulated the effect of these activities (Sinclair Knight Mertz Engineering (SKM), 2006).

The dust modelling undertaken by SKM, 2006 indicates that dust levels at Koolanooka should not become a significant issue. Residences surrounding these operations are many kilometres away and hence should experience little impact. The nearest residential premises to the mine which could be affected by site generated dust plumes is 5 km to the south and 3 km to the west. The property 3 km west of the mine site is leased to Midwest on a long term contract for use as exploration offices and the property 5km to the South of the mine is now owned by Midwest.

The most sensitive receptor in the project area is the Koolanooka TEC. SKM's assessment indicates that this receptor should mostly experience impact below the NSW dust emission standard TSP levels (NSW DEC, 2005), and will be below levels which are recognised to cause a health impact to such vegetative species, as demonstrated in vegetative health studies (Doley, 2006).

A further dust modelling report produced for a project in the Windaning Range indicated that dust emissions at Blue Hills were also not likely to be a significant issue, The results of the modelling at Windaning Range indicated that predicted PM_{10} concentrations resulting from proposed operations at the other mine site complied with project air quality goals, provided the specific operational controls recommended by the report were adhered to (Heggies, 2006). However in order to ensure that the DSO proposal impacts are adequately represented regarding the aspect of dust, Midwest nominates a 50 m buffer zone surrounding the TEC impact area that will be recognised as an impact area of influence.

An Annual Progress Report on an integrated research program at Koolyanobbing, conducted for Portman Iron Ore Limited (Portman, 2007), clearly demonstrated some key characteristics of dust deposition behaviour over distance from mining activity. In an assessment on dust loads on individual plants in October 2006, dust loads were found to rapidly fade with distance, and that at a distance of 50 m (the proposed buffer width for the Midwest DSO PER) dust loads experienced were roughly halved from those adjacent to the actual impact area. Midwest therefore believes this demonstrates that the proposed buffer width of 50 m from the TEC cutback area is an adequately sized buffer, when combined with observations by SKM that dust impacts are unlikely to be a significant vegetative health issue at the point of impact.

Also it should be highlighted that from further correspondence with Portman Iron Ore Limited, it has been observed that the combination of drought and dust impacts on vegetation in this region can amplify vegetative impacts, and that impact loads experienced will be heavily influenced by prevailing winds. Both of these elements will be taken into account when carrying out monitoring and daily mining operations.

8.4.3.2 Roads

Munckton Road and part of the haul road on M70/1013 have been sealed to minimise dust issues generated by heavy haulage. Lignosulphate binders will be used on the haul road to minimise dust emissions.

8.4.3.3 Port

Operations at Geraldton Port will be managed by Geraldton Port Authority as part of their Environmental Licence under Part V of the *Environmental Protection Act 1986*, and as such

issues concerning dust management at the Port do not fall within the scope of this proposal. It should be noted that the proposal will have similar ore handling rates as the Transportation of Stockpile of Fines Project which is currently operational, and this project will likely cease before the proposed work commences. Ore conditioning to reduce dust emissions is not a viable option for Midwest due to the potential contamination of product resulting from such measures.

8.4.3.4 Dust Suppression

If the Koolanooka pit waters are used for dust suppression they will be blended with bore water with the aim of providing a salinity level of no greater than 5,000 ppm TDS. Currently the Koolanooka pit contains a water body measuring about 9,600 m^2 in area and estimated 2 m in depth. The water level is about 285 m AHD and a recent sample has a water salinity of 20,000 mg/LTDS (57% of the salinity of seawater). Calculations for a water body of 2 m depth suggest that the original salinity of the groundwater be approximately 2,500 mg/L TDS. Given that groundwater inflow does not keep pace with the summer evaporation of about 11 mm/d, the rate of inflow into the pit at current water levels is calculated to be less than 110 m^3/d (Rockwater, 2004a). All other water required for dust suppression activities will be sourced from surrounding, licensed bores, and total dust suppression requirements of the general project will be 180 kl / day. An additional 1000kl / day will be required during the Karara haul road development, which will take approximately one year to complete.

The blending of pit and bore water to reduce the salinity level will ensure no long term salinity issues occur; rehabilitation will not be impeded and damage to any surrounding vegetation will be minimal. Midwest will ensure that dust suppression techniques used do not adversely affect bordering vegetation with this influence. The use of pit water through such blending will also ensure that a gradual drop in pit water salinity levels is experienced as these waters will become diluted through groundwater inflow. Water will be transported by truck from Koolanooka sources for dust suppression in the Mungada area.

8.4.4 Management & Mitigation

Midwest intends to keep dust to a minimum during construction and operation of the Koolanooka and Blue Hills mines. Dust management options are outlined below and in the Project EMP.

8.4.4.1 Mine Site

Midwest have committed to the use of water trucks to dampen down operational surfaces as necessary and to conduct monitoring and auditing of impacts to the bordering TEC vegetation, as detailed in this PER and the EMP.

During construction and operations activities, dust will be minimised by:

- using water sprays (where appropriate);
- using covered and skirted conveyors at ore transfer points;
- sealing of relevant joints and installation of a dust collection system; and
- ensuring correct equipment design, operational procedures and adequate operator training occurs.

The crushing and screening plant at Koolanooka will be fitted with dust suppression and extraction equipment features that may include but are not limited to:

- containment apparatus on conveyor transfer points;
- belt scrapers on the conveyor belt;
- collection trays under the belt plough on the return belt;
- dust suppression sprinklers at transfer points and stockpiles;
- deluge sprays at the ROM area and the hopper; and
- if any infrastructure is required to be moved from its original position once the Project is operational, then dust control equipment will be reinstalled and operated according to the original plant specifications.

8.4.4.2 TEC Cutback

The proponent nominates a dust buffer zone of 50 m in width surrounding the cutback disturbance as an area that will likely receive concentrated impact from blasting based dust. Micwest will install dust monitoring equipment along the borders of this buffer zone, for the purposes of determining the actual deposition exhibited across the duration of activities at this site.

Dust monitoring will also be carried out by Midwest with regard to the vegetative health of the TEC area through assessment of static dust monitoring points and through surveying by qualified botanists. SKM dust modeling indicates that on most days this will not be a significant issue however, Midwest makes a commitment to halt operations during periods of extreme weather conditions.

Midwest would like to highlight that in the proposed cutback area no priority flora has so far been recorded, and this combined with the observations by SKM on the potential for dust deposition impact to plant health being low, Midwest hold the view that any dust health impacts on surrounding vegetation are likely to be low. Additionally the actual area of impact to this vegetation community is small, given that the clearance area is 4.46 ha of the total TEC area of 3500 ha.

8.4.4.3 Roads

- Munckton Road and part of the haul road on M70/1013 has been sealed to minimise dust issues generated by heavy haulage.
- Lignosulphate binders will be used to surface treat the haul road where necessary. An initial application will be carried out on necessary surfaces and a further application being required after 4-6 months. The product to be used is PolyCom by Biocentral Laboratories. Technical details of this substance can be found detailed as Technical Appendix 13-6.
- Water tankers will be used to moisten areas which have the potential to generate dust, including areas that receive heavy traffic, unsealed roads and access tracks.

8.4.4.4 Port

- Conveyers loading ore onto ships are fitted with an existing dust management system including dust extractors at transfer points.

8.4.4.5 Project in General

The EMP will identify specific management measures to minimise dust generation from all aspects of the project including:

- incorporation of dust control measures into project design where dust emissions are significant;
- implementation of dust suppression techniques in areas with high dust generating potential, including allocation of a dedicated water truck for this purpose, with a second truck to be utilised if necessary;
- water spray from water trucks will be directed away from vegetation where practicable, and combined with blending methods, dust suppression water will not be of an excessive salinity in order to minimese vegetation health;
- minimisation of vegetation clearing;
- staged clearing and progressive rehabilitation to minimise exposed areas;
- regular inspections to visually assess dust generation; and
- halting of operations during of weather conditions which have the potential to generate excessive and uncontrolled levels of dust, particularly toward the recognised Threatened Ecological Community.

The commitments within the EMP will be consistent with the amount of dust expected to be generated in various areas of the project and the environmental and social values to be protected in those areas.

Midwest will also undertake the following:

- vegetation clearing and exposed surfaces will be kept to a minimum wherever practicable.
- the performance of dust suppression equipment will be monitored and equipment will be maintained in an effective operating condition;
- where unacceptable dust levels occur, further dust suppression controls will be implemented;
- dust suppression methods will be developed in consultation with the DEC to maintain the integrity of neighbouring DEC land if required; and
- dust management methods will be audited annually and on an as needs basis.

8.4.5 Predicted Outcome

The results of the model indicate that maximum concentrations of TSP likely to be deposited over the TEC will exceed the NSW DEC (2005) standard in some locations. It should be noted however, that concentrations at which vegetation is impacted by dust

deposition (SKM, 2006) are not predicted to be exceeded. This will lead to the minimal adverse impact to the TEC flora at Koolanooka or flora at Blue Hills.

8.4.6 Environmental Management Commitments

Commitment 9: Assessment of the affect of dust on the health of TEC flora will be undertaken prior to construction/operation and monitoring of impact will continue throughout the life of the Project as required by Regulatory Authorities.

8.5 GREENHOUSE GAS EMISSIONS

8.5.1 Management Objectives

The objectives for management of gaseous emissions are to:

- Ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.
- Minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions.

8.5.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- EPA Guidance Statement No. 12. Guidance Statement for Minimising Greenhouse Gas Emissions (EPA, 2002).
- EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA, 2000).
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005).
- Australian Methodology for the Estimation of Greenhouse Gas Emissions and Sinks 2002 Series, Australian Greenhouse Office.

8.5.3 Potential Impacts

8.5.3.1 Greenhouse Gas Emissions

Greenhouse gases in the Earth's atmosphere play a role maintaining global temperature by absorbing infra-red radiation. The International Panel on Climate Change has determined that it is likely that the increases in greenhouse gas in the Earth's atmosphere are implicated in the observed changes in the Earth's climate. Australia, with 0.3% of the world's population contributed 1.4% of global greenhouse gases in 1995 (Government of Western Australia, 1997; Department of Foreign Affairs and Trade, 1997 and Government of Western Australia, 1998). WA contributed around 11% of national emissions in 1990 and approximately 12% in 1995 (Bond, 2007).

The six greenhouse gases specifically covered by the Kyoto Protocol are carbon dioxide (CO_2), methane (CH_4), perfluorocarbons (CFx), hydrofluorocarbons (HFC), sulphur hexafluoride (SF_6) and nitrous oxide (N_{20}). To give a common base for considering the impact of the various gases, they are usually expressed in terms of carbon dioxide equivalents, where the potential of each to lead to heating of the atmosphere is expressed as a multiple of the heating potential of carbon dioxide.

The proposal will release greenhouse gases, predominantly carbon dioxide either directly or indirectly from fossil fuel consumption and biomass decomposition. Direct contributions include:

- Combustion of diesel fuel used in vessels, heavy and light vehicles.

- Detonation of explosives used in blasting.

Decomposition of cleared vegetation and release of carbon dioxide from the soil was not considered significant and therefore was not estimated as part of this assessment.

Indirect proposal contributions to greenhouse gas emissions include the combustion of gas or coal at the relevant power station to meet the proposal's power requirements.

An assessment was made (Technical Appendix 13.8) of the greenhouse gas emissions likely to be associated with the project. The following energy sources were included in the assessment:

- Fuel consumption by mobile mining equipment.
- Fuel consumption by mobile electricity generators and lighting plants.
- Electricity sourced from the Western Australian grid supply (if electricity is not generated on site).
- Fuel consumption by equipment used to transport the final product to the Tilley railway siding.

Sources of greenhouse gas are; direct fossil fuel consumption and indirect fossil fuel consumption (Technical Appendix 13.8).

Direct Fossil Fuel Consumption

Nearly all mobile equipment used during the construction and operational phases will be diesel-powered. This includes light vehicles, haul trucks, dozers, roadtrains and drill rigs. Estimates were made on the quantity of diesel to be consumed each year by the anticipated number of pieces of equipment, their respective duties and approximate fuel efficiency.

Greenhouse gas emissions are also expected from stationary equipment such as the crushing/screening plant and lighting plants.

Annual diesel consumption for the Project is estimated to be 2,839 kL. This equates to greenhouse gas emissions of 8,499.8 t CO2-e/yr (Bond, 2007)

Additional greenhouse gas emissions are expected from the blasting activities during mining. The Project is expected to use approximately 792 tonnes of ANFO (a mix of ammonium nitrate and diesel) for blasting, contributing approximately 132.26 t CO_2-e/yr (Bond, 2007)

Indirect Fossil Fuel Consumption

An alternative scenario is to look at the estimated fuel and energy consumption and resulting emissions, assuming that electricity is sourced from the Western Australian grid. This results in higher emissions than if electricity is generated on site – due largely to the fact that much of the WA grid electricity is sourced from coal-fired generators, which, although cheaper, is more greenhouse intensive than diesel-fired generators.

The Project is expected to generate approximately 13, 802 t CO_2-e/yr, if electricity from the WA grid is used exclusively (Bond, 2007).

Annual emissions of greenhouse gases (8,632 – 13,802 t CO_2-e/yr) are substantially less than the lowest emission threshold for reporting to the WA Greenhouse Gas Inventory (100,000 tonnes).

8.5.4 Management & Mitigation

- Greenhouse gas emission minimisation will be incorporated into mine planning in accordance with EPA Guidance Statement for Minimising Greenhouse Gas Emissions (2002).
- Energy efficient technology will be selected where practicable and energy consumption will be considered as a criterion in equipment selection.
- Vegetation clearing will be minimised where practicable, thereby assisting to minimise greenhouse gas emissions from the Project.
- Progressive rehabilitation of open areas will result in partial offsets of emissions over the life of the Project.
- Atmospheric emissions will not be reported to the National Pollutant Inventory as they do not meet the minimum reporting threshold values.

8.5.5 Predicted Outcome

The Project will generate greenhouse gases, mainly from the consumption of electricity and diesel fuel. Emissions of greenhouse gas and other gaseous emissions from the Project will be kept as low as practicable.

8.6 NOISE AND VIBRATION

8.6.1 Management Objectives

Two uninhabited residences are located relatively close to Koolanooka mine. The first residence is known as "Dingle Dell", located approximately 5 km to the south of the mine, and is owned by Midwest. The second residence is located on Munckton Road 3 km to the northwest of the mine and is leased to Midwest.

The objectives for the management of noise and vibrations are to:

- Minimise the noise and vibration associated with the construction and operation of the proposal.
- Protect the amenity of nearby residents from noise and vibration impacts resulting from activities associated with the proposal by ensuring the noise and vibration levels meet statutory requirements and acceptable levels.

8.6.2 Applicable Standards and Guidelines

Applicable Standards and Guidelines include:

- *Environmental Protection (Noise) Regulations 1997* (Western Australian Government).
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2006).
- Statement of Planning Policy Road and Rail Transport Noise (WAPC, 2005).
- AS2670:2001 Evaluation for human exposure to whole body vibration.
- AS2436-1981 'Guide to Noise Control on Construction, Maintenance and Demolition Sites'.

8.6.3 Potential Impacts

8.6.3.1 Mining

Mining operations will be undertaken 24 hours a day on a continuous basis. Ore will be loaded into mine trucks using a hydraulic excavator and haul trucks. Ore will then be loaded into the crushing plant by front end loaders and loaded back into trucks by front end loaders once processed.

