



## **ENVIRONMENTAL MANAGEMENT PLAN (EMP) FOR THE ARGYLE UNDERGROUND PROJECT**

### **WEED MANAGEMENT PLAN**



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## 1. INTRODUCTION

### 1.1 PURPOSE

The primary aims of this Management Plan are aligned with the Argyle (2003a) Weed Management Plan, which are to:

- Prevent the introduction of new and additional weeds to the Argyle lease area;
- Control the early spread of weeds before they have significant detrimental effects;
- Prioritise and target established weed populations to prevent further spread;
- Ensure there is ongoing action to control weeds in the future through a maintenance program; and
- Establish ongoing monitoring and subsequent control of weeds found at the mine.

Management Actions, which will ensure that these objectives are met, are outlined in Table B7-1 Weed Management.

### 1.2 SCOPE

This Management Plan identifies actions to control weeds on the site after evaluating their potential impact on the environment and the effectiveness of control measures. Annual reviews of weeds on the site have been conducted in conjunction with the Department of Agriculture during open cut mining operations and will continue during the Project. Actions will apply throughout mining and closure operations and are allocated to responsible people are listed in Section .

### 1.3 AREA

Argyle mining lease and miscellaneous licences.

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## 2. DEFINITIONS

Plants are regarded as weeds even if they are native plants, if they out-compete other plants and/or alter the conditions in the ecosystem making it unsuitable for native plant or animal species.

'Declared' plants are those listed pursuant to Section 37 of the *Agriculture and Related Resources Protection Act 1976*. There is legislation in place that requires landholders to control or eradicate declared plants when it grows on their land.

### 3. DETAILS

Systematic management of weeds on the Argyle lease commenced after Dr Eleanor Bennett completed a whole of site weed survey in the dry season of 2001. Recommendations were made with regard to weed control methods and reviewed by the Department of Agriculture, Kununurra and the Australian Quarantine and Inspection Service. Department of Agriculture Priority 1 and 2 species were selectively targeted for management resulting in a Weed Control Action Programme for the 2002 wet season. This programme has been reviewed annually to formulate weed management actions to be carried out in the wet season.

Twenty-four introduced species of weeds are now known to occur on the Argyle lease (Bennett 2001a & b, Mattiske, 2004a). Some of these are now so widespread throughout the Kimberley region that active management is not considered beneficial (pers. com. Department of Agriculture, 2002). Control efforts (spraying/grubbing) are therefore generally directed at weed species for which there is an opportunity to eradicate or at least contain their distribution.

The majority of introduced species on the site flourish in a disturbed or modified environment. Activities associated with the development of the Project have the potential to further introduce or spread weeds in the area particularly via vehicle movements.

Table B7.1 contains the Weed Management actions that are aligned with and describe commitments to ensure that the Weed Control Action Programme, reviewed annually, is implemented successfully. The primary elements of the actions are to prevent, quantify, prioritise and control weed species to minimise their impact on the environment in the Argyle lease area.

#### 3.1 DECLARED PLANTS

Of the 24 introduced plant species recorded on the Argyle operational areas, none are considered Declared Plants within this region.

#### 3.2 AGGRESSIVE WEEDS

The following species are particularly aggressive and rapidly dominate rehabilitation areas however most are deemed to be 'beyond management throughout the region' (Argyle, 2003a) and no active management is undertaken except on an ad hoc basis:

##### ***Aerva javanica* (Kapok)**

This weed species could be controlled to some degree by removal or treatment of the plants prior to seeding each year. This species was used in the seed mix in the early rehabilitation trials.

##### ***Calotropis procera* (Calotropis)**

This species is a declared plant (P1) for all municipal districts in that portion of the State North of the 26<sup>th</sup> parallel of latitude (except for the municipal districts of Ashburton, Brome, Halls Creek, Derby-West Kimberley and Wyndham-East Kimberley).

##### ***Cenchrus biflorus*, *C. ciliaris*, *C. echinatus* and *C. setigerus* (Gallons Curse, Buffel Grass, Burr grass and Birdwood Grass)**

*Cenchrus biflorus* was ranked at Priority One to eradicate in the first Argyle Weed Management Plan (Argyle, 2003a). *Cenchrus setigerus* is more difficult to address as a result of the dominance of pastoral activities in the area near Argyle. Buffel Grass was used in the seed mix in early rehabilitation trials.

