Karijini National Park

Management Plan 1999–2009

MANAGEMENT PLAN N0 40

Department of Conservation and Land Management

National Parks and Nature Conservation Authority

KARIJINI NATIONAL PARK

Management Plan
1999 - 2009

Department of Conservation and Land Management
for the
National Parks and Nature Conservation Authority
Perth, Western Australia, 1999

PREFACE

All national parks in Western Australia are vested in the National Parks and Nature Conservation Authority (NPNCA). The management of these parks is carried out by the Department of Conservation and Land Management (CALM) in accordance with the *Conservation and Land Management Act 1984* (the CALM Act).

Within the context of the management regime established by law, the Government has determined that the Aboriginal traditional owners of Karijini National Park, represented by the Karijini Aboriginal Corporation and tribal elders, shall have direct input into the management of the Park through the establishment of the Karijini Park Council. The Karijini Park Council will be constituted as a Ministerial Committee to provide advice directly to the Minister on all matters in the Park which affect the interests of Aboriginal people.

The Government has also directed that a further Ministerial Committee be formed to represent the broader interests of the Pilbara community. This group shall be known as the Karijini National Park Advisory Committee, and shall also report directly to the Minister.

Throughout this Plan the phrase "Aboriginal traditional owner" means "Aboriginal persons recognised as being traditionally associated with land within the Park". The term does not qualify the vesting of Karijini National Park in the NPNCA, nor is it an acknowledgment by the Government of the existence of native title to the land. The involvement of Aboriginal traditional owners in the preparation and implementation of this Plan does not imply any weakening of any native title application sought for the land.

Day to day management remains the responsibility of CALM (refer Introduction, Section 2.1).

The NPNCA is responsible for the preparation of management plans for all land vested in it. These plans are usually prepared by CALM and issued as draft plans by the National Parks and Nature Conservation Authority for public comment and final approval by the Minister*.

A draft management plan was released in May 1989, and following a submission by the Karijini Aboriginal Corporation (KAC) the Government agreed to prepare a new plan which considered the interests of Aboriginal people with traditional affiliations to the Park. A second version of the draft plan was then prepared by a planning team comprising equal numbers of CALM and KAC representatives, and was completed late in 1992, but was not released. A further draft plan, amended to reflect the new government's policy, was released for public comment in 1996. This present Plan has incorporated many of the public comments received in response to that and earlier drafts.

National park management plans are designed to cater for public demand for appropriate recreation opportunities, while maintaining and restoring the natural and cultural environment, protecting indigenous flora and fauna, and preserving archaeological, historic and scientific resources and values.

According to the CALM Act, management plans should contain a statement of the policies or guidelines proposed to be followed, and a summary of operations proposed to be undertaken, for a specified period (but not exceeding 10 years).

* "The Minister" is the Minister responsible for the CALM Act, in this case the Minister for the Environment.

ACKNOWLEDGMENTS

Many individuals and organisations - government and non-government - have contributed to the plan (particularly through comment provided via public review of the earlier draft management plans), and their assistance is acknowledged with gratitude.

There have been many people who have been closely associated with the preparation of the several versions of this management plan including Hugh Chevis, Keith Cunningham, Richard Grant, Aminya Koch, Chris Muller, Noel Olive, Allan Padgett, Maitland Parker, Slim Parker, Peter Sandell, Peter Sharp, Tony Start and Susan Woenne-Green who all provided strong support and sound advice.

The final plan was coordinated by Jim Williamson, with Burke Stephens and Matt Cavana providing technical assistance and CALM's Information Management Branch producing the maps.

The valuable contribution of Karijini Aboriginal Corporation personnel and CALM staff, including Karijini National Park Rangers and Pilbara Regional staff, to the management planning process is gratefully acknowledged.

Particular thanks to all members of Karijini Aboriginal Corporation who attended planning team meetings in Onslow and in the Park, providing valuable input to the plan as well as considering various drafts. Special thanks to those members of Karijini Aboriginal Corporation who are no longer with us, but whose participation is remembered with gratitude.

NOMENCLATURE

Inclusion of a name in this publication does not imply its approval by the relevant nomenclature authority.

Spelling of Aboriginal words in the text of this management plan may not necessarily be universally accepted.

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INTRODUCTION

1.0 OVERVIEW

1.1 The Study Area

Karijini National Park covers an area of 627 444 ha in the Hamersley Range in the Pilbara Region of Western Australia (Map 1). The Park extends from latitude 23˚13'S to 22˚13'S (approximately 110 km) and from longitude 117˚53'E to 118˚45'E (approximately 70 km). Additions proposed for the Park (Sections A.1.5, B.5.3) will extend these dimensions. Excisions from the Park for iron ore mining and associated infrastructure have changed the boundary of Karijini National Park (Section A.1).

Wittenoom was the closest town to the Park being about 60 km from the Park headquarters (via Yampire Gorge), but following consideration of the health risks linked to the area's past association with blue asbestos mining the Government decided in October 1994 to close the town. Nearby are the mining towns of Tom Price, Paraburdoo, and Newman. Approximately 70% of the Park's boundary adjoins the pastoral leases of Marillana, Juna Downs, Turee Creek, Rocklea, Hamersley, Mt Florance, and Mulga Downs (Map 2). At the nearest point, the Park is approximately 200 km from the coast.

The Hamersley Range has had a relatively brief history of colonial settlement, with mining and pastoralism being major land uses. The Park remains in a relatively undisturbed condition compared with surrounding pastoral country. Evidence of former exploration and mining activities exists at a number of locations within Karijini National Park. Exploration and mining activities associated with iron ore tenements within the Park will require careful assessment and management to conserve the Park's natural and cultural values, and the integrity of the landscape. Such developments should be designed to minimise impact on the quality of the visitor experience.

1.2 History of Tenure and Management

The first comprehensive proposal for a national park in the Hamersley Range area appeared in a report prepared by the Western Australian Sub-committee of the Australian Academy of Science Committee on National Parks in 1962. An area of 23 644 ha of the plateau had been reserved since 1956 as Dales Gorge Nature Reserve although it was not under active management.

The national park proposal was submitted to Cabinet by a Government appointed Reserves Advisory Committee in April 1969. An area of 590 458 ha (incorporating Dales Gorge Nature Reserve) was subsequently gazetted on 31 October 1969 as A Class Reserve No. 30082 (Dales Gorge National Park). It was vested in the National Parks Board of Western Australia for the purpose of a National Park and managed as such. Subsequently the name of the Park was changed to Hamersley Range National Park. Hamersley Gorge (106 ha) was added to the Park as a separate area. With the proclamation of the CALM Act in 1985, the Park was vested in the NPNCA and CALM assumed responsibility for its management. Excisions of land for mining and associated purposes, and boundary rationalisation with adjoining pastoral leases reduced the area of the Park, and changed the perimeter and internal boundaries (Section A 1.5 and Map 2). Additions to the Park (Mt Meharry, O'Briens Block and Hamersley Gorge) have increased the area to its current size of 627 444 ha. Future excisions will also affect internal boundaries (Section A.1.5).

On 21 June 1993, the Government endorsed the formation of joint CALM/Aboriginal committees to help resolve issues of concern relating specifically to Aboriginal people. The Government also endorsed the formation of a joint CALM/local community advisory committee to address matters of local concern arising in the management of the Park.

The name, Karijini National Park, reflects both the Aboriginal history of the area and the continuing association of traditional owners with the Park, particularly through the Karijini Park Council. The renaming of Karijini National Park was official at the date of Government approval (29 April 1991), and publicly notified in the Government Gazette on of 22 November 1991.

Management of the Park dates back to the early 1970s when the first Park Ranger resided in Wittenoom. In 1979, the Ranger moved to the present Park Headquarters. He was assisted by a mobile Ranger during the tourist season. In 1985, a second permanent Ranger was appointed to the Park, and a further two in 1987.

Karijini National Park is recognised by the Government as having established mineral interests, and is the subject of specific policy commitments addressing this issue (Introduction, Section 3.1).

1.3 Conservation Significance

Karijini National Park contains a representative sample of many of the geological types, plant and animal communities and landscape forms of the central portion of the Hamersley Range.

The Park has many outcrops of some of the oldest rock formations exposed on the Australian continent, presenting opportunities for expanding our knowledge of the evolution of life on earth. The range of rock types present in the Park includes banded ironstones, dolomites, shales and granite.

The effect of millennia of natural erosive and depositional processes on the geology has been to produce an array of landscape features, the best known of which are the gorges, for which the Park is famous. These include Dales Gorge, Yampire Gorge, Kalamina Gorge and the four gorges that meet at Oxers Lookout. Other landscape features of importance are the old plateau that the gorges are incised into, the highest points in the State, including Mt Meharry and Mt Bruce, waterfalls, broad valleys and plains. The old plateau, which has a combination of rolling topography, red soil and pale green spinifex with emergent white trunked snappy gums and bloodwoods has an ageless beauty which encapsulates the appeal and experience of the Park and the Pilbara.

The biological diversity of the Park equals its geological and landscape diversity. The vegetation includes a range of vegetation formations ranging from grasslands to closed forests, with most areas of the Park having hummock grasslands of *Triodia* species with various open shrub and tree layers over them. Generally the shrub layer is dominated by *Acacia* species and the tree layer by *Eucalyptus*. However, this understates the diversity in the vegetation, which includes Mulga (*Acacia aneura*) stands on flats and hill slopes, Paperbark (*Melaleuca leucadendra*) forests in gorges, sedge lands around permanent pools and bulrush (*Typha*) stands within them. The flora making up this vegetation includes some 500 species of native flora, including species on the priority flora list (Section A.2.6). One species of declared rare (threatened) flora is known from immediately adjacent to the Park whilst another occurs in it. The vegetation and landscape provide habitat for the fauna of the Park which includes a wide range of insects, amphibians, reptiles, birds and mammals. Two species of fauna declared as threatened, one of which is endemic to the Pilbara, are known to occur in the Park (Section A.2.7.2).

Preservation is a recognition that the values of certain natural resources warrant protection by ascribing conservation as the principal land use for a site on which they occur. Thus the conservation value of reserves is likely to increase over time owing to the changes that many other land uses have on the ecology of non-reserved areas. This is particularly true of areas which are subject to land uses which can dramatically alter the ecology of large areas such as sheep or cattle grazing (Environmental Protection Authority 1992).

The large size of the Park contributes to its conservation value, as it allows for adequate buffers to disturbances from surrounding land uses (largely grazing of pastoral leases) as well as enabling the Park to absorb the high level of tourist use that it receives and giving it scope to cope with the degradation of conservation values caused by feral animals and weeds.

There are large concentrations of iron ore within the Park, some close to areas of major cultural and landscape interest such as Mt Bruce, Dales Gorge and Turee Creek. Exploitation of these deposits could impact on conservation values of the Park.

The Marandoo tenement and the associated transport corridors have been excised from the Park, dividing it in two and resulting in extensive common boundaries. These areas will require management sympathetic to the conservation ideals of the management plan to avoid diminution of the conservation values of the Park.

Any expansion of the Park must aim to conserve current conservation values, and, increase the Park's conservation value.

1.4 National Estate

Karijini National Park is listed by the Australian Heritage Commission on the Register of the National Estate. The boundaries of the listed area are those current at 28 February 1977, which coincide with current Park boundaries except for recent changes (Section A.1) The listing is detailed in Appendix 3; criteria for the listing and associated values are shown in Appendix 4. The recently updated assessment statement associated with this listing (Australian Heritage Commission 1992) states that:

Karijini National Park comprises a complete north-south transverse section of the Hamersley Ranges. The area's value as a representative example of the Hamersley Range is enhanced by most of the area being relatively unmodified by pastoralism or large-scale mining operations. There are five large identified wilderness areas within the Park.