Noise modelling will not be undertaken at the Koolanooka mine site as this aspect is not expected to be a significant issue. The distance of the two homesteads closest to the mining operations (3 km and 5 km) does not warrant noise modelling because they are uninhabited. One of these residences is leased for use by Midwest. Mining activity is currently being conducted on the DSO Fines Project, and thus any noise created by this proposa; will be similar to the existing noise, although, it is noted blasting activities have not yet commenced at this site.

Noise modelling is not required at the two Mungada pits as; the nearest residences are also a significant distance away.

8.6.3.2 Road Transport

Ore will be transported from Blue Hills to the Koolanooka site via the upgraded existing Mt Karara/Mungada Haul Road and then along existing roads and heavy haulage routes to Geraldton Port.. The use of the Mt Karara/Mungada Haul Road for transportation of ore from Blue Hills to the gazetted Shire Road (Mungada Road) will require the haul road to be returned back to its original width to accommodate haulage trucks.

The transport route follows gazetted roads as defined in the *Road Traffic Act 1974* therefore no noise amelioration is required. The noise from the heavy haulage trucks propulsion and braking systems will comply with the *EPA Draft Guidance Statement for EIA No 14 (Version 3) Road and Rail Transportation Noise*.

8.6.4 Management & Mitigation

All practicable measures will be implemented to minimise noise emissions generated by mining and processing activities. Noise management measures that may be considered include:

- design and layout of mine site (eg stockpile locations) to minimise noise emission;
- purchase of plant and equipment with reduced sound pressure levels; and
- blasting during daylight hours.

Management of employee noise exposure will be in compliance with the *Mines Safety and Inspection Act & Regulations 1994*. This will include engineering plant design solutions to minimise noise generation and / or propagation, on-going monitoring of noise exposure levels, use of personal protective equipment, and appropriate operational practices.

Midwest will also undertake the following:

- noise will be considered in plant and equipment selection and appropriate construction methods;
- low-noise equipment will be used wherever possible; and
- silencers, mufflers and noise barriers will be used where necessary.

8.6.5 Predicted Outcome

There will be no adverse impact to the local community from noise or vibration due to the distances of sensitive receptors from the operations areas.

8.7 WASTE ROCK & TOPSOIL STOCKPILES

8.7.1 Management Objectives

The objectives for the management of waste rock materials and topsoil are to:

- Ensure that waste rock is placed and managed to negate or control impacts to surface water flow and groundwaters, and ensure there are no long-term impacts on the surrounding environment.
- Clearly identify potentially acid generating material, selectively handle this material and store the material so that acid leachate is not generated.
- Stockpile topsoil effectively for later use in rehabilitation.

8.7.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- Environmental Notes on Mining Waste Rock Dumps (DoIR, 2001).
- Environmental Notes on Mining Acid Mine Drainage (DoIR, 2006).
- Mine Void Water Issues in WA (WRC, 2003).
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005).

8.7.3 Potential Impacts

8.7.3.1 Waste Rock Stockpiles

Waste rock stockpiles produced by the project (hematite and detrital ore) are expected to amount to 1.7 million tonnes per year with the majority being produced at Koolanooka. The haematite ore at Koolanooka has very low sulphur content and contains no pyritic shales. The assessed total sulphur in the haematite ore is 0.149%.

Given the low sulphur content of the ore and the lack of any observable issues at existing wasterock stockpiles generated from previous mining over thirty years ago, the potential for acid generation is unlikely. This position is supported by the results of the National Association of Testing Authorities (NATA) accredited Chemistry Centre of WA who used the suspension peroxide oxidation combined acidity and sulphate method (SPOCAS) to asses samples obtained from all three pits (WA Chemistry Centre, 2006) (See Technical Appendix 13.3). Assessment confirmed that all samples were within guideline values and no treatment was recommended.

The waste rock generated by the project will be stockpiled on land which has been previously cleared where this is possible. The waste may also be used for construction purposes (e.g. road base material and construction of bunds), where the material is a suitable for this purpose.

At Koolanooka waste rock will be backfilled into the existing pit and / or will be dumped onto the existing waste dumps to the west and south of the South Fold cutback, Figure 4.2. This area has been significantly disturbed by previous operations.

At Mungada East, waste rock will be added to the existing dump to the west and south of the pit, and at Mungada West, waste rock will be dumped to the east and south of the existing waste dump on the eastern flank of the pit, Figure 4.3.The dumps at Mungada will be designed to form extensions to the existing waste landforms and will be shaped to fit in smoothly with existing natural ridgelines. These extensions will cover some areas that had been cleared during historical mining activities, but will constitute the majority of the project clearance required in the Blue Hills area.

8.7.3.2 Topsoil Stockpiles

Topsoil stockpiling is expected to occupy only small areas, as a portion of the project area is already cleared of vegetation and in some areas minimal topsoil is available naturally. As far as possible topsoil will be directly placed onto areas ready for revegetation, but where stockpiling is necessary this will be conducted on the toe of designated waste dump areas (Figure 4.2 & Figure 4.3) and will comply with all commitments made in this PER and the project EMP. If suitable topsoil material for revegetation purposes cannot be obtained in sufficient quantity for revegetation purposes, Midwest will source suitable material from existing waste dumps, or other predisturbed locations, that do not require vegetation clearance.

8.7.4 Management & Mitigation

8.7.4.1 Waste Rock

- Overburden stockpiles will be planned and constructed in compliance with the Environmental Notes on Mining Waste Rock Dumps (DoIR, 2001), and the Guidelines for Mining Proposals in Western Australia (DoIR, 2006).
- Overburden stockpiles will be constructed with a rounded footprint to conform with surrounding natural landforms.
- If overburden stockpiles are placed near drainage channels they will be monitored and rock armoured or culvert channelled if necessary to prevent scouring and erosion.
- Windrows will be used along the crest of slopes to prevent erosion of the slopes. Toe windrows will be used to contain eroded material if needed.
- Waste dump design will consider the physical nature of material and landform stability, chemical nature of waste materials, associated pollution prevention, integration into surrounding landscape and revegetation issues. For example, waste rock dumps will be set well back from pit edges.
- Design criteria for waste dumps:
    - maximum height 25 m above natural ground level at the structure site;
    - 8 metre wide berms every 10 metre of height;
    - berms to be sloped at 5º into body of dump;
    - berms to have cross bunds placed every 30 m; and
    - top surface and berms will have bunds.
- Some waste material will be used to improve the formation and revegetation of historic waste dumps to improve their aesthetic appeal.

- Although production of sulphidic waste rock is unlikely, strategies will be implemented where necessary, to manage potential acid forming materials through encapsulating in neutralising material or clay.
- Waste rock rehabilitation requirements will be discussed further in the Closure Plan for this project.

8.7.4.2 Topsoil

- A plan will be prepared showing all areas requiring topsoil removal prior to commencement of stripping.
- The top 150 mm of topsoil will be stripped prior to land disturbance, wherever it is present and safely accessible.
- Where practicable, topsoil will not be stripped when wet as this can lead to compaction and loss of soil structure.
- Where little topsoil exists and rehabilitation is required, suitable material will be sourced from previously disturbed and cleared areas. Additionally, the entire length of the haul road needs to be pre-striped for it to be reinstated. Some of this topsoil materia obtainedl will be made available for use in other topsoil poor locations.
- Topsoil will be applied as soon as possible to areas being rehabilitated. If stripped topsoil exceeds rehabilitation requirements at that time, excess topsoil will be stockpiled for later use.
- Topsoil stockpiles will be constructed (no higher than 2 m) and managed to preserve its biological activity.
- Stockpiles will be scarified to encourage germination and seed bank enrichment during this time.
- To minimise airborne dust from topsoil stockpiles /or areas from where topsoils are sourced, non-saline water will be applied when required. Surfaces will be monitored to ensure crusting does not inhibit seed germination. A vegetative cover will assist in reducing wind erosion.

8.7.4.3 Borrow pits and quarries

Materials required for road base will sourced from waste rock material that is suitable for this purpose, and / or from the cleared 3 m verge alongside the haul road, or from borrow pits where suitable materials are present. If borrow pits are required to supply project needs then disturbances the necessary approvals will be obtained and where possible will be sourced from local pre-cleared areas.

- Where possible, borrow pits and quarries if needed will be located behind physical terrain and/or vegetation belts or otherwise in areas that would reduce their visual impact;
- Where possible, borrow pits and quarries will not be located in areas where their presence would impact on surface drainage patterns;
- Where possible, trees and heavy stands of vegetation will be avoided;
- Where possible, each borrow pit and quarry will not exceed 1 ha in surface area.

- Access to borrow pits and quarries will be from a single track only;
- The removal of borrow material will be limited to inside the designated borrow pit area;
- Drainage and erosion control structures will be developed around the pit to control the impact of substantial rainfall events;
- The maximum final depth of borrow pits and other small excavation structures will be 2 metres from the maximum reasonably expected groundwater level;
- Borrow pits and quarries will be rehabilitated as soon as possible after use, and will be landscaped to best fit into the existing environment; and
- The final depth of borrow pits and quarries will not be more than 2 m or as otherwise approved.

8.7.5 Predicted Outcome

Disposal of waste rock will not produce any additional environmental impact to that which already exists at Koolanooka and Blue Hills.

Existing landscape values will be retained where possible and pre-exiting disturbed areas in poor vegetative condition will be enhanced by enhanced placement of waste, rehabilitation and revegetation.

8.7.6 Environmental Management Commitments

Commitment 10: The Closure Plan, detailing waste rock management, will be implemented.

8.8 ASBESTOS

8.8.1 Management Objectives

Based on a review of the exploration and mining data no asbestiform minerals have been observed in the Koolanooka or Blue Hills deposits, based on a review of the exploration and mining data. Therefore, asbestiform minerals are not anticipated to present a risk to safe mining operations.

This section of the PER will fully discuss the potential for asbestos impacts on the project and suitable management actions, in the unlikely event that asbestiform materials are discovered within the DSO proposal area. Additionally, the EMP, EMS and CP will detail consideration of asbestos material management.

8.8.2 Applicable Legislation, Standards and Guidelines

- Asbestos Management in Mining, DME.
- Management of Asbestos in Mining Operations, DOIR 2001.

8.8.3 Potential Impacts

Asbestiform minerals can be present :

- in ultramafic mineral assemblages;
- in iron ore deposits where there has been tight folding of the mineral sequence; and
- where Banded Iron Formations (BIF) have been altered and metamorphosed.

None of these conditions are expected to be present at Koolanooka or Blue Hills.

Asbestiform minerals have not been observed or logged in historical or recent diamond drill core from either deposit. Reverse circulation (RC) drilling produces percussion drill chips and asbestiform minerals have not ever been geologically logged from drilling either deposit. Historical mining operations at both the Koolanooka and Blue Hills sites by Western Mining Company (WMC) in the late 1960s to the early 1970s similarly do not record any occurrence of asbestiform minerals in either the ore or waste products extracted.

For the above reasons, it is improbable that asbestiform minerals will occur either at Koolanooka or Blue Hills. However, confirmation of the complete absence of asbestiform minerals would require mining of the entire site.

8.8.4 Management & Mitigation

In the unlikely event that asbestiform minerals are encountered during mining operations, this hazard will be managed by implementing the Midwest "Fibrous Minerals Procedure", with reference to the guidelines Asbestos Management in Mining, DOCEP, and Management of Asbestos in Mining Operations, DOIR 2001. No fiberous material will be transported offsite.

8.8.4.1 Planning

- Employees will assess the potential for ultramafic rocks being intersected, particularly serpentinites and sheared fine-grained tremolite-talc rocks.
- Employees will refer to the regional-asbestos/fibrous-mineral location plan to identify units predisposed to this type of mineral occurrence, and will check with the Environmental Officer or Senior Geologist if in doubt.

Midwest will ensure the drilling contractors :

- have a suitable cyclone (especially for RAB rigs) on site to firmly fit plastic sample bags;
- water injection systems are provided and operating;
- have suitable lengths of chimney or outer return hoses that are being used to divert dust away from drill work and sampling areas; and
- have appropriately rated dust masks on site and that these are being worn.

8.8.4.2 Programme

Midwest personnel should:

- brief the contactors of the potential danger, when fibrous minerals are encountered before and during the programme;
- plan drilling and work areas so that minimum dust exposure is experienced;
- act if dust levels are deemed unacceptable, (close down the rig if necessary);
- report all fibrous materials to the Senior Geologist and OS&H Officer;
- ensure adequate supply of plastic sample bags are available to use when required;
- ensure that appropriatly rated dust masks are available on site and are worn at every stage of the programme including drilling, sieving and sampling; and
- ensure that disposable paper coveralls are available to be worn by the drill crew and field staff when fibrous materials are expected.

8.8.4.3 Rehabilitation and Disposal

- Rehabilitation of the bagged samples is to be determined on the location and extent of fibrous minerals encountered in the drilling by the Project Geologist, Environmental Officer and OS&H Officer.
- Bagged fibrous mineral samples are to be disposed of at the nominated disposal site. Action on disposal and rehabilitation of non bagged samples will be dependant upon an assessment of the drill site location and quantity of fibrous materials.
- Fibrous material will be disposed of in accordance with Management of Asbestos in Mining Operations Guidelines, DoIR 2001

8.8.4.4 Sample Dispatch

- Assay laboratories must be informed of the presence of fibrous materials in the samples on the accompanying sample submission documentation. Sample bags must be clearly marked with "Caution – Asbestos" flagging.

8.8.5 Predicted Outcome

It is viewed by Midwest the detection of asbestos ore materials is extremely unlikely, as this material has not been found at this site at any time in the past, during mining and exploration activities.

8.8.6 Environmental Management Commitments

Commitment 11: **Midwest will abide by all commitments provided in the Midwest "Fibrous Minerals Procedure", the DSO PER and its supporting documents, concerning management of asbestos materials.**

8.9 SOLID, HAZARDOUS AND LIQUID WASTES

8.9.1 Management Objectives

The objectives for waste, hydrocarbon, chemical, explosives and other hazardous substance management are to:

- Reduce the volume of waste through product selection, reuse and recycling.
- Ensure that waste is contained and isolated from groundwater and surface water, and that storage, treatment or collection of waste does not result in long term impacts on the surrounding environment.
- Ensure all site generated waste is removed by a licensed contractor and disposed of in the Morawa Shire landfill or other appropriate facility; and
- Minimise the environmental impacts of hydrocarbons, chemicals (solvents, cleaning fluids etc.) and explosives through appropriate storage, handling and disposal.

8.9.2 Applicable Legislation, Standards and Guidelines

Applicable standards and guidelines include:

- Water Quality Protection Guidelines No. 10 Mining and Mineral Processing Above-ground fuel and chemical storage (Department of Water, 2000);
- Australian Standard 1940-2004 : The storage and handling of flammable and combustible liquids;
- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005);
- *Explosives and Dangerous Goods Act 1961*
- *Explosives and Dangerous Goods (Explosives) Regulations* 1963
- Guidance Note S301, Storage of Dangerous Goods Licensing and Exemptions (DoIR, 2004);
- Dangerous Goods (Transport) (Road and Rail) Regulations 1999 (Government of Western Australia); and
- Australian Code for the Transport of Dangerous Goods by Road and Rail (National Road Transport Commission and ACTDG, 2005).
- Used Tyre Strategy for Western Australia (Waste Management Board, 2005).
- Australian Standard 1768–2003, Lightning Protection.
- Australian Standard 2187.0–1998, Explosives-Storage, Transport and Use -Part 0: Terminology.
- Australian Standard 2187.1–1998, Explosives-Storage, Transport and Use -Part 1: Storage.

- DEC – Contaminated Sites Management Series – Bioremediation of hydrocarbon-contaminated soils in Western Australia, October 2004.

8.9.3 Potential Impacts

Construction and operation activities associated with the mine will generate waste materials and require the transport, storage and handling of hydrocarbons and chemicals. If not adequately handled, stored or disposed of these materials can contaminate local soil, groundwater or surface waters. Contamination can arise from the escape of leachate containing hydrocarbons, chemicals, elevated nutrients, or heavy metals. Visual amenity may be impacted by inadequately managed waste and feral animals may be encouraged to the area.

Types of waste generated by the Project include the following:

- domestic waste;
- recyclable products;
- waste oils, greases and lubricants;
- organic debris including vegetation;
- general refuse including waste metal, cardboard and packaging;
- sewage; and
- inert waste including excess fill.

8.9.4 Management & Mitigation

8.9.4.1 General Waste

No onsite waste disposal will be undertaken during this Project, and domestic and construction waste will be minimised through reuse and recycling where appropriate. General waste will be managed by a licensed Contractor and removed from site for disposal in an approved landfill.

Consideration will be given to the best design and operation of short term waste storage facilities to be used by the waste removal contractor. Storage facilities will be designed so as to minimise infiltration of water, formation of leachates, and distribution of litter by wind and water, and will include effective fire management. A Bellan Cage will be utilised to prevent the spread of windblown litter on site. More details on the specifics of short term waste management will be provided in the Project EMP.

Waste production will be audited periodically to identify new opportunities for reduction, re-use and recycling. Used tyres will be stored in accordance with Part VI of the *Environmental Protection Act 1986 Regulations*. These commitments will also be provided in the EMP for this proposal.

Sewage and grey water from the mine operations will be treated on-site using approved septic tank and leach drain systems.

Liquid effluent generated at the site including oils and water from the workshop will be managed in accordance with relevant legislation.

8.9.4.2 Hazardous Substances

During construction and operations, hazardous substances will be stored according to the requirements of Australian Standard 1940. Storage of bulk fuel will be in above ground tanks within bunded, impermeable enclosures, or in double skinned tanks.

Hazardous substance management, including procedures for the correct handling, storage, spill management and clean up will be incorporated in the Project EMP. Spill response equipment will be located in the vicinity of work areas, with site personnel trained in spill response management.

Refuelling, workshop and vehicle wash down areas will be constructed to prevent discharge of spills, leaks or wastes: drains, bunds or oil / water separators will be fitted where appropriate.

Storage of explosives will be in a remote magazine in accordance with the *Explosives and Dangerous Goods Act 1961* and *Explosives and Dangerous Goods (Explosives) Regulations 1963.*

Hazardous waste and spilled hazardous materials will be removed from site by a licensed contractor for disposal in an approved facility in accordance with the requirements of the controlled waste regulations.

Midwest will also undertake the following:

8.9.4.3 Bulk Hydrocarbon Storage Facilities

- Bulk hydrocarbons containers will be stored and managed in accordance with *Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids (AS 1940-1993).*
- Containers that are self bunded (double skinned) will be protected against collision by equipment and/or vehicles by the placement of appropriate barriers or bollards.
- Tanks that are not self bunded will be contained in secondary facilities with impervious floors and bunds, with a capacity to contain 110% of the volume of the largest tank or 25% of the total volume stored in the compound.
- Containers will be appropriately labelled as required by the relevant legislation;
- Areas adjacent to secondary storage facilities will be contoured to drain away from the facilities.
- Water or other liquids that collect in the storage facilities will be removed and treated. This is to maintain the containment capacity and integrity of the facility.

8.9.4.4 Minor Storage

- Drums and small containers of hydrocarbon products will be stored upright with fitted lids, in secondarily contained facilities.
- Storage facilities will have impervious floors and bunds, with a capacity to contain 110% of the volume of the largest container or 25% of the total volume stored in the compound.

- Drums and containers will be checked regularly for signs of corrosion and leaks.
- Containers will be labelled as required by the relevant legislation.

8.9.4.5 Spills

- Spill response equipment will be readily accessible in each work area to enable quick response to spills. As a minimum, spill response equipment will be located at fuel storage and transfer facilities, work areas, near open water bodies, and at maintenance workshop areas.
- Spills will be controlled at the source, contained and cleaned up as soon as they occur. Contaminated material will be removed and bio-remediated (if biodegradable) or disposed at a licensed facility.
- In the event of spills, environmental management will require internal and external reporting and incident analysis and described within the project EMS and EMP. Decision matrices will be developed to determine which incidents and impacts require external reporting and the appropriate reporting timeframes. These will be defined in the Environmental Management Plan and Environmental Management Systems documents.
- Personnel will be trained and competent in spill management.

8.9.4.6 Waste Disposal

- Storage of waste oil will be in accordance with the *Dangerous Goods Regulations 1992*;
- Waste oil will be managed in accordance with the bulk storage and / or minor storage management requirements described above.
- Where practicable, waste materials will be minimised by reuse and recycling.
- Oily waste materials (filters, rags, spill clean up materials) will be segregated from general waste, contained and disposed of off site at a licensed facility.

8.9.4.7 Bioremediation Facility

- Soil and biodegradable materials contaminated by hydrocarbons will be disposed in a designated site for bioremediation in accordance with the Environmental Protection Authority Guidelines for Oil Farming of Oily Wastes.
- The bio-remediation facility will be vertically separated from the groundwater table.
- Materials in the facility will be placed at depths of less than 30 cm, aerated through periodic tilling and kept moist to encourage bacterial activity.
- Remediated materials will contain residual hydrocarbon levels. Acceptable levels will be determined in conjunction with the DEC, and those materials, determined to be acceptable will be used for rehabilitation activities.

- Management of remediated soils will take place in accordance with the current DEC guideline 'Bioremediation of hydrocarbon-contaminated soils in Western Australia, October 2004'.

8.9.4.8 Workshop / Servicing Areas

- Where practicable, a dry workshop policy will be implemented. Spills will be picked up by absorbent materials.
- Vehicles and mobile equipment will be washed down on a concrete surface that drains to a sump. Oils and sediments will be separated from the wash down water, prior to the water being re-used on site.

8.9.4.9 Explosives

- Explosives will be stored in a magazine registered and licensed in accordance with the *Explosives and Dangerous Goods Act 1961* and the *Explosives and Dangerous Goods (Explosives) Regulations 1963* and in accordance with Australian Standard 1768–2003, Lightning Protection, Australian Standard 2187.0–1998, Explosives - Storage, Transport and Use -Part 0: Terminology, Australian Standard 2187.1–1998, Explosives -Storage, Transport and Use -Part 1: Storage.
- Spills of nitrate based explosives will be removed by being hosing with water. The potential for spillage of these products is extremely unlikely as use of these products will be carefully and tightly managed, and the only opportunity for spillage is during explosive charge fuelling, which is done directly by hose from an external contractor's truck to each explosives hole. These materials will not be required to be stored on site, and as such spillage of these materials is highly unlikely.

8.9.4.10 Housekeeping and General Wastes

- Waste will be segregated into general waste, recyclable wastes and hazardous waste.
- Waste receptacles will be available at the appropriate locations to enable waste segregation and containment.
- Practices will be implemented in relation to waste generation, to minimise production of waste through efficient designs, reduction of materials required, and the reuse/recycling of waste materials.
- As a minimum, batteries and scrap metal will be recycled.
- Where possible, recyclable waste will be removed by a contractor to a recycling facility.
- General waste will be removed to the Morawa Shire or other approved landfill facility by a contractor.
- Waste will be secured against wind blown litter and animal foraging by use of a Bellan Cage;
- Littering will be prohibited.

- Work areas will be kept neat and tidy.
- On decommissioning of a work area, non-permanent structures and facilities will be removed and disposed of appropriately in accordance with the Conceptual Closure Plan for this Project.

8.9.4.11 Sewerage

- Septic tanks and leach drains will be constructed and maintained in accordance with Department of Health and Local Council requirements.

8.9.4.12 Fire

- All employees and contractors will undergo site environmental induction and training that includes bushfire prevention and emergency response procedures;
- Select site personnel will undergo advanced training in fire suppression;
- Fire breaks will be established around the site in agreement with the Fire and Emergency Services Authority (FESA) and the DEC;
- Mobile plant and light vehicles will be equipped with appropriate fire suppression equipment that complies with relevant Australian Standards and staff will be trained in its use;
- Internal hot work permits will be required for work that has the potential to create ignition sources. Hot works will not occur within 3 m of vegetation without a prior risk assessment and written approval from the Site Manager; and
- Fire extinguishing equipment will be available at each work area where hot works occur and will be maintained in accordance with Australian Standards.

8.9.5 Predicted Outcome

The management of general and hazardous waste is expected to result in negligible environmental impacts.

8.9.6 Environmental Management Commitments

Commitment 12: Procedures for the issues raised in Section 8 will be detailed in the Project EMP.

8.10 SOCIAL AND CULTURAL ENVIRONMENT

8.10.1 Management Objectives

The objectives for management of the social and cultural environment are to:

- avoid disturbance to cultural and heritage sites;
- ensure compliance with relevant legislation including the *Heritage of Western Australia Act 1990* and the *Aboriginal Heritage Act 1972*; and
- respect the rights of all land owners.

8.10.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- EPA Guidance Statement No. 41. Assessment of Aboriginal Heritage (EPA, 2004); and
- Guidelines for Consultation with Indigenous People by Mineral Explorers (DoIR, 2004).

8.10.3 Potential Impacts

8.10.3.1 Indigenous Heritage

Koolanooka Mine site

Approval to disturb previously recorded Aboriginal site DIA 4496 has been obtained under Section 18 of the *Aboriginal Heritage Act 1972*. Aboriginal Heritage DIA site 5868 has been determined to be a duplicate of the site DIA 4496.

Permission for the disturbance to Aboriginal Heritage site DIA 4496 was applied for after the Company's mining licences had been granted and covers the entire length of the Koolanooka Hills. Under Section 18(3) of the *Aboriginal Heritage Act 1972*, Midwest has been granted consent by the Minister for Indigenous Affairs to use its mining leases to "undertake mining operations through an extension of the existing open pit operations." This consent was granted to Midwest in December 2003 and is contingent on meeting the various obligations and responsibilities under the *Aboriginal Heritage Act 1972* (Appendix J).

Two other sites of Aboriginal Heritage significance are found within the local area (DIA 20817 and DIA 20816). These sites are remote from the project and are not expected to be impacted.

To date no Aboriginal groups have made objections to the granting of the Mining Leases or to previous mining operations in the area.

Blue Hills Mine site

If the proponent needs to disturb the observed archaeological sites at this location (small cave (DIA 20858) and large cave (DIA 20857)), Midwest will obtain consent from the

Minister for Indigenous Affairs under Section 18 of the *Aboriginal Heritage Act 1972* prior to any such activity occurring.

Mt Karara/Mungada Haul Road

The Project will not impact on Aboriginal Heritage sites in regard to the Mt Karara/Mungada haul road, as only a 3 m wide pre-cleared roadside verge will be impacted at this location, and no haul road realignment will occur. The re-establishment of this haul road will not impact on any areas of new vegetation and will not impact on any potential aboriginal heritage.

8.10.3.2 Non-Indigenous Heritage

The Project will not impact on the heritage values of the Koolanooka Hills area.

8.10.4 Management & Mitigation

8.10.4.1 Indigenous Heritage

Aboriginal community representatives and elders will be consulted as part of the planning process for mining and construction activities. Management plans will be discussed and agreed upon.

The locations of existing registered sites will be taken into account to minimise and avoid where possible, impacts to Aboriginal sites. Registered sites will not be removed, damaged or altered without approval from the Minister of Indigenous Affairs, under Section 18 of the *Aboriginal Heritage Act 1972*.

Any significant new sites identified during ethnographic and archaeological survey or construction will not be removed, damaged or altered without approval under Section 18 of the *Aboriginal Heritage Act 1972*.

Midwest will undertake management of Aboriginal Heritage sites by:

- completing a full assessment for the presence of Heritage sites;
- consulting with appropriate custodians maintained throughout the Project;
- gaining approval for any intended impact on heritage areas;
- establishing appropriate exclusion zones, with fencing and signage of these areas if required;
- training the workforce and contractors on any relevant heritage requirements;
- establishing a dedicated heritage management plan if required, and discussion of heritage considerations within the site EMP;
- reporting potential heritage areas or artefacts if encountered during the Project;
- ensuring disturbance to sites is in accordance with conditions of any Section 18 approvals;
- demarcing sites requiring protection on the ground if appropriate, and on site maps. Exclusion zones around these sites will be established and communicated to personnel;

- ensuring that employees and contractors complete a site induction prior to commencement of work. The induction will inform personnel of nearby sites (if appropriate) and their legal obligations to protect sites and/or disturb sites according to approved procedures;
- ensuring employees and contractors promptly report the identification of any Aboriginal sites in the vicinity of operations.. Where sites are identified, they will be avoided; and
- employing qualified anthropologists/archaeologists to assess sites as circumstances dictate and require.

8.10.4.2 Non-Indigenous Heritage

As the Koolanooka mine is listed in the Morawa Heritage Inventory, Midwest has photographed the site prior to the commencement of earthworks. Photographs of the mine will also be taken at completion of mining activities to continue the photographic record of the site. Archiving of the photographic record will be determined in consultation with the Shire of Morawa.

Midwest has established a local Community Development Fund in Morawa which aims to support local business ventures and the community in general. As part of this undertaking Midwest will include a local employment clause in all Midwest Project and related contracts.

Midwest will also endeavour to fulfil the desired social outcomes of the Morawa Shire Council and Shire of Perenjori, with respect to the local areas influenced by this Project. This will include consideration of accommodation, transport, small business use, servicing, and local education and training options.

Midwest where possible and feasible will support local businesss for services and supplies. This may include a possible establishment of a temporary revegetation nursery in Morawa and the use of locacl workshop for fleet vehicle servicing requirements.

Public Access

- Public notices will be sent out prior to disruption or temporary closure of roads and public access.
- Communication channels for public comments and complaints will be established and maintained. These channels will be made known to the community.
- Any existing fences and tracks affected by activities will be restored.
- Where practicable alternative access will be established for temporary disruptions to recreational use / access.
- Public access to the site will be restored at the completion of activities.
- The Mt Karara / Mungada Road will remain available to all road users at all times.
- Public notices will outline the expected length of closure and anticipated re-opening of closed areas.

- During the operational phase of the project no public access issues are anticipated.
- A management plan will manage access to site during mining activities, in particular blasting.`

8.10.5 Predicted Outcome

Significant sites identified from the DIA Aboriginal Sites register and during ethnographic and archaeological surveys and construction will not be removed, damaged or altered without approval under Section 18 of the *Aboriginal Heritage Act 1972.*

8.10.6 Environmental Management Commitments

Commitment 13: Midwest will consult with traditional owners and obtain their consent to disturb any new Aboriginal Heritage sites discovered in the Project disturbance area. Midwest will obtain approvals relevant to the *Aboriginal Heritage Act 1972* for disturbance to heritage sites.

Commitment 14: Midwest will photograph the Koolanooka mine area prior to disturbance and provide the photographs to the Morawa Shire for their archiving.

8.11 VISUAL AMENITY, LANDFORM AND GEOCONSERVATION

8.11.1 Management Objectives

The objectives for management of visual impact, landscape and geo-heritage are to:

- Minimise the project impacts with regard to community use and access to significant environmental features.
- Ensure landscape values are considered and measures are adopted to reduce the visual impacts of the project.
- Maintain and protect any significant landscape and geo-heritage values and to maintain the integrity, ecological functions and environmental values of the soil and landform.

8.11.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- EPA Guidance No. 33 Environmental Guidance for Planning and Development (EPA, 2005);
- WA Planning Commission Statement of Planning Policy No. 2, Environment and Natural Resource Policy (WAPC, 2004).

8.11.3 Potential Impacts

To date geoconservation in Western Australia has been primarily limited to the recognition of geological monuments such as those identified in Lemmon, *et al* (1979), however the concepts and principles of Sharples (2002) will be incorporated into the assessment of geoconservation of the BIF at Koolanooka and Blue Hills. Geoconservation considers non-living parts of the environment – geological features, landforms and soils. Sharples (2002) emphasises that biodiversity is dependant upon geodiversity and successful nature conservation requires the integration of bioconservation and geoconservation.

The Koolanooka area is listed in the Morawa Heritage Inventory, with the recommendation that, should the mine ever be re-opened, the site should be photographed prior to the commencement of earthworks. The Project will minimise impact on the anthropocentric values of the BIF, and Midwest will ensure a photographic record of the mine is maintained.

The anthropocentric or geo-heritage values of the Blue Hills area are also significant, with mining activities having a potential impact through loss of these values.

There are no geo-heritage sites at either Koolanooka or Blue Hills.

8.11.4 Management & Mitigation

At both mining areas, impact will be minimised by ensuring clearing only occurs in approved areas and overburden stockpiles are located in an area that minimises any impact to visual amenity or prominent drainage lines, and that the stockpiles are shaped to blend in with local landforms. At Koolanooka Midwest make the commitment that existing waste dumps will be reshaped where possible, to better consider aesthetic concerns at this

minesite. Considerations of final landform will be incorporated into the project Closure Plan. This document will be made available to stakeholders for comment as part of the EIA process.

Roads and other infrastructure will be designed and located in order to minimise long term impacts on the area's future status and use as a conservation reserve. Infrastructure removal and rehabilitation of the site in line with the furture land use requirements will be carried out upon closure.

Computer generated depictions of the predicted final landforms of the area on completion of the Project have been included in the PER. These images are provided, together with photos demonstrating the current condition, as Plates 8-1 through to 8-6.

8.11.5 Predicted Outcome

There will likely be no significant impact to the geo-heritage or anthropocentric values of the Koolanooka / Blue Hills area, after waste dumps are blended appropriately into surrounding ridgelines and rehabilitation has been successfully conducted upon closure.

Plate 8-1: Photo of Koolanooka – Original View

Plate 8-2: Photo of Koolanooka – Stylised view post completion of the proposal.

Plate 8-3: Photo of East Mungada – Original View

Plate 8-4: Photo of East Mungada – Stylised view post completion of the proposal.

Plate 8-5: Photo of West Mungada – Original View

Plate 8-6: Photo of West Mungada – Stylised view post completion of the proposal.

8.12 REHABILITATION, DECOMMISSIONING AND CLOSURE

8.12.1 Management Objectives

The objectives for rehabilitation, decommissioning and closure are to:

- Ensure that rehabilitation achieves a long term safe, stable and functioning landform which is consistent with the surrounding landscape and other environmental values.
- Fulfil commitments made to stakeholders and regulators regarding closure outcomes.

8.12.2 Applicable Standards and Guidelines

Applicable standards and guidelines include:

- AMEC Mine closure Guidelines (AMEC, 2000).
- ANZMEC/MCA Strategic Framework for Mine Closure (2000).
- Mine Closure Guideline for Minerals Operations in WA. (DoIR ,2000).
- Mine Void Water Issues in WA (WRC, 2003).
- Guidance Statement No 6: Rehabilitation of Terrestrial Ecosystems (EPA, 2006).
- Guidelines on Safety Bund Walls Around Abandoned Open Pits. (DME, 1997).
- Mine Closure and Completion. (DITR, 2006).

8.12.3 Potential Impacts

At Koolanooka ore will be excavated from areas that have already been disturbed or partially mined but which are external to the existing pit. The South Fold Orebody will be excavated from a cut back to the immediate south-southeast of the old pit with ore being transported to the plant site via a combination of existing and new haul roads.

Operations at the Mungada East & Mungada West pits at Blue Hills will be resumed and will be connected to Koolanooka through re-instating the existing Mt Karara / Mungada Haul road.

8.12.4 Management & Mitigation

A full Closure Plan (*ecologia*, 2007) has been developed to comply with the AMEC Mine Closure Guidelines (2000) and ANZMEC/MCA Strategic Framework for Mine Closure (2000), to return the mine site to a self-sustaining ecosystem that is consistent, as far as possible, with the natural surrounding area. All activities will be adequately financed, implemented and monitored to achieve the agreed targets.

Decommissioning will comprise the safe dismantling and removal of infrastructure, the appropriate disposal of waste materials and returning the impacted areas as close as possible to their pre disturbed state.Where the removal of non-visible infrastructure, or features that

have been incorporated into the natural landscape may cause environmental damage; their retention will be discussed with the relevant authorities at the time.

Formation of waste rock stockpiles will be performed progressively over the project's duration, taking into account the desirable final landform and rehabilitation requirements. The predicted waste dump layouts for Koolanooka, Mungada East and Mungada West are provided in Figures 8-2, 8-3 and 8-4 respectively. Waste dumps from previous mining will also be included, where feasible. Specifically, the Northern Waste dump alongside the public access road will be reshaped and rehabilitated, and concerns in regard to erosion will be addressed.

Rehabilitation will occur progressively as disturbed areas are no longer utilised. Upon the completion of mining activities, should Midwest not undertake further operations, all sites impacted by the project will be rehabilitated. Rehabilitation activities will include;

- re-establishment of stable landform with erosion protection for long term stability;
- ripping of compacted areas and on contours of slopes; and
- spreading of vegetation debris to return organic matter to the area and provide supplementary seeding with appropriate species. Seed stock will be gathered in 2007 - 2008, during the pre-clearance of the area of impact, to provide an effective provenance seed-set for use during rehabilitation practices.

The rehabilitation programme will include development of completion criteria to indicate the stagewhen rehabilitation can be considered self sustaining. Closure considerations will include assessment and remediation of contaminated sites, ongoing placement of waste materials to improve the form of existing waste dump areas, and the rehabilitation of all project disturbed areas, including exploration drill pads and tracks.

Additionally a suitable pit abandonment strategy will be developed and detailed in the Closure Plan. This will take into account that the area is to become a tourist destination after closure. This strategy will also incorporate the needs of the local shire and DOCEP for safe tourism access.

Midwest will also undertake the following:

- Temporary infrastructure will be removed, divested or otherwise disposed of appropriately.
- Soils contaminated with hydrocarbons will be removed and bioremediated.
- Borrow pits and other excavations, other than the iron ore pits, will have surfaces battered to an angle of 15º or less. The maximum final depth of borrow pits and other small excavation structures will be 2 metres from the maximum reasonably expected groundwater level.
- Disturbed areas will be land formed to achieve free draining status and blend in with the surrounding environment.
- Pre-existing drainage networks will be re-established.
- Erosion and sedimentation will be minimised by the construction of erosion control berms, bunds or contour banks as appropriate.
- Windrows that interfere with natural drainage will be breached as a minimum, and completely removed as appropriate.

- Compacted surfaces no longer required for operations will be contour ripped or scarified to promote water penetration and the catchment of seed.
- Disturbed areas will be progressively rehabilitated as far as possible.
- Topsoil (100 mm if available) or a suitable growth medium and vegetation (if available) will be spread over the area.
- Where required, native provenance seeds will be used to enhance revegetation.
- Hygiene requirements will be maintained during rehabilitation.
- Weed infestations will be controlled by physical or chemical means.
- Rehabilitated areas will be sign-posted and protected from disturbance.
- Areas where revegetation is not successful will receive remedial attention e.g. remedial seeding with local provenance seed.

Waste dumps will be constructed to blend with the surrounding landscape and have the following structural criteria**:**

- maximum height 25 m above natural ground level at the structure site;
- 8 metre wide berms every 10 metre of height;
- berms to be sloped at 5º into body of dump;
- berms to have cross bunds placed every 30 m; and
- top surface and berms to have bund along the crest.

8.12.5 Predicted Outcome

At Koolanooka, rehabilitation will result in a safe, stable landform with revegetation consistent with the adjacent TEC and blending into the surrounding landscape.

There will be no introduction of weeds or diseases to the TEC area or new rehabilitation areas.

At Blue Hills, disturbed areas will be rehabilitated to blend with the surrounding landscape and revegetation will aim at providing a vegetation complex similar to the pre-existing complex.

8.12.6 Environmental Management Commitments

Commitment 15: A Closure Plan has been developed in alignment with AMEC Mine Closure Guidelines (2000) and ANZMEC/MCA Strategic Framework for Mine Closure (2000). During the life of mine, the plan will be reviewed and updated as required to ensure information remains current.

Commitment 16: A Final Mine Closure Plan will be developed in consultation with the DEC and DoIR. The plan will define appropriate closure criteria necessary for the establishment of safe landforms and self sustaining ecosystems, and set out procedures for monitoring in order to meet compliance with the closure criteria.

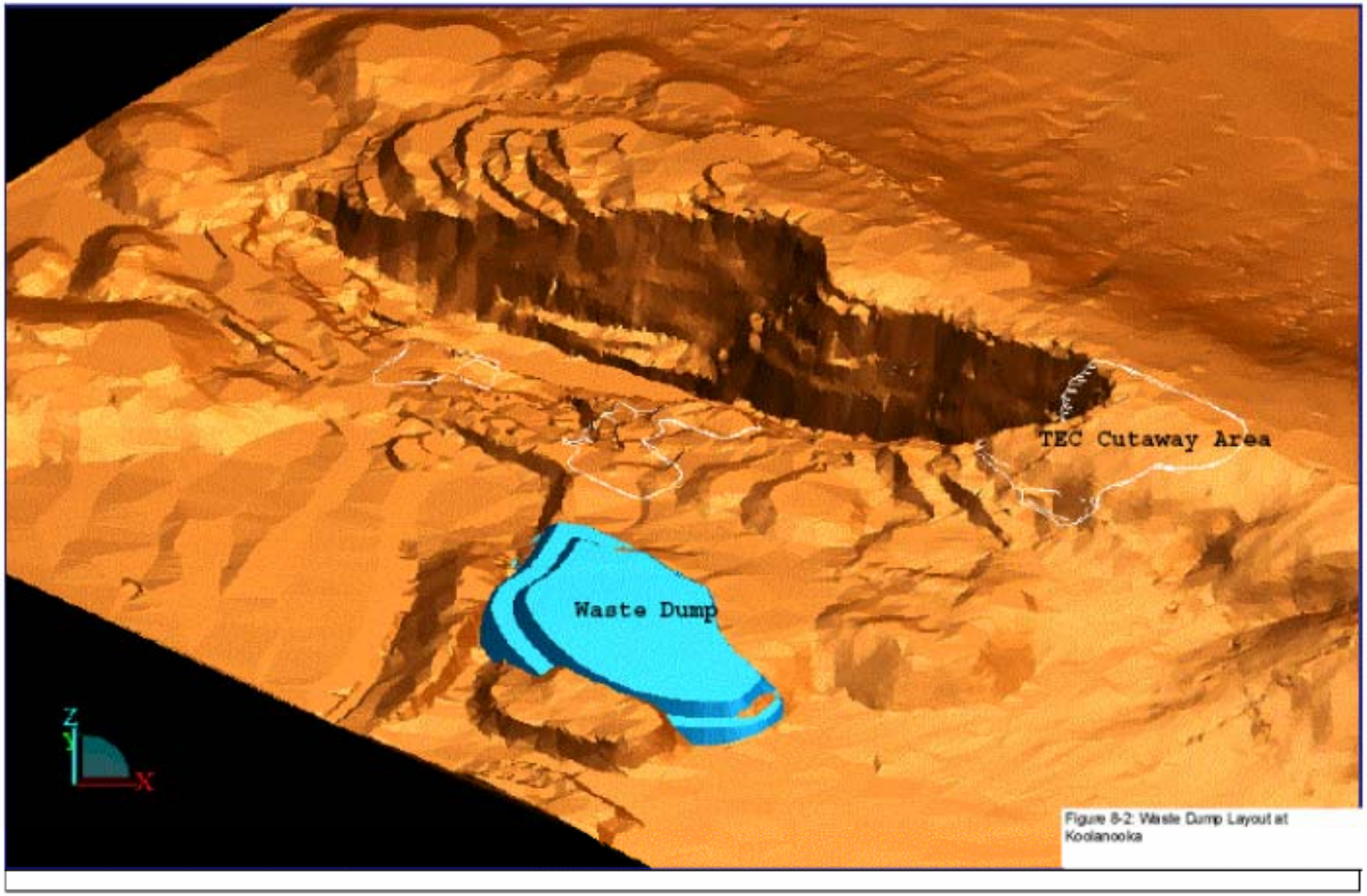


Figure 8-3 Waste Dump Layout at Koolanooka

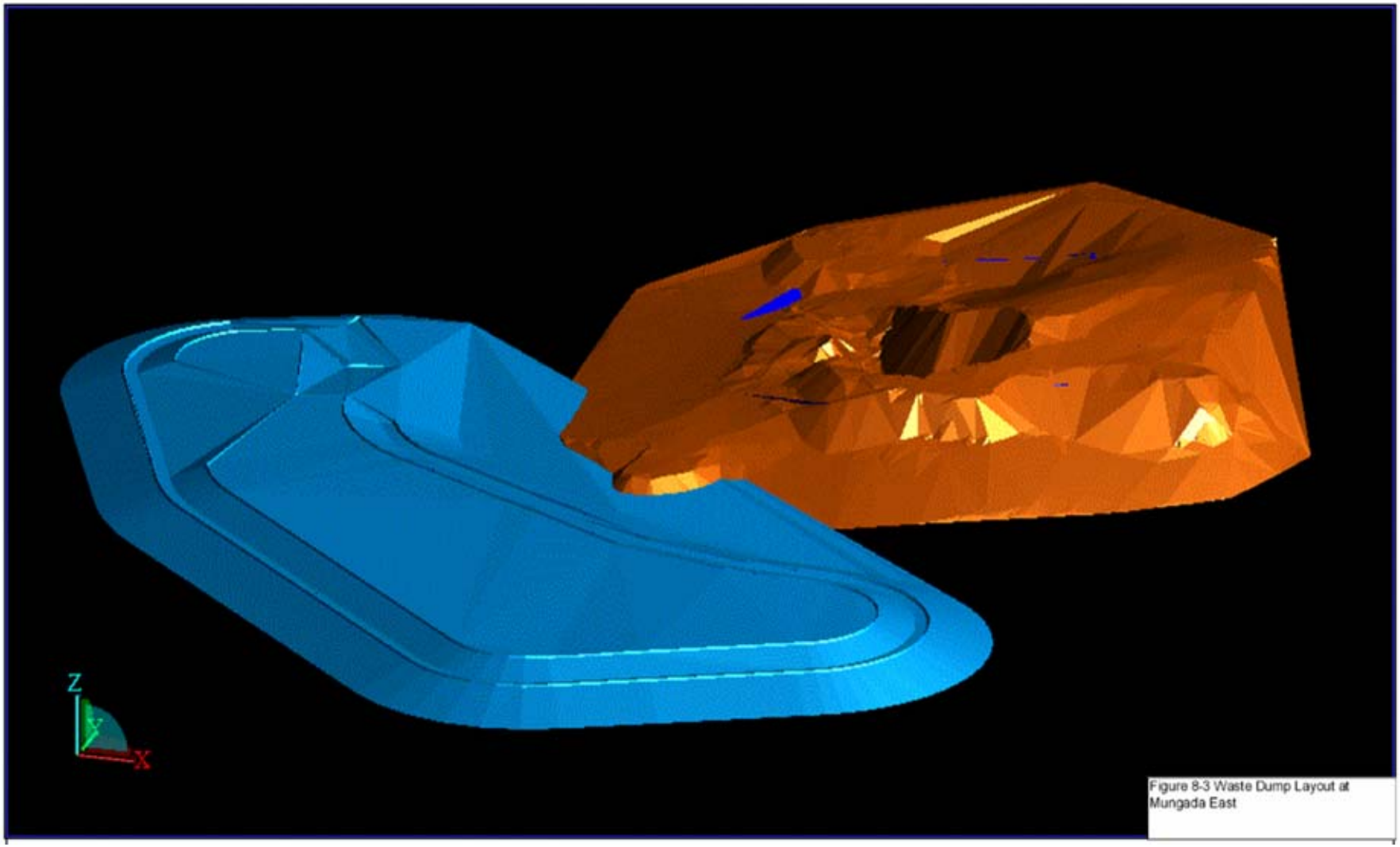


Figure 8-4 Waste Dump Layout at Mungada East

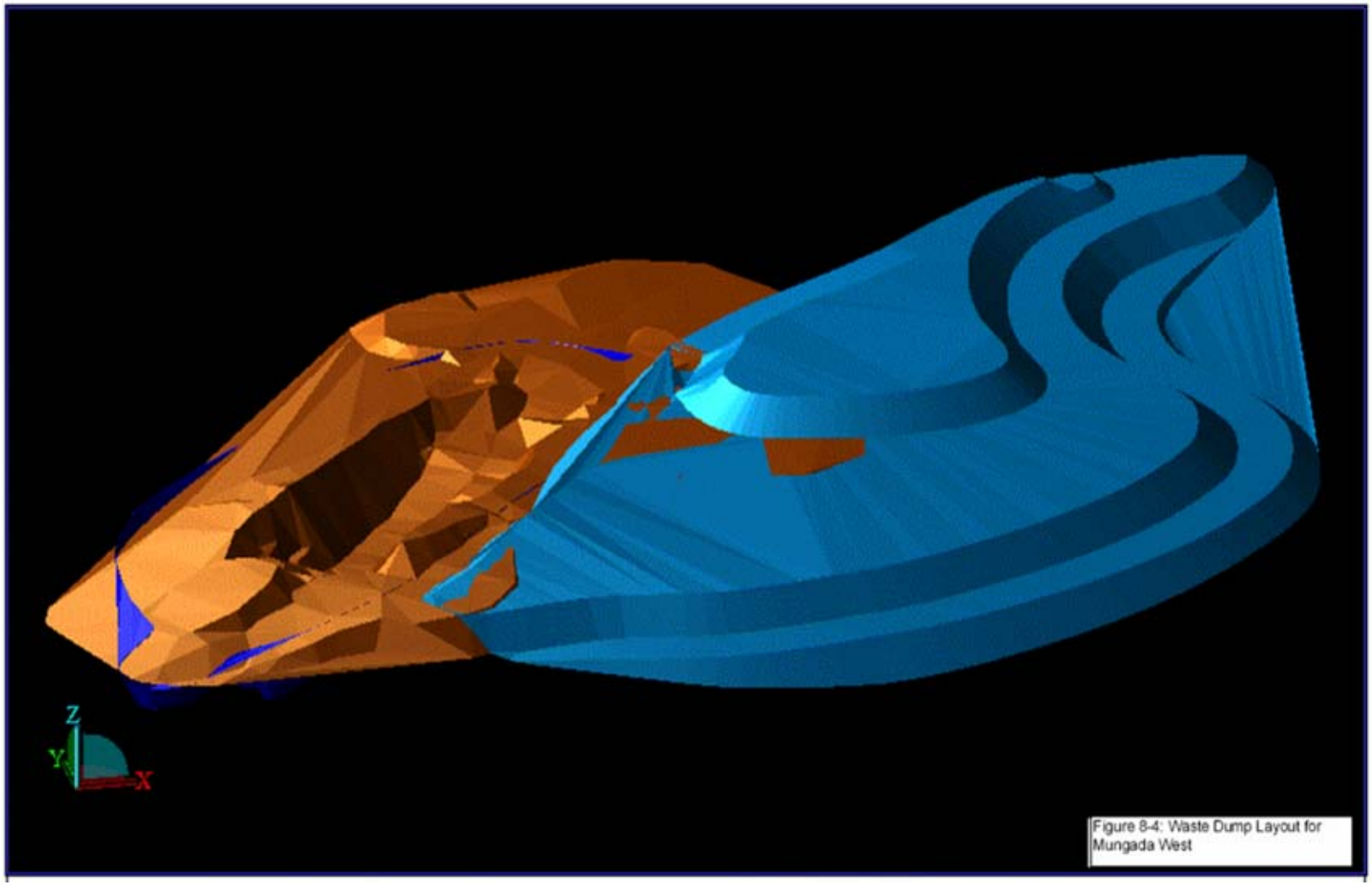


Figure 8-5 Waste Dump Layout at Mungada West

9.0 CONCLUSION

The Koolanooka/Blue Hills Direct Shipping Ore Project will be undertaken in line with the Environmental Protection Authority's Principles of Environmental Protection. The objectives and principles set out in Section 4A of the *Environmental Protection Act 1986* have been incorporated into project planning and development:

- The project has been designed to minimise the environmental footprint through using previously cleared areas: mine pits, haul roads and storage areas, as much as is practicable. Clearing will be kept to a minimum outside these areas.
- Baseline surveys have been undertaken to assess the environmental values of areas that could be impacted by the project.
- Specialist surveys and modelling to assess the existing project environment and determine potential impacts have been conducted.
- Specific management plans will be developed and implemented as part of risk based impact avoidance and management.

Midwest has made a range of formal commitments with respect to the project mine sites to indicate their commitment to constructing and operating in an environmentally responsible manner. The formal commitments will be implemented to the satisfaction of the DEC (Audit Section).

The key environmental issues associated with the development of the mine have been identified as;

- vegetation clearing of the Koolanooka TEC,
- impacts to priority flora at Blue Hills and
- impacts to Mallefowl (*Leipoa ocellata*).

Management and mitigation measures have been incorporated into the project to a minimum where practicable. It is believed that the proposed measures are sufficient to ensure the project complies with relevant legislation and does not have significant environmental impacts.

Midwest is committed to minimising, mitigating and offsetting environmental impacts that cannot be practicably avoided. Midwest will ensure potential impacts associated with construction and operation of the Koolanooka/Midwest DSO Project will be managed through the DSO Environmental Management Plan and other issue specific plans, to be developed for the Project. Midwest will consult with relevant authorities and follow their recommendations to achieve improved environmental standards wherever practicable.

The development of Koolanooka / Midwest DSO project will provide a number of significant benefits including:

- Diversification of employment opportunities at a time of regional drought.
- Local economic benefits.

Midwest believes that the construction and operation of the Koolanooka / Midwest DSO Mining Project will result in net economic and social benefits to the local and regional community and the State as a whole.

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11.0 Appendices

Appendix A: DEWHA Project Referral Advice

COMMONWEATLH OF AUSTRALIA

ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999

DECISION THAT ACTION IS NOT A CONTROLLED ACTION

I, MARK FLANIGAN, Assistant Secretary, Policy and Compliance Branch, Department of the Environment and Heritage, a delegate of the Minister for the Environment and Heritage for the purposes of section 75 of the *Environment Protection and Biodiversity Conservation Act 1999*, decide that the proposed action, set out in the Schedule, is not a controlled action.

SCHEDULE

The proposed action to develop the Koolanooka Direct Shipping Iron Ore Project to mine and process iron ore, Koolanooka, Western Australia, and as described in the referral received under the Act on 24 November 2004 (EPBC 2004/1886).

Dated this 20 day of DECEMBER 2004

.....

ASSISTANT SECRETARY
POLICY AND COMPLIANCE BRANCH
DEPARTMENT OF THE ENVIRONMENT AND HERITAGE

Appendix B: Fauna Desktop Review

Fauna Species	Common name	Status	Koolanooka (ATA Environmental 2004)	Koolanooka (Alan Tingay & Associates, 1996)	Blue Hills (Bamford Consulting Ecologists 2004)
Mammals					
Family Bovidae					
Capra hircus *	Goat		Opp	Evidence at Sites 1, 2, 3, 4.	
Family Canidae					
*Vulpes vulpes**	Fox		Opp	Scratchings and scats at Sites 4, 5, 6, 7, 8, 12, 13	
Family Dasyuridae					
Sminthopsis dolichura	Little Long-tailed Dunnart		Site 5, 6		Sites 3, 4, 5
Family Felidae					
*Felis catus**	Cat		Opp	Scats at Site 12	
Family Leporidae					
*Oryctolagus cuniculus**	Rabbit		Opp	Evidence at all sites	
Family Macropodidae					
Macropus fuliginosus	Western Grey Kangaroo		Opp	Site 13	
Macropus robustus erubescens	Euro		Opp	Scratchings at all sites.	
Macropus rufus	Red Kangaroo		Opp		
Family Molossidae					
Nyctinomus australis	White-striped Mastiff Bat	Status??		Site 1, 4, 12	
Family Muridae					
*Mus musculus**	House Mouse		Site 1	Site 1, 3, 5, 7	
Pseudomys hermannsburgensis	Sandy Inland Mouse			Site 4	
*Rattus rattus**	Black Rat		Opp		
Family Tachyglossidae					

Tachyglossus aculeatus	Echidna		Opp Scratchings	Scratchings at all sites. Seen at Site 12.	
Family Vespertilionidae					
Chalinolobus gouldii	Gould's Wattled Bat			Site 13	
Vespadelus regulus	Southern Forest Bat			Site 12	
Vespadelus finlaysoni	Finlayson's Cave Bat		Opp		
Birds					
Family Acanthizidae					
Acanthiza apicalis	Inland Thornbill			Sites 1, 2, 4, 5, 7, 8, 9, 10, 11	
Acanthiza chrysorrhoa	Yellow-rumped Thornbill			Sites 1, 2, 4, 13	
Acanthiza uropygialis	Chestnut-tailed Thornbill			Sites 1, 2, 3, 4, 5, 6, 8, 9, 11, 12	Sites 1, 4, 5
Aphelocephala leucopsis	Southern Whiteface			Sites 1, 9, 13	
Pyrrholaemus brunneus	Redthroat			Sites 1, 3, 4, 5, 6, 7, 8, 11	Site 3
Smicornis brevirostris	Weebill			Sites 1, 3, 5, 7, 8, 9, 12	
Family Acciptridae					
Accipiter fasciatus	Brown Goshawk	Migratory species *EPBC ACT 1999*			
Aquila audax audax	Wedge-tailed Eagle	Migratory species *EPBC ACT 1999*		Sites 1, 2, 3, 12, 13	
Circus assimilis	Spotted Harrier	Migratory species *EPBC ACT 1999*			
Family Aegothelidae					
Aegotheles cristatus	Australian Owlet-nightjar			Site 1	
Family Anatidae					
Anas superciliosa	Pacific Black Duck	Migratory species *EPBC ACT 1999*		Site 12	
Anas gracilis	Grey Teal	Migratory species *EPBC ACT 1999*		Site12	
Tadorna tadornoides	Australian Shelduck	Migratory species *EPBC ACT 1999*		Site 12	
Family Artamidae					
Artamus cinereus	Black-faced Woodswallow			Site 12	
Artamus minor	Little Woodswallow			Sites 3, 4, 12	Site 4
Gymnorhina tibicen	Australian Magpie			Site 9	
Family Campephagidae					
Coracina novaehollandiae	Black-faced Cuckoo-shrike			Site 13	Site 5

Family Caprimulgidae					
Eurostopodus argus	Spotted Nightjar			Sites 1, 13	□
Family Casuariidae					
Dromaius novaehollandiae	Emu		□	Site 4, 6, 12, 13.	
Family Caprimulgidae					
Eurostopodus argus	Spotted Nightjar		□		
Family Cinclostomatidae					
Cinclosoma castanotus	Chestnut Quail-thrush			Sites 7, 9	
Family Climacteridae					
Climacteris rufa	Rufous Treecreeper				□
Family Columbidae					
Ocyphaps lophotes	Crested Pigeon		□	Sites 12,13	
Phaps chalcoptera	Common Bronzewing		□	Sites 8, 9, 10, 11	□
Family Corvidae					
Corvus bennetti	Little Crow		□	Sites 1, 2, 3, 5, 6, 9, 10, 11	
Corvus coronoides	Australian Raven		□	Sites 5, 7, 9, 10, 13	Site5
Family Cracticidae					
Cracticus nigrogularis	Pied Butcherbird		□	Site 13	Site 5
Cracticus tibicen	Australian Magpie		□		
Cracticus torquatus	Grey Butcherbird			Site 9, 12, 13	Site 1, 3, 4
Family Dicruridae					
Grallina cyanoleuca	Magpie Lark		□	Site 13	
Rhipidura fuliginosa	Grey Fan-tail			Sites1, 2, 3, 4, 7, 8, 9, 10, 11	
Rhipidura leucophrys leucophrys	Willie Wagtail		□	Sites 4, 12, 13	
Family Falconidae					
Falco berigora	Brown Falcon	Migratory species *EPBC ACT 1999*	□	Site 3, 13	
Falco cenchroides	Nankeen Kestrel	Migratory species *EPBC ACT 1999*	□	Site 12, 13	
Falco longipennis	Little Falcon	Migratory species *EPBC ACT 1999*		Site 13	
Family Hirundinidae					
Cheramoeca leucosternus	White-backed Swallow			Site 12	
Petrochelidon nigricans nigricans	Tree Martin		□		
Hirundo neoxena	Welcome Swallow		□	Sites 2, 12	

Hirundo nigricans	Cliff Swallow			Sites 4, 8, 9,	
Family Maluridae					
Malurus lamberti	Variegated Fairy-wren		□		
Malurus leucopterus leucopterus	White-winged Fairy-wren	Vulnerable *EPBC Act* 1999 Schedule 1 *Wildlife Conservation Act* 1950	□		
Malurus splendens	Splendid Fairy-wren		□	Sites 2, 4, 9, 13	Site 1, 3, 4
Malurus pulcherrimus	Blue Breasted Fairy-wren			Sites 3 & 4	
Family Megapodidae					
Leipoa ocellata	Malleefowl	Vulnerable *EPBC Act 1999* Schedule 1 *Wildlife Conservation Act* 1950		Evidence at Site 2 & 8.	
Family Meliphagidae					
Acanthagenys rufogularis	Spiny-cheeked Honeyeater			Sites 1, 12	Site 5
Anthochaera carunculata	Red Wattlebird		□		
Certhionyx variegatus	Pied Honeyeater		□		
Epthianura aurifrons	Orange Chat		□		
Epthianura tricolor	Crimson Chat		□		
Lichmera indistincta	Brown Honeyeater			Site 13	
Lichenostomus leucotis leucotis	White-eared Honeyeater		□		
Lichenostomus virescens	Singing Honeyeater		□	Sites 1, 2, 3, 4, 5, 7, 9, 12, 13	Sites 1, 2, 3, 4
Manorina flavigula	Yellow-throated Miner		□	Sites 1, 13	□
Melithreptus brevirostris leucogenys	White-fronted Honeyeater		□		□
Family Meriopidae					
Merops ornatus	Rainbow Bee-eater	Migratory species *EPBC ACT 1999*	□		Site 5
Family Motacillidae					

Anthus novaeseelandiae	Richard's Pipit		□	Site 12	
Family Pachycephalidae					
Colluricincla harmonica	Grey Shrike-thrush		□	Sites 1, 2, 5, 7, 8, 9, 11, 12	Sites 1, 2, 3, 4
Oreoica gutturalis	Crested Bellbird		□	Sites1, 4, 5, 7, 8, 9, 10, 11	
Pachycephala pectoralis	Golden Whistler			Sites 7, 8, 9	
Pachycephala rufiventris rufiventris	Rufous Whistler		□		
Family Pardalotidae					
Pardalotus striatus	Striated Paradalote		□	Site 2	
Family Passeridae					
Taeniopygia guttata	Zebra Finch		□	Sites 4, 5, 6, 12, 13	
Family Petroicidae					
Drymodes brunneopygia	Southern Scrub Robin			Site 8	
Eopsaltria australis griseogularis	Western Yellow Robin		□	Site 8	□
Petroica goodenovii	Red-capped Robin		□		Site 5
Petroica multicolor	Scarlet Robin				□
Family Podargidae					
Podargus strigoides	Tawny Frogmouth		□		□
Family Podicipedidae					
Poliocephalus poliocephalus	Hoary-headed Grebe			Site 12	
Tachybaptus novaehollandiae	Australian Grebe		□		
Family Pomotostomidae					
Pomatostomus superciliosus	White-browed Babbler		□	Sites 2, 6, 9, 13	
Family Psittacidae					
Barnardius zonarius	Port Lincoln Parrot			Sites 1, 2, 3, 6, 7, 10, 11, 13	
Cacatua roseicapilla	Galah		□	Sites 1, 9, 13	□
Cacatua sanguinea sanguinea	Little Corella		□		
Calyptorhynchus latirostris	Carnaby's Cockatoo	Schedule 1 *Wildlife Conservation Act* 1950 Endangered *EPBC Act 1999*	□		
Platycercus zonarius	Australian Ringneck		□		Site 5
Psephotus varius	Mulga Parrot		□	Sites 1, 9, 12, 13	
Family Rallidae					
Fulica atra	Eurasian Coot		□		

Family Sylviidae					
Cincloramphus mathewsi	Rufous Songlark		□		
Family Turnicidae					
Turnix varia	Painted Button Quail			Site 2	
REPTILES					
Family Agamidae					
Caimanops amphiboluroides	Mulga dragon				Sites 1, 3, 5 & Opp
Ctenophorus nuchalis	Central Netted Dragon		Site 1		
Ctenophorus reticulatus			Site 1,5		Site 1 & Opp
Ctenophorus scutulatus	Lozenge Marked Dragon		Site 1 & Opp.		Sites 1, 3, 4 & Opp
Pogona minor	Western Bearded Dragon		Site 1 & Opp		Site 2
Family Boidae					
Antaresia stimsoni stimsoni	Stimson's Python		Opp.		
Family Elapidae					
Demansia psammophis reticulata	Yellow-faced Whipsnake		Opp.		
Pseudechis australis	King Brown Snake			Evidence at Site 1	
Pseudonaja nuchalis	Gwardar		Opp.		
Family Gekkonidae					
Diplodactylus pulcher	Beautiful Gecko		Site 1,2,4 & Opp.		Sites 1,3, 4, 5
Diplodactylus squarrosus			Opp.		
Gehyra variegata	Variegated Dtella		Site 4,5 & Opp.	Sites 1, 6, 8, 13	Sites 1, 2, 4
Heteronotia binoei	Binoe's Gecko		Site 2,4,6,7 & Opp.	Sites 1, 2, 3, 8, 10, 11	Sites 2, 4, 5
Strophurus strophurus			Opp.	Sites 1, 2	
Underwoodisaurus milii	Thick-tailed Gecko		Site 1 & Opp.		
Family Pygopodidae					
Delma australis	Marbled-faced Delma		Opp.	Site 8	Sites 1, 2 & Opp
Family Scincidae					
Cryptoblepharus plagiocephalus	Callose-palmed snake eyed skink		Opp.	Site 1	Site 3
Ctenotus uber			Site 1, 2		Sites 1, 2, 3, 4 & Opp
Ctenotus mimetes					Site 1
Cyclodomorphus branchialis	Mallee Slender Blue-tongued Lizard	DEC Priority 2	Opp.		Sites 2, 3
Ctenotus pantherinus	Leopard Ctenotus			Site 6	
Egernia depressa	Pygmy Spiny-tailed Skink		Site 4,5 & Opp	Sites 6, 8, 11	Site 1 & Opp
Ctenotus schomburgkii					Opp.

Egernia stokesii badia	Western Spiny-tailed Skink	Endangered *EPBC Act 1999* Schedule 1 *Wildlife Conservation Act 1950*oedura	Opp.		
Eremiascincus richardsoni					Sites 4, 5
Lerista gerrardii			Site 1,2,7	Sites 1, 7, 8, 9	Site 1, 3, 4 & Opp
Lerista muelleri	Mueller's Lizard		Opp		Site 1 & Opp
Menetia greyii	Common Dwarf Skink		Site 4 & Opp		Sites 3, 4
Morethia butleri	Woodland Morethia Skink		Opp	Sites 9, 12	Site 4
Tiliqua rugosa	Shingleback		Opp		
Family Typhlopidae					
Ramphotyphlops hamatus	Burrowing snake				Site 1
Family Varanidae					
Varanus caudolineatus	Pygmy Monitor		Site 2 and Opp		Site 2
Varanus gouldii	Gould's Goanna				Site 5
Varanus panoptes	Argus Monitor				Opp
Amphibians					
Family Leptodactylidae					
Pseudophryne occidentalis	Orange-crowned Toadlet			Site 13	
Family Myobatrachidae					
Neobatrachus aff. *centralis*	Desert Trilling Frog				Site 1

Appendix C: Fauna Habitat Descriptions

SURVEY	TIMING	SITE AND COORDINATES	SITE DESCRIPTION
ATA Environmental 2004	15th-23rd December 2003	Site 1: 50 422804E / 6770340N	Flat, open woodland.
		Site 2: 50 423793E / 6769682N	Sloped topography. Closed heath to open shrubland
		Site 3: 50 422962E / 6771165N	Flat topography. Tall closed shrubland of Acacia species.
		Site 4: 50 422820E / 6771805N	Sloped Topography. Tall Acacia and Allocasuarina shrubland.
		Site 5 50 420999E / 6770635N	Flat, Acacia shrubland.
		Site 6: 50 423581E / 6770532N	Open woodland over tall shrubland situated on a ridge.
		Site 7: 50 422292E / 6771524N	Along the sidewalls of a mine pit.
Alan Tingay & Associates 1996	June 1996	Site 1	York Gum, *Eucalyptus loxophleba,* and occasional *Casuarina cristate,* 6-10m tall, 10-30% canopy cover, over mixed shrubs 1.5-2m tall, 2-10% canopy cover, over mixed shrubs, <1m tall 2-10% canopy cover. Leaf litter sparse <2cm deep, scattered under shrubs. Logs and twigs abundant. Banded Ironstone slope with red loam between rocks.
		Site 2	Unstratified mixed shrubland, 1.5-2.5m tall, 70-100% canopy cover. Leaf litter sparse and clumps under shrubs, <2cm deep, twigs and logs. Rocky hilltop.
		Site 3	*Acacia* spp. 2-4m tall, 10-30% canopy cover with emergent York Gum, *Eucalyptus loxophleba* < 5m tall, over mixed shrubs, 1-1.5 m tall 2-10% canopy cover, over mixed shrubs <0.5m tall 2-10% canopy cover. Leaf litter very sparse, occasional logs and twigs. Rocky with numerous surface boulders.
		Site 4	*Acacia* spp., *Grevillea* sp. and occasional *Hakea* sp. and Mallee 2-3m tall, 10-30% canopy cover, over seedlings of above species. 0.5-1m tall, 2-10% canopy cover, over dead grass <0.5m tall, 10-30% canopy cover. Leaf litter, terete leaves clumped under shrubs, < 8cm deep. Sand, yellow-brown sandy loam becoming gravely at 25cm deep.
		Site 5	Mallee and *Acacia* sp. 4-5m tall, 2-10% canopy cover, over *Grevillea* spp. 2-3m tall, 10-30% canopy cover, over shrubs 0.5-1.5m tall, 2-10% canopy cover, over dead grass <0.5m tall, 10-30% canopy cover. Some sections in lower drainage areas have denser bushes to 1.5m tall. Leaf litter broad

			and terete leaves, clumped under shrubs to 10cm deep. Soil yellow-brown loam.
		Site 6	*Acacia* spp. 2-3m tall, 2-10% canopy cover over *Dodonaea* sp. and *Acacia* sp. 1-1.5m tall, <2% canopy cover. Leaf litter sparse, clumped mainly terete leaves with dead shrubs and twigs. Soil stony, gravely , loamy clay flats.
		Site 7	Mallee 3-4m tall 10-30% canopy cover and occasional *Acacia* sp. 1-1.5m tall <10% canopy cover, over sparse dead grass. Leaf litter clumped under mallees <6cm deep, broad leaves, bark and twigs. Soil, red sandy loam.
		Site 8	Mallee, *Allocasuarina campestris* and *Acacia* spp. 3-5m tall 30-70% canopy cover. Leaf litter clumped <4cm deep, broad leaves, twigs and logs. Soil, gravel slopes with rocks.
		Site 9	York Gum, *Eucalyptus loxophleba*, 5-8m tall, 2-10% canopy cover, over *Acacia* spp. 2-4m tall, 10-30% canopy cover, over *Acacia* spp. and *Dodonaea* sp. 1.2-2m tall, 2-10% canopy cover. Mistletoe, *Amyema miquell* is common on York Gums. Leaf litter clumped under trees and shrubs, mostly broad terete leaves, < 5cm deep, bark, twigs and numerous logs. Soil red clay loam with some pebbles.
		Site 10	Thickeys, 4-6m tall, 70-100% canopy cover, over *Acacia* spp., 1-1.5m tall, <10% canopy cover. Some areas have dead grass <0.5m tall, 2-10% canopy cover. Leaf litter continuous, broad and terete leaves, bark and twigs <4cm deep. Soil red clay loam with surface granite rocks and pebbles.
		Site 11	*Acacia* spp., *Melaleuca* sp. and *Allocasuarina campestris*, 2-3m tall, 30-70% canopy cover, over *Acacia* spp. 0.5-1m tall, 2-10% canopy cover. Leaf litter sparse, clumped under shrubs, mainly terete leaves <2cm deep, old branches and logs. Rocky slope with loamy clay soil.
		Site 12	Old mine site including spoil heaps and excavated pit.
		Site 13	Farmland, with or without remnant vegetation.
Bamford Consulting Ecologists 2004	9 – 16th February 2004	Site 1 (WGS 84) 486 240E / 6 776 107 N	Dense shrubland of Narrow-leaf Mulga *Acacia linophylla* on plain of red loam
		Site 2 489 355E / 6 766 668N	Rocky ridge of banded ironstone. Shallow, rocky soil supported a mixed shrubland of *Acacia, Allocasuarina* and Myrtaceae species.
		Site 3 489 510E / 6 776 392N	Slopes of mixed red loam and rocky soil at base of rocky ridge. Vegetation mainly a dense shrubland of Narrow-leaf Mulga.
		Site 4 489 738E / 6 776 082N	Red loam plain supporting a low woodland of woollybutt eucalypts with a mid-storey of Narrow-leaf Mulga. A lot of dead wood on the ground.
		Site 5 486 802E / 6 775 651N	Loamy clay soils, forming Gilgai mounds in places, with a low woodland of Melaleuca grading into lignum shrubland with scattered, small eucalypts. Subject to irregular inundation.

Appendix D: Classification of Species under the WA Wildlife Conservation Act

Classification	Definition
Schedule 1	Fauna that is rare or likely to become extinct
Schedule 2	Fauna that is presumed to be extinct
Schedule 3	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
Schedule 4	Other fauna in need of special protection

Appendix E: Explanation of Conservation Codes

Table E-1 Definition of categories described under the EPBC Act.

Conservation Category	Definition
Extinct	A species is extinct if there is no reasonable doubt that the last member of the species has died.
Extinct in the wild	A species is categorised as extinct in the wild if it is only known to survive in cultivation, in captivity or as a naturalised population well outside its past range; or if it has not been recorded in its known/expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	The species is facing an extremely high risk of extinction in the wild in the immediate future.
Endangered	The species is likely to become extinct unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate; or its numbers have been reduced to such a critical level, or its habitats have been so drastically reduced, that it is in immediate danger of extinction.
Vulnerable	Within the next 25 years, the species is likely to become endangered unless the circumstances and factors threatening its abundance, survival or evolutionary development cease to operate.
Conservation Dependent	The species 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 five years.

Table E-2 Definition of Declared Rare and Priority categories.

Code	Definition
DRF	Declared Rare Flora-Extant Taxa. 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.
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, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally >5), or known populations being large, and either widespread or protected. 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.

(From Atkins, 2006, Declared Rare and Priority Flora List 2006, Dept. CALM)

Table E-3 Explanation of codes for Declared Weeds in Western Australia.

Priority	Requirements
P1 Prohibits movement	The movement of plants or their seeds is prohibited within the State. This prohibits the movement of contaminated machinery and produce, including livestock and fodder.

Priority	Requirements
P2 Aim is to eradicate infestation	Treat all plants to destroy and prevent propagation each year until no plants remain. The infested area must be managed in such a way that prevents the spread of seed or plant parts on or in livestock, fodder, grain, vehicles and/or machinery.
P3 Aims to control infestation by reducing area and/or density of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property, on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set for all plants: • within 100 metres inside of the boundaries of the infestation. • within 50 metres of roads and high-water marks on waterways. • within 50 metres of sheds, stock yards and houses. Treatment must be done prior to seed set each year. Of the remaining infested area: • Where plant density is 1-10 per hectare, treat 100% of infestation. • Where plant density is 11-100 per hectare, treat 50% of infestation. • Where plant density is 101-1000 per hectare, treat 10% of infestation. Properties with less than two hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated.
P4 Aims to prevent infestation spreading beyond existing boundaries of infestation	The infested area must be managed in such a way that prevents the spread of seed or plant parts within and from the property, on or in livestock, fodder, grain, vehicles and/or machinery. Treat to destroy and prevent seed set for all plants: • within 100 metres inside of the boundaries of the infested property. • within 50 metres of roads and high-water marks on waterways. • within 50 metres of sheds, stock yards and houses. • Treatment must be done prior to seed set each year. Properties with less than two hectares of infestation must treat the entire infestation. Additional areas may be ordered to be treated. Special considerations: In the case of P4 infestations where they continue across property boundaries, there is no requirement to treat the relevant part of the property boundaries as long as the boundaries of the infestation as a whole are treated. There must be agreement between neighbours in relation to the treatment of these areas.
P5	Infestations on public lands must be controlled.

(Department of Agriculture and Food, 2006).

Appendix F: Priority Flora / Flora of Conservation Significance having the potential to occur within the Project area

Table F-1 Rare and Priority Flora and flora of conservation significance having potential to occur within the Koolanooka Hills survey area.

Family	Species	Status
Chenopodiaceae	*Halosarcia bulbosa* Paul G.Wilson	Rare
Myoporaceae	*Eremophila nivea*	Rare
Myoporaceae	*Eremophila rostrata ms*	Rare
Myoporaceae	*Eremophila viscida* Endl.	Rare
Myrtaceae	*Eucalyptus synandra* Crisp	Rare
Anthericaceae	*Tricoryne* sp. Morawa (G.J. Keighery & N. Gibson 6759)	P1
Asteraceae	*Gnephosis setifera* P. S. Short	P1
Asteraceae	*Millotia dimorpha* P.S.Short	P1
Asteraceae	*Rhodanthe collina*	P1
Myrtaceae	*Leptospermum exsertum*	P1
Myrtaceae	*Melaleuca barlowii* Craven	P1
Asteraceae	*Fitzwillia axilliflora* (Ewart & Jean White) P.S.Short	P2
Myrtaceae	*Baeckea* sp. Perenjori (J.W. Green 1516)	P2
Myrtaceae	*Baeckea sp.* Three Springs (M.E. Trudgen 5368)	P2
Rhamnaceae	*Stenanthemum poicilum* Rye	P2
Aizoaceae	*Gunniopsis rubra*	P3
Asteraceae	*Angianthus micropodioides*	P3
Asteraceae	*Epitriche demissus*	P3
Asteraceae	*Podotheca uniseta* P. S. Short	P3
Frankeniaceae	*Frankenia glomerata* Turcz.	P3
Goodeniaceae	*Lechenaultia galactites* L.W.Sage ms	P3
Mimosaceae	*Acacia acanthoclada* subsp. *glaucescens* Maslin	P3
Mimosaceae	*Acacia formidabilis*	P3
Mimosaceae	*Acacia isoneura subsp. Isoneura*	P3
Myrtaceae	*Enekbatus longistylus* Trudgen & Rye ms	P3
Myrtaceae	*Verticordia venusta* A.S.George	P3
Papilionaceae	*Urodon capitatus* Turcz.	P3
Poaceae	*Austrostipa blackii* (C.E.Hubb.) S.W.L.Jacobs & J.Everett	P3
Proteaceae	*Grevillea asparagoides*	P3
Proteaceae	*Grevillea stenostachya* C.A.Gardner	P3
Proteaceae	*Persoonia pentasticha* P.H.Weston	P3
Stylidiaceae	*Levenhookia octomaculata* F.L.Erickson & J.H.Willis	P3
	New Species (DEC survey, 2005)	
Mimosaceae	*Acacia* sp. Koolanooka falcate (R. Meissner and Y. Caruso 84)	
Anthericaceae	*Caesia* sp. Koolanooka Hills (R. Meissner and Y. Caruso 78)	
Sapindaceae	*Dodonaea* sp. Koolanooka Hills (R. Meissner and Y. Caruso 17)	
Rutaceae	*Drummondita* sp. Koolanooka Hills (R. Meissner and Y. Caruso 69)	
Chenopodiaceae	*Lepidosperma* sp. Koolanooka (K. Newbey 9336)	
	Taxa of Interest (DEC survey, 2005)	
Mimosaceae	*Acacia* aff. *declinata*	
Dilleniaceae	*Hibbertia* aff. *exasperata*	
Myrtaceae	*Eucalyptus ebbanoensis* subsp. *glauciramula*	
Caesalpiniaceae	*Labichea lanceolata* subsp. *brevifolia*	
Cyperaceae	*Tetraria* aff. *capillaris*	

(Summarised from: FloraBase, 2006; a DEC database Rare Flora search, 2004; Atkins 2006 and previous surveys).

Table F-2 Rare and Priority Flora and flora of conservation significance having potential to occur within the Blue Hills survey area.

Family	Species	Status
Myrtaceae	*Eucalyptus synandra* Crisp	Rare
Aizoaceae	*Gunniopsis divisa* Chinnock	P1
Apiaceae	*Hydrocotyle* sp. Warriedar (P.G. Wilson 12267)	P1
Asteraceae	*Millotia dimorpha* P.S.Short	P1
Asteraceae	*Rhodanthe collina* Paul G.Wilson	P1
Myrtaceae	*Chamelaucium* sp. Yalgoo (Y. Chadwick 1816)	P1
Myrtaceae	*Leptospermum exsertum* Joy Thomps.	P1
Myrtaceae	*Micromyrtus cuensis* J.W.Green ms	P1
Myrtaceae	*Melaleuca barlowii* Craven	P1
Myrtaceae	*Micromyrtus* sp. Warriedar (S. Patrick 1879A)	P1
Proteaceae	*Grevillea subtiliflora* McGill.	P1
Proteaceae	*Persoonia kararae*	P1
Rhamnaceae	*Polianthion collinum* Rye [syn.*Genus* sp. Yalgoo (J.M. Ward s.n. 11/7/1999)]	P1
Apiaceae	*Hydrocotyle coorowensis* H.Eichler ms	P2
Papilionaceae	*Isotropis canescens* F.Muell.	P2
Rhamnaceae	*Stenanthemum poicilum* Rye	P2
Aizoaceae	*Gunniopsis rubra* Chinnock	P3
Goodeniaceae	*Lechenaultia* sp. Kokardine (B.H. Smith 177)	P3
Lamiaceae	*Spartothamnella* sp. Helena & Aurora Range (P.G. Armstrong 155-109)	P3
Mimosaceae	*Acacia formidabilis*	P3
Mimosaceae	*Acacia speckii* R.S. Cowan & Maslin	P3
Mimosaceae	*Acacia acanthoclada* subsp. *glaucescens* Maslin	P3
Myrtaceae	*Calytrix uncinata* Craven	P3
Poaceae	*Austrostipa blackii* (C.E.Hubb.) S.W.L. Jacobs & J.Everett	P3
Proteaceae	*Grevillea globosa* C.A.Gardner	P3
Proteaceae	*Grevillea scabrida* C.A.Gardner	P3
Proteaceae	*Persoonia pentasticha* P.H.Weston	P3
Stylidiaceae	*Levenhookia octomaculata* F.L.Erickson & J.H.Willis	P3
	New Species (DEC survey, 2005)	
Mimosaceae	*Acacia* sp. Karara (C. Godden 14)	P2
Mimosaceae	*Acacia woodmaniorum* Maslin & Buscumb	DRF
Asteraceae	*Calotis* aff. *cuneifolia* (A. Markey & S. Dillon 3447)	
Chenopodiaceae	*Lepidosperma* sp. Karara (H.Pringle 3865)	
Lamiaceae	*Prostanthera* aff. *campbellii*	
Mimosaceae	*Acacia* aff. *coolgardiensis*	
Myoporaceae	*Eremophila* cf. *platycalyx* A. Markey & S. Dillon 3337)	
Myoporaceae	*Eremophila* sp. (A. Markey & S. Dillon 3338)	
Rutaceae	*Drummondita* aff. *microphylla*	
	Taxa of Interest (DEC survey, 2005)	
Adiantaceae	*Cheilanthes* cf. *lasiophyllum* x *sieberi*	New hybrid

Family	Species	Status
Caesalpiniaceae	*Senna glutinosa* spp. *chatelainiana* x *charlesiana* (A. Markey & S. Dillon 3413)	New hybrid
Chenopodiaceae	*Maireana planifolia* x *villosa*	New hybrid
	Taxa of Interest (Woodman survey, 2006b)	
Mimosaceae	*Acacia* aff. *subsessilis*	Poss. new taxon
Lamiaceae	*Prostanthera* sp.	Possibly undescribed

Summarised from: FloraBase, 2006; DEC database search, 2004; ATA, 2004; Woodman Environmental Consultants, 2004, 2006a & 2006b; Markey & Dillon, 2006).

Appendix G: Flora Species Collected from the Koolanooka/Blue Hills Flora Surveys

Table G-1 List of flora species collected during the current Koolanooka flora surveys.

Family	Species
Adiantaceae	*Cheilanthes adiantoides*
Amaranthaceae	*Ptilotus obovatus*
	Ptilotus polystachyus var. *polystachyus*
Anthericaceae	*Thysanotus manglesianus*
	Thysanotus patersonii
Apiaceae	*Trachymene cyanopetala*
Asclepiadaceae	*Rhyncharrhena linearis*
Asteraceae	Asteraceae sp.
	?Senecio sp.
	Lawrencella rosea
	Myriocephalus guerinae
	Rhodanthe battii
	**Sonchus oleraceus*
	Waitzia acuminata var. *acuminata*
Casuarinaceae	*Allocasuarina acutivalvis* subsp. *prinsepiana*
Chenopodiaceae	*Maireana carnosa*
	Rhagodia drummondii
Dioscoreaceae	*Dioscorea hastifolia*
Epacridaceae	*Astroloma serratifolium*
Euphorbiaceae	*Calycopeplus paucifolius*
Goodeniaceae	*Goodenia ?berardiana*
	Velleia hispida
Isoetaceae	*Isoetes inflata*
Malvaceae	*Sida atrovirens*
Mimosaceae	*Acacia acuminata*
	Acacia assimilis subsp. *assimilis*
	Acacia exocarpoides
	Acacia nigripilosa subsp. *nigripilosa*
	⚐ *Acacia sclerosperma* subsp. *sclerosperma*
	Acacia tetragonophylla
Myoporaceae	*Eremophila oldfieldii* subsp. *oldfieldii*
Myrtaceae	*Melaleuca fulgens* subsp. *fulgens*
	Melaleuca nematophylla
	Melaleuca radula
Papilionaceae	*Daviesia hakeoides* subsp. *hakeoides*
Poaceae	*Aristida contorta*
	Austrostipa elegantissima
Polygalaceae	*Comesperma volubile*
Polygonaceae	**Acetosa vesicaria*

Family	Species
Proteaceae	*Grevillea levis*
	Grevillea paradoxa
Sapindaceae	*Dodonaea inaequifolia*
Solanaceae	*Anthocercis anisantha* subsp. *anisantha*
	Solanum ellipticum
Sterculiaceae	*Rulingia luteiflora*

Classification and nomenclature according to the Western Australian Herbarium (FloraBase, 2007),

Key: * = introduced species

⚑ = flora of interest

Table G-2 List of flora species collected during the current Blue Hills (Mungada East) flora surveys.

Family	Species
Adiantaceae	*Cheilanthes adiantoides*
	Cheilanthes sieberi subsp. *sieberi*
Amaranthaceae	*Ptilotus obovatus*
	Ptilotus obovatus var. *obovatus*
	Ptilotus schwartzii
Anthericaceae	*Arthropodium dyeri*
Apiaceae	*Xanthosia bungei*
Apocynaceae	*Alyxia buxifolia*
Asclepiadaceae	*Rhyncharrhena linearis*
Asteraceae	*Calocephalus multiflorus*
	Calotis hispidula
	Calotis sp.
	Lawrencella rosea
	Myriocephalus guerinae
	Rhodanthe battii
	Waitzia acuminata var. *acuminata*
Boraginaceae	**Echium plantagineum* **(P1 weed)**
	Trichodesma zeylanicum
Boryaceae	*Borya sphaerocephala*
Caesalpiniaceae	*Senna artemisioides* subsp. x *artemisioides*
Casuarinaceae	*Allocasuarina acutivalvis* subsp. *prinsepiana*
Crassulaceae	*Crassula colorata* var. *acuminata*
	Crassula extrorsa
Cyperaceae	*Lepidosperma costale*
	⚐ *Lepidosperma* sp. Blue Hills
Dilleniaceae	*Hibbertia arcuata*
Droseraceae	*Drosera macrantha* subsp. *macrantha*
Epacridaceae	*Astroloma serratifolium*
Euphorbiaceae	*Calycopeplus paucifolius*
Goodeniaceae	*Goodenia ?berardiana*
	Goodenia berardiana
	Scaevola spinescens
Lamiaceae	*Hemigenia* sp. Cue (K.F. Kenneally 47A)
	Hemigenia sp. Pindar (H. Demarz 7428)
	Hemigenia sp. Yuna (A.C. Burns 95)
	Microcorys obovata
	Prostanthera patens
Malvaceae	*Sida atrovirens*
	Sida calyxhymenia
	Sida excedentifolia
	MALVACEAE sp.
Mimosaceae	*Acacia acuminata*
	Acacia aneura var. *aneura*
	Acacia aneura var. ?*argentea*
	Acacia aneura var. *argentea*
	Acacia aneura var. *microcarpa*
	Acacia anthochaera
	Acacia assimilis subsp. *assimilis*
	Acacia aulacocarpa

Family	Species
	Acacia aulacophylla
	Acacia ayersiana
	Acacia coolgardiensis subsp. *effusa*
	Acacia exocarpoides
	Acacia murrayana
	Acacia ramulosa var. *ramulosa*
	⚐ *Acacia woodmaniorum* **(DRF)**
	Acacia tetragonophylla
Myoporaceae	*Eremophila clarkei*
	Eremophila latrobei subsp. *latrobei*
	Eremophila oldfieldii subsp. *oldfieldii*
	Eremophila sp.
Myrtaceae	*Aluta aspera* subsp. *hesperia*
	Eucalyptus ewartiana
	Eucalyptus loxophleba subsp. *supralaevis*
	Melaleuca nematophylla
	Micromyrtus obovata
	⚐ *Micromyrtus acuta* **(P1)**
	⚐ *Micromyrtus trudgeni i***(P3)**
	Thryptomene decussata
Papilionaceae	*Gastrolobium laytonii*
	Mirbelia bursarioides
Phormiaceae	*Dianella revoluta* var. *divaricata*
Plantaginaceae	*Plantago debilis*
Poaceae	*Austrodanthonia caespitosa*
	**Pentaschistis airoides*
	**Pentaschistis airoides* subsp. *airoides*
Proteaceae	*Grevillea extorris*
	Grevillea obliquistigma subsp. *obliquistigma*
	Hakea invaginata
	Hakea recurva subsp. *recurva*
	⚐ *Persoonia pentasticha* **(P3)**
Rhamnaceae	*Cryptandra imbricata*
Rubiaceae	**Galium spurium*
Rutaceae	*Drummondita microphylla*
	Philotheca brucei subsp. *brucei*
	Philotheca deserti subsp. *deserti*
	Philotheca sericea
Santalaceae	*Exocarpos aphyllus*
Sapindaceae	*Dodonaea inaequifolia*
	Dodonaea pachyneura
	Dodonaea petiolaris
	Dodonaea viscosa subsp. *spatulata*
Solanaceae	*Solanum ellipticum*
	Solanum lasiophyllum

Classification and nomenclature according to the Western Australian Herbarium (FloraBase, 2007),

Key: * = introduced species

⚐ = flora of interest

Table G-3 List of flora species collected during the current Blue Hills (Mungada West) flora surveys.

Family	Species
Adiantaceae	*Cheilanthes adiantoides*
Amaranthaceae	*Ptilotus exaltatus*
	Ptilotus obovatus var. *obovatus*
Anthericaceae	*Thysanotus manglesianus*
Asteraceae	*?Waitzia* sp.
	Olearia pimeleoides
	Rhodanthe sp.
Caesalpiniaceae	*Senna artemisioides* subsp. *filifolia*
	Senna artemisioides subsp. x *artemisioides*
Chenopodiaceae	*Maireana tomentosa* subsp. *tomentosa*
	Maireana trichoptera
	Maireana villosa
	Rhagodia ?drummondii
	Rhagodia sp.
	Sclerolaena fusiformis
	Sclerolaena uniflora
Cupressaceae	*Callitris columellaris*
Dilleniaceae	*Hibbertia arcuata*
Droseraceae	*Drosera macrantha* subsp. *macrantha*
Euphorbiaceae	*Calycopeplus paucifolius*
Goodeniaceae	*Scaevola spinescens*
Lamiaceae	*Prostanthera magnifica*
	Prostanthera patens
Loranthaceae	*Amyema gibberula*
	Amyema gibberula var. *tatei*
	Lysiana casuarinae
Malvaceae	*Sida arenicola*
	Sida atrovirens
Mimosaceae	*Acacia ?coolgardiensis* subsp. *coolgardiensis*
	Acacia acuminata
	Acacia aneura var. *argentea*
	Acacia aneura var. *major*
	Acacia anthochaera
	Acacia assimilis subsp. *assimilis*
	Acacia aulacophylla
	Acacia burkittii
	Acacia coolgardiensis subsp. *effusa*
	Acacia exocarpoides
	Acacia obtecta
	Acacia ramulosa var. *linophylla*
	Acacia ramulosa var. *ramulosa*
	Acacia sclerosperma
	Acacia tetragonophylla
	⚐ *Acacia woodmaniorum* **(DRF)**
Myoporaceae	*?Eremophila ?decipiens* susbp. *decipiens*
	Eremophila clarkei
	Eremophila exilifolia
	Eremophila georgei
	Eremophila latrobei subsp. *latrobei*
Myrtaceae	*Aluta aspera* subsp. *hesperia*
	Eucalyptus loxophleba subsp. *supralaevis*

Family	Species
	Melaleuca hamata
	Melaleuca leiocarpa
	Melaleuca nematophylla
	⚑ *Micromyrtus acuta* **(P1)**
	⚑ *Micromyrtus trudgenii* **(P3)**
	Thryptomene costata
Orchidaceae	*Cyanicula amplexans*
Papilionaceae	*Mirbelia bursarioides*
Phormiaceae	*Dianella revoluta* var. *divaricata*
Pittosporaceae	*Pittosporum angustifolium*
Poaceae	*Austrostipa scabra*
	Monachather paradoxus
	POACEAE sp.
Polygalaceae	*Comesperma integerrimum*
Proteaceae	*Grevillea obliquistigma* subsp. *obliquistigma*
	Hakea recurva subsp. *recurva*
	⚑ *Persoonia pentasticha* **(P3)**
Rhamnaceae	*Cryptandra imbricata*
Rutaceae	*Drummondita microphylla*
	Philotheca brucei subsp. brucei
	Philotheca deserti subsp. deserti
	Philotheca ?sericea
	Philotheca sericea
Santalaceae	*Exocarpos aphyllus*
	Santalum acuminatum
	Santalum lanceolatum
Sapindaceae	*Dodonaea inaequifolia*
	Dodonaea petiolaris
Solanaceae	*Solanum ellipticum*
	Solanum ?lasiophyllum
	Solanum lasiophyllum
	Solanum nummularium

Classification and nomenclature according to the Western Australian Herbarium (FloraBase, 2007),

Key: * = introduced species

⚑ = flora of interest

Appendix H: Priority Flora Recorded from the Koolanooka Hills and Blue Hills Survey Areas

Koolanooka Hills

No Priority taxa were recorded at the Koolanooka Hills site surveyed.

Blue Hills

***Acacia woodmaniorum* Declared Rare Flora**

Acacia woodmaniorum ms **(DRF)** (Mimosaceae) is a species that appears to be restricted to the Blue Hills area. This species is described below by an adapted version of that provided by Bruce Maslin (*Acacia* specialist) for the Holotype specimen (PERTH 07414897) at the Western Australian Herbarium.

A. woodmaniorum is an intricately branched prickly harsh shrub 1-1.5 (-2) m tall. The bark is grey and slightly rough. The new shoots are red when first initiated. The branchlets are light green or yellow at extremities, the decurrent phyllodes are glaucous and more or less lightly pruinose. The marginal nerve of phyllodes is red (young), ageing to yellow. Three spines occur on angles of the free portion of the phyllodes, and are pale red when young, aging to brown. The dead decurrent phyllodes are grey and persist on branches below living crown. The peduncles are often ringed red and the wattle flowers are yellow.

***Micromyrtus acuta* Rye, Priority 1**

Micromyrtus acuta is a rounded shrub growing to 0.5 – 2.5 m high. The leaves are tiny (up to 3 mm long and 1 mm wide) and shaped like a tear drop (wide at one end and narrow at the other). It produces small white flowers from around July to September and occurs on a number of different substrates, including ironstone.

***Micromyrtus trudgenii* Priority 3**

*Micromyrtus trudgenii*is an erect, open and straggly weeping shrub growing to 0.5 – 2 m tall. This species has small, linear-oblong leaves that tend to grow in dense clusters and then fall as they begin to age. The shrub produces yellow flowers, which have been noted in July and September. The flowers are small and tubular with five lobes, cream to yellow in colour. *Micromyrtus* sp. Warriedar was previously known from about 21 populations at Karara Station and the central Tallering Land System including Blue Hills. (This taxa was recorded at Mungada East and Mungada West).

***Persoonia pentasticha*, Priority 3**

Persoonia pentasticha is an erect, spreading shrub growing to between 0.4 to 1.8 m in height. The flowers are yellow and are produced from August to November. It grows on sandy loam at the base of granite outcrops. *Persoonia pentasticha* was previously known from about 31 populations at Koolanooka Hills and the central Tallering Land System including Blue Hills. (This taxa was recorded at Mungada East and Mungada West).

Appendix J: *Aboriginal Heritage Act, 1972* Section 18 Approval

Minister for Consumer and Employment Protection; Indigenous Affairs;
Minister Assisting the Minister for Public Sector Management;
Leader of the House in the Legislative Assembly

Our Ref: 0321145

Mr Brett Manning
Company Secretary & General Manager of Administration
Midwest Corporation Ltd
PO Box 1915
WEST PERTH WA 6872

Dear Mr Manning

ABORIGINAL HERITAGE ACT 1972 - SECTION 18 – MINING OPERATION – KOOLANOOKA HILLS – SOUTHEAST OF GERALDTON

I refer to the Notice of 22 October 2003 given by you, Mr Brett Manning, to the Aboriginal Cultural Material Committee (ACMC) advising that you require to use the land described in Schedule 1 of the Notice as Mining Leases M70/1012, M70/1013 and M70/1014 (the land) for a purpose described in Schedule 2 of the Notice to undertake mining operations through an extension of the existing open pit operations and the recovery of a magnetite iron ore concentrate from the mine ore processing site (the purpose).

In accordance with my powers under section 18(3) of the *Aboriginal Heritage Act 1972* (AHA), and following consideration of recommendations of the ACMC, I hereby grant consent to the use of the land for the purpose, subject to the conditions set out below.

On current knowledge, the purpose will impact upon Aboriginal heritage site DIA 4496 (Koolanooka Hills).

Conditions of Consent

That Midwest Corporation Ltd:

- Ensure that all employees and contractors are advised of their obligations and responsibilities under the *Aboriginal Heritage Act 1972*.
- Ensure that a thorough archaeological investigation is undertaken for those areas it intends to mine or clear for infrastructure in the future that have not been previously disturbed by mining.
- Provide the Registrar of Aboriginal Sites (the Registrar) at the completion of the development proposal a written report outlining whether and to what extent the development has impacted on

20th Floor, 197 St George's Terrace, Perth, Western Australia 6000 Telephone: (08) 9222 9211 Facsimile: (08) 9321 6003
Email: jkobelke@dpc.wa.gov.au Internet: www.ministers.wa.gov.au/kobelke

Appendix K: Midwest Corporation Pty Ltd Groundwater Licence

File No: MG88

Department of Water
Government of Western Australia

Page 1 of 1

Instrument No. GWL159255(2)

LICENCE TO TAKE WATER

Granted by the Department under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	Midwest Corporation Pty Ltd		
Description of Water Resource	Gascoyne Combined - Fractured Rock West - Alluvium	**Annual Water Entitlement**	165000 kL
Location of Water Source	Koolanooka Mine Site - M70/1014, M70/1013 & M70/1012 Old Karara - E59/1175 Lot 5995 On Plan 226759 - Volume/Folio 1835/686 - Lot 5995 Koolanooka		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Dust suppression Mineral ore processing Mining camp purposes	Koolanooka Mine Site - M70/1014, M70/1013 & M70/1012
	Dust suppression	Tilley Siding - Lots 3935 & 3878 on Plan 232417

Duration of Licence	From 11 July 2008 to 31 July 2013

This Licence is subject to the following terms, conditions and restrictions:

1 The annual water year for water taken under this licence is defined as 1 July to 30 June.

2 The water year is defined as a specified 12 month period for the purposes of groundwater management planning, annual water accounting and annual reporting.

3 The following monitoring programme is to be undertaken by the licensee or his representative and the following information must be supplied to the Department of Water by 31 July of each year. A) pumpage from each well and total wellfield pumpage should be recorded monthly to the nearest kilolitre. B) water levels in all monitoring wells should be measured monthly to the nearest centimetre. C) water levels in each production well should be measured monthly to the nearest centimetre, preferably after the well has been rested, otherwise a note should be made if the well was pumping. D) water quality in all production wells is to be determined monthly by conductivity and every 12 months by major components analysis (see attached).

4 The Department of Water, at its discretion, may direct changes to be made to the monitoring programme at any time.

5 That should the licensee's draw adversely affect the aquifer or other users in the area, the Department of Water may reduce the amount that may be drawn.

6 Approval by the Department of Water is to be obtained prior to the construction of additional and replacement wells and the modification or refurbishment of existing wells.

7 That the licensee shall allow access, in an agreed manner, by Department of Water personnel for the purposes of inspection at any time.

End of terms, conditions and restrictions

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000

12.0 Glossary of Terms and Abbreviations

AHD – Australian Height Datum
ANZECC – Australian and New Zealand Environment and Conservation Council
ARMCANZ – Agricultural and Resource Management Council of Australia and New Zealand
ARRP Act – Agriculture and Related Resources Protection Act, 1976
CALM – Department of Conservation and Land Management
CSIRO –Commonwealth Scientific and Industrial Research Organisation
DEC – Department of Environment and Conservation
DoE – Department of Environment
DIA – Department of Indigenous Affairs
DoIR – Department of Industry and Resources
DRF – Declared Rare Flora
DEWHA – Department of Environment and Heritage
DSO – Direct Shipping Ore
EIA – Environmental Impact Assessment
EMP – Environmental Management Plan
EPA – Environmental Protection Authority
EPBC Act – Environment Protection and Biodiversity Conservation Act, 1999
GL - gigalitres: 1 x 10^6 m^3
PER – Public Environmental Review
RL – Relative Level
ROM – Run of Mine
TDS – Total Dissolved Solids
TEC –Threatened Ecological Community
tph – tonnes per hour

13.0 LIST OF TECHNICAL APPENDICES (ATTACHED DISK)

Appendix 13.1 Alan Tingay & Associates (1996) *Vertebrate Fauna Koolanooka Mine Site Morawa*. Report No 96/53. Prepared for Kingstream Resources N.L.

Appendix 13.2 ATA Environmental (2004a) *Vegetation and Flora Assessment Koolanooka*. Report No 2004/23. Prepared for Midwest Corporation

Appendix 13.3 ATA Environmental (2004c) *Fauna Assessment Koolanooka*. Report No. 2004/40 Prepared for Midwest Corporation

Appendix 13.4 Bamford Consulting Ecologists (2004) *Blue Hills Fauna Assessment*. Prepared for Midwest Corporation

Appendix 13.5 Bamford Consulting Ecologists (2006b) *Mt Karara/Mungada Haul Road; Fauna Assessment*. Unpublished report prepared for Woodman Environmental Consulting Pty Ltd.

Appendix 13.6 Dustcheck Brochure on Lignosulphate Polymer, Rainstorm, Perth

Appendix 13.7 Bennett Environmental Consulting (2004) *Flora and Vegetation Blue Hills*. Prepared for Midwest Corporation.

Appendix 13.8 Bond, K. (2007) *Greenhouse Gas Assessment. Koolanooka/Blue Hills Remnant Direct Shipping Iron Ore (DSO) Mining Project*. Prepared for *ecologia* Environment.

Appendix 13.9 *Ecologia* Environment (2007a), Unpublished, *Koolanooka Hills/Blue Hills Flora and Vegetation Survey*, *ecologia* Environment, Perth

Appendix 13.10 *Ecologia* Environment (2007b), Unpublished, *Koolanooka/Blue Hills DSO Mining Project Short Range Endemic Biological Assessment ecologia* Environment, Perth

Appendix 13.11 *Ecologia* Environment (2007c), Unpublished, *Risk assessment for potential impact to Stygofauna on the DSO project*, *ecologia* Environment, Perth

Appendix 13.12 *Ecologia* Environment (2007d), Unpublished, *Risk assessment for potential impact to Troglofauna on the DSO project*, *ecologia* Environment, Perth

Appendix 13.13 Hames Consulting Group (2003) *Section 18 Application under Aboriginal Heritage Act (1972) To Undertake Mining Operations at Koolanooka Hills Western Australia Archaeological Survey and Pandawn Descendants*. Prepared for Midwest Corporation.

Appendix 13.14 O'Connor R. (1996) *Report on an Ethnographic Survey of Exploration Lease E70/1212 at Koolanooka Hills and Exploration Lease E59/462 at Blue Hills*. Prepared for Kingstream Resources N.L

Appendix 13.15 Quartermaine G. (1996) *Archaeological Site Survey. Report on a Preliminary Archaeological Investigation for Aboriginal Sites Midwest Iron and Steel Project Areas, Mullewa*. Prepared for Kingstream Resources N.L.

Appendix 13.16 Rockwater Pty Ltd (2004a) *Assessment of Groundwater Supplies for proposed Mining of Iron Ore at Koolanooka*. Unpublished report prepared for Midwest Corporation Ltd.

Appendix 13.17 Rockwater Pty Ltd (2004b) *Assessment of Groundwater Supplies for proposed Mining of Haematite Iron Ore at Koolanooka (Stage 1)*. Unpublished report prepared for Midwest Corporation Ltd.

Appendix 13.18 Rockwater Pty Ltd (2006) *Results of groundwater exploration drilling at Koolanooka and Blue Hills*. Unpublished report prepared for Midwest Corporation Ltd.

Appendix 13.19 Rockwater Pty Ltd (2007) Results of bore census, air lifting and test pumping at Koolanooka & Blue Hills 2007-004. Unpublished report prepared for Midwest Corporation Ltd.

Appendix 13.20 Sinclair Knight Mertz (2006) *Koolanooka Dust Modelling and Impact Assessment*. Prepared for Midwest Corporation Ltd.

Appendix 13.21 WA Chemistry Centre (2006). Unpublished Report for Ecologia Environment on acid sulfate soil testing by Suspension Peroxide Oxidation Combined Acidity and Sulfate method (SPOCAS), WA Chemistry Centre, Perth.

Appendix 13.22 Western Heritage Research (2005), Report of an archaeological survey of the proposed Blue Hills haul road and Morawa rail siding. Prepared for Midwest Corporation.

Appendix 13.23 *ecologia* Environment (2007), Midwest Corporation Lmited DSO project Environmental Scoping Document, *ecologia* Environment, Perth.

Appendix 13.24 e*cologia* Environment (2008a), Midwest Corporation Limited DSO project Environmental Management Plan, *ecologia* Environment, Perth.

Appendix 13.25 *ecologia* Environment (2008b), Midwest Corporation Limited DSO project Environmental Management System, *ecologia* Environment, Perth.

Appendix 13.26 *ecologia* Environment (2008c), Midwest Corporation Limited DSO project Closure Plan, *ecologia* Environment, Perth.

Appendix 13.27 *ecologia* Environment (2008d), Midwest Corporation Limited DSO project Karara Camp Environmental Management Plan, *ecologia* Environment, Perth.

Appendix 13.28 *ecologia* Environment (2007), Midwest Corporation Limited DSO project Threatend Species Management Plan, *ecologia* Environment, Perth.

Appendix 13.29 *Ecologia* Environment (2008f), Unpublished, *Koolanooka / Blue Hills DSO Mining Project Stygofauna Assessment Survey*, *ecologia* Environment, Perth

Appendix 13.30 *Ecologia* Environment (2008g), Unpublished, *Koolanooka / Blue Hills DSO Mining Project Troglofauna Biological Assessment*, *ecologia* Environment, Perth