

ORD RIVER IRRIGATION SCHEME STAGE 2 BIODIVERSITY ASSESSMENT

BIODIVERSITY ASSESSMENT REPORT AND RECOMMENDATIONS

BY THE

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ABBREVIATIONS AND GLOSSARY

NT	Northern Territory
WA	Western Australia
NT DLPE (DLPE)	Northern Territory Department of Lands Planning and Environment
WA DEP	Western Australian Department of Environmental Protection
WA EPA	Western Australian Environmental Protection Authority
NT ORD (ORD)	Northern Territory Office of Resource Development
WA DRD (DRD)	Western Australian Department of Resources Development
EA	Environment Australia
SMEC	Snowy Mountains Engineering Corporation
EIS	Environmental Impact Statement
ERMP	Environmental Review and Management Plan
WA WRC	Western Australian Water and Rivers Commission
CALM	Western Australian Department of Conservation and Land Management

Executive Summary

This report assesses the environmental impact of a proposed irrigation project on the Biodiversity of the Weaber, Keep River and Knox River Plains. The assessment is the first part of a two-part assessment process. This first assessment report will address the fundamental issue of whether or not the proposal can sustain the biodiversity of the region. A second assessment report will then be undertaken to determine whether or not the project can be managed in a manner that is not deleterious to the environment.

Major Issues

The major environmental issues identified with the impact of the proposed Ord River Irrigation Area Stage 2 development on the Biodiversity of the area are:

- Impact on Flora and Fauna through the clearing of approximately 35,000 ha of vegetation.
- Adequacy of surveys undertaken.
- Conservation of Black Soil plains in both the Northern Territory and Western Australia.
- Conservation of lagoons/wetlands/watercourses, particularly Milligan Lagoon and the Keep River.
- Hydrology.

Conclusion

It is considered that the environmental issues associated with the impact on biodiversity from the proposed Ord River Irrigation Area Stage 2 have been adequately identified. Some of the issues have been resolved through the assessment process, while others have been identified as recommendations within this report. Further issues relating to the environmental management of the project will be subject to a second assessment to be completed later this year.

Development of the M2 area will lead to a substantial loss of vegetation and will change the natural hydrological regime in the area. It is unlikely that any species of flora or fauna will become extinct as a result of this development, however some fauna will be affected by the loss of a large area of habitat.

Some vegetation associations / communities comprise small areas and this brings into question the vegetation community/ association's viability and sustainability in the long term. The Keep River and other watercourses in the Project Area will also change as a result of the development, however there is the possibility that additional habitat may be created in the Keep River.

The assessment of biodiversity has focussed on the relationships between vegetation, fauna and water in the short and long-term. To ensure that vegetation remains, the Northern Territory Department of Lands Planning and Environment and the Western Australian Environmental Protection Authority have applied a target that at least 30% of each vegetation association/ community and group is protected and subject to management for protection. In addition, riparian zones around watercourses and wetlands have been excluded from the development and should be protected from changes in hydrology. Areas being protected from development within the Project Area will in many cases be a component of a much larger conservation system as a consequence of the Western Australian and Northern Territory Governments' conservation reserve initiatives.

Where additional information on biota is required, this will be obtained and incorporated into the final project design prior to construction.

The outcome of this assessment is that the environmental issues in relation to the conservation of biodiversity have been satisfactorily addressed, and that the proposal may proceed to the second stage of environmental assessment provided the undertakings and commitments detailed in the draft Environmental Impact Statement/Environmental Review and Management Plan, as modified by recommendations in this report, are implemented.

Summary of Recommendations

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with;

- **the environmental commitments and safeguards identified in the Ord River Irrigation Area Stage 2 draft Environmental Impact Statement (EIS) as modified in the Supplement to the draft EIS, and**
- **as recommended in this report and consolidated in Appendix B.**

Recommendation 2

To ensure conservation of flora, fauna and black soil meets the biodiversity initiatives of both governments, it is recommended that:

- **the proponents determine whether ET4 is located within the proposed reserves when seeking verification of the occurrence of G1, G4 and Em9 outside of the project area;**
- **the proponents investigate and verify the presence of Em8 and Gt2 in areas adjacent to the project area within proposed secure reserves; and**
- **the WA and NT Governments consider the opportunities available to incorporate black soil areas into existing and proposed conservation reserves.**

Recommendation 3

It is recommended that additional surveys for aquatic and terrestrial fauna within and adjacent to the project area (eg frogs, reptiles, bats, subterranean fauna) be implemented by the proponents following approval and prior to final project design, to ensure that the project design takes account of relevant additional information on rare or threatened species.

Recommendation 4

The conservation initiatives, as proposed by the NT Office of Resource Development and the WA Department of Resources Development, should be implemented by the NT and WA Governments as a priority. In addition, both the NT and WA Governments should consider opportunities to incorporate additional black soil areas into existing and proposed conservation reserves.

1 Introduction and Background

This report assesses the environmental impact of a proposed irrigation project on the Biodiversity of the Weaber, Keep River and Knox River Plains. The assessment is the first part of a two-part assessment process. This first assessment report will address the fundamental issue of whether or not the proposal can sustain the biodiversity of the region. A second assessment report will then be undertaken to determine whether or not the project can be managed in a manner that is not deleterious to the environment.

This assessment process has been conducted in accordance with the requirements of the Administrative Procedures of the Northern Territory *Environmental Assessment Act* 1982 and the Western Australian *Environmental Protection Act* 1986, and an agreement made between the Northern Territory and Western Australia in 1993. The proponents for the project are Wesfarmers Sugar Company Pty Ltd, Marubeni Corporation and the Water Corporation of Western Australia. The project is being managed by the proponents on behalf of the other stakeholders.

This report reviews the draft Environmental Impact Statement (draft EIS); comments on the draft EIS by members of the public, community groups and government bodies; and the proponents' response to these comments in the Supplement to the draft EIS. This report also relies on information, comments and advice provided by Northern Territory Government agencies, the Western Australian Department of Environmental Protection (WA DEP) and the Western Australian Environmental Protection Authority (WA EPA)

The Ord Irrigation Area commenced agricultural land development in the 1960's and this proposal represents the second stage of irrigated land development, with water supplied from the existing Ord River dams.

There has been substantial change in the context within which Stage 1 and Stage 2 are being considered.

The Stage 1 development preceded Self-Government in the Northern Territory and the Western Australian *Environmental Protection Act* 1986, and the related growth in community environmental awareness and statutory assessment. In addition, heritage legislation, water legislation reform, national and international biological diversity agreements, greenhouse gas protocols, and the national agreement on ecologically sustainable development have all been major additions to the broad context within which this Stage 2 proposal is being examined.

The Ord River Irrigation Area Stage 2 (M2 Supply Channel) development (hereafter referred to as the M2 project) involves the development of irrigated farmland predominantly for growing sugar cane, the development of a sugar mill and the development of storage facilities at the port of Wyndham.

1.1 Environmental Impact Assessment Process

Environmental impact assessment is the process of defining those elements of the environment which may be affected by a proposed development and determining the significance, risks and consequences of the potential impacts of the proposal at a local and regional level.

This proposal is being assessed jointly by the Northern Territory Department of Lands, Planning and Environment (DLPE) and the WA EPA as an Environment Impact Statement (EIS)/Environmental

Review and Management Programme (ERMP). The draft EIS/ ERMP (Kinhill Pty Ltd, 2000) was released for a ten week public review period between 24 January and 31 March 2000.

Given the complexity of the project the DLPE and the WA EPA decided to assess the proposal in two parts. The first part relates to clearing approximately 35,000 ha of land in terms of the potential loss of biodiversity, and the second part, to be reported on later this year, will focus on detailed management of the development in the short and long term. As a consequence of this approach, the DLPE and the WA EPA will be reporting twice.

In addition, the assessment reports will address the whole project area and not be limited to that portion of the project area within respective State/Territory borders. The Commonwealth, through Environment Australia (EA), has been involved in the assessment under cooperative arrangements with the NT and WA.

It is the intention of the NT and WA Governments that environmental conditions issued under the *WA Environmental Protection Act 1986* should apply to the whole of the Project Area. However, the environmental conditions cannot be set for the whole of the Project Area until the NT Parliament passes enabling legislation. In the meantime, any Statement of Approval issued under the *WA Environmental Protection Act 1986* can only apply to that portion of the Project Area located within WA.

The contents of this report form the basis of advice to the Northern Territory Minister for Lands, Planning and the Environment on the biodiversity issues associated with the proposal.

1.2 Environmental Impact Assessment History

In March 1996, the NT Minister for Lands, Planning and Environment and the WA Minister for Environment agreed that the development of the second stage of the Ord River Scheme should be jointly assessed at the level of Public Environment Report (PER). The WA process was determined to be the lead process, with provision being made for incorporating NT requirements. PER guidelines were developed incorporating comments from government agencies and the public.

The WA Department of Resource Development and consultants SMEC and the Queensland Department of Natural Resources then prepared a Preliminary Design Study on behalf of both governments.

In April 1998, the NT and WA governments selected Wesfarmers Ltd and Marubeni Corporation as the preferred proponents for the development, based on the Preliminary Design Study documentation. The proponents then notified the WA DEP of additions to the development. The main additions were a proposed 400,000 tonne per annum raw sugar mill and an upgrade of the port of Wyndham. Four sites for the mill were under consideration, two in WA, one on the border and one in the NT. On the basis of advice from the proponent and the WA DEP, the WA EPA determined the proposal should be assessed at the higher level of an ERMP, equivalent to an EIS under the NT *Environmental Assessment Act*.

Guidelines for the EIS/ ERMP (based on the original PER guidelines) were finalised by both the DLPE and the WA DEP and jointly issued to the proponents in August 1999.

The draft EIS/ ERMP and technical appendices were submitted by the proponents on the 20 January 2000 and placed on public review for a 10 week period from 24 January 2000 until 31 March 2000. The documentation was also distributed widely to relevant NT and WA Government departments and agencies.

Given the complexity of the project, the DLPE and the WA DEP decided to assess the proposal in two parts. The first part relates to clearing approximately 35,000 ha of land in terms of the potential loss of biodiversity, and the second part, to be reported on later this year, will focus on detailed management of the development in the short and long term.

With WA taking the lead role, all public submissions were forwarded to the WA DEP. The NT Government provided a consolidated submission to the WA DEP and the proponents, incorporating the comments received from other NT departments and agencies. The WA DEP forwarded a summary of all submissions to the proponents for a response. The proponents provided a response to submissions on 1 June 2000. The response was then distributed to various agencies for further comment.

To aid the WA EPA further in providing its advice on biodiversity to the WA Minister for Environment, the WA EPA convened a one-day workshop comprising technical experts, government agencies and proponents' representatives.

The workshop was held on 29 July 2000 and the WA EPA generated an outcome statement arising from the workshop. A summary by the WA EPA of the outcomes from the workshop is attached in Appendix A.

Based on advice given to both governments on the response to the submissions and outcomes from the WA EPA workshop, the proponents were asked to clarify some issues relating to biodiversity. Further submissions were made to the WA EPA and documentation copied to the DLPE.

All documentation provided by the proponents, submissions made by both government agencies and the public, and issues raised in the WA EPA workshop are the basis for this assessment report on biodiversity.

1.3 Major Issues

The major environmental issues identified with the impact of the proposed Ord River Irrigation Area Stage 2 development on biodiversity are:

- Impact on Flora and Fauna through the clearing of approximately 35,000 ha of vegetation.
- Adequacy of surveys undertaken.
- Conservation of Black Soil plains in both the NT and WA.
- Conservation of lagoons/wetlands/watercourses, particularly Milligan Lagoon and the Keep River.
- Hydrology.

Further issues relating to the environmental management of the proposal will be identified and addressed in the second part of the assessment to be reported on later this year.

2 The Proposal

The M2 Project is located near Kununurra (see Figure 1), within the Victoria-Bonaparte Biogeographic Region. The Project Area extends over approximately 76,000 ha of land comprising the Weaber, Keep River and Knox Creek Plains, and involves approximately equal areas within WA and the NT.

The M2 project as outlined in the ERMP / draft EIS (Kinhill Pty Ltd 2000a) (see Figure 2) involved the following components:

- irrigated sugarcane plantation development by Wesfarmers-Marubeni of approximately 29,000ha with potential for future 'sell down' to independent farmers;
- the sale of 3,000ha of land by Wesfarmers-Marubeni to independent farmers on an unconditional basis with respect to the types of crops that may be grown;
- the development of 3,000 ha for irrigation, drainage and flood protection infrastructure by the Water Corporation;
- the construction and development of a raw sugar mill by Wesfarmers-Marubeni with a capacity of approximately 400,000 tonnes per annum (tpa) of raw sugar and 160, 000 tpa of molasses;
- the management of 41,000 ha of land surrounding the farm land; and
- raw sugar and molasses storage and handling facilities at Wyndham.

Since the release of the ERMP/ draft EIS, the proponents (see Figures 3,4 & 5) have made a number of modifications to the proposal. These include:

- a reduction of total farm development to approximately 30,500ha;
- a reduction to 1,500ha of land for independent farmers;
- an increase to 42,500 ha of land to be managed as a buffer area;
- the protection and preservation of all riparian vegetation within the Project Area. This is to be achieved by wider buffer zones on portions of Border Creek and the Keep River;
- the re-design of levee configurations in relation to conservation areas north of farm unit X41, to the east of E410, east of E46 and east of farm unit W64 to enable natural flooding to occur;
- a reduction of the farm area to the south of Milligan Lagoon and a wider flood channel between Milligan Lagoon and the Keep River to the north;
- the re-design of levee HDX1 to permit surface water flow to Milligan Lagoon from the south west;
- development of a drainage corridor through farm unit X432 to enable surface water flow between Milligan Lagoon and the Keep River;
- the development of a siphon underneath the drainage corridor to permit irrigation of farm units X431, X432 and the remainder of farm units X441 and X442; and
- the re-design of farm units W36 and W65 to reduce the flow velocities and potential erosion effects.

In addition to the above, the following commitments have also been made;

- the locations of all flood protection levees along Border Creek are to be reviewed in consultation with the Western Australian Waters and Rivers Commission (WA WRC) prior to project implementation;
- The proponents will investigate and verify the occurrence of vegetation associations/ communities G1, G4, and Em9 adjacent to the project area to ensure 30% of the association/ community is protected.

The main characteristics of the proposal are summarised in Table 1 below. A detailed description of the proposal is provided in Section 3 of the ERMP / draft EIS (Kinhill Pty Ltd, 2000b).

Lot numbers throughout the document refer to the plain on which they are located. W for Weaber, K for Keep and X for KnoX.

Table 1 - Summary of key proposal characteristics (Kinhill Pty Ltd, 2000b)

Element	Description	Amount
Land within the Project Area	<ul style="list-style-type: none"> • Project area • Land managed as a buffer • Wesfarmers-Marubeni sugarcane estate • Infrastructure • Land for independent farms 	<ul style="list-style-type: none"> • 76,000 ha* • 42,500 ha* • 29,000 ha* • 3,000ha* • 1,500ha*
Land outside the Project Area	<ul style="list-style-type: none"> • M2 Channel (Lake Kununurra to Project Area) • Wyndham Port Facilities 	<ul style="list-style-type: none"> • 690 • 1
Production	<ul style="list-style-type: none"> • Raw sugar • Molasses 	<ul style="list-style-type: none"> • 400,000 tpa • 160,000 tpa
Infrastructure (total area approx. 3000ha)	<ul style="list-style-type: none"> • Irrigation channels • Annual water requirement • Drains • Flood protection levees • Balancing storage dams (operating volume) • Roads • Power lines 	<ul style="list-style-type: none"> • 160 km* • 740 GL* • 153 km* • 142 km* • 5.6 GL • 161 km • 165 km
Wyndham Port	<ul style="list-style-type: none"> • Raw sugar store • Molasses store 	<ul style="list-style-type: none"> • 180,000t • 75,000t

Key:

* = approximate
 GL = Gigalitres
 km = kilometres
 ha = hectares
 tpa = tonnes per annum
 t = tonnes

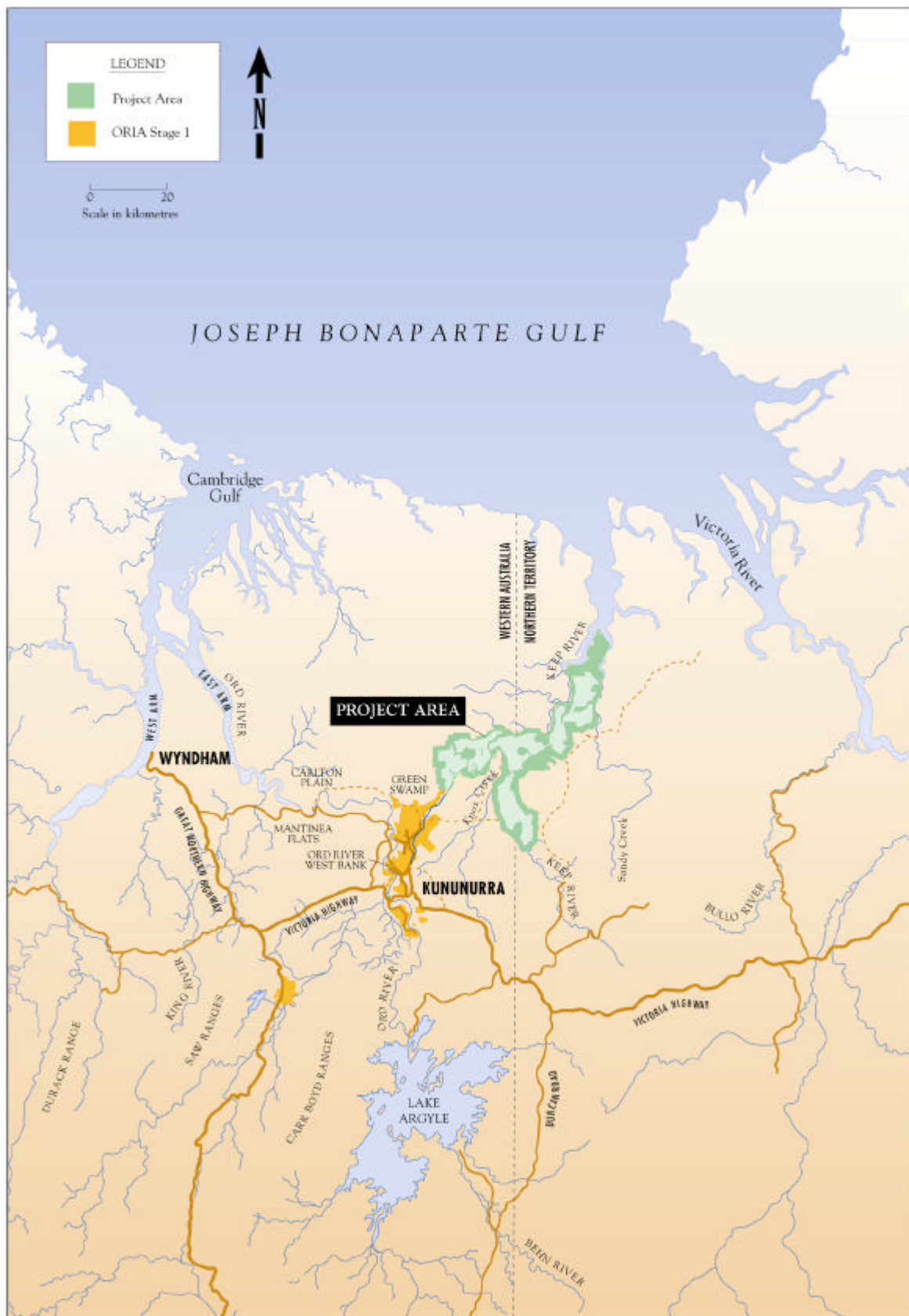
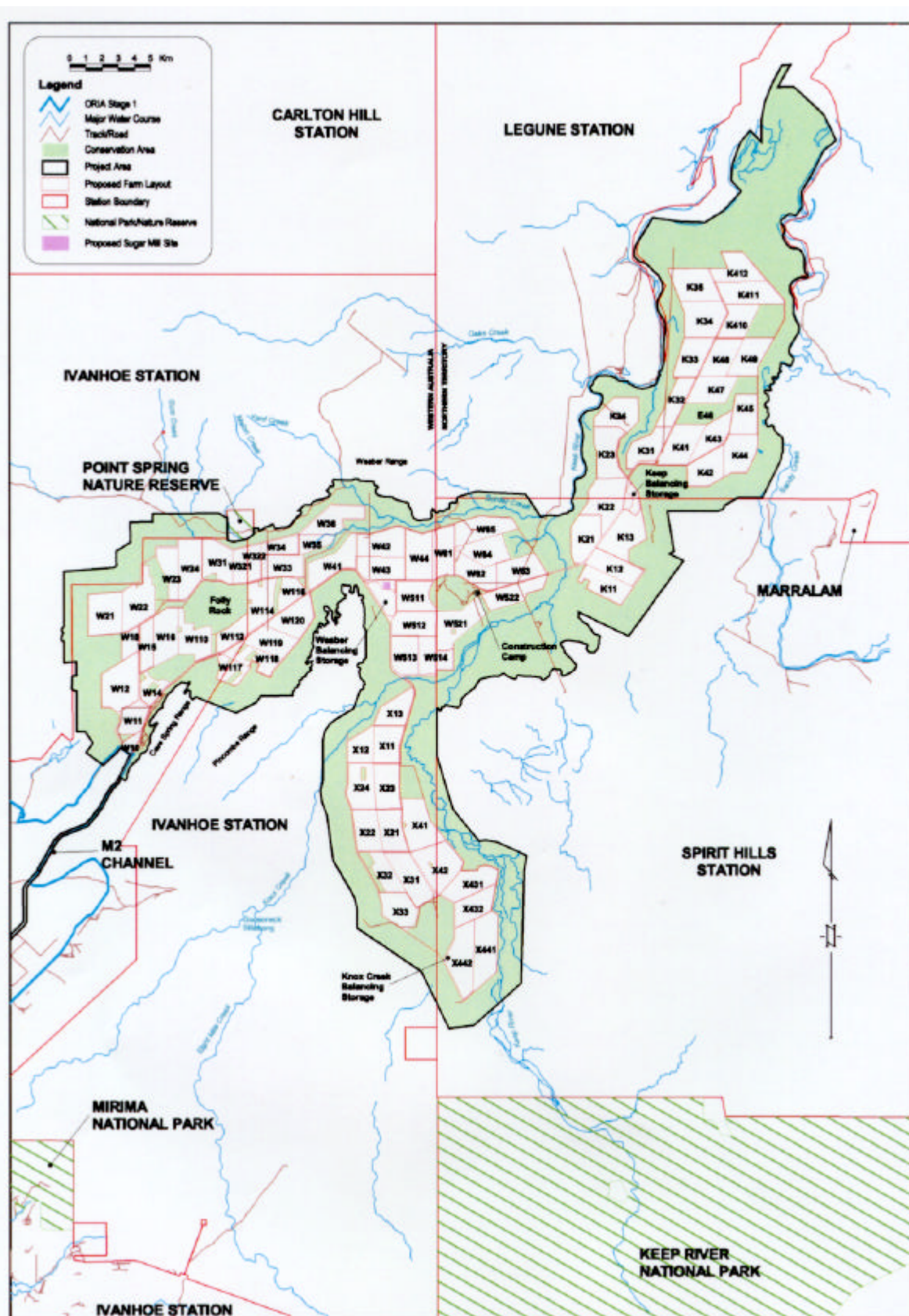
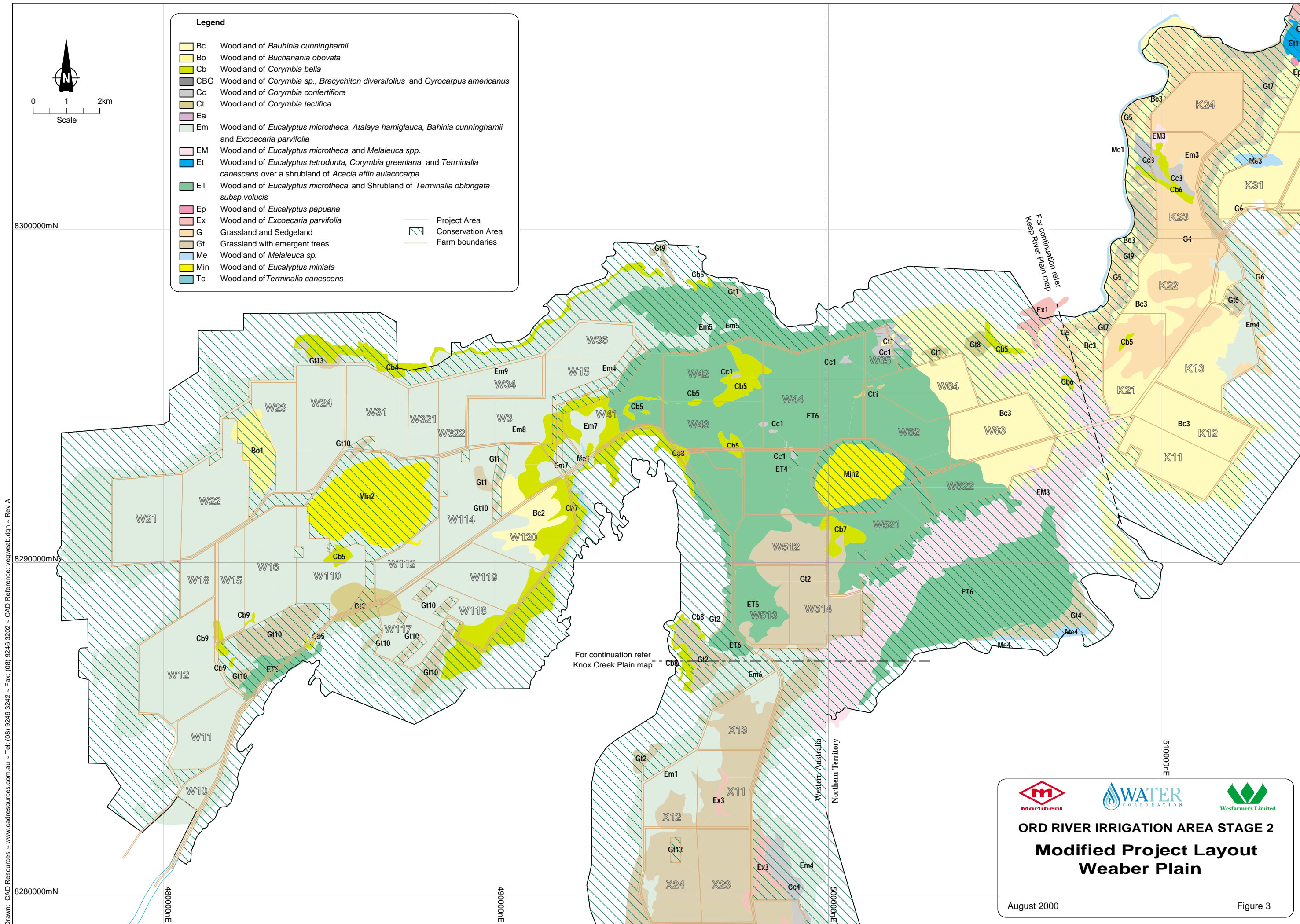


Figure 1: Overview of the Ord Region and Project Area (Kinhill Pty Ltd, 2000a)





Drawn: CAD Resources - www.cadresources.com.au - Tel: (08) 9246 3242 - Fax: (08) 9246 3202 - CAD Reference: vegweb.dgn - Rev A

ORD RIVER IRRIGATION AREA STAGE 2

Modified Project Layout

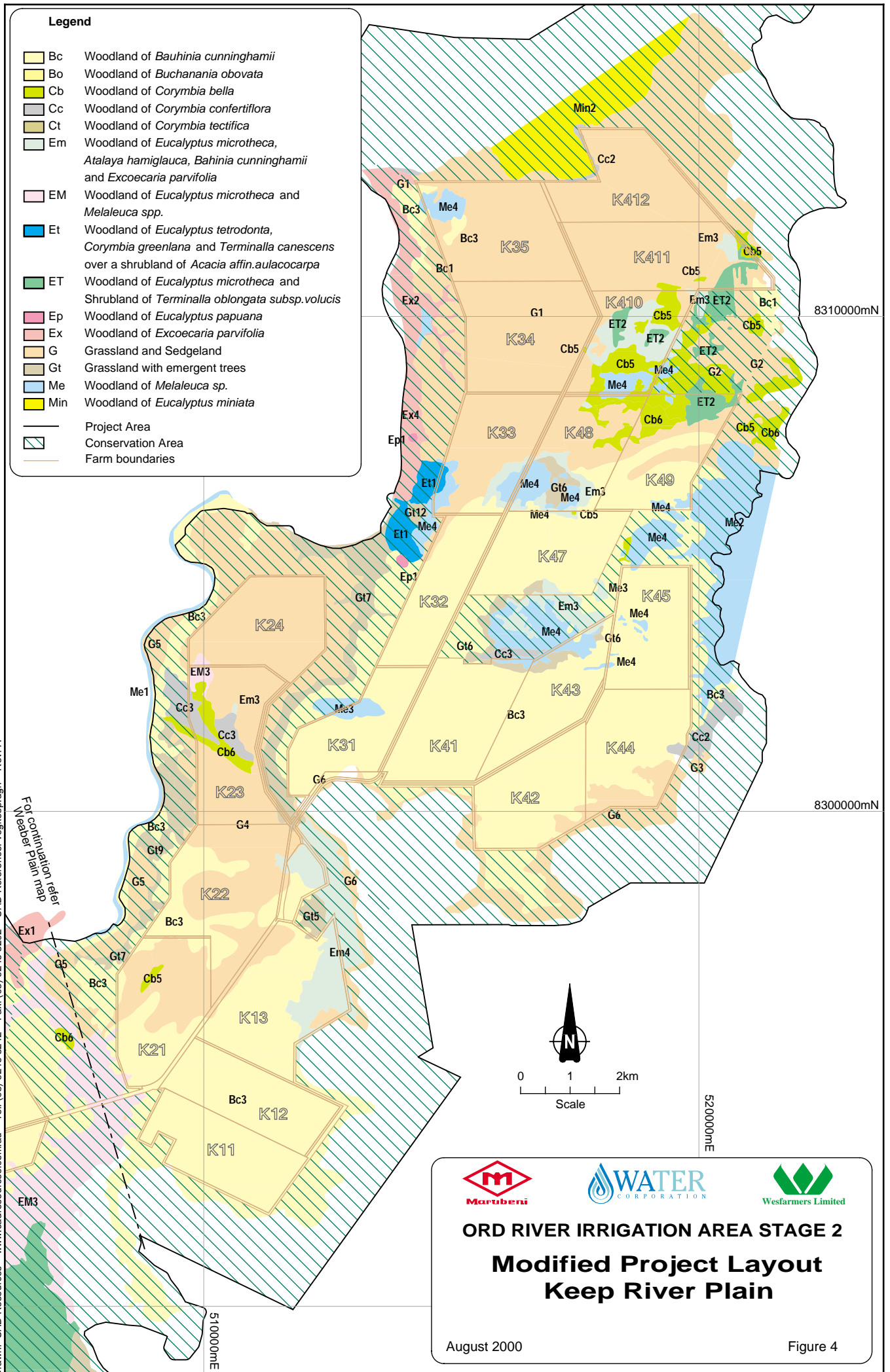
Weaber Plain

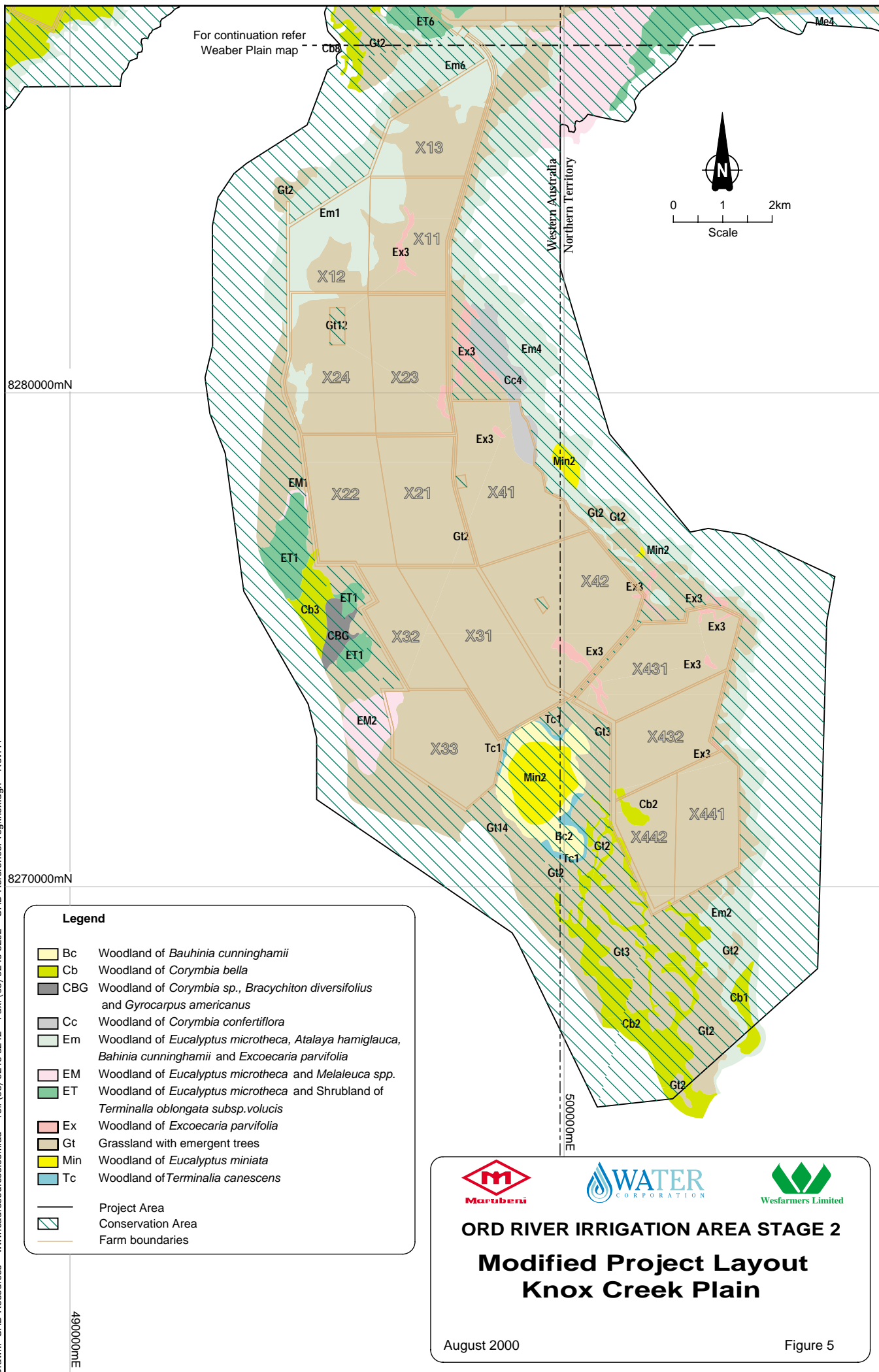
August 2000

Figure 3

Legend

- Bc Woodland of *Bauhinia cunninghamii*
- Bo Woodland of *Buchanania obovata*
- Cb Woodland of *Corymbia bella*
- Cc Woodland of *Corymbia confertiflora*
- Ct Woodland of *Corymbia tectifica*
- Em Woodland of *Eucalyptus microtheca*, *Atalaya hamiglauc*, *Bahinia cunninghamii* and *Excoecaria parvifolia*
- EM Woodland of *Eucalyptus microtheca* and *Melaleuca spp.*
- Et Woodland of *Eucalyptus tetrodonta*, *Corymbia greenlana* and *Terminalia canescens* over a shrubland of *Acacia affin.aulacocarpa*
- ET Woodland of *Eucalyptus microtheca* and Shrubland of *Terminalia oblongata subsp.volucis*
- Ep Woodland of *Eucalyptus papuana*
- Ex Woodland of *Excoecaria parvifolia*
- G Grassland and Sedgeland
- Gt Grassland with emergent trees
- Me Woodland of *Melaleuca sp.*
- Min Woodland of *Eucalyptus miniata*
- Project Area
- Conservation Area
- Farm boundaries





3 Environmental Impact Assessment

3.1 Introduction

The information provided in the draft EIS/ERMP has been assessed along with submissions from advisory bodies and the public, the response document to these submissions by the proponents, and further submissions made by the proponents to the WA EPA. This assessment determines the adequacy of the proposed design in relation to the conservation of biodiversity within the Victoria-Boneparte bioregion (see Figure 6). Outcomes from the WA EPA workshop on biodiversity have also been included in this making this assessment.

Assessment has been undertaken jointly between the DLPE and WA DEP. Recommendations made in this report generally reflect the recommendations and conditions provided in the WA assessment report to the WA Minister for Environment.

It is important for interpretation purposes that the recommendations (in **bold**) are not considered in isolation, as the text identifies concerns, suggestions and undertakings associated with the project.

Subject to the next assessment and further decisions that permit the project to proceed, the primary recommendation of this assessment is:

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with;

- **the environmental commitments and safeguards identified in the Ord River Irrigation Area Stage 2 draft Environmental Impact Statement as modified in the Supplement to the draft EIS, and**
- **as recommended in this report and consolidated in Appendix B.**

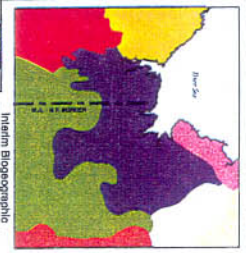
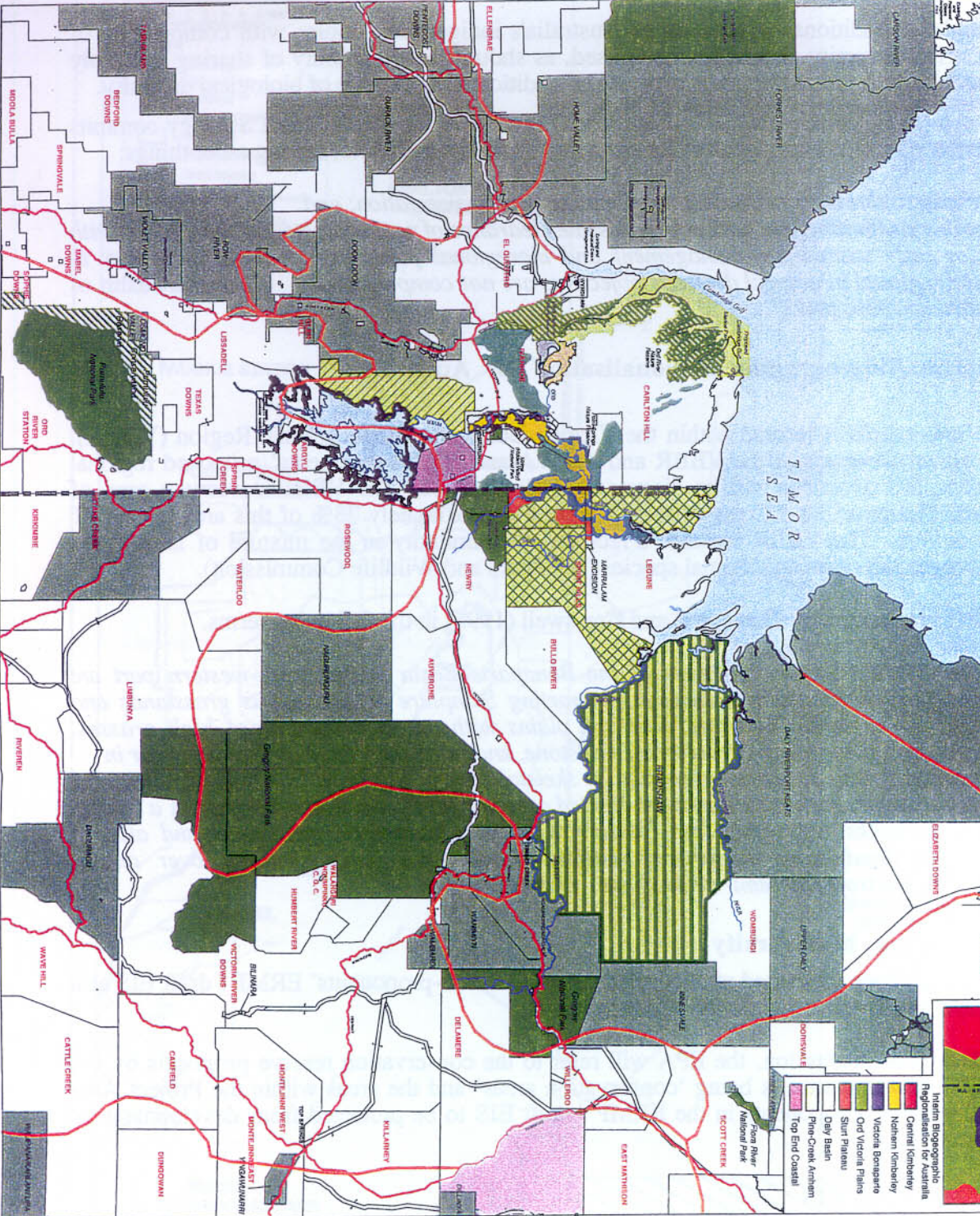
3.2 Biodiversity

3.2.1 Context

Biodiversity comprises a very complex set of components and relationships. The DLPE and the WA EPA have considered the biodiversity implications of the development proposal in a number of ways. It is recognised that biodiversity has two key aspects; its intrinsic value at the individual species, species assemblages and genetic levels, and its functional value at the ecosystem level.

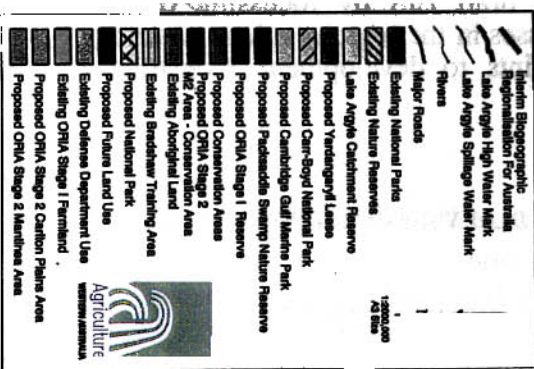
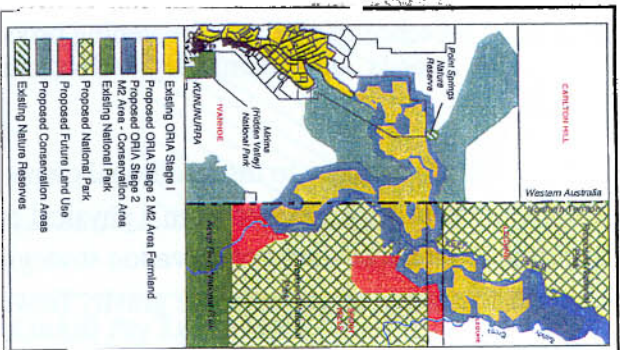
There are a number of contexts within which this consideration is relevant. They are at the national, regional and local levels. Information on aspects of biodiversity and the biogeographic region in which the proposal is sited is given below.

Victoria Bonaparte Region Existing and Proposed Land Uses



ORD RIVER IRRIGATION AREA STAGE 2 PROPOSED DEVELOPMENT

Map Title: Ordmap 57a
Date First Issued: 20 Jan. 2000
Revision No.:
Our Ref: Xsordmap57a/ordmap57a.dgn
AMG Zone 52 projection
Produced by
Spatial Resource Information Group
Agriculture, WESTERN AUSTRALIA



3.2.1.1 Biological diversity

Biological diversity is defined in the National Strategy for the Conservation of Australia's Biological Diversity as the variety of all life forms; the different plants, animals and micro-organisms, the genes they contain, and the ecosystems they form (Commonwealth of Australia, 1996).

The Commonwealth Government, with all State and Territory Governments, signed the National Strategy for the Conservation of Australia's Biological Diversity in 1996. The National Strategy defines 3 levels of biodiversity:

- genetic diversity – variation of genes/ genetic information contained in all individual plants, animals and micro-organisms both within and between populations that comprise individual species as well as between species;
- species diversity – the variety of individual species within a region; and
- ecosystem diversity – the diversity of all living organisms and non living components within a given area and their relationships.

The National Strategy for the Conservation of Australia's Biological Diversity adopted the following principles as a basis for the Strategy's objectives and actions:

1. Biological diversity is best conserved in-situ.
2. Although all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical to the conservation of biological diversity.
3. It is vital to anticipate, prevent and attack at source the causes of significant reduction or loss of biological diversity.
4. Processes for and decisions about the allocation and use of Australia's resources should be efficient, equitable and transparent.
5. Lack of full knowledge should not be an excuse for postponing action to conserve biological diversity.
6. The conservation of Australia's biological diversity is affected by international activities and requires actions extending beyond Australia's national jurisdiction.
7. Australians operating beyond our national jurisdiction should respect the principles of conservation and ecologically sustainable use of biological diversity and act in accordance with any relevant national or international laws.
8. Central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems.
9. The close, traditional association of Australia's indigenous peoples with components of biological diversity should be recognised, as should the desirability of sharing equitably benefits arising from the innovative use of traditional knowledge of biological diversity.

In relation to land clearing, it is noted that Objective 7.1 of the National Strategy commits State, Territory and Commonwealth Governments by the year 2000 to, among other things:

“(1) arresting and reversing the decline of remnant native vegetation; and

- (m) *avoiding or limiting any further broad-scale clearance of native vegetation, consistent with ecologically sustainable management and bioregional planning, to those instances in which regional biological diversity objectives are not compromised.”*
(Commonwealth of Australia 1996, p.42).

3.2.1.2 Interim Biogeographic Regionalisation for Australia

The M2 Project Area is located within the Victoria-Bonaparte Biogeographic Region (VBBR) Figure 6 shows the extent of the VBBR and the NT and WA Governments’ proposed regional conservation initiatives that will be discussed in Section 3.3. The VBBR covers an area of 72,970km² (Thackwell and Cresswell, 1995), with approximately 73% of this area in the NT and 27% in WA. The VBBR contains a recognisable similarity in the mixture of landforms, geology, vegetation types and animal species (NT Parks and Wildlife Commission).

The VBBR is described by Thackwell and Cresswell (1995) in the following terms.

“Within the VBBR Phanerozoic strata of the Bonaparte Basin in the north-western part are mantled by Quaternary marine sediments supporting Samphire – Sporobolus grasslands and mangal, and by red earth plains and black soil plains with an open savanna of high grasses. Plateaux and abrupt ranges of Proterozoic sandstone, known as the Victoria Plateau, occur in the south and east, and are partially mantled by skeletal sandy soils with low tree savannas and hummock grasslands. In the south east are limited areas of gently undulating terrain on a variety of sedimentary rocks supporting low Snappy Gum over hummock grasslands and also of gently sloping floodplains supporting Melaleuca minutifolia low woodland over annual sorghums. Dry hot tropical, semi- arid summer rainfall”.

3.2.2 Measures to address biodiversity

Both the proponents and the NT and WA Governments have proposed measures to address the issue of conservation of biodiversity within the region. The proponents have proposed measures that are targeted at a project level in the draft EIS/ERMP. Both the NT and WA Governments have proposed measures to further address the issue of biodiversity at a regional level.

For the purposes of this assessment, the conservation proposals by the NT and WA Governments will be referred to as ‘conservation areas’. As there is a current point of debate on the conservation status of areas within the Project Area proposed by the proponents in the draft EIS/ ERMP to be protected from development, these will be referred to as ‘buffer areas’.

3.2.2.1 Draft EIS/ERMP

The proponents addressed biodiversity in the draft EIS/ERMP by focussing on the identification or likely presence of species, threatening processes in the region (ie land clearing, land degradation, fire, weeds and chemicals) and constraints to development. Constraints identified included:

- areas of particular significance to the traditional owners;
- the suitability of land for agriculture from a physical point of view of development;
- recommendations from previous conservation strategies, and

- infrastructure requirements, for example gravity flows in irrigation channels.

This assessment resulted in some initial areas within the Project Area being set aside. These included the southern Keep River Plain, Folly Rock, Spirit Hills homestead, the Keep River and its riparian areas, and Milligan Lagoon.

After reviewing the conservation of vegetation associations and soil types the proponents added further land to the buffer areas to improve the conservation of particular areas. This included:

- a reasonably large area of black soil on the southern Weaber Plain, which has been identified as having areas of wild rice stands;
- the Keep River Plain where there are some conservation areas to protect certain vegetation associations/ communities; and
- the west Knox Creek Plain.

In developing the project design, the proponents incorporated corridors linking the various buffer areas within the Project Area, and considered whether the land being set aside as buffer areas would be viable in the long term. The project was also designed so that the buffer areas were on the perimeter of the project, backing onto undeveloped land, to minimise edge effects. Section 10.3 of the draft EIS/ERMP (Kinhill Pty Ltd, 2000a) details the attributes of the various buffer areas.

In relation to buffer boundaries, the extent of the conservation area was also given consideration and in many cases natural boundaries were used. In other areas a 1500m buffer area was adopted, as this provided a reasonable width and tract of land for management of conservation.

In addition, the proponents provided an understanding of the biological environment of the Project Area through a range of biological surveys. The results are documented in the ERMP / draft EIS. Where species were expected to be present but were not in surveys, provision for their likely presence was made.

3.2.2.2 Conservation initiatives

In relation to securing a comprehensive, adequate and representative reserve system the NT and WA Governments have proposed a number of conservation initiatives, (see Table 2), to complement future Ord Stage 2 developments in relation to the conservation of biodiversity in the region (see Figure 6).

Within the VBBR, more than half of the land is considered to have either medium or high status for management of biodiversity. Approximately 11% of the biogeographic region is currently gazetted as National Park or Conservation Reserve and is actively managed for biodiversity purposes by relevant government agencies and a further 15% of the VBBR is the subject of an approved Environmental Management Plan (Department of Resources Development (DRD) and Northern Territory Office of Resource Development (NT ORD), 2000).

The proposed additions to the conservation estate (contingent on further development of Ord Stage 2) are shown in Table 2.

Table 2: Proposed Regional Biodiversity Conservation Initiatives (DRD and NT ORD, 2000)

Area	Location
Northern Territory	
Spirit Hills portion of a new National Park (226,000ha)	The Spirit Hills pastoral lease borders the Keep River National Park. This area is currently owned by the NT Land Corporation and would be destocked and upgraded to National Park status.
Western Legume portion of a new National Park (83,000ha)	The western portion of the Legume pastoral lease, between the Keep River and the State/Territory border. This area is owned by the NT Government and would be destocked and upgraded to National Park status.
Western Australia	
Livistona Range Conservation Area (55,700ha)	Located on Ivanhoe pastoral lease. This area would be destocked and upgraded to Conservation Area status. This is previously unnamed rangeland country – the name “Livistona Range” has been proposed by CALM as an interim name until a permanent name is approved.
Pincombe Range Conservation Area (17,900ha)	The Pincombe Range is located on the Ivanhoe pastoral lease and includes Cave Spring Range and Sorby Hills. This area would be destocked and upgraded.
Ninbing Range Conservation Area (6,300 ha)	The Ninbing Range is located on the Carlton Hill pastoral lease. Ninbing comprises three separate blocks that would be destocked and upgraded.
Weaber Range Conservation Area (22,500ha)	The Weaber Range is located on Ivanhoe pastoral lease abutting the Point Springs Nature Reserve.
Mt Zimmerman Conservation Area (9,400ha)	Mt Zimmerman is located on the Ivanhoe pastoral lease and abuts the existing Keep River National Park.

The proposed initiatives add 421,600 ha to the conservation estate with 309,800 ha being in the NT and 111,800 ha in WA (DRD and NT ORD, 2000).

3.2.3 Other issues considered when assessing biodiversity

The M2 Project involves substantial development of land on the Weaber Plain, Knox River Plain and Keep River Plain. There will be large-scale clearing of land, for irrigated agriculture and related infrastructure, new water-related management requirements, as well as issues associated with the introduction of agricultural crops and chemicals.

These developments will result in a substantial change in the environment in both the short-term and long-term. These include changing vegetation patterns, changes to the cracking clay environment of the black soil plains, a reduction in fauna habitat, and groundwater rise resulting from the irrigation of farm land.

The consideration of these short and long-term issues and their individual and cumulative consequences (e.g. the loss of up to 35,000 ha of vegetation through clearing), is one of the fundamental environmental issues, both from the point of view of the extent of clearing as well as the threats to biological diversity due to the clearing.

In reviewing biodiversity, the assessment has considered the EIS/ERMP guidelines, the outcomes of the technical workshop (Appendix A), surveys undertaken, criteria used for assessing biodiversity and some of the key ecosystem relationships.

3.2.3.1 Guidelines

The EIS/ERMP guidelines noted that consideration of biological diversity will include the following basic elements:

- a comparison of a number of development scenarios to evaluate protection of biodiversity at the species and ecosystem levels;
- no known species of plant or animal becomes extinct as a consequence of the development and the risks to threatened species are considered to be acceptable;
- no association or community of indigenous plants ceases to exist as a result of the project;
- there is comprehensive, adequate and secure representation of scarce or endangered habitats within the project area and/or in areas which are biologically comparable to the project area within NT and the WA, protected in secure reserves; and
- the project area itself includes a comprehensive and adequate network of conservation areas and linking corridors whose integrity and biodiversity is secure and protected.

3.2.3.2 Workshop

In view of the significant biodiversity implications of the M2 project, the WA EPA convened a one day workshop comprising technical experts, government agencies and proponents representatives from the NT, WA and the Commonwealth.

The workshop was held on 29 July and an outcome statement arising from the workshop was generated. A wide range of views and opinions were expressed by attendees, however, a clear understanding and appreciation of the workshop discussion could only be obtained by being present.

A summary of this workshop has been included in Appendix A.

3.2.3.3 Surveys

This assessment notes that in relation to surveys undertaken by the proponents:

- no surveys have been undertaken for estuarine flora and fauna;
- no sampling of stygofauna was undertaken in the Keep River Plain or the Knox Creek Plain; and
- there is limited baseline data, particularly in relation to aquatic flora and fauna of the Keep River and Milligan Lagoon.

It is also noted that:

- terrestrial fauna is reasonably well known;
- vegetation and soil surveys have been comprehensive within the development area, but not for the whole of the project area;
- documentation of the biodiversity values of the area to Aboriginal people has yet to be completed; and
- surveys in the Project Area have been more detailed than for most of the bioregion.

3.2.3.4 Criteria for assessing biodiversity

The conservation status of regional ecosystems is based on their remaining extent in the bioregion together with their condition and presence of threatening processes (Sattler and Williams, 1999).

In Queensland, the conservation status of individual regional ecosystems has been assessed in terms of three classes:

- endangered - less than 10% of pre-European extent remains in an intact condition across the bioregion, or its distribution has contracted to less than 10% of its former range;
- of concern - 10-30% pre-European extent remains in an intact condition in the bioregion; and
- no concern at present - over 30% of pre-European extent remains in an intact condition in the bioregion (Sattler and Williams, 1999).

It has been recognised during the assessment process that from a biodiversity perspective and taking no account of any other land degradation issues, there are several key criteria now being applied in States where clearing is still occurring:

- “(i) the ‘threshold level’ below which species loss appears to accelerate exponentially at the ecosystem level is regarded as being at a level of 30% of the pre-clearing extent of the vegetation community;
- (ii) a level of 10% of the original extent is regarded as being a level representing “endangered”;
- (iii) it is not acceptable for clearing to put the threat level into the class below. In effect this means that it is not acceptable to clear below the threshold level of 30% anywhere; and
- (iv) from a biodiversity perspective, stream reserves should generally be in the order of 200m wide” (WA EPA, 1999).

3.2.3.5 Ecosystem drivers

In assessing the impact on biodiversity the assessment process has attempted to distinguish whether there will be any change in values as a consequence of the project; the links between various ecosystem components that will be affected; and whether the effects will be so great that the values and attributes of those components will no longer be present.

In examining biodiversity consideration has been given to the relationship between soils, climate, vegetation, fauna, hydrology and habitat. In terms of links between ecosystem components, important ecosystem drivers that relate to the M2 Project include:

- the strong wet season/ dry season cycle, with a hot, humid and wet summer (October – April) and warm dry winter (May-September);
- the high seasonal variations in rainfall which are subject to monsoon and cyclone influences, and heavy downpours that occur during the wet;
- the seasonal surface flows in rivers that relate very closely to heavy rainfall events, with rapid response and relatively short duration flows;
- seepage from saturated sub-soils which maintains low flows in some channels for some months into the dry season, particularly in larger rivers including the Ord and Keep;
- seasonal flows in rivers ranging from high-energy flood events to extended periods without surface flow;
- the influence of hydro-geomorphological processes that control channel dynamics and sediment distribution on riparian and aquatic communities;

- the quick recession of the Keep River, above the confluence with Border Creek, into semi-permanent and permanent pools following the end of the wet;
- the Keep River catchment comprising eroded sandstone ranges and erosional plains in the upper catchment and depositional plains in the lower catchment, particularly the Weaber, Keep and Knox Plains;
- the Weaber Plain contributing to an extended flow in Border Creek and the lower Keep River, past the end of the wet, due to its capacity to hold water longer than the Knox and Keep River floodplains;
- the presence of black soils on the Weaber, Keep and Knox Creek Plains;
- the dominant vegetation of Weaber, Keep and Knox Plains being grasses;
- the Weaber, Keep and Knox Plains providing a major contribution to the carbon (energy) input into the lower Keep River system, together with the grasses on the erosional plains further up the catchment;
- vegetation on the Weaber, Keep and Knox Plains being of relatively better quality and condition than that found on the other major blacksoil areas within the Victoria-Bonaparte Biogeographic Region (ie. Auvergne Station);
- irrigation of farm units during the dry season will lead to permanently wet conditions within the irrigation zone of influence;
- irrigating crops will lead to rising groundwater levels across the whole of the development, requiring groundwater discharge into the Keep River. This will affect riparian as well as aquatic communities of the lower Keep River;
- fish fauna reproduction, and spawning upriver, is triggered by the commencement of the wet season flows in the northern rivers;
- changed hydrological conditions within the Keep River may mask or alter this trigger for some aquatic species;
- rising groundwater levels may threaten the vegetation and fauna habitat values within the buffer zone surrounding the project;
- permanent flow in the Keep River may result in increased areas of riparian vegetation, extended habitat for aquatic plants and associated changes in fauna habitat in both situations; and
- flood events will still drive the dynamic interaction between sediment mobility and riparian and aquatic plant communities, particularly given the Keep River is not regulated.

3.3 Issues Raised in Submissions

Through the joint assessment process agreed between the NT and WA Governments, all submissions on the draft EIS/ ERMP were directed to the WA EPA. The WA EPA received 66 submissions on the project. Of these, 37 indicated support for the project. Appendix C lists those people and organisations that made submissions on the draft EIS/ERMP.

Key issues raised in submissions, relating to biodiversity, focussed on:

- the impact of clearing particularly in relation to terrestrial biodiversity, greenhouse, and the lost opportunity to establish a comprehensive, adequate and representative reserve system;
- the superficial description of the response of the biota to clearing;
- development of the Weaber, Knox Creek and Keep River Plains and its impact on the ecosystem, wilderness value, habitats and soils;
- whether all soil and vegetation associations were represented in the buffer areas;
- the basis on which the proponents determined the buffer corridors;

- why four of the vegetation associations were not being represented in the buffer area;
- the lack of baseline data, particularly in relation to aquatic flora and fauna (eg frogs, fish, estuarine fauna) of the Keep River and Milligan Lagoon;
- inadequate data and sampling in relation to stygofauna;
- the impact of altered flow regimes and hydrology (from the construction of water control levees) on fish migration, riverine habitat and distribution of aquatic flora;
- the need for more extensive surveys for reptiles and frogs, prior to State Government approval of the project;
- the integrity of the buffer areas, their use for infrastructure developments, future uses, and weed incursion;
- tenure and management arrangements for the buffer area;
- the affect on the buffer area from rising groundwater and farm practices. Submissions indicated that the proponents have taken a commendable approach in establishing buffer areas around the farm development, however, concern was expressed in relation to how these buffer areas will survive as biodiverse areas with the influence of agriculture and elevated water tables adjacent. Submissions also queried the impact on the values of the conservation buffer area in the long-term;
- the need for a comprehensive and representative reservation of the surrounding uplands;
- the need for the proposed WA and NT Government conservation reserve initiatives to be publicly available;
- possible impacts from the development on Point Spring Nature Reserve, wetlands and watercourses;
- interbasin transfers of plant and fauna species ie movement of flora and fauna (eg fish and weeds) down the irrigation channel from the Ord River to the Keep River.
- adequacy of design criteria for drainage and flood protection under high flow conditions, eg setbacks, scouring protection, height and location of levees;
- superficial treatment of Aboriginal issues in relation to loss of biodiversity on traditional lands and impacts on food species; and
- the completion of the Aboriginal Socio-Economic Impact Assessment (ASEIA) prior to project approvals; and
- the EPA Guidelines on the project indicate that the ASEIA should be available to the EPA to consider during the assessment process and prior to reporting.

3.4 Assessment

It is recognised that if the project proceeds there will be a substantial change to the environment. The extent of this change and potential impacts on the environment cannot be predicted with certainty, however, it is likely that the buffer areas will be impacted, groundwater will rise and adaptive management will be very constrained.

Consideration has been given to the impacts on biodiversity arising from the development in terms of the consequences to individual species as well as groups of species. That is, to examine whether any species will become extinct or to consider whether any groups such as vegetation associations / communities or black soil dependent fauna (ie endemics) are lost. These questions have been considered on the basis of the relationships that exist primarily between vegetation and soils, vegetation and fauna, and hydrology and vegetation.

Given the complexity of these relationships, and the relatively limited knowledge of them, the issue of biodiversity has been approached by focussing on vegetation and the consequences of its loss, and the implications to management of its retention to other dependent elements of biodiversity. For example, the clearing of a large area of black soil will lead to the loss of vegetation within the farm areas and the loss of that vegetation as habitat for fauna. If habitat is lost, increased pressure is placed on remaining comparable habitat or adjoining but different habitat by dependent fauna.

The development of land for irrigated agriculture will lead to the intentional overwatering of the soils and progressive rising of the groundwater table. At some point, rising watertables will reach the root zone of vegetation and may reach riparian areas leading to discharge unless there is intervention in the form of cessation of irrigation or other active management such as deep drains or pumping.

The issues of flora and fauna, black soil, survey adequacy, wetlands and watercourses and hydrology, although separated in assessment, are fundamentally linked to each other. These are discussed below.

3.4.1 Flora, fauna and black soil

In the Victoria Bonaparte region direct clearing of vegetation has been limited, although long term pastoral use has had an influence on vegetation health and distribution. This assessment considers that the region has retained its full range of biodiversity values and recognises the importance of protecting them.

The project design, as presented in the draft EIS/ERMP, identified 72 vegetation associations/communities within 17 major groups as occurring in the Project Area. Of these:

- four out of the 72 vegetation associations/ communities would not be conserved within the Project Area;
- of the remaining 68 vegetation associations/ communities 14 would have less than 30% of the pre-development area conserved within the buffer area; and
- two of the 17 groups would not have at least 30% of their existing area within the Project Area left intact.

As discussed above, it is important that the conservation target for vegetation mapped at the group and vegetation association/ community levels should be 30%. Any areas of the 18 vegetation associations identified external to the Project Area within protected areas may be considered as an acceptable contribution to the conservation target, although the preference would be for protection in-situ, in accordance with the National Biodiversity Strategy.

In an endeavour to meet this target, the proponents modified the project design and incorporated additional areas within the buffer area. A summary of the 18 vegetation associations that were initially proposed to have representation of less than 30% are shown in Table 3.

In the modified project design, two of the 18 vegetation associations/ communities (Em8 and Gt2) do not meet the 30% target, although the retention of these associations/ communities have increased from 11% to 15 % for Em8 and 20% to 26% for Gt2. It is accepted that although 30% is a target, the retention of these two vegetation associations/ communities is acceptable, subject to the proponents investigating their existence outside the project boundary in adjacent areas.

In addition, it is also noted that in relation to vegetation associations/ communities G1, G4 and Em9, the proponents have made a commitment to investigate and verify the occurrence of these vegetation associations/ communities adjacent to the project area, and within proposed reserves, to ensure 30% of the association/ community is protected.

In relation to G1 and G4 the proponents have stated (Kinhill Pty Ltd, 2000b) that an additional 91 ha and 133 ha (respectively) is required to achieve the retention target of 30%. The vegetation associations/ communities have a high probability of occurrence on an area of 3,500ha of black soil adjacent to the Project area and on the west side of the Keep River. This area is within the proposed extension to the Keep River National Park.

In relation to Em9, an additional 114ha is required to achieve the retention target of 30%. The proposed amendments to farms W11, W12, W14 and W36 result in the conservation of 28% of the association, and through an analysis of aerial photography the proponents have indicated a high probability of the occurrence of the association on an area of 500ha of black soil adjacent to the project area on the north west portion of the Weaber Plain. It is understood that this area is now to be resumed from the Ivanhoe pastoral lease and incorporated into the Project Area as part of the buffer.

The proponents have also planned to protect an area of vegetation association ET4, located to the west of the Cockatoo Land System on farm W511. ET4 has a total area of 16ha and is the only occurrence of this vegetation association/ community in the project area. Whilst its protection is supported, there is concern in relation to the long-term viability and sustainability of this small area even though the proponents have linked the area via a 250m corridor to the Cockatoo Land System. It is acknowledged this initiative would result in significant rework to the engineering design particularly in relation to irrigation water supply and drainage.

In total 13,000ha of cracking clay soils will be protected within the buffer areas, and the additional black soil area of 500ha in the northwest portion of the Weaber Plain will be protected.

Table 3: Summary Results of Proposed Supplementary Conservation Initiatives

Vegetation Association/ Community	Conservation proposed in ERMP / draft EIS			Proposed Supplementary Conservation Initiatives		Total proposed buffer area (%)
	Area proposed for development (ha)	Area proposed within buffer (ha)	Area proposed within buffer (%)	Additional buffer area (ha)	Location (refer to Figures 3,4 & 5)	
Grassland						
G1	2459	924	27	91	West of Keep River	30
G4	1513	458	23	133	West of Keep River	30
Grassland with Emergent Trees						
Gt2	7210	1838	20	540	Farms X431, X432, X441 and X442	26
Gt3	208	22	10	180	Farm X442	88
Gt5	35	0	0	35	Keep Balancing Storage	100
Gt6	80	28	26	4	Farm K41	30
Gt8	29	11	27	29	Farm W65	100
<i>Bauchinia cunninghamii</i> woodland						
Bc3	6116	2136	26	225	Farms W65, K31	30
<i>Corymbia bella</i> woodland						
Cb9	26	9	27	5	Farm W14	40
<i>Corymbia confertiflora</i> woodland						
Cc1	84	1	1	25	Farm W65	31
<i>Corymbia confertiflora</i> woodland						
Ct1	39	0	0	20	Farm W65	51
Ct2	145	45	24	12	Farm W110	30
<i>Eucalyptus micritheca</i> woodland						
Em7	176	22	11	37	Farm W41	30
Em8	966	116	11	44	Farm W36	15
Em9	7026	2558	27	114	Farms W14, W36, NW Weaber	33
<i>Eucalyptus microtheca</i> woodland and shrubland of <i>terminalia oblongata</i> ssp.volucris						
ET4	16	0	0	5	Farm W511	31
ET5	350	97	22	75	Farm W14	38
<i>Melaleuca</i> sp. Woodland						
Me3	43	0	0	13	Farm K31	30

Recommendation 2

To ensure conservation of flora, fauna and black soil meets the biodiversity initiatives of both governments, it is recommended that:

- the proponents determine whether ET4 is located within the proposed reserves when seeking verification of the occurrence of G1, G4 and Em9 outside of the project area;
- the proponents investigate and verify the presence of Em8 and Gt2 in areas adjacent to the project area within proposed secure reserves; and
- the WA and NT Governments consider the opportunities available to incorporate black soil areas into existing and proposed conservation reserves.

In relation to ET4, it is suggested that the proponents assess the possibility of locating the linkage between ET4 and the Cockatoo Land System closer to the infrastructure corridor to the north of farm W511.

The proponents have given the following additional commitments in relation to conservation of flora, fauna and black soil:

- all riparian vegetation within the Project Area is to be preserved and protected for the purposes of conservation;
- acceptance of 30% target for vegetation associations/ communities;
- to locate vegetation communities G1, G4 and Em9 in protected areas.

The proponents have also indicated that an additional area containing at least 500ha of black soil on the northwest portion of the Weaber Plain containing Em9 will be added to the project area as part of the buffer area.

3.4.2 Survey adequacy

Fundamental to the assessment of biodiversity and impacts resulting from the proposal is the level of information available. In determining the survey adequacy the assessment took into consideration views expressed at the Biodiversity Workshop, views expressed in public submissions and the view expressed by Environment Australia (EA) that a frog and reptile survey should be undertaken by the proponents prior to project approval.

It is recognised that due to seasonal factors additional flora and fauna surveys would not be appropriate until 2001. Also noted the proponents' commitment to baseline monitoring, however, it is considered that the proponents should undertake additional surveys prior to final project design and construction, to ensure that the design and management identify and protect vulnerable and threatened species.

Recommendation 3

It is recommended that additional surveys for aquatic and terrestrial fauna within and adjacent to the project area (eg frogs, reptiles, bats, subterranean fauna) be implemented by the proponents following approval and prior to final project design, to ensure that the project design takes account of relevant additional information on rare or threatened species.

3.4.3 Watercourses, wetlands, riparian vegetation and hydrology

As part of the assessment, the DLPE and WA EPA sought clarification on hydrological aspects in relation to the project. These included:

- the setback between the development area and adjacent watercourses and wetlands;
- the viability of various buffer areas within perimeter flood protection levees;
- hydrology in the vicinity of Milligan Lagoon; and
- hydrology in the vicinity of Border Creek.

In the draft EIS/ERMP it was proposed that the setback of the project development from the incised channel of rivers and the outer edge of the riparian zone of wetlands be 250m and 100m from the incised channels of significant creeks. In further discussions with the proponents, the WA DEP requested that consideration be given to measure setbacks from the upper levee of rivers and creeks rather than incised channels. The proponents advised that in many cases the upper levees were poorly defined or non-existent and that it was agreed that an appropriate alternative for determining adequate setback from watercourses would be the extent of riparian vegetation.

In response to the above points, the proponents have redesigned the project (see Figures 3,4 & 5). These modifications include:

- increasing the buffer area on the Knox Creek Plain to include additional riparian vegetation. This has been achieved by reducing the size of farm units X41, X431, X432 and X441;
- re-configuring levees to the north of farm X41, to the east of E410, east of E46 and east of farm W64 to enable natural flooding to occur;
- redesigning levee HDX1 to permit surface water ingress to Milligan Lagoon from the south west;
- developing a drainage corridor along the northern boundary of farm X432 to enable surface water flow between Milligan Lagoon and the Keep River.
- constructing a siphon underneath the drainage corridor to permit irrigation of farms X431, X432 and the remainder of farms X441 and X442; and
- re-designing farm units W36 and W65 to reduce flow velocities and potential erosion effects along Border Creek.

The proponents have given the following additional undertakings and commitments:

- all riparian vegetation within the Project Area is to be preserved and protected within the buffer area; and
- the locations of all flood protection levees along Border Creek are to be reviewed in consultation with the WA WRC prior to project implementation;

One site of particular importance is the Point Springs Nature Reserve (A34585). This Reserve was declared in 1997 and encompasses an area of 303ha which protects a small patch of remnant rainforest and wetland supported by permanent water seepage at the base of the Weaber Range. The rainforest has high biodiversity value, as well as being of biogeographical importance for ongoing scientific research (CALM, 1999).

It is important that all riparian vegetation in the Project Area and wetlands such as Point Springs and Milligan Lagoon be protected. The proponents have re-designed the project to allow for the protection

of these areas and have given an assurance that potential hydrological impacts to Border Creek and wetlands such as Point Springs Nature Reserve and Milligan Lagoon will not be significant.

Another key concern in relation to biodiversity was the implication of rising groundwater levels on riparian zones, wetlands, watercourses and vegetation, especially in buffer zones.

Based on the following advice from the WA WRC that:

- vegetation associations/ communities should be able to adapt to the gradually changing groundwater conditions over time, subject to effective management actions;
- vegetation is likely to be reasonably tolerant of the increased groundwater levels and salinities;
- with the exemption of Sandy Creek initial groundwater salinities are less than 3000mg TDS
- there will be some additional salt discharge via groundwater to drains and water courses, even with an active program of groundwater management;
- with adaptive management this should not lead to major vegetation death and biodiversity loss in the buffer zones; and
- in the Sandy Creek area, the riparian vegetation is dominated by *Melaleuca* spp which are generally tolerant of water logging and salinity,

it is considered that the impact of rising groundwater levels on vegetation can be adequately managed.

3.4.4 Conservation initiatives

It is recognised that a proposal of this scale must be considered in a regional and local context and this requirement was identified in the draft EIS/ERMP guidelines. It is also recognised that the proponents alone may not be able to protect biological diversity and that the participation of the NT and WA Governments will be required to achieve this.

Conservation reserves proposed by the WA and NT Governments, provide for improved representation within conservation areas of key landforms, vegetation species and complexes, fauna and related habitats. The conservation initiatives, as listed in Table 2, should be implemented by the NT and WA Governments as a priority, should the project be approved, as these reserves are considered fundamental elements in addressing and protecting biodiversity relevant to the proposal. In addition, these initiatives should be established as early as possible.

It is further noted that an expansion of the Project Area is proposed to incorporate an area containing approximately 500 ha of black soil in the north west portion of the Weaber Plain. It is recommended that this area be added to the proposed Weaber Range Conservation area initiative by the WA Government.

Furthermore, the tenure and management of the conservation areas and buffer areas have yet to be resolved. The issue of tenure should be resolved quickly to ensure environmental values related to biodiversity are protected.

Both the NT and WA Governments should also consider the opportunities available to incorporate any additional black soil areas to existing and proposed conservation reserves.

Recommendation 4

The conservation initiatives, as proposed by the NT Office of Resource Development and WA Department of Resource Development, should be implemented by the NT and WA Governments as a priority. In addition, both the NT and WA Governments should consider opportunities to incorporate additional black soil areas into existing and proposed conservation reserves.

3.5 Social and Cultural Issues

A separate study of the social, cultural and economic impact of developments related to this project on Miriung and Gajerrong people is being conducted by the Aboriginal Representative Bodies, with the support of the proponents in parallel to the EIS/ERMP. This study is yet to be completed.

To ensure that there is the opportunity for consideration of relevant Aboriginal issues by the public and assessors in a timely manner, the EIS guidelines stated that information from this study and other reports should be referred to in the draft EIS/ERMP and that additional relevant information should be published prior to the DLPE and the WA EPA reporting to their respective Ministers.

The DLPE and WA EPA are aware that the Aboriginal Socio-Economic Impact Assessment (ASEIA) has not substantially progressed and that the terms of reference for the study are still being negotiated. In addition, the DLPE and WA EPA are also aware that the proponents are seeking an Indigenous Land Use Agreement (ILUA), that this agreement is a fundamental component of the project, and that Wesfarmer's position is that in the absence of an ILUA there will be no project.

Bearing this in mind the WA EPA met several times with representatives of the Miriung and Gajerrong people to assist the WA EPA in understanding what was important to them in terms of values, traditional use of the project area, perception of landscape and attitudes to the project.

In these discussions, the Miriung and Gajerrong people expressed the view to the WA EPA that:

- the M2 project will significantly change their country and this will effect the Miriung and Gajerrong people;
- for the M2 project to proceed, developers and government must consider and understand the significance and attachment of the land to the Miriung and Gajerrong people;
- the development must not affect sacred sites and ongoing traditional or cultural practices that are linked to the land;
- Ord Stage 2 will have similar affects to that of Ord Stage 1 in terms of reduced water quality, weed infestation, loss of access etc;
- environmental problems created by Ord Stage 1 must be dealt with before Ord Stage 2 can go ahead;
- the M2 project will have a bad affect on the Keep River;
- the Keep River is important for hunting and fishing;
- the Ord Stage 2 development will affect bush tucker resources, through clearing of land and the use of chemicals;
- more people in their country will push the Miriung and Gajerrong people out even further, and will prevent them from using their country the way they always have; and

- the development may cause problems for their people and their culture that have not been considered.

The Miriung and Gajerrong people also requested that they be given the opportunity by government to properly explain the significance to their people of the land in the Project Area and that they be given such an opportunity before a decision as to whether the project may be implemented is taken.

It is considered important that the Miriung and Gajerrong people's concerns and views are heard and that the results of the ASEIA and other related studies are considered by the proponents and government at the earliest opportunity.

4 Conclusion

It is considered that the environmental issues associated with the impact on biodiversity from the proposed Ord River Irrigation Area Stage 2 have been adequately identified. Some of the issues have been resolved through the assessment process, while others have been identified as recommendations within this report. Further issues relating to the environmental management of the project will be subject to a second assessment to be completed later this year.

Development of the M2 area will lead to a substantial loss of vegetation and will change the natural hydrological regime in the area. It is unlikely that any species of flora or fauna will become extinct as a result of this development, however some fauna will be affected by the loss of a large area of habitat.

Some vegetation associations / communities comprise small areas and this brings into question the vegetation community/ association's viability and sustainability in the long term. The Keep River and other watercourses in the Project Area will also change as a result of the development, however there is the possibility that additional habitat may be created in the Keep River.

The assessment of biodiversity has focussed on the relationships between vegetation, fauna and water in the short and long-term. To ensure that vegetation remains, the DLPE and the WA EPA have applied a target that at least 30% of each vegetation association/ community and group is protected and subject to management for protection. In addition, riparian zones around watercourses and wetlands have been excluded from the development and should be protected from changes in hydrology. Areas being protected from development within the Project Area will in many cases be a component of a much larger conservation system as a consequence of the Western Australian and Northern Territory Governments' conservation reserve initiatives.

Where additional information on biota is required, this will be obtained and incorporated into the final project design prior to construction.

The outcome of this assessment is that the environmental issues in relation to the conservation of biodiversity have been satisfactorily addressed, and that the proposal may proceed to the second stage of environmental assessment provided the undertakings and commitments detailed in the draft EIS/ERMP, as modified by recommendations in this report, are implemented.

5 References

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Kinhill Pty Ltd (2000a) *Environmental Review and Management Programme / Draft Environmental Impact Statement, Ord River Irrigation Area Stage 2, Proposed Development of the M2 Area, Main Report*, prepared for Wesfarmers Sugar Company Pty Ltd, Marubeni Corporation and Water Corporation of Western Australia, Perth, WA.

Kinhill Pty Ltd (2000b) *Responses to Public Submissions*, prepared for Wesfarmers Sugar Company Pty Ltd, Marubeni Corporation and Water Corporation of Western Australia, Perth, WA.

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Appendix A
Summary of WA EPA Workshop on Biodiversity
29 July 2000

In view of the significant biodiversity implications of the M2 project, the WA EPA convened a one day workshop comprising technical experts, government agencies and proponent representatives.

The workshop was held on 29 July and an outcome statement arising from the workshop was generated. A wide range of views and opinions were expressed by attendees, however, a clear understanding and appreciation of the workshop discussion could only be obtained by being present.

Questions addressed as part of the Outcome Statement of the Workshop were based on the WA EPA's guidelines, and Table 4 provides a summation of conclusions arising from discussions.

Table 4: Summary of Conclusions arising from the Biodiversity Workshop

Question	Workshop Response
Will biodiversity be unacceptably impacted?	<ul style="list-style-type: none"> • There were no specific risks of species extinction. • The level of survey was not adequate to identify all possible risks to extinction with certainty, particularly in relation to species in areas subject to inundation and watercourses.
Does the proponent need to change the proposal?	<ul style="list-style-type: none"> • Black soil reservation was a critical issue. • Concern expressed in relation to the small amount of black soil proposed to be held in reserved areas. • Concern expressed in relation to edge effects resulting from the long linear boundary between the farmland and the buffer area around the development.
If there is a change to the proposal, are there any additional impacts?	<ul style="list-style-type: none"> • There were no specific changes to the proposal put forward at the workshop and no changes to the proposal were recommended as an outcome of the workshop. • Black soil areas could be increased by allocating one or more production blocks (farm units) to conservation purposes. The engineering design of the M2 area would not need to be altered to achieve this.
Is there any additional information or survey work required?	<ul style="list-style-type: none"> • Additional survey work is required including: <ul style="list-style-type: none"> • a survey to determine that lizard and frog species which occur within the project area also occur elsewhere; • identification of down-stream impacts on migratory bird species that are the subject of international treaties. This would include identifying impacts from the proposal on Keep River outflows and tidal coastal areas; and • the possible effects of drainage and rising water table on aquatic flora and fauna species. • On-farm retention of water would minimise impacts, but in the absence of exhaustive surveys of aquatic species, there is the possibility of adverse impact.
Are the proposed Government's regional biodiversity conservation initiatives adequate?	<ul style="list-style-type: none"> • The adequacy of proposed regional biodiversity conservation initiatives is an issue for government to resolve. • Setting aside areas for conservation reserves and national parks is a lengthy and involved process. • It would be desirable to set aside a larger discrete area of black soil. • The project would not preclude the establishment of a comprehensive adequate and representative reserve for the region.
Under what conditions should the project proceed?	<ul style="list-style-type: none"> • Management arrangements by the Environmental Management Entity and ongoing auditing are vital. • These arrangements would need to be addressed in any conditions of approval placed on the project. • Concern expressed as to whether the buffer area around the farm units gave adequate protection of biodiversity of black soil areas. This could be improved and additional reservation of black soil areas would improve biodiversity.

Not all attendees to the workshop agreed with all of these conclusions. However, the WA EPA found the discussion very constructive and assisted it in the formulation of its view on the proposal.

Appendix B
Wesfarmers Sugar Company Pty Ltd, Marubeni Corporation and Water
Corporation of Western Australia Consolidated Environmental Management
Commitments

11 August 2000

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
Chapter 1—Project Objectives and Background							
1.5.1	The ongoing management proposed for the Project's conservation areas would include research focussed at improving environmental management systems for these areas.	Operation.	Environmental Management Entity on behalf of Wesfarmers–Marubeni, Water Corporation and independent farmers.	Improve knowledge of environmental management.	By including the requirement for research in the EMP.	CALM and PWCNT.	–
Chapter 3—Description of the Project							
3.2.4	Wesfarmers–Marubeni and the Water Corporation would prepare an EMP for the Project upon receipt of environmental approval. The EMP would incorporate all the requirements of the commitments and conditions that apply to the Project and be prepared in consultation with the DEP, the Department of Lands, Planning and Environment and other regulatory authorities. Compliance with the EMP would be mandatory for all landowners and occupiers within the Project Area.	Before construction.	Wesfarmers–Marubeni and the Water Corporation.	Effective environmental management.	By preparing and implementing the EMP.	EPA and DLPE.	To satisfaction of EPA and DLPE.
3.3.2	<p>All farms in the Project Area would be developed with irrigation tailwater management systems. Irrigation tailwater is the water leaving the end of the furrows during watering and is unavoidable if uniform water application to the crop is desired.</p> <p>A conceptual tailwater management system proposed for use in the Project Area is shown in Figure 3.3 and would consist of the following elements:</p> <ul style="list-style-type: none"> tailwater ditch that collect tailwater from the furrows and deliver it to a tailwater dam; tailwater dams. The volume of these dams would be optimised during detail design with the objective being to minimise discharges of irrigation tailwater during the dry season. As a minimum, the tailwater dam capacity would be sufficient to provide the specified first-flush stormwater retention capacity (see Section 5.5.2) for the Project—12 mm of rainfall runoff for sugarcane farms and 25 mm of rainfall runoff from other farms; tailwater return pumps and pipelines that would return irrigation tailwater to the farm head ditch or to other intermediate points in the farm irrigation system for application to the crop. The tailwater return pumps would be set to operate at partial filling of the dam, thereby reducing the volume of tailwater requiring storage. 	Construction.	Wesfarmers–Marubeni and independent farmers.	Virtually eliminate discharges of irrigation tailwater during the dry season.	By constructing and operating the tailwater return system.	–	To satisfaction of DEP and DLPE.
3.10	In areas where reserve widths significantly greater than those required for construction, only the sections necessary for construction and future maintenance purposes would be cleared.	Construction.	Wesfarmers–Marubeni and the Water Corporation.	Avoid excessive clearing.	By including requirement in construction contracts and monitoring.	–	–

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
Chapter 5—Surface Water							
5.4.1	Monitoring of erosion along all watercourses, including constructed drains would be undertaken as part of the EMP for the Project. Localised management of any erosion would be undertaken on an as-needed basis by the Environmental Management Entity that would be established as part of the Project	Operation.	Environmental Management Entity on behalf of Wesfarmers–Marubeni, independent farmers and the Water Corporation.	Minimise erosion of water courses.	By monitoring and implementing remedial measures as needed.	–	–
5.6.3	Water quality monitoring would form an important component of the environmental management programme proposed for the Project. Data collected by the monitoring programme would be assessed regularly in conjunction with management practices with the aim of minimising impacts on the receiving environment.	Operation.	Environmental Management Entity on behalf of Wesfarmers–Marubeni, independent farmers and the Water Corporation.	Provide data for improved management.	By implementing EMP.	WRC and DLPE.	To satisfaction of WRC and DLPE.
Chapter 6—Groundwater							
6.5.5	Groundwater monitoring for the Project would commence with delineation drilling across the interpreted position of the palaeochannel aquifers in order to define their actual position beneath the irrigation area. An extensive network of groundwater monitoring bores would also be installed within and adjacent to the irrigation area prior to the commencement of irrigation. This network would include bore transects aligned perpendicular to the Keep River and Sandy Creek to acquire additional data for the better understanding of the river–groundwater interactions, and the establishment of monitoring bores adjacent to Milligan Lagoon. Groundwater samples would be collected during the delineation drilling to quantify the vertical and horizontal water quality distribution.	Construction.	Wesfarmers–Marubeni and the Water Corporation.	Confirm parameters adopted for groundwater modeling.	Conduct further groundwater monitoring.	WRC and DLPE.	To satisfaction of WRC and DLPE.
Chapter 10—Biological Environment—Impacts and Management							
10.1.3	Any loss of or impairment to, the use of flora or fauna and other resources by Miriuwung and Gajerrong people would be addressed in an Indigenous Land Use Agreement (ILUA) to be negotiated between the Co-proponents and the Miriuwung Gajerrong people.	Before construction.	Wesfarmers–Marubeni and the Water Corporation.	Obtain agreement of Miriuwung Gajerrong people.	By negotiation.	Miriuwung and Gajerrong people.	Agreement of relevant parties.
10.4.8	To ensure that the existing environmental significance of the Point Spring Nature Reserve is maintained, Wesfarmers–Marubeni and the Water Corporation would cooperate with CALM in implementing its management requirements for the site. The overall responsibility for the management of the reserve would remain with CALM. The conservation area between the proposed farmland and Point Spring Nature Reserve would be managed for the purpose of conservation.	Before construction.	Wesfarmers–Marubeni and the Water Corporation.	Maintain environmental values of Point Spring Nature Reserve.	By providing co-operation as appropriate	CALM.	To satisfaction of CALM.

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
10.5.1	Permanent monitoring sites for flora, fauna and biodiversity would be established in conservation areas, along ecological corridors and in selected sites in the Project Area. Monitoring would be undertaken on a regular basis with the monitoring parameters clearly defined following consultation with the staff of CALM and the Parks and Wildlife Commission of the Northern Territory (refer to Supplementary Commitments with regard to baseline biological monitoring of the Keep River).	Before construction and operation.	Environmental Management Entity on behalf of Wesfarmers–Marubeni, independent farmers and the Water Corporation.	Monitor flora, fauna and biodiversity.	As committed.	CALM and PWCNT.	To satisfaction of CALM and PWCNT
10.5.2	To limit any potential for over clearing, all areas designated for construction works would be clearly marked on development maps and on the ground prior to commencement of works. Vegetation clearance would be staged so that areas are cleared only as required. Designated conservation areas and vegetation buffers would be clearly established and monitored to ensure they remained undisturbed. All contractors and consultants would be required to participate in a formal environmental and cultural heritage induction programme on the importance of the natural and social environment.	Before construction.	Wesfarmers–Marubeni and the Water Corporation.	Limit any potential for over clearing and improve environmental awareness.	As committed.	–	–
10.5.6	Rehabilitation of any sites disturbed during development would be undertaken progressively using seed species collected from the Project Area. Areas disturbed during development of the infrastructure would be rehabilitated as each stage of the work is completed, particularly those drainage channels designated as conservation-vegetation corridors. Where possible, topsoil would be utilised immediately or removed and stockpiled for later use on disturbed areas. Once the development was complete, the topsoil would be spread over the disturbed areas, allowing seeds and rootstock stored in the soil to germinate and become established. Active reseeding of some areas may also take place. Monitoring of success of rehabilitation would be undertaken.	Construction.	Wesfarmers–Marubeni and the Water Corporation.	Effective rehabilitation of disturbed sites.	By including requirements in construction contracts and monitoring.	Miriuwung Gajerrong people, CALM and PWCNT	To satisfaction of Miriuwung Gajerrong people, CALM and PWCNT.
10.5.7	A seed collection programme would be undertaken before vegetation is cleared. A seed mix appropriate to the area to be rehabilitated would be prepared and scattered over the disturbed areas. Alternatively, seedlings could be germinated and planted out at the commencement of the wet season. Only seeds of plant species endemic to the Project Area would be used in revegetation projects.	Construction.	Environmental Management Entity on behalf of Wesfarmers–Marubeni, independent farmers and the Water Corporation.	Effective rehabilitation of disturbed sites.	Seed collection and use in rehabilitation projects.	Miriuwung Gajerrong people, CALM and PWCNT.	To satisfaction of Miriuwung Gajerrong people, CALM and PWCNT.

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
Chapter 12—Issues Specific to Miriung and Gajerrong People							
12.4.5	Resolve all Native Title issues by concluding an ILUA with the Miriung and Gajerrong people.	Before construction.	Wesfarmers-Marubeni, the Water Corporation, WA and NT Governments.	In order to ensure that Miriung and Gajerrong aspirations are met and to ensure that statutory land transfer processes can occur.	By formal negotiations.	Aboriginal Representative Bodies and the Miriung and Gajerrong people.	To satisfaction of the NNTT.
12.5.2	Comply with relevant cultural heritage legislation and the aspirations of Miriung and Gajerrong people.	Before construction, during construction and operation.	Wesfarmers-Marubeni, the Water Corporation, Environmental Management Entity and independent farmers.	Ensure compliance.	By undertaking cultural heritage assessments.	Aboriginal Representative Bodies, Miriung and Gajerrong people, AAPA, HCB and AAD.	To satisfaction of the Miriung and Gajerrong people, the AAPA, the HCB and the AAD.
12.5.8	Establish 'green access paths';	Before construction.	Wesfarmers-Marubeni, the Water Corporation, WA and NT Governments.	Ensure that Native Title rights are maintained.	By agreement with Government.	Aboriginal Representative Bodies, the Miriung and Gajerrong people and relevant Government agencies.	To satisfaction of the Miriung and Gajerrong people and relevant Government agencies.
12.5.8	Establish the Conservation Area.	Before construction.	Wesfarmers-Marubeni, the Water Corporation, WA and NT Governments.	Ensure protection of cultural heritage sites. Ensure that Native Title rights are maintained.	By agreement with Government.	Aboriginal Representative Bodies, the Miriung and Gajerrong people and relevant Government agencies.	To satisfaction of the Miriung and Gajerrong people and relevant Government agencies.
12.6.2	Complete an Aboriginal Socio-Economic Impact Assessment.	Before construction.	Wesfarmers-Marubeni and the Water Corporation	Ensure that the Miriung and Gajerrong view of the Project is understood and enable the negotiation of an ILUA.	By establishing the Working Group with Miriung and Gajerrong people and the Aboriginal Representative Bodies.	Aboriginal Representative Bodies and the Miriung and Gajerrong people.	To satisfaction of the Miriung and Gajerrong people.
Chapter 15 – Community Issues							
15.4.5	Access to the Keep River would be maintained.	Before construction, during construction and operation.	Wesfarmers-Marubeni, the Water Corporation and the Environmental Management Entity.	Ensure public access to the Keep River.	By providing designated recreation sites.	Miriung and Gajerrong people and local recreation groups.	To the satisfaction of Miriung and Gajerrong people and local recreation groups.

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
Supplementary Commitments							
2.4.2, 10.3.5	Reconfigure the design of the Keep River balancing storage	Before construction	Water Corporation	Conservation of 35ha of vegetation association Gt5	By implementing appropriate design	-	-
10.3.5	Redesign Farm W511	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of 5ha of vegetation association ET4	By implementing appropriate design	-	To the satisfaction of the DEP
10.3.5	Redesign Farm W65	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of 20ha of vegetation association Ct1	By implementing appropriate design	-	-
10.3.5	Redesign Farm K31	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of 13ha of vegetation association Me3	By implementing appropriate design	-	-
10.3.5	Redesign Farm W65	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 25ha of vegetation association Cc1	By implementing appropriate design	-	-
10.3.5	Redesign Farm X442	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 180ha of vegetation association Gt3	By implementing appropriate design	-	-
10.3.5	Redesign Farm W36	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 44ha of vegetation association Em8	By implementing appropriate design	-	-
10.3.5	Redesign Farm W41	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 37ha of vegetation association Em7	By implementing appropriate design	-	-
10.3.5	Redesign Farms X41, X431, X432, X441, and X442	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 540ha of vegetation association Gt2	By implementing appropriate design	-	-
10.3.5	Redesign Farms W11, W12, W14, and the M2N irrigation channel	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 75ha of vegetation association ET5	By implementing appropriate design	-	-
10.3.5	Confirm the location of vegetation association G4 outside of the Project Area	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 133ha of vegetation association G4	By implementing appropriate survey work	-	-
10.3.5	Redesign Farm W110	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 12ha of vegetation association Ct2	By implementing appropriate design	-	-
10.3.5	Redesign Farms W11, W12, W14, and the M2N irrigation channel	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 5ha of vegetation association Cb9	By implementing appropriate design	-	-
10.3.5	Redesign Farms W65 and K31	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 225ha of vegetation association Bc3	By implementing appropriate design	-	-
10.3.5	Redesign Farm K41	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 4ha of vegetation association Gt6	By implementing appropriate design	-	-
10.3.5	Redesign Farms W11, W12, W14, W36 and the M2N irrigation channel; and confirm the location of vegetation association Em9 outside of the Project Area	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 614ha of vegetation association Em9	By implementing appropriate design and survey work	-	-
10.3.5	Confirm the location of vegetation association G1 outside of the Project Area	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 91ha of vegetation association G1	By implementing appropriate survey work	-	-
10.3.5	Redesign Farm W65	Before construction	Wesfarmers Marubeni and the Water Corporation	Conservation of a further 29ha of vegetation association Gt8	By implementing appropriate design	-	-
5.5.2, 10.3.3	Redesign boundaries to Farms X41, X431, X432, and X441	Before construction	Wesfarmers Marubeni and the Water Corporation	To ensure conservation of all riparian vegetation, and adequate setback of the developed area from natural watercourses	By implementing appropriate design	-	-

Relevant ERMP/EIS Section	Commitment	Timing	Responsibility	Objective	Action	Further consultation	Compliance Criteria
10.3	Redesign flood protection levees east of Farm X23, east of Farm W64, and east of conservation areas E46 and E410	Before construction	Wesfarmers Marubeni and the Water Corporation	To ensure the inundation of the conservation areas by natural flooding, and associated drainage	By implementing appropriate design	-	-
5.3.1, 6.5.3	Redesign flood protection HDX1	Before construction	Water Corporation	To ensure minimal hydrological impact on Milligan Lagoon	By implementing appropriate design	WRC and DLPE	To satisfaction of WRC and DLPE
5.3.1, 6.5.3	Design a drainage corridor through Farm X432	Before construction	Wesfarmers Marubeni and the Water Corporation	To ensure adequate surface water flows between Milligan Lagoon and the Keep River	By implementing appropriate design	WRC and DLPE	To satisfaction of WRC and DLPE
5.3.1, 5.4.1	Complete further analysis of predicted water velocity regime and stability of soils along the lower 20km of Border Creek	Before construction	Wesfarmers Marubeni and the Water Corporation	To ensure erosion effects in and around Border Creek are not significant	By implementing appropriate design	WRC and DLPE	To satisfaction of WRC and DLPE
9	Complete an additional biological survey of the Keep River in the vicinity of the Project Area	Before Project implementation	Wesfarmers Marubeni and the Water Corporation	To confirm current predictive models, and provide additional baseline data for inclusion in the EMP	By implementing survey work	DEP, DLPE, NT Dept. of Fisheries	To the satisfaction of DEP, DLPE, and NT Dept. of Fisheries

Appendix C
List of Respondents to the draft EIS/ERMP

State/Territory/Local Government

- Agriculture Western Australia
- CSIRO Land and Water
- Western Australian Department of Conservation and Land Management
- Western Australian Department of Environmental Protection – Air Quality Management Branch
- Western Australian Department of Environmental Protection – Licensing Branch
- Western Australian Department of Environmental Protection – Conservation Branch
- Western Australian Department of Primary Industry and Fisheries
- Western Australian Department of Resources Development
- Environment Australia
- Main Roads, Western Australia
- Northern Territory Government
- Shire of Wyndham-East Kimberley
- Western Australian Water and Rivers Commission
- Western Australian Museum

Organisations

- Aboriginal Legal Service of Western Australia (Inc.)
- Australian Cotton Cooperative Research Centre
- Bardena Farms Pty Ltd
- Care of the Ord Valley Environment (COVE)
- Conservation Council of Western Australia Inc
- Ecological Society of Australia Inc
- Kununurra Chamber of Commerce
- Miriuwung & Gajerrong Families Heritage & Land Council
- Northern and Kimberley Land Councils
- Ord River District Co-Operative
- The Environment Centre N.T. Inc
- Whelans Survey and Mapping Group

Individuals

- Mark and Sharon Albers
- Josephine Bedetti
- R B Dessert III
- Spike and Kae Dessert
- Barbara Dickey
- Stewart Dobson
- Dr Michael Douglas
- Robyn Ellison
- Bruce Ellison
- Warren Ford
- Richard Foster
- Dr H. G. Gardiner

- Jane and Greg Harman
- Jim and Judy Hughes
- Lindsay and Ann Innes
- Geoff Johns
- Barbara Johnson
- Rob Kelly
- Stuart and Libuse Lauder
- Jim and Julie Leach
- Grant Lodge
- Peter McCosker
- K. G McNair
- Patricia Muirson
- Ruth O'Connor
- Chris Robinson
- Frank Rodriguez
- Michael Smith
- Darryl Smith
- Paul and Elisabeth Stewart
- Kirsten Stoldt
- Andrew Trezona
- C Turner
- K Turner
- Dr N Uren
- Bruce Vandersee
- Allan Wedderburn

Plus two confidential submissions