##### ***Stylosanthes hamata* (Verano Stylo)**

This species is a very aggressive coloniser and rapidly establishes in rehabilitation areas (often to the exclusion of other native species). Control of this species could be achieved in some areas by seeding

aggressive and dominating native species, as this weed species appears to prefer open and disturbed sites.

#### **Tridax procumbens (Tridax)**

This species is a very aggressive coloniser and rapidly establishes in rehabilitation areas (often to the exclusion of other native species). Control of this species could be achieved in some areas by seeding aggressive and dominating native species, as this weed species also appears to prefer open and disturbed sites.

### **3.3 WEED SPECIES CONTROLLED ON SITE**

The following weed species are subject to control measures such as patch and spot spraying at Argyle:

**Alternanthera pungens** (Khaki weed) is a native of South America. The flowers emit a pungent odour and the fruits are extremely spiny. There are four native species of *Alternanthera* (joyweeds) in the east Kimberley with which it can be confused.

**Barleria prionitis** (Porcupine Bush) is a native of tropical east Africa and Asia. It is an erect prickly shrub; usually single stemmed growing to about 1.5 m tall. The stems and branches are stiff and smooth, with leaves up to 100 mm long and 40mm wide, with three to five sharp, pale coloured spines at the base of the leaves. It is one of 28 officially recognised non-native species which, although only barely established in Australia, has the potential to become a significant threat if left uncontrolled ([www.weeds.crc.org.au](http://www.weeds.crc.org.au) 2003).

**Gomphrena celosioides** (Gomphrena) is a native of South America and is a prostrate or sprawling annual or perennial herb with white flowers.

**Jatropha gossypifolia** (Bellyache Bush) is a native to tropical South America and is a shrub to 1.5m tall, densely glandular and hairy with terminal flowers. There are distinct male and female flowers and large rounded, three angled fruits.

**Passiflora foetida** (Stinking Passion Flower) is a native of South America and the West Indies. It is a softly hairy woody twiner with an unpleasant smell. The passionfruit flowers are white and the fruit becomes yellow when ripened. Control of this species could be achieved in some areas by seeding with aggressive and dominating native species, as this species appears to prefer open and disturbed sites.

**Ruellia tuberosa** (Ruellia, Popping seed) is a native of South America and is an upright or prostrate herb with blue flowers.

**Tribulus terrestris** (Caltrop) is a native of South Africa. It is a prostrate plant with stems up to 2m long, leaves are opposite, each consisting of 4-8 pairs of spear shaped leaflets. There are long hairs on the leaf margins and lower surface and the stems are round and hairy with yellow flowers.

**Wedelia lobata** (Singapore Daisy): Native from Mexico to Argentina; mat-forming perennial herb to 70 cm high, with stems to 2 m or more long; leaves 3–11 cm long, 2.5–8 cm wide, dark green above, paler below, with simple white hairs, margins toothed.

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## 4. RESPONSIBLE PEOPLE

The following people are responsible for actions to manage weeds:

### 4.1 SUPERINTENDENT ENVIRONMENT

The Superintendent Environment is responsible for ensuring that weed surveys are completed and that liaison with the Department of Agriculture, Kununurra continues, to enable prioritisation of weed species to allocate resources for control. Weed control measures and results are then reported routinely to management and annually to regulators via the AER.

### 4.2 ENVIRONMENTAL OFFICER

The nominated Environment Officer(s) will conduct annual weed surveys of the site recording population sizes and new occurrences and will search for weeds in the Hydrocarbon Contaminated Soil Bioremediation Area (HCSBA) as part of the Site Monthly Environment Inspections.

### 4.3 SUPERINTENDENT CONTRACTS AND INFRASTRUCTURE

The Superintendent Contracts and Infrastructure will ensure that all external contracts specify that vehicles, machinery and equipment brought to the site will be clean to prevent the spread of weeds.

### 4.4 SUPERINTENDENT CAMS

The Superintendent, CAMS is responsible for organizing the spraying of weed species and populations selected in the latest review of the Weed Control Action Programme prepared each year.

## 5. RELATED DOCUMENTS

### 5.1 MANAGEMENT AND OPERATIONAL PLANS

- Argyle (2003a) Weed Management Plan December 2003.
- Bennett Environmental Consultancy Pty Ltd (2001a,b) Weed Survey – Argyle and Surrounding Areas. Unpublished report to Argyle September 2001.

### 5.2 PROCEDURES/WORK INSTRUCTIONS

- Argyle (2003n) Work Instruction for Spraying Roundup. August 2003
- Argyle (2004h) Site Environmental Inspection & Licence Condition Compliance Report.

Weed research references and other background documents are listed in Part C References of the Environmental Protection Statement (EPS).

## 6. RECORDS MANAGEMENT

As subsequent revisions of this document are carried out, previous versions are retained within DM5 for records management purposes in accordance with the **Management of Controlled Documents Procedure #AD-226750**.

## 7. APPENDICES

**7.1 TABLE B 7-1: WEED MANAGEMENT**

Action	Key Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.7.1	Status of weeds on the Argyle lease.	Quantify population sizes and distributions of weed species on the mining lease and miscellaneous licence areas.	Survey known weed populations and estimate sizes. Search for new populations.	Annually	Environmental Advisor, Environment	Produce an updated weed list.	Site Environmental Inspection & Licence Condition Compliance Report (Argyle, 2004h)
B.7.2	Identification of significant weeds that require control measures.	Prioritise high-risk weed species and populations for control to prevent further spread.	Liaise with Department of Agriculture & AQUIS to identify weed species/populations requiring control measures. Write Weed Control Action Plan.	Annually - Q4 prior to wet season	Superintendent Environment	Department of Agriculture, Kununurra's written approval of the Weed Control Action Plan	Nil
B.7.3	Spread of weeds on the Argyle lease.	Reduce distribution and population size of weed species on the Argyle leases and miscellaneous licenses.	Implement the control actions in the Weed Control Action Plan.	Annual	Superintendent Environment Superintendent CAMS	Completion of spraying program in wet season. Number of locations and/or weed population sizes decreasing.	Work Instruction for Spraying Roundup (Argyle, 2003m)n
B.7.4	Spread of weeds on the Argyle lease.	Site personnel become familiar with target weed species and will report weed species sightings.	Produce & roll out posters and pamphlets about high-risk weed species.	Annually after review of WCAP	Superintendent Environment	Posters are in each work area, pamphlets available from the environment section. Weeds covered in Site Induction.	Nil

APPENDICIES

Action	Key Issue	Objective	Management Action	Timing	Responsibility	Target	Work Instruction - Procedure
B.7.5	Transport of weed seeds and pathogens, on and off the mining lease on vehicles and heavy equipment.	Ensure all contractors and employees are aware of the requirement to bring vehicles and machinery to site in a clean condition to prevent the introduction of weeds and pathogens.	Include text "Vehicles and machinery will enter and leave the Argyle site clean to prevent the spread of weeds" in: Site Induction All external contracts	Ongoing Annual	Superintendent, Contracts & Infrastructure Superintendent Environment	Include text in: Site induction presentation All new external contracts	(Contracts) eg: Roche HSE Condition 31.2
B.7.6		To quantify the risks of new and additional weeds and pathogens being introduced to and from the Argyle lease area.	Evaluate the risks of transporting weeds and pathogens on heavy machinery entering and leaving site. If high then assess appropriate control measures.	2005	Manager Mine Planning and Technical Services	Low risk of transporting weeds and pathogens.	Nil
B.7.7	Transport of weed seeds in contaminated soil from the vehicle wash down bays to the HCSBA.	Early detection of weed species in the HCSBA.	Inspect (HCSBA) and control any weed species that emerge.	Monthly	Environmental Officer, Environment	Weed surveys are completed as part of the monthly inspection of the HCSBA. Emergent weeds are controlled.	Site Environmental Inspection & Licence Condition Compliance Report (Argyle, 2004h)
B.7.8	Introduction of non-endemic plant species with potential to become weeds.	Select plant species for accommodation camps and office grounds that are unlikely to become weeds. (Preferentially select local provenance species).	Develop a list of plant species suitable for ornamental plantings in accommodation camps and office grounds in liaison with Agriculture, Kununurra and local plant nurseries.	2005	Environmental Advisor Superintendent CAMS	Completed reference list of plant species suitable for use as ornamentals in camp and office grounds.	Nil
B.7.9	Proliferation of introduced plants that have potential to become weeds.	Maximise removal of introduced plants on the Argyle mining lease and miscellaneous licences.	Remove, burn and bury plant species that are not endemic to Argyle lease and miscellaneous licences areas.	During decommissioning	Environmental Superintendent	All introduced plants removed during decommissioning	Introduced Plant Identification and Removal Plan (TBA)