The Park is a geological type locality, and contains extensive deposits of fossil material. The northern gorges and escarpment have been used extensively for geological research and teaching.

The area shows considerable biological diversity. It is especially rich in species of the genus Acacia, *with 46 of the 54* Acacia *species which occur in the Pilbara region occurring in the Park.*

Many other flora and fauna species of special significance occur in Karijini National Park. The area contains populations of eight species of flora considered as rare, poorly known or of restricted distribution at either the national or state level.

One mammal recorded from Karijini National Park, the Bilby[1]*, is considered vulnerable at the national level. These species, along with a further four vertebrate species, are gazetted as rare under the Western Australian Wildlife Conservation Act.*

The area is scenically outstanding. The landscape is characterised by naturalness, ruggedness and diversity. Steep sided orange and red banded gorges

[1] Burrows possibly dug by Bilbies have been recorded in the Park (Ninox Wildlife Consulting 1991), but Bilbies are now thought to be absent from Karijini National Park (Section A 2.7.3).

in the north provide the setting for a series of waterfalls and deep permanent pools, whilst peaks such as Mt Bruce provide vistas of green-gold hummock grassland and grey-green mulga woodland.

The area and its Aboriginal sites of significance are highly valued by the Panyjima, Yinhawangka and Kurrama Aboriginal people.

The Register of the National Estate, as defined in the *Australian Heritage Commission Act 1975*, lists Australia's natural and cultural heritage. They are places that:

... have aesthetic, historic, scientific or social significance or other special value for future generations as well as for the present community.

The Register is the national reference point of places with national estate values. It should alert planners, decision makers, researchers and the community at large of the heritage value of these places.

Listing in the Register gives some protection to a place under Section 30 of the Act. This aims to ensure that the Commonwealth Government does not unnecessarily damage Australia's heritage. Under it, Commonwealth Ministers or their agencies are required not to take any action which adversely affects a place in the Register, unless there is no feasible and prudent alternative. They are also required to inform the Commission of any proposed Commonwealth action which might significantly affect a registered place.

Section 30 only binds the Commonwealth Government. Listing a place in the Register does not provide any legal constraints or controls over the actions of State or Local Government, or of private owners. It does not give the Commonwealth Government any rights to manage, acquire or enter private property.

Listing a place in the Register does, however, mean that the heritage values of places entered are recognised and this should contribute to their greater protection.

The Register serves several functions (Australian Heritage Commission 1990a):

- *it gives planners and decision-makers at all levels of government and in the private sector, objective information about the national estate values of places, and thus enables them to consider this when they are making decisions*
- *it ensures as far as possible, at the Commonwealth level, that the national estate values of listed places are carefully considered before Commonwealth actions are taken which might affect them*
- *it provides researchers and scientists with information about Australia's National Estate*
- *it alerts Australians to the presence of places of national estate significance and educates them on the value of Australia's natural and cultural heritage*.

All of the strategies in this management plan are designed to ensure that Park policy and management are consistent with the National Estate status of Karijini National Park.

1.5 Recreation and Tourism Significance

Karijini National Park is renowned for its landscape. It protects a large area of the rugged Hamersley Range and its gorges with their permanent water and associated plant and animal communities. Most people visit the better known gorges such as Dales, Red and Joffre, where platforms are strategically located to give the best views. Circular Pool and Fortescue Falls within Dales Gorge are of particular interest, as is the view into the junction of four gorges - Red, Weano, Joffre and Hancock - from Oxers Lookout. Kalamina Gorge has ready access, and while not as spectacular as some other gorges, it has a curved waterfall and pools, and is lined with eucalypts. Hamersley Gorge also has steep access with formed steps leading down to a series of pools and cascades that are backed by a rock wall contorted by folding.

In 1992 work on a new campground at the Dales recreation area was completed providing improved facilities for visitors. The area has been sensitively designed to provide privacy at individual campsites, with communal facilities close by. The various needs of visitors have been catered for by segregating individual and group sites, and in providing non-generator areas and generator use areas. A similar development near Weano Gorge (Savannah Camp) is proposed within the life of this plan (Section B.7.3.2).

Other existing recreational opportunities include the views obtained while driving through the Park, in particular along the Mt Bruce-Weano Gorge, Weano Gorge-Fortescue Falls, and Mt Bruce-Mt Windell axes. Residents of local communities, including Tom Price and Paraburdoo, make use of the south-western areas of the Park, especially for weekend visits, including overnight camping. Each year many visitors climb Mt Bruce which offers commanding views of the Hamersley Ranges and interceding valleys.

Possible future developments will include additional camping and day use facilities, interpretive walks in mulga woodland, and access to Mt Meharry, at 1 245 m the highest mountain in Western Australia.

Karijini National Park offers visitors the opportunity to appreciate and understand an arid zone environment with its unique landscape, specialised plants and animals, and long history of Aboriginal culture and tradition.

1.6 Aboriginal Significance

The land comprising the Park and surrounding areas is of enduring significance to contemporary Panyjima, Yinhawangka and Kurrama Aboriginal people, most of whom now reside in such towns as Onslow, Karratha, Roebourne, Wickham and Port Hedland. Despite disruptions which have occurred to traditional life, they seek to retain social, religious and personal bonds that have persisted for countless generations.

The Park and surrounding area is rich in physical evidence of the occupation and use of the land by Aboriginal people from ancient times (Section A.5.5.5). A recently discovered habitation site has had its contents dated at 18 000 years old.

The contemporary and archaeological significance of Karijini National Park to Aboriginal people add important dimensions to the understanding and appreciation of the Park. With careful consideration and sensitive interpretation these dimensions will serve to enhance the management of conservation, recreation, and cultural heritage values.

1.7 Commercial Mineral Significance

The pattern of iron ore tenements across the Park, and surrounding it on adjacent pastoral leases and Vacant Crown Land (Map 3), indicates the large commercial mining interest in this area. Small deposits of gold and crocidolite occur and have been mined, but the major commercial focus is on iron ore. The majority of tenements are covered by various Government Agreement Acts enacted in the late 1960s and early 1970s.

Following a request from Hamersley Iron Pty Ltd, Parliament approved the excision[2] from Karijini National Park of 9 305 ha (gazetted 11 January 1991), which includes the Marandoo mining tenement, an access corridor west to the boundary of the Park and beyond to Rosella Siding, and an eastern corridor from Marandoo to the boundary of the Park close to Juna Downs homestead.

The Marandoo proposal was approved on 6 October 1992, subject to Ministerial conditions on protection of the environment (refer Appendix 6) and pursuant to the provisions of the *Environmental Protection Act 1986*.

1.8 Public Participation

Karijini National Park attracts many visitors, and in 1991 won a category of the annual Tourist Industry Award for Western Australia. The Park also holds special interest for Aboriginal people, conservation groups and the mining industry. All attempts have been made to address the full scope of public interests in Karijini National Park in formulating this management plan.

Public participation in the consultation process took numerous forms, including responses to newspaper advertisements, local government and pastoral briefings, public meetings in local towns, meetings with Aboriginal traditional owners, workshops, and meetings with other special interest groups.

A previous draft plan was open for public submissions for over two months and received 50 written submissions. All these submissions have been considered in the preparation of this plan.

The current management plan has been prepared following Government's decision to support Aboriginal and local Community involvement in park management through participation with CALM on advisory committees reporting directly to the Minister.

1.9 Previous Studies

Numerous studies of Karijini National Park and surrounding areas have contributed to the inventory of the Park's natural and cultural resources, and of their inter-relationships. These include studies on flora (Texasgulf 1979, Trudgen 1980, van Leeuwen 1984, Mattiske 1986, 1991), Acacia species (Maslin 1982), reptiles (Johnstone 1983), ants (Majer 1983), tourism (Barrington and Partners 1986), visitor patterns (Cavana 1986), airborne asbestos (Ashton 1986), roading (Main Roads Department 1988) and ethnography (Green and Rumley 1991). Nevertheless, the Park and surrounding lands require extensive further research, including on flora, fauna and Aboriginal history and culture.

CALM personnel contribute on an ongoing basis to the knowledge and understanding of Park flora, fauna, ecology, landscape, and cultural interpretation, without formal documentation being written, or as part of comments submitted by CALM to the Environmental Protection Authority.

It was reported to the planing team that some studies concerning various aspects of the Park and surrounding areas have been undertaken without reference to those Aboriginal people who maintain custody of these areas. Of particular concern to the Aboriginal traditional owners are the numerous studies that purport to record or otherwise deal with matters of Aboriginal cultural and social heritage which have been conducted with little regard for Aboriginal traditional management responsibilities for the land and cultural sites and objects within it. A particular concern is that some studies have been conducted and conclusions made without accountability to the Aboriginal traditional owners.

[2] Under the terms of the *Iron Ore (Wittenoom) Agreement Act 1972*.

The management structure for Karijini National Park will endeavour to ensure that future studies concerning all aspects of the Park's resources and values are conducted with the knowledge of the Aboriginal traditional owners, and with their permission when the study deals with matters pertaining to Aboriginal cultural heritage.

2.0 PARK MANAGEMENT

2.1 Management Goals and Objectives

The primary management goal for national parks, as defined in the *Conservation and Land Management Act 1984*, is:
... to fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest.

Specific goals for management of Karijini National Park are:

- **Conservation**

  Conserve biological, physical, cultural and landscape resources and values.

- **Recreation and Tourism**

  Facilitate public enjoyment of natural and cultural resources and values in a manner compatible with conservation goals.

- **Community Relations**

  Develop mechanisms for community input to implementation of the plan, and promote informed appreciation of natural and cultural resources and values.

- **Research and Monitoring**

  Promote knowledge of, and research into, the natural and cultural environment, and monitor and control impacts of management activities and public use.

- **Commercial Use**

  Ensure that the impacts of industrial and other commercial uses on conservation resources and values are strictly controlled.

The objectives for Park management describe briefly an overall management intention. Specific intentions are reflected in management strategies, and are linked to the objectives for that section by statements which summarise various implications for management.

2.2 Karijini Park Council

A key initiative in this plan is the establishment of the Karijini Park Council (Section B.1.1). On 21 June 1993 Cabinet endorsed the formation of a joint CALM/local Aboriginal committee to address Park management issues of particular interest to Aboriginal people.

It will provide a forum for Aboriginal traditional owners to contribute to the development of policy in relation to the Park. The Karijini Park Council will provide advice directly to the Minister.

The State Government recognised that the Aboriginal traditional owners can make a significant contribution to the management of Karijini National Park. Through the Park Council, representing the traditional owners of land now included within the Park, Government endorsed a structure through which the Karijini Park Council reports directly to the Minister on Park management issues affecting their interests. As explained in the preface, management of the Park is the legal responsibility of CALM, but the formation of the Park Council enables the traditional owners to maintain traditional responsibilities for stewardship of the land whilst playing an active role in management within the limits of existing legislation. The functions of the Karijini Park Council are:

- *to assist, in association with CALM, in the preparation of management plans for approval by the Minister for the Environment;*

- *To assist CALM, within the provisions of the CALM Act, in the implementation of management plans approved by the Minister;*

- *to develop policy in relation to Aboriginal interests in the Park;*

- *to provide advice to the Minister for the Environment in all matters relating to Aboriginal involvement in the Park .*

The Park Council, which is the primary agent for Aboriginal participation in Park management, will consist of equal representatives of CALM and the KAC in addition to the elders of the Panyjima, Yinhawangka and Kurrama people (Preface; Section B 1.1). CALM will be responsible for the day-to-day management of the Park.

2.3. Karijini National Park Advisory Committee

When Government endorsed the concept of joint CALM/Aboriginal committees to provide for Aboriginal participation in the management of national parks it also initiated the creation of community Advisory Committees to represent the interests of the general community. Membership of

the Karijini National Park Advisory Committee will reflect the interests of the wider community, and members will be appointed by the Minister on the basis of expertise, experience, personal interest and community profile. Government representation will be kept to a minimum, and will usually be confined to one officer from CALM. The Karijini National Park Advisory Committee will be a forum to hear public opinion, and exchange advice and information on management and planning issues (Section B.1.3), and will report directly to the Minister.

Advice and opinion emanating from the Karijini National Park Advisory Committee will be communicated directly to the NPNCA and the Park Council via the CALM representative on the Advisory Committee.

Advisory Committees cannot be empowered to administer management programs or activities, or to direct CALM staff or Karijini Park Council members, but their advice is of considerable importance to the implementation of the management plan.

2.4 National Parks and Nature Conservation Authority

The CALM Act provided for the establishment of the National Parks and Nature Conservation Authority (NPNCA) in which Karijini National Park is vested. The Act lists the functions of the Authority to include developing policies, providing advice to the Minister, and, preparing, reviewing and monitoring management plans. The NPNCA will be briefed by the Karijini Park Council and the Karijini National Park Advisory Committee on recommendations arising from these bodies. This plan is consistent with the NPNCA's policy on Aboriginal participation in national parks and nature reserves (see Appendix 7).

2.5 Department of Conservation and Land Management

2.5.1 Functions

The Department of Conservation and Land Management (CALM) was established under the CALM Act and given a range of functions including the management of land and its associated flora and fauna, and to assist the National Parks and Nature Conservation Authority in its functions. CALM is subject to the direction and control of the Minister, and its administrative structure is headed by an Executive Director.

2.5.2 Scope

The scope of CALM's responsibilities is represented by its mission statement:

To conserve Western Australia's wildlife and manage lands and waters entrusted to the Department for the benefit of present and future generations.

2.5.3 Primary Objectives

CALM has established the following primary objectives in relation to its mission:

Management: protect, restore and enhance the value of resources entrusted to the Department so as to meet, as far as possible, the diverse expectations of the community.

Conservation: conserve the indigenous plant and animal species and environmental processes in natural habitats throughout the State.

Recreation and Tourism: facilitate the public enjoyment of the natural attributes of public lands in a manner that does not compromise conservation and other management objectives.

Knowledge: seek a better understanding of the natural environment and to promote awareness and appreciation of its values.

2.5.4 Legislative Base

CALM operates under two principal Acts, the *CALM Act* and the *Wildlife Conservation Act*. These Acts include a number of statutory requirements for CALM to manage land and wildlife, including that:

- for national parks where there is a management plan, management must be in accordance with that published plan. The plan must be made available for public review and comment in the draft phase; and
- national parks must be managed to provide public recreation consistent with the conservation of flora, fauna, landscape and other values.

2.5.5 Departmental Policy Statements

CALM policies are documented as policy statements and are further elaborated in associated Administrative Instructions. Over 50 policy statements have been approved with many being relevant to Karijini National Park. These documents are available to the public (see Appendix 9).

2.5.6 Management Structure

CALM has a regional system of management with the Pilbara Regional Office being located in Karratha. A Park Headquarters is located at Dignam's Well. Day-to-day management of the Park is the responsibility of the Ranger in Charge who is responsible to the Pilbara Regional Manager. Requirements for technical expertise not available in the region are provided by specialist branches within CALM, by other Government agencies, and by consultant technical specialists.

2.6 Karijini Aboriginal Corporation

The Karijini Aboriginal Corporation (KAC) was incorporated pursuant to the *Commonwealth Aboriginal Councils and Associations Act 1976* in January 1991, at the direction of the Aboriginal traditional owners (refer Preface) of the Park land and

surrounding areas.

Aboriginal traditional owners have significant contributions to make to conserving natural and cultural systems, and KAC's objectives correspond with those formally identified by CALM (Introduction, Section 2.1). The responsibilities which flow from Aboriginal traditional and contemporary relationship with the land enrich these objectives, particularly with respect to the management of a national park. These responsibilities include:

Heritage: protect and preserve the evidence of thousands of years of Aboriginal traditional use of the land as it pertains to contemporary Aboriginal people.

Culture: support and protect the ongoing social, economic and ceremonial activities and knowledge by which the Aboriginal traditional relationships of land to people are expressed and maintained.

Conservation: conserve the indigenous flora and fauna of the Park, both physically and with respect to the traditional significance that plant and animal species have to Aboriginal people.

Recreation: promote the Aboriginal significance of the Park to enhance the public education and appreciation of its natural and cultural resources and values.

Management: protect the traditional Aboriginal values of the Park and surrounding land so that an harmonious acceptance and appreciation of these values will be available to all Park visitors.

A meeting of Aboriginal people with traditional affiliations to Karijini National Park was held at Millstream in March 1994, and overwhelmingly endorsed KAC as the appropriate body to represent the traditional owners on matters occurring within the Park boundaries. The meeting also determined that for issues outside Park boundaries, and for issues relating to traditional law and site matters, nominated elders from the three language groups should also be consulted.

2.7 Reporting Responsibilities

The NPNCA, the Karijini Park Council and the Karijini National Park Advisory Committee may advise the Minister on matters relating to the management of Karijini National Park. The responsibilities of the NPNCA are defined in the CALM Act, including the responsibility to produce management plans for lands which are vested in it, and to monitor the implementation of management plans.

The Karijini Park Council was established to ensure that the Aboriginal traditional owners have input into the management of the Park, and can provide advice directly to the Minister (Introduction, Section 2.1).

The Karijini National Park Advisory Committee was endorsed by Government to represent the interests of the broader community, and may also provide advice directly to the Minister.

According to Section 54 of the *CALM Act*, the NPNCA is responsible for the preparation of proposed management plans, and for the review of expiring plans and preparation of further management plans. CALM will work together with the Karijini Park Council and the Karijini National Park Advisory Committee to prepare and review management plans, for the approval of the NPNCA and the Minister. Both the Karijini Park Council and the Karijini National Park Advisory Committee will also comment on major projects, new issues or policies which are subject to NPNCA approval.

A strong link exists between the NPNCA, the Karijini Park Council and the Karijini National Park Advisory Committee through CALM which is represented on all three bodies.

The strategies in Part B of this Plan highlight the roles of the NPNCA and KAC, but should not be taken to indicate the limit of the role of either.

2.8 Living Areas

Part of the decision to prepare this management plan for Karijini National Park, which would take into account the interests and aspirations of Aboriginal people (Section A.3), involved in principle endorsement by both CALM and the NPNCA of the establishment of living areas within the Park.

Living areas, as is the case with other precincts within the Park, will be subject to this Plan, and to the deliberations of the Park Council and the Minister for the Environment. They will be agreed between the Minister and the KAC and formalised as specific lease agreements between Aboriginal traditional owners and CALM's Executive Director.

2.9 Adjoining Lands

Karijini National Park is surrounded largely by pastoral stations and some vacant Crown land. The continuing modification to the ecology of the region brought about by this form of land use makes the conservation value of the Park, now and in the future, of prime importance (Environmental Protection Authority, 1992).

Other management options might include integrated natural resource management of some portions of lands adjacent to the Park by CALM and neighbouring land users.

In order to combine the objectives of operating an economically viable mining project and minimising environmental impact on the Park, Hamersley Iron and CALM have agreed on a consultative process to address issues of environmental impact arising from

the Marandoo Mine project by way of a statement of mutual understanding (Appendix 5). Additionally an MOU covers consultative land management of Hamersley Iron pastoral leases adjoining the Park.

3.0 GOVERNMENT DECISIONS

3.1 Mineral Exploitation and Excisions

The State is bound by Government Agreement Acts (Section A 4.2) to allow commercial iron ore deposits currently sited within Karijini National Park to be assessed in accordance with Government policy. Mineral exploration in Karijini National Park may be permitted subject to the concurrence of the Minister for the Environment, and referral to the Department of Environmental Protection (DEP) where exploration involves significant ground disturbance. Mining may be permitted subject to DEP assessment and the consent of both Houses of Parliament.

The NPNCA, the Karijini Park Council and the Karijini National Park Advisory Committee are able to advise the Minister directly on Park management issues including exploration and mining applications, rationalising of tenements, and compensating additions. (Section B.5).

The review of existing iron ore tenements within existing and proposed Park boundaries will aim at reducing the number of tenements (Section B.5.2) and reaching agreement on infrastructure corridors. This review could result in the excision of rationalised tenements and infrastructure corridors from the Park. It is strongly expected that any such corridors will be reserved under the Land Act and managed as part of the Park as a Section 5(g)[3] reserve under the CALM Act. Additional tenement applications would be dealt with in accordance with Government policy.

In December 1990, both Houses of Parliament approved excisions from the Park for the Marandoo mining lease, a western corridor to service Marandoo, and an eastern corridor to service any mining tenements excised from this area of the Park, and for any mines developed south-east of the Park.

Those parts of the corridor not required for infrastructure (railway, service road, power line) will be vested in the NPNCA and managed with the park through this management plan.

A Reserves Bill passed by Parliament on 22 December 1991 returned Panyjima Pool to the National Park in exchange for land at the south-western edge of the tenement that will be used for temporary accommodation of the Marandoo construction workforce. When rehabilitated this land may be reincluded in the Park.

3.2 Previous Draft Management Plan

A draft management plan for the Park was released in May 1989[4] for the statutory period of public review. Following a submission to the Minister from Karijini Aboriginal Corporation (KAC), the Government decided that a new draft management plan would be prepared to take into account the interests and aspirations of Aboriginal people.

A planning team comprising equal representation from CALM and KAC began drafting the new plan early in 1991. Substantial sections of the May 1989 plan remain, although the format has been altered. New sections have been written to take account of the participation of Aboriginal traditional owners and the Karijini National Park Community Advisory Committee, and to reflect current Government policies.

All public submissions to the previous draft plan have been analysed and, where appropriate, they have been taken account of in the preparation of this plan.

[3] Under the CALM Act, land reserved as Section 5(g) is land other than national parks, conservation parks, nature reserves, marine reserves, State forest or timber reserves. The Section 5(g) land must be vested in either the NPNCA or the Lands and Forest Commission.

[4] *Hamersley Range National Park, Draft Management Plan.* May 1989.

PART A. BACKGROUND AND RESOURCES

A.1 PARK BOUNDARIES AND TENURE

A.1.1 Special Purpose Excision

An excision of approximately 360 ha from the north east corner of the park occurred in 1987 to enable the development of the Munjina roadhouse, caravan park and camping area. This enables visitors to avoid having to travel to Wittenoom for supplies and services and so avoid potential contact with asbestos.

A.1.2 Marandoo and Western Corridor

The Marandoo iron ore deposit is located on a reserve of 48 square kilometres held under a Government Agreement Act, within Karijini National Park. There are two components, a reserve and an infrastructure corridor. They were excised from the Park by Parliament in January 1991 to facilitate mining of the Marandoo deposit.

The western corridor has a width of 1000 metres of which less than 100 metres is held by Hamersley Iron under a title under the *Land Act 1933*. The remaining 900 metre width of corridor is a Section 5 (g) reserve under the CALM Act, vested with the NPNCA and managed through this Plan as part of the Karijini National Park. The 5 (g) reserve will allow for future additional infrastructure to parallel the Hamersley railway line, subject to the Environmental Protection Act approval process.

The western corridor is continuous with the northern part of the Marandoo tenement. It has been excised to enable transport of iron ore from the mine to Rosella Siding on the Dampier - Tom Price Railway.

A.1.3 Eastern Corridor

The eastern corridor runs from Marandoo to the eastern boundary of the Park, and abutting Juna Downs. This corridor was assessed by the EPA as part of the Environmental Review and Management Plan for Marandoo and the western corridor. Hamersley Iron commenced work on the proposed railway to the east during the construction phase of Marandoo. Its purpose is to link with future iron ore mines, to the east of Karijini National Park. These could include Hamersley Iron's Rhodes Ridge, Giles Mini and Yandicoogina deposits, Robe River's West Angelas deposit, and Hancock Resources' Hope Downs deposit. The corridor could also service any mines resulting from rationalisation of tenements, within the Park.

A.1.4 Previous Boundary Recommendations

The current Park boundaries are mostly governed by the location of pre-existing mining tenements and pastoral leases. The boundaries are difficult to determine on the ground and are largely inaccessible.

The EPA made the following recommendations with respect to Karijini National Park (Environmental Protection Authority 1975):

- add Hamersley Gorge to the Park.
- include Dales Gorge in the National Park and prevent mining from interfering with the scenic quality of the Gorge's geology.
- add those parts of Juna Downs which extend into the eastern boundary to the Park if released. An agreement was negotiated in 1984 between CALM and the lessees of Juna Downs for a land exchange along the Park's eastern boundary. This agreement means that the Park boundary conforms with existing fences and natural barriers to stock trespass. Although this agreement resulted in a net loss to the Park of about 900 ha, it improved the management boundaries.

In 1974 the Conservation Through Reserves Committee (CTRC) made two recommendations in addition to those listed above. These were that Mt Meharry be included in the Park, and that a portion of the Fortescue Plain be added at an opportune time. Mt Meharry (Reserve No 41864), O'Briens block (Reserve No 42165) and Hamersley Gorge (Reserve No. 30082) have since been included in the national park.

A.1.5 Future Boundaries

The current boundaries of the Park are determined by historic cadastral boundaries and recent alterations. These recent alterations have been for a variety of purposes (Introduction Section 1.2; Sections A.1, B.2).

Further alterations to the Park and its boundaries can be expected to occur. In part these alterations will result from the excision of any Park land for the purposes of iron ore mining and the additions of compensating land. They will also result from the inclusion of areas of land actively sought by Park managers which have cultural, landscape, or biological values.

It is proposed that areas of high conservation value be added to the Park to compensate for the excision of tenement areas with high mining potential. These compensatory additions will be sought by identifying realistic final external Park boundaries which achieve conservation and management objectives.

The additions would implement all outstanding EPA recommendations (Environmental Protection Authority 1975) for the Park. These recommendations relate to improved representation of mulga woodland, grasslands on cracking clay soils

and some vegetation components of the Ashburton Botanical District and the Fortescue Valley. Together the proposed additions will increase the size of the Park by about 35% and achieve sound and readily identifiable management boundaries (Environmental Protection Authority 1992).

Notwithstanding the above, it needs to be noted that the variation in vegetation through the Hamersley Ranges and the Fortescue Valley is poorly documented, and it may be desirable to modify some existing proposals for additions to the Park following more detailed biological survey.

Future boundaries need to be viewed in a dynamic context. The Karijini Park Council and the Karijini National Park Advisory Committee should be actively involved in the process of identifying areas for addition to the Park (Section B 5.3).

A.2 NATURAL RESOURCES

A.2.1 Climate

The Pilbara is located within the Australian arid zone which extends inland from the continent's western coastline. Karijini National Park experiences low rainfall which is both unreliable and seasonally distributed. Annual rainfall is in the range 200-350 mm and falls predominantly in summer (November - April). January and February are, on average, the wettest months of the year while September and October are the driest. Humidity is generally low with dry easterly winds predominating for most of the year. Pan evaporation exceeds mean monthly rainfall for each month of the year.

Temperatures are high in summer and moderate in winter. The diurnal range of temperature can be high. Meteorological records are kept at Park Headquarters and Marandoo. During 1975-83 the mean maximum temperature for January was 38˚C and the mean minimum temperature for July was 8.5˚C. Mean annual rainfall was 330 mm (Muir 1983). In mid-summer daily temperatures as high as 48˚C have been recorded. Frosts occasionally occur in winter.

The aridity of the western side of the continent stems largely from the fact that the air associated with high pressure systems has been cooled by cold offshore currents. As the air subsides over the land it becomes warmer and the relative humidity drops. In the summer months the high pressure belt moves southward and atmospheric conditions over the Pilbara become less stable, often bringing rain.

Local thunderstorm activity can occur between December and June and is generally related to the convergence of moist tropical air at mid latitudes. Rainfall in May and June is often caused by the interaction of tropical moist air with southern cold fronts.

Tropical cyclones can form in the Indian Ocean and Timor Sea, usually between December and March. Their occurrence and paths are unpredictable and they may not result in rainfall in particular parts of the Pilbara for many seasons. When they do occur, daily rainfall of 50 - 150 mm is common. Winds moderate as a cyclone moves inland.

A.2.2 Geology

A.2.2.1 Introduction

Rocks within the Karijini National Park are mainly Proterozoic (600 - 2500 million years in age) with lesser occurrences of Archaean (greater than 2500 million years in age) and Cainozoic (less than 65 million years in age) rocks. Groups of rocks were deposited on the older basement rocks in a water-covered shelf or basin known as the Hamersley Basin. These groups of rocks are the Fortescue, Hamersley and Turee Creek Groups and, collectively, they comprise the Mt Bruce Supergroup. Subsequent uplift and folding with associated erosion has formed the present Hamersley Range topography.

A.2.2.2 Basement rocks

The basement which underlies the Park is called the Pilbara granite and greenstone terrain and is composed of Archaean granites, granitic gneisses and greenstones. The basement is generally better exposed north of the Hamersley Range but an outcrop of the basement rock is exposed in the south eastern portion of the National Park in the centre of an anticlinal structure known as the Milli Milli Dome.

A.2.2.3 Fortescue Group

The Fortescue Group is the lowest (oldest) unit of the Mt Bruce Supergroup and rests unconformably upon the basement rocks. The group is subdivided into the Hardey Sandstone, Mt Jope Volcanics and Jeerinah Formation which comprise an interlayered sequence of sedimentary and basaltic rocks all of which have been intruded by doleritic sills and dykes. The Hardey Sandstone, which forms the basal unit of the Fortescue Group within the Park, is composed primarily of reddish brown and green arkosic sandstone with minor conglomerates. The overlying Mt Jope Volcanics consist of a variety of volcanic rock of basaltic composition which include pillow lavas (laid under water), pyroclastics (compacted volcanic ash) and volcanically derived water-lain sediments. The Jeerinah Formation, which forms the uppermost unit of the Fortescue Group, is characterised by shale, chert, dolomite and quartzite with intruded dolerite sills. The Hardey Sandstone, Mt Jope Volcanics and Jeerinah Formation of the Fortescue Group outcrop on the flanks of the Milli Milli Dome.

A.2.2.4 Hamersley Group

The Hamersley Group is a thick sequence (approximately 2400 m) of sedimentary rocks interbedded with minor felsic volcanic rocks (the Woongarra Volcanics) and intruded by dolerite dykes and sills. The Marra Mamba Iron Formation forms the basal unit of the Hamersley Group and is overlain, in order, by the Wittenoom Dolomite, Mt

Sylvia Formation, Mt McRae Shale, Brockman Iron Formation, Weeli Wolli Formation, Woongarra Volcanics and Boolgeeda Iron Formation. The principal sedimentary rock types making up these units are banded iron-formation (BIF), dolomite, siltstone and shale. Some BIFs are composed of layers of iron oxides alternating with fine grained quartz (chert), while others are dominantly layers of different iron-magnesium silicates.

Much of the distinctive character of the Karijini National Park is due to extensive outcrops of the Brockman iron formation. This thick resistant unit of BIF, shale and chert forms most of the higher country within the Park, underlying much of the Hamersley Plateau, capping the more prominent peaks and standing out as characteristic terraced cliffs where undercut by erosion.

A.2.2.5 Turee Creek Group

The Turee Creek Group is a sedimentary sequence which consists of interbedded mudstone, siltstone, sandstone, conglomerate and carbonate. This group is only exposed in the southwestern corner of the Park, in the flanks of the Turee Creek Syncline.

A.2.2.6 Cainozoic Deposit

The Cainozoic deposits in the Park consist mainly of colluvial and alluvial valley fill dating back to the Eocene (38 million years in age). Isolated occurrences of the Robe Pisolite are present in the Park and appear as limonite gravel with silicified wood fragments cemented with iron minerals. Ferricrete also occurs in isolated patches and appears as a cemented iron-rich hematite gravel or duricrust over the Brockman iron formation.

The rocks found in the Park and their relationships are illustrated in Map 4.

A.2.2.7 Mineralisation

Mineralisation within the Park includes iron ore and small deposits of gold, copper, lead, blue tiger eye and blue asbestos (crocidolite).

Within the Hamersley region most of the large iron ore deposits occur in the Brockman and Marra Mamba Iron Formations which are composed of banded iron formation (BIF). Fresh BIF contains bands of magnetite and gangue minerals (chert, carbonates and silicates). Commercial deposits in these formations are formed by supergene enrichment of the BIF. In this process gangue minerals in BIF are replaced by Goethite (hydrated iron oxide), and dissolved out and the magnetite is oxidised to hematite. The resultant hematite-goethite ores, which may alter locally to purer hematite, provide the rich sources of iron sought by miners. Average ore grades in operating mines are usually over 60% iron. The Marra Mamba iron deposit at Marandoo is a good example of a hematite-goethite ore body.

Deposits of crocidolite (blue asbestos) have been found at several places in the Hamersley Range and are to be seen exposed in the walls of gorges as horizontal seams. This resource has been exploited at Wittenoom, Yampire and Dales Gorges. Local production ceased in 1966. Mining was mainly conducted underground but the tailings, dumped along the cliff faces, are still evident.

Alluvial gold deposits are known to occur in the upper Turee Creek area. Gold was discovered in the area within the Milli Milli Dome in the 1890s but the field was abandoned in 1896 as a consequence of drought. The original Turee Creek diggings were rediscovered as recently as 1980 and were popular with fossickers.

The Park's geology is of interest because of the interaction between the rock types and erosion which have exposed the underlying rock and produced peaks and valleys, ridges and escarpments on the surface. Most of the exposed rock units are of great age (2500 million years old) and are underlain by older Archaean basement rocks of the Pilbara Craton which are predominantly granitic. These basement rocks outcrop in the southern half of the Park.

A.2.3 Soils and Landform

Karijini National Park falls within the Pilbara soil - landscape province of the Western Region II (Bettenay 1983) and the Hamersley Soil Region (Payne *et al* 1982). In general, the Pilbara has a soil and drainage pattern which is largely controlled by the basement geology. Soils have been formed *in situ* by weathering of surface formations and by concentration of weathered products in lower parts of the landscape. The soil colour is generally linked to that of the parent rock.

The Hamersley Range has extensive upland areas of red lithosols (weathered rock fragments) which are ferruginous, being derived from the Brockman iron formation. A minority of calcareous soils tend to be caramel coloured. In the beds of watercourses, soils consist mainly of sand and gravel with a low silt content. However, broad drainage flows are characterised by clays which tend to be more fertile than other Park soils.

The soils on the Park's hills, ridges, and plateaus are predominantly stony and skeletal loams. They are of low fertility, generally slightly acidic and occasionally saline. On the basalts of the Fortescue Group, infertile self-mulching clays have developed over small areas of the uplands. These clays are usually alkaline and are over 1m in depth with a dense surface mantle of basalt pebbles. The Park has extensive areas of hills and steep slopes with no significant soil development.

On gently sloping footslopes and pediments, shallow stony loams and clays have developed. These soils are seasonally hard-setting. They originated from Tertiary colluvial deposits which have been subjected to weathering by rejuvenated drainage. In the central region of the Park, within the high level valley plains, characteristic soils are earthy clays. Here the silt component is higher than on the slopes and there

has been more pronounced sorting of components. Extensive areas of brown clay to depths greater than 1.5m support mainly mulga woodlands. An example of this soil type can be seen immediately to the east of Mt Bruce. This area supports an open stand of *Eucalyptus coolibah* interspersed with mulga.

Alluvial soils are not well represented in the Park although they do occur in lower parts of the landscape. They are normally clay and loams which are deeper and more fertile than the upland soils, exhibiting higher nutrient levels. The clays may support tussock grasslands (*Astrebla, Aristida* or *Chrysopogon*) and the loamy soils support relatively dense stands of mulga.

Many of the soils in the Park are considered to be highly erodible. This particularly applies to alluvial clay soils which are very susceptible to erosion in the form of sheeting, rilling and gullying. These more fertile soils have also been exposed to the greatest grazing pressure under pastoral management. Other soil types are protected by a mantle of stones which if removed, can expose the soil to erosion.

In common with other arid environments, soil development in the Pilbara is generally poor. The inherently fragile soil/vegetation system is susceptible to disturbance.

A.2.4 Hydrology

A.2.4.1 Surface Water

A feature of catchments in the Pilbara is their variable rate of surface discharge. Significant stream flow is generated for short periods after intense rainfall. Overall stream flow in the Park is low and highly variable. The largest volume tends to occur between December and March after cyclonic rainfall.

Essentially, all surface water north of the central divide drains into the Fortescue River (Map 5). The old plateau surface is being incised by streams which are cutting down to new base levels and in the process creating deep gorges. These gorges often begin abruptly, for example, Joffre and Kalamina Gorges, Circular Pool and Fortescue Falls within the Dales Gorge have perennial flows of water. Other streams are not perennial, but most have permanent pools supplemented by groundwater seepages. The water in these pools remains at low temperatures. Most of the numerous parallel streams, that flow from the northern scarp after rain, lose themselves in the alluvial soils of the Fortescue Plain before reaching the river as surface drainage.

Areas of the Park to the south of the central divide drain into the Ashburton River via Turee Creek. A number of permanent pools associated with springs occur on the upper reaches of Turee Creek. Milli Milli Spring, Minthicoondunna Spring and Coppin Pool are all accessible to four wheel drive vehicles. The drainage lines in the southern catchment tend to be dendritic. This area slopes gently southward without a prominent escarpment.

A.2.4.2 Groundwater

Groundwater occurs in the valley-fill sediments and fractured bedrock of the Hamersley Range. The main aquifers are alluvial gravels, calcrete and pisolite, fissured Wittenoom dolomite, and fractured iron formation and sandstone.

Groundwater quality in the Hamersley Range is generally good and most groundwater is likely to be potable although brackish water may occur in shales or in low lying areas. Groundwater in calcretes may be hard. Groundwater yields are likely to be poor in areas underlain by shales or volcanic rocks.

Although the groundwater resources of the Park remain largely unproven, the largest inferred reserves are in the valley systems developed over Wittenoom dolomite, including the area surrounding Marandoo. Groundwater here occurs both in the overlying calcrete and pisolite, and in the fissured dolomite. The upper catchment of the Fortescue River (southern branch) is within a major upland valley which traverses the Park between Mt Windell and north of Mt Bruce. The Mt Bruce flat drains into the Turee Creek catchment (Map 5). Water tables are generally deep, up to 40 m deep in the Marandoo-South Fortescue area. A portion of the water for Tom Price comes from the South Fortescue borefield which is recharged from the catchment of the Fortescue River (south branch).

Five sinkholes have been noted in the Tom Price borefields. At other places deep and dangerous cracks have formed where the surface is subsiding. Currently water is being pumped from a limited number of bores so that the land in each of these areas is being placed under some stress.

Karijini National Park is within the proclaimed Pilbara Groundwater Area in which all groundwater bores (except for pastoral use) must be licensed. Substantial dewatering will be required for mining the part of the Marandoo ore body which lies below the water table (any such mining will be subject to further environmental reviews).

Any future proposals to exploit groundwater resources existing at such locations as the Turee Creek syncline should only be entered into after an environmental impact study is undertaken with respect to the possible effects on the area's natural and cultural values.

A.2.5 Landscape

Karijini National Park incorporates a large section of the Hamersley Plateau, the most extensive elevated area of land in Western Australia. It can be broadly classified as being within the Hamersley Plateau geomorphic province (Payne *et al* 1982). A prominent scarp runs along the northern edge of the Plateau which is indented by long spurs rising from the Fortescue River Plain. The existing drainage patterns represent antecedent channels which have

been superimposed into the underlying bedrock through tectonic uplift. This has created a highly dissected landscape with deep incised gorges such as Wittenoom, Yampire and Dales Gorges. The gorges of the plateau margin often follow fault lines (Texasgulf 1979).

Many creeks have exploited joints and other fractures cutting across the rocks. These water courses are characteristically straight and often parallel to neighbouring valleys. Angular creek junctions occur in areas where two or more directions of jointing are present. Soft, easily eroded shale and dolomite, occurring beneath the main iron formation layers, has enabled the creeks to cut back rapidly into the Range. Spectacular gorges and waterfalls are the result. Plunge pools occur at the foot of many of the falls, such as Circular Pool and Joffre Falls.

The slope and step appearance of many valley sides results from the alternation of weak and resistant rock types. Shale and dolomite generally form the gentler slopes, while iron formation outcrops are marked by notches and steep cliffs (Thorne 1991).

Most of the prominent topographical features of the Hamersley Range are capped with highly resistant banded iron formations of the Hamersley Group. The landforms of the plateau generally are a result of preferential weathering of the various sedimentary components.

The Hamersley Plateau is traversed by a series of hills running along a northwest-southeast axis. The hills are generally above 1 000 m in altitude while elevated plains are 700-800 m and the valley floors are in the range of 550-650 m above sea level (Map 5). Turee Creek, in the southern section of the Park, is the lowest point at 500 m. The northern section of the Park is dominated by Mt Vigors (1 145 m) while Mt Bruce, further south near Marandoo, is the second highest peak in Western Australia at 1 235 m. The highest point in the State is Mt Meharry (1 245 m) which lies in the eastern part of the Park.

The central divide of the Hamersley Range is the watershed between the South Fortescue River which drains to the north, and Turee Creek which drains south into the Ashburton River. An escarpment on the southern side of the Range is not as prominent as the northern scarp. The southern escarpment is associated with the Turee Creek syncline.

Exploration and mining activities and their associated infrastructure, including the Marandoo lease and possible future mine sites and corridors, have the potential to significantly alter the character and appearance of the landscape, particularly in natural areas where there has previously been only minimal human activity or disturbance. Sensitive landscape planning and management can minimise the loss of scenic quality associated with environmental change that is most apparent to the public and which results in criticism of land use activities.

Landscape or visual resource planning and management, is concerned with the conservation and management of land, vegetation and water resources in ways that maintain, enhance or restore the health and appearance of the environment. The prime goal of landscape planning and management in natural environments is to ensure that all uses and activities are planned and implemented so as to complement rather than detract from the inherent visual qualities of the environments in which they occur. Landscape planning is an integral component in natural resource planning and land use management processes. (CALM Policy Statement No 34).

A.2.6 Flora and Vegetation

Karijini National Park falls mainly within the Fortescue Botanical District of the Eremaean Botanical Province (Beard 1975). The Ashburton Botanical District is marginally represented in the southernmost fringe of the Park (Mattiske and Associates 1986). An estimated 1 500 to 2 300 flowering plant species are found within the Fortescue Botanical District (Trudgen and Casson 1998), of which 481 are known to occur within Karijini National Park. It is estimated that within the Park there are between 750 to 800 species (Trudgen and Casson 1998). No survey of the flora or vegetation of the Park has been published although the *Acacia* species of the Hamersley Range area have been studied (Maslin 1982), as has the flora and vegetation of the Marandoo mining area (Texasgulf 1979, Mattiske and Associates 1991) and the route of Karijini Drive (van Leeuwen and Bromilow, unpublished data). Mattiske and Associates also defined and mapped vegetation in the Mt Channar area immediately to the south of the Park (1986). Land Systems mapping has been conducted for the whole of the Park, initially as part of the Ashburton River Catchment Rangeland Survey (Payne et al. 1988) and more recently as part of the Pilbara Ranges, Fortescue River Catchment Rangeland Survey (A.A. Mitchell, Agriculture WA) [5].

A survey of rare and geographically restricted plants of the Fortescue Botanical District (van Leeuwen, 1984) documented 65 species that are restricted to the District. Of these, 28 occurred within conservation reserves and 10 have been recorded in the Park. Localities within the Park that contain a high proportion of restricted species are the Mt Bruce area and the gorges of the northern escarpment. Currently there are 39 taxa on CALM's Declared Rare and Priority Flora list which occur in the Park. Most of the taxa are distributed in the northern portion of the Park, although several are found in the vicinity of Mt Meharry.

[5] Karijini National Park is within the Pilbara biogeographic region as defined by the Interim Biogeographic Regionalisation for Australia (IBRA) (Thackway and Cresswell 1995). However, given that the flora surveys referred to were conducted under the previous referencing system, the pre-IBRA nomenclature has been used for vegetation mapping in this management plan.

The flora of the Park is in a transitional zone between the floras of the southern Torresian and the central Eyrean bioclimatic regions. The Torresian elements tend to be contained within drainage lines and protected gorges. 70% of *Acacia* species in the Fortescue Botanical District are shared with the South Kimberley area and 72% are shared with the Central Eremaean Area. Three major southern acacias (*Acacia xiphophylla, A. aneura* and *A. dictyophleba*) are at the northern margins of their range in the Pilbara and do not occur in the Kimberley. Genera such as *Clerodendrum* and *Brachychiton* are relatively common in the Kimberley but are found in the Fortescue only in fire-protected areas such as rocky gullies.

Within the Pilbara there is a marked transition between mulga dominated communities to the south of latitude 23˚S and *Triodia/Eucalyptus* dominated communities to the north. This *Acacia-Triodia* line is a major phytogeographic boundary thought to be related to temperature (Beard 1975) or to winter rainfall (A.N. Start, pers comm 1992), rather than to any changes of substratum. The Park is in the *Acacia-Triodia* transition zone. In this zone the southern acacias continue to occupy sites favourable to them.

Of flora known to occur in the Park, *Thryptomene wittweri* is the only species declared to be rare under Section 23F(2) of the Wildlife Conservation Act 1950. Another declared rare species, *Lepidium catapycnon*, occurs north and east of the Park in the vicinity of Wittenoom Gorge, The Governor and Newman. Numerous species on the Priority Flora list occur in the Park, including: *Acacia daweana; A. effusa; Olearia fluvialis; Brachychiton acuminatus*; and, *Eucalyptus pilbarensis, Daviesia eremaea* and *Barbula ehrenbergii*.. Several others including *Ptilotus mollis* and *Thryptomene* sp. Mt. Channar have been recorded in close proximity and may occur in the Park. *Olearia mucronata* is located in Hamersley Gorge. More intensive surveys may reveal other species that warrant addition to the Priority Flora list.

In terms of species richness, the gorges and low lying areas of the Park display greater species diversity than the uplands of the Plateau. Similarly, the shrublands are more diverse than the hummock grasslands. *Eucalyptus leucophloia* (snappy gum) and *E. gamophylla* are the dominant tree species of the uplands while the valley plains support shrublands of *A. aneura* (mulga) in association with *A. pruinocarpa* (gidgee), *Senna* and *Eremophila* spp. On the better soil types the ground cover is predominantly comprised of ephemeral species which are replaced by *Triodia pungens* and *Plectrachne* spp. on the lower slopes, and by *T. wiseana*, which becomes dominant on the hills and ridges. Vegetation zones of the Park are shown in Map 7.

A.2.6.1 Major Vegetation Communities

Hills, Ridges and Plateaus

A tree steppe of scattered *E. leucophloia* over *T. wiseana* is characteristic of the banded iron formation and dolomite hills and ridges. On some of the higher peaks, mallee eucalypts (for example, *E. kingsmillii*) replace snappy gum as the dominant species. *Callitris glaucophylla* occurs on hillsides protected from fire. The upland areas of the Fortescue Group (southwest region of the Park) are typically shrub steppe (*A. aneura* sometimes associated with either *T. pungens* or *T. basedowii*) or grass steppe (*T. wiseana*).

Gullies and Gorges

In sheltered gorges, elements of the Kimberley flora such as *Melaleuca argentea, Ficus virens*, and *Brachychiton acuminatus*. can be found. The floors of some gorges contain permanent water sources and support a riverine woodland of *E. camaldulensis, E. victrix, Corymbia* spp. *E. microtheca, A. pruinocarpa,* and *M. argentea*. The cliff faces of the gorges have been colonised by specialised plants. *Astrotricha hamptonii* (iron ore plant) is an unusual shrub that is endemic to the Pilbara. Other unusual species in the gorges include the fern species *Adiantum capillus-veneris* and *Pteris vittata*.[6]

Lower Slopes and Valley Plains

On the lower slopes, and on some valley plains, the tree steppe changes with the addition of *Corymbia hamersleyana* and *C. deserticola* , and *T. pungens* and *T. melvillei to* the spinifex layer. The valley plains are generally characterised by a low woodland (or shrubland) of mulga associated with *A. pruinocarpa*. Treeless open spaces are frequent. *Eremophila* and *Senna* spp. form a sparse shrub layer. The ground cover consists mainly of *Triodia* spp. and ephemerals such as *Ptilotus* spp.

A.2.6.2 The Acacia Flora

The acacia flora (with more than 53 species recorded to date) comprises mainly a mixture of wide-ranging arid zone and sub-tropical elements (Maslin 1982). Only four species are endemic to the Hamersley Range: *A. daweana, A. effusa,* and *A. exilis*. With the exception of *A. daweana* the other two endemic species have close relatives in the area. It has been postulated that areas peripheral to the central arid zone were climatically unpredictable during the Quaternary. The resultant stresses were probably ideal conditions for speciation. The endemic acacia species of the Hamersleys are, therefore, likely to have evolved recently.

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6 *Adiantum capillus - veneris* is also found in the NT, SA and Queensland but in WA is found only in the gorges of the Hamersley Range. *Pteris vittata* is also found in Queensland and Victoria but in WA is only found in the Hamersley Gorges (Stephen van Leeuwen, pers comm 1992).

A.2.6.3 Role of Fire

Fire is a major factor in determining species distribution. Fire sensitive species are often restricted to specialised habitats. The floors of deep gorges, steep rocky hillsides, and scree slopes are habitats that offer almost complete protection from fire for species such as cypress pine (*Callitris glaucophylla*). Mulga is also a fire sensitive community which will not tolerate burning at frequent intervals. The hummock grasslands are well adapted to fire and can burn regularly. Evidence shows that since European settlement the frequency of burning in the Central Australia hummock grasslands has been reduced but that fires, when they occur, have been more extensive than was previously the case (Bolton & Latz 1978). These intense fires have carried into the mulga woodlands with the result that they are now less extensive relative to the hummock grasslands. Extensive summer wildfires (such as occurred in December 1986 and 1997) have caused mulga woodlands to contract in favour of hummock grasslands. Winter burning, if followed by rain, may favour shrubs (*Senna, Indigofera*) relative to grasses (Suijdendorp 1980).

A.2.6.4 Exotic Plants

Karijini National Park is relatively free from serious infestations of exotic plants. However, a few introductions have become well established in specific niches. Most weeds in the Park are associated with areas of soil disturbance (watercourses or road verges) or areas of favourable moisture status. Feral stock are frequently agents of disturbance and vectors of weed seeds. Park visitors are a less significant agent of weed infection. *Alternanthera pungens* (khakee weed) has been found on several occasions in camping areas, presumably introduced on the clothing or equipment of campers.

The following weeds represent major threats to natural values of the Park:

Cenchrus ciliaris (buffel grass) - present throughout the Park in most larger drainage lines. *C. ciliaris* provides good fodder but is an aggressive competitor with native annual grasses, and herbs and shrubs.

C. echinatus (Galland's curse) - a common weed in the Kimberley that makes camping uncomfortable. Spread by tourists, the weed is present at Millstream and has resulted in closure and quarantine of part of the Crossing Pool camp ground. Within the Park it is present in amenity areas around the staff accommodation at headquarters.

Bidens bipinnata - a taxon which is believed to have become naturalised since European settlement. It is spread by cattle, sheep and other feral stock, is common on alluvial flats and in mulga areas, and is an aggressive competitor against native daisies and everlastings. *B. bipinnata* is common on the Mt Bruce flats.

Acetosa vesicaria (ruby dock) - an invasive weed found throughout arid Australia which grows on disturbed sites, for example roads, gravel pits and railway lines as well as creek lines. It tends to become dominant, out-competing native species. It is widely spread within the Park. It is particularly bad near Yampire Gorge, at Marandoo, and is also on the Mt Bruce flats, at Milli Milli and, Minthicoondunna Springs, and near the junction of the Karijini and Banjima Drives.

Aerva javanica (kapok bush) - a colonising shrubby perennial that was allegedly introduced into the northwest in saddle bags of Afghan camel trains. Present within the Park at Coppin Pool, Minthicoondunna Spring, Milli Milli Spring and other areas subject to soil degradation through the impacts of grazing by feral stock. The weed is also present within the Marandoo lease area. Although not numerically abundant at present it has the potential to increase dramatically, as it is a prolific seed producer with the capacity to establish a considerable soil stored seed bank.

Species recorded for the Park and declared under the *Agriculture and Related Resources Protection Act 1976* (ARRP Act) include *Argemone mexicana* (Mexican poppy) and *Datura* sp. (thorn apple). The Mexican poppy, in particular, is known to be a very difficult species to eradicate because of the long dormancy period of its seeds. However, in Karijini National Park it usually occurs on gravel banks and creek lines where it does not compete with native species.

Declared species not yet recorded in the Park, but which represent potential threats, are *Xanthium occidentale* (Noogoora burr), *Carthamus lanatus* (saffron thistle) and *Salvinia molesta*.

Typha sp. (bulrushes) exist in waterholes throughout the Park. The Typha may be the native *T. domingensis* or the introduced *T. orientalis*. Where *T. orientalis* occurs, it may become a problem if the plants continue growing into the pools. At Fortescue Falls, for example, typha is well established at the edges of, and extends into, the pool at the base of the Falls. It is not known if this represents the indigenous or exotic species. Clumps of typha are also present downstream in Dales Gorge, and at Milli Milli Spring and other permanent pools on the Turee Creek system.

The Date Palm (*Phoenix dactylifera*) is a woody plant that has been recorded adjacent to several permanent and semi-permanent pools and springs on the Turee Creek system in the southern part of the Park. They pose a threat to areas of reliable water supply and are thought to have been introduced by early cameleers.

A.2.7 Fauna

A.2.7.1 Vertebrate Fauna

At least 30 species of native mammal, 133 species of bird, 90 species of reptile and amphibian, and eight

species of fish are found in the Park. In addition, seven species of feral mammal occur in the Park. The herpetofauna (frogs, lizards and snakes) is particularly rich. Surveys of the fauna of the Hamersley Ranges are documented in (Butler 1976 in Texasgulf 1979), Muir (1983), and Ninox Wildlife Consulting (1985, 1991). Studies in the region (particularly of mammals) date back to the 1920s.

The principal habitats within the Park are the hummock grasslands, mulga low-woodlands, and the fringing vegetation of pools and streams. Many birds utilise the creekside and gorge vegetation. It is the complexity and productivity of the vegetation that accounts for species diversity in these areas; access to water itself is not a major factor. The additional species of these habitats are often insectivores. Such pools are important to some of the birds of harsh, dry habitats, for example Spinifex Pigeon, Zebra Finch and the Painted Finch. They are not creekline birds, but they fly in for daily drinks. Sedges and bulrushes often dominate the pool edges providing a habitat for the Clamorous Reed-warbler (*Acrocephalus stentoreus*) and for several species of frog. The steep sided gorges are generally unsuitable for waterbirds.

Most, if not all, of the species of bat present within the Park have been captured over streams and pools of the gorges and major creeks. Some species prefer the denser vegetation of the creeklines to forage in, and probably roost in creekline trees. Others forage the wide open spaces and roost in hollow trees or rock caverns (or crevices), often high on ridges or well away from pools and streams. The greatest diversity of fish species is to be found in the pools and springs associated with the major creek systems, which provide a greater variation of habitats than do the isolated pools of the northern gorges. The Flat-shelled Tortoise (*Chelodina steindachneri*) has been recorded from the gorges, Milli Milli Spring, Minthicoondunna Spring and near the Park's headquarters.

The hummock grasslands are the preferred habitats for many species of ground-living mammal and for a large proportion of the reptiles of the Park. The Pilbara Ningaui (*Ningaui timealeyi*) and the Little Red Antechinus (*Dasykaluta rosamondae*) are two examples of small mammals commonly found in hummock grassland habitats. Both are endemic to the Pilbara. Dragon-lizards are the most commonly seen lizards in the Park (Johnstone 1983). The spinifex hummocks provide shelter for these species from the extremes of climate from predators.

Mulga shrublands and woodlands are the preferred habitat of a number of species which tend to be at the northern margins of their distributions within the Hamersleys. Examples include the Bourke Parrot (*Neophema bourkii*), Desert Flyeater (*Gerygone fusca mungi*), and the Broad-tailed Thornbill (*Acanthiza apicalis*). Some species are not known to occur on the Hamersley Plateau but are represented on the alluvial systems of either the Fortescue River (north of Park) or the Ashburton drainage (south of Park). Among the small mammals the Ooldea Dunnart (*Sminthopsis ooldea*) has been recorded in mulga woodland south of the Park boundary. Similarly, a number of reptiles from the Ashburton drainage system do not extend into the Park. The Long-tailed Dunnart has been presumed to be rare in the Park, but suitable habitat - rocky hills, breakaways and screes - is widespread.

A.2.7.2 Threatened and Otherwise Specially Protected Fauna

Of the vertebrate fauna known to occur in Karijini National Park, one species has been declared fauna that is rare or likely to become extinct (threatened) and another single species has been declared to be otherwise Specially Protected:

- Peregrine Falcon *Falco peregrinus* (Specially Protected)
- Pilbara Olive Python *Morelia olivacea barroni* (Threatened)

The Peregrine Falcon (*Falco peregrinus*) is distributed throughout Australia but is not common anywhere. It is an infrequent visitor to the Pilbara, mostly between March and August. Within the Hamersley Range, birds have been seen perched on the steep cliff faces of gorges.

The only reptile known to occur in the Park which is considered to be threatened is the Pilbara Olive Python (*Morelia olivacea barroni*). This snake normally lives near permanent or semi-permanent water. Individuals have been recorded from Wittenoom, Marandoo and Dales Gorge.

A.2.7.3 Fauna Skeletons

The skeletal remains of four smaller mammals have been identified from the Marandoo area (Texasgulf 1979). The Desert Mouse (*Pseudomys desertor*) has a limited distribution in Central Australia, extending across the Tanami Track into the southeast Kimberley. The Western Chestnut Mouse (*P. nanus*) is abundant in the Kimberley and on Barrow Island, however, its remains indicate that its former distribution encompassed the Marandoo area and perhaps the Hamersley Plateau as a whole. Similarly the Pale Field Rat (*Rattus tunneyi*) was once widespread in arid areas but is now found only along the northern coast. The remains of a Long-tailed Hopping Mouse (*Notomys longicaudata*) (now Presumed Extinct) from Marandoo could be the only record of this species from the Pilbara.

A.2.7.4 Critical Weight Range Mammals

The decline in population and contraction in range of some mammal species is most apparent in those of intermediate size (35g-5.5kg adult body weight, known as the critical weight range) which are herbivores or omnivores. The environment of arid Australia is challenging for these animals to inhabit due to its infertile soils, and consequent restriction of digestible production to small fertile areas. This

challenge is exacerbated by uncertain climate with droughts of irregular and unpredictable length. The consequent temporal restriction of these animals to scattered pockets of suitable habitat during drought exposed them to higher probabilities of local extinction. Pastoralism, which massively changed habitat suitability particularly in more fertile areas; changed fire regimes from a frequent and spatially diverse regime under aboriginal occupation to an infrequent and extensive regime under European occupation; habitat changes as a result of other feral herbivores and predation by foxes and feral cats are factors thought to have contributed to the demise of these animals by affecting the size, spatial frequency, energy and nutrient cycling between and within these refugial habitats and the habitats that were interspersed between them. The impacts of these threatening processes on the refugial pockets and the intervening landscape served to lessen their effectiveness as refugia and decrease the probability of recolonisation by migration between packets. Over the relatively short period of European settlement this has contributed to a marked simplification of the mammal fauna. Foxes are rare vagrants in the National Park, but cats may be contributing to the decline.

The Spectacled Hare Wallaby (*Lagorchestes conspicillatus*) is an example of a mammal whose population has declined dramatically in the Pilbara. No records exist of it in the Park. Rothschild's Rock Wallaby (*Petrogale rothschildii*), a species restricted to the Pilbara and eastern Gascoyne, is now only present in the Park at very low densities. The abundance of shelter for this species, and the widespread presence of their food source (*Triodia pungens*), suggests that some other factors are suboptimal. Fox predation is considered to be a serious threat to these two species elsewhere.

The Bilby (*Macrotis lagotis*) and the Northern Brushtail Possum (*Trichosurus arnhemensis*) are examples of marsupials that may well have been present in the Park but are now thought to be absent. It is possible that populations might be found given more intensive searching, particularly in southern areas of the Park. Burrows possibly dug by the Bilby have been recorded south-east of Minthicoondunna Spring (Ninox Wildlife Consulting 1991).

It is of interest to note that native birds have fared reasonably well with none being certainly extinct while reptiles have suffered no extinctions and no apparent reduction in range.

A.2.7.5 Invertebrate Fauna

Knowledge of the invertebrate fauna of the Pilbara is restricted to a few surveys conducted in the vicinity of the Park. In particular, ants (Formicinae) have been studied as ecological indicators of stability on rehabilitated iron ore mine sites and hence the majority of information available refers to this one taxon (National Parks Authority 1983). However, some study has been carried out on termites (Isoptera) and springtails (Collembola) in the West Angelas area to the south east of the Park.

The ant fauna of the Park is characteristic of arid southern Australia although a few tropical species are also present. A cumulative species count of 73, from 23 genera and six families, was the result of surveys in the Park and the adjacent West Angelas area (Majer 1983). Individual species of ant are important seed harvesters, pollinators, scavengers and predators.

Termites influence the production, flow and storage of energy and nutrients in arid systems. *Mastotermes darwiniensis* (a serious pest of northern Australia because it destroys live wood) is at the southern limit of its distribution in the Pilbara. It has been recorded at Figtree Soak in Yampire Gorge. Other species feed on dead wood, grass and on acacia litter.

Springtails tend to be less abundant in the soil and litter of arid areas although they can play an important role in regulating the rate of decomposition of litter through a catalytic effect on microbial activity. The effect of environmental disturbances on these taxa has not been thoroughly investigated.

Karijini National Park maintains numerous relictual populations of the south western land snail genus *Bothriembryon*. These snails, from an unknown number of undescribed species, are known from gorge and mulga environments throughout the Park.

A survey of aquatic invertebrates in the Pilbara (Ponder 1987) did not reveal any endemic macro-invertebrates within the Park. The sites sampled were Circular Pool and Fortescue Falls. However, *Nosoticta liveringa*, a small damselfly, occurs on permanent pools in several gorges. It is a relictual species in the Pilbara (not known from any other location) but common in parts of the Kimberley .

Pin Cushion Millipedes (*Unixenus myobergi*) can aggregate in plague proportions upon rocks rendering them slippery under foot. They may also cause standing pools of water to become polluted. March flies occur in late summer and can be a source of great annoyance to visitors.

In the Pilbara, following heavy summer rain, the mosquito *Culex annulirostris* is the vector of viruses that cause Australian encephalitis. The last major outbreak of the disease was in 1981.

A.2.7.6 Dingos

Purebred dingos (*Canis familiaris dingo*) occur throughout Karijini National Park. The dingo, although a declared animal under the Agriculture and Related Resources Protection Act 1976 has been afforded protection on CALM managed lands. The Park is one of the few areas of Western Australia where it is feasible to protect dingos. Considerable research has been conducted into their behaviour in the Pilbara region. The average diameter of a dingo's range in the lower Fortescue area has been determined as 10-15 km although individual dogs may disperse

away from their home territory (Thomson 1994). Watercourses are the preferred routes to and from the Park.

Dingos are regarded as native animals, though evidence shows they were introduced 4 000 - 5 000 years ago. There is some evidence that eradicating dingos results in increases in fox and cat populations to the detriment of native fauna populations.

Dingos are readily controlled by baiting with 1080 meat baits. Agriculture WA has perfected methods of control based on intensive research carried out in the Pilbara (Thomson 1994). The risk to non-target species has been carefully assessed in the laboratory and by field trials designed to measure the impact of actual dingo control operations.

The species which was thought to be most at risk was the carnivorous Northern Quoll (*Dasyurus hallucatus*). Prior to the distribution of 1080 meat baits, quolls were captured and fitted with radios; their movements were tracked and then the area was baited for dingos. Follow-up tracking studies revealed there were no quoll fatalities (King 1989).

The risk to smaller carnivorous marsupials can be eliminated by the use of dried meat bait injected with 1080. When meat is dried it acquires a biltong-like consistency and becomes too tough and stringy for the smaller carnivores to chew. Birds are likewise affected. Reptiles are naturally tolerant to 1080 because of their low energy requirements (J Kinnear, pers comm 1992).

A.2.7.7 Exotic Animals

Eight exotic vertebrates occur in the Park:

- Cat *Felis catus*
- European Fox *Vulpes vulpes*
- House Mouse *Mus musculus*
- Horse *Equus caballus*
- Donkey *Equus asinus*
- Dog *Canis familiaris*
- Cattle *Bos taurus*
- Camel *Camelus dromedarius*

All are fairly common, with the exception of the fox and camel. Cattle, horses and donkeys have the greatest impact on the Park's environment, but strategic fencing has limited the impact in some areas. The impact of donkeys is especially obvious around Milli Milli.

Rabbits (*Oryctolagus cuniculus*) are not present but given good rainfall conditions may be capable of extending their range into the Park. They have been recorded at West Angelas, just southeast of the Park (A.N. Start *pers comm.* 1998). Domestic dogs (*Canis familiaris*) or dogs that are crossbred with dingos may occasionally occur in the Park. A recent sighting of a camel (*Camelus dromedarius*) confirms an earlier single recording (S van Leeuwen, pers comm 1992). The house mouse appears to have a similar habitat to that of the Sandy Inland Mouse (*Pseudomys hermannsburgensis*). The extent of competition between the two species has not been researched. The introduced honey bee (*Apis mellifera*) occurs in the Park, with populations concentrated

near sources of permanent water. The ecological significance of feral honey bees is still undetermined, although recent research suggests that feral bees may displace competing native insects.

The presence of domestic pets, particularly dogs and cats, in national parks is a controversial issue. Domestic pets can interfere with native wildlife and, as a result, impede wildlife viewing by visitors; they can also be a general nuisance to visitors and, in particular, foul camping and other visitor areas. In some circumstances they may escape and become feral. Because of these problems, CALM does not generally allow unrestricted entry of domestic pets into conservation reserves. Departmental policy does allow for Park residents to keep domestic pets if they are confined to residential areas. However, due to the difficulties in controlling feral cats, and since both domestic and feral cats are well known for their destructive predation on native fauna, cats will be prohibited from the Park including residential areas. Staff living within the Park will not be permitted to keep cats as pets (Section B 7.4).

A.2.8 Fire

Fire history records have been kept for Karijini National Park since 1976. CALM research staff are involved in a major study on fire ecology, particularly in relation to mulga woodlands. Records indicate that lightning was responsible for over 90% of the area burnt in the past 10 years. Fires ignited by lightning in recent years have tended to be extensive due to the uniform fuel loads. This is in contrast to the previous regime of frequent smaller fires resulting from Aboriginal burning, which resulted in a mosaic of spinifex at differing stages of succession. The knowledge of traditional owners will be important in determining appropriate fire management regimes. In December 1986, a severe wildfire originating from an adjoining pastoral lease burnt approximately 25% of the Park. Another large fire occurred three years later, adjacent to the 1986 wildfire. Fires in October, November and December 1997 burnt approximately 60% of the Park.

The nature of the primary fuel in the Park (spinifex) is such that it will normally only carry a fire after a return period of about five years although this interval can be much shorter with good seasonal conditions. Spinifex will burn under most weather conditions but fire behaviour is particularly sensitive to wind strength and direction.

Fires that regularly encroach into mulga and other fire sensitive communities can reduce the occurrence and long-term viability of these vegetation types. CALM research staff have been studying fire ecology and behaviour in the Park for the past nine years. Data from these studies have been used in fire protection plans now being used for the Park.

The terrain of the Park and the inaccessibility of its boundaries make it impossible to construct or maintain conventional fire breaks, and as a result existing tracks and roads have been used for fire control. Approximately 70% of the Park boundary adjoins pastoral leases where fire management is practiced in order to protect stock and improve pasture.

CALM has conducted various strategic controlled burning operations in recent years. Most of these have been concentrated in northern parts of the Park. Controlled burning by hand from vehicle tracks has been used, for example, to establish buffers against wildfires to protect camping areas and the Ranger settlement. Aerial burning (using incendiaries dropped at regular intervals) is used to divide the Park into cells in order to prevent the run of wildfires. An aerial burnt buffer was primarily responsible for containing a large wildfire in the north-east corner of the Park in 1991. It is envisaged that, as more biological information comes to hand regarding the fire sensitivities of plant and animal species, mosaic burning over wide areas of the Park will supplement buffer burning.

Park records indicate that activities by visitors are a relatively minor cause of fires. The inappropriate use of fire is a major area of public concern and a critical management responsibility. Based upon the current understanding of Aboriginal fire regimes and arid zone ecology, burning needs to be practiced to maintain species diversity in spinifex-dominated communities. However, prescribed burning too frequently or at the wrong time of the year leading to large intense fires can be detrimental to some communities which should be protected from frequent fire, for example mulga woodlands.

A.3 CULTURAL RESOURCES

A.3.1 Traditional Use and Significance

The land for which Karijini Aboriginal Corporation members have traditional responsibility encompasses Karijini National Park (including Marandoo) and extends past Park boundaries in all four directions. The traditional Aboriginal people from this area are primarily from three major language groups, Panyjima, Kurrama and Yinhawangka.

Roughly speaking, the northern half of Karijini National Park is included within the traditional country of the Panyjima. From within the Park their country extends northwest to Hamersley Station, north past Wittenoom, up past the Chichester Range to the tablelands and the White Springs area. To the east Panyjima country extends from about Rhodes Ridge north to Weeli Wolli Creek and up to Mulga Downs. The traditional heartland of the Panyjima is the Fortescue and the tablelands of the Hamersley Range, including the gorges along the Hamersley scarp. Senior people are able to identify with a further traditional refinement of Panyjima "highlands" and "lowlands".

The southern part of the Park encompasses traditional country of the Yinhawangka, and extends west of the

Park boundaries to Rocklea Station, and southwest to the Paraburdoo area. Yinhawangka country extends south of the Park to the vicinity of the Ashburton River between about Seven Mile creek and the Angelo River Junction on the Turee Creek. Wyloo Station marks the approximate western and southern extent of Yinhawangka country.

The heartland country of the Yinhawangka includes the Turee Creek and its passage through the ranges in the south of the Park and north, within the Park to encompass the Milli Milli Springs and Coppin Pool area until it abuts Panyjima traditional lands at Mt Bruce.

The area of traditional interest for the Kurrama is the western central area of the Park south of and including Mt Bruce, which is shared with Yinhawangka traditional interests, and then west to encompass the Mt Tom Price area and the northern sections of Rocklea Station.

The drawing of Park boundaries in the last 20 years has never taken Aboriginal traditional criteria into account, with the result that there tends to be a picture of Aboriginal traditional interests as completely encompassed by the land of the Karijini National Park. In terms of the territorial, social and ceremonial networks of which Panyjima, Yinhawangka and Kurrama are a part, the Park boundaries cut across networks of social and religious alliance which relate Panyjima to other Aboriginal people who are their relatives and neighbours to the north, northwest and northeast. The same is the case with the Yinhawangka and their relatives and neighbours to the south, southwest and southeast.

Although the patterns of residence, travel and resource exploitation have changed dramatically, experiences of these activities are still recalled with nostalgia by senior men and women, particularly those who were adults or who grew to adulthood during the expansion of the pastoral industry. Most importantly, these experiences provide a vehicle for instructing children and grandchildren the traditional basis for those patterns, the basis of Aboriginal law, which is of enduring significance to Aboriginal traditional owners today.

Recounting such events as who travelled together to certain locations for certain purposes is employed to illustrate a wealth of traditional detail such as family links through marriage and ritual alliances, traditional ownership of sites or areas of country by particular people and families gained through birth, conception, and ritual knowledge. Recounting geographical characteristics of the land, including sources of water and food and shelter reveals the traditional detail of how and by which ancestral creatures those features were created and named, which places on the land are "open" for social and economic activities and which are restricted in access to only some for ceremonial purposes.

After describing the beauty and abundance of resources of a particular place, senior people often then sing the music of the meaning of that place.

These aspects are vital components of the Aboriginal cultural heritage of Karijini National Park and surrounding areas. Cultural heritage can be and is being celebrated, taught and sung at a distance, but it requires replenishment from the land. Contemporary Aboriginal traditional owners are eager to be able to teach the young these things whilst on their traditional country which they are assisting to manage, not on others' country in towns which are hundreds of kilometres away.

The Karijini Aboriginal Corporation was established in early 1990 and incorporated on 29 January 1991. It was established to give cohesion to Aboriginal traditional owners of Karijini National Park and surrounding areas who currently reside in towns spread throughout the Pilbara and often on other Aboriginal peoples' traditional land. KAC's objectives (among others) are to work towards the maintenance of traditional land by establishing formal access to those lands and sites and to work together with CALM in the co-operative management of the lands which comprise Karijini National Park.

A.3.2 Protection of the Aboriginal Cultural Resource

Under traditional law, the Aboriginal traditional owners of Karijini National Park are responsible for the Park's lands, as well as for considerable areas outside the Park's boundaries. In particular, Aboriginal traditional owners are responsible for, and obliged to protect, preserve and manage areas, sites and objects of Aboriginal significance associated with that country.

In traditional terms, management includes protection and preservation of physical sites and objects as well as the protection and preservation of traditional knowledge pertaining to them. A fundamental dimension of cultural knowledge to Aboriginal traditional owners today is the "meaning" of the land as it reveals the record of creation and the history of human activity.

This record is revealed in many features of the land and includes mountains, breakaways, rock shelters, valleys, peaks, gorges, plains, water courses, waterholes, camping areas, travel routes, ceremonial routes, places of conception, birth, death and burial. The locations, names, shapes, associated ceremony and songs, and the relationships of one to another within certain areas of land all provide the record which tells the story of the spirit and the substance of the country and its people. Managing the knowledge of all of these attributes of the land entails responsibilities and obligations for Aboriginal people.

These responsibilities and obligations are of continuing importance to Aboriginal people, particularly with respect to teaching Aboriginal

cultural heritage to the young.

Karijini National Park and surrounding areas are immensely rich in evidence of Aboriginal habitation and economic exploitation. Brown (1987) estimated that there could be several thousand rockshelters with evidence of human use in the Hamersley Plateau area alone.

More recently Green and Rumley (1991), in an investigation undertaken under the auspices of KAC, have identified over 100 sites within the Marandoo mining tenement and the western corridor.

Under the provisions of the *Aboriginal Heritage Act 1972-80* all Aboriginal sites and Aboriginal cultural objects in Western Australia are protected. In 1995 the Aboriginal Affairs Department took over the responsibility for administering the Act from the Trustees of the W.A. Museum. It also took over responsibility for the care and protection of Aboriginal sites and objects, as defined in the Act.

As yet there has been no systematic research undertaken under the auspices and control of the Aboriginal traditional owners for the purpose of documenting the Aboriginal cultural resource of Karijini National Park. It is imperative that the parties represented on the Karijini Park Council assist the traditional owners to authorise and oversee research dealing with Aboriginal cultural heritage conducted within the National Park.

It is important that appropriate mechanisms exist so that the management of Karijini National Park can proceed without endangering the cultural heritage of the Aboriginal traditional owners.

In recognition of this need, KAC has established the Karijini Aboriginal Heritage Committee (KAHC). The members of this Committee comprise Aboriginal people with traditional responsibilities covering the area of the Park and adjacent country.

One of the primary functions of the KAHC will be to act as an advisory committee to the Karijini Park Council. In this capacity it will consider any proposals in relation to the management which may affect the Park's Aboriginal cultural heritage and to advise the Park Council of any adverse impacts.

A.3.3 Colonial Heritage

Colonial exploration of the Hamersley Ranges began in 1861 when F.T. Gregory led a party inland from a landing point at Hearson Cove (near Dampier). Their route traversed the Hamersley Ranges twice. Gregory was an accomplished surveyor and naturalist. He was responsible for naming many landmarks in the area including the Hamersley Range after his friend and supporter Edward Hamersley. He also named Mt Bruce and the Fortescue River.

Gregory's reports of good grazing lands attracted settlers to the region in 1863. Early leases were mainly for grazing sheep. Camels were the major means of transport for supplies and wool throughout the Pilbara hinterland. An early lease on the Hamersley Range, Mt Bruce Station, was later relinquished because of its low pastoral productivity. Relics of pastoral occupation remain in the Park in the form of dwellings, stockyards, and wells. The present Park headquarters are on the site of the old Mt Bruce outstation (Dignam's Well) but little remains of the building which was constructed of cajeput timber. A stone hut in the vicinity of the northern gorges is particularly noteworthy due to its connection with early pastoral history. The origin of this structure is not known.

Several of the northern gorges were officially named by Dr Gordon Oxer of Wittenoom (Rundle, 1970). Dr Oxer was the town doctor, operator of the Wittenoom Chalet, and chairman of the Wittenoom Tourist and Progress Association during the 1960s. He named Kalamina Gorge, Weano Gorge, Knox Gorge, and Circular Pool between 1959 and 1963. Oxers Lookout was subsequently named to recognise his contribution to developing the Park. On Dr Oxer's death the people of Wittenoom made a small stone plinth at Oxers Lookout, and placed on it a sundial that Oxer had made and which was previously on his stone gatepost in Wittenoom. It was loose and therefore removed, pending more secure fixing, but has not been replaced.

The colonial exploration and expansion into the area cannot be separated from the vital, but little recorded, participation by Aboriginal traditional owners whose intimate knowledge of the land was exploited for exploration, prospecting, and the development and maintenance of pastoral properties. Immediate ancestors of the present Aboriginal traditional owners were born on, worked on and were buried on the pastoral properties which they helped to develop.

A.4 MINING AND EXPLORATION

A.4.1 History of Resource Exploitation

Mining has been a major industry in the region since 1878 when gold was discovered at Nullagine. In 1888, the Pilbara goldfield was opened and a townsite developed at Marble Bar. About this time alluvial gold deposits in Turee Creek were also being mined. Most activity was focused on the headwaters of the Turee Creek within the area now proclaimed as Park. The Turee field was abandoned in 1896. Evidence of mining, and some gravesites, remain in the area.

Blue asbestos (crocidolite) was first mined in the northern escarpment in 1936 by Leo Snell who was reputedly shown the seams of fibre by an Aboriginal man named Weano. Mining commenced in Yampire Gorge and in Dales Gorge at the junction of the Circular Pool tributary. Lang Hancock also mined in Yampire Gorge before moving to Wittenoom Gorge in 1937. The mines in Wittenoom Gorge operated until 1966.

In 1960, the Commonwealth Government lifted its embargo on exporting iron ore. This led to the development of the Pilbara as a major iron ore producer with the mining of deposits in the Hamersley district at Mt Whaleback, Mt Tom Price, and Paraburdoo. Future projects under consideration in the area include West Angelas (Robe River Iron Associates) located to the south east of the Park, and Area C (BHP). Hamersley Iron's Marandoo project has commenced, as has BHP's Yandi project located to the east of the Park. Future projects include: Hope Downs (Hancock Resources), Giles Mini (Hamersley Iron), and Rhodes Ridge (Hamersley Iron). With the growth of the iron ore industry in the early 1960s, the population and infrastructure of the region have greatly expanded. Ten towns were built during this period, including Tom Price and Paraburdoo to the west of the Park, and Newman to the east.

A.4.2 Government Agreement Acts

Most of the tenements in Karijini National Park are subject to Government Agreement Acts and all relate to iron ore (Table 1). These Acts provide that the tenements shall remain in place so long as prescribed fees and Agreement Act (administered by the Department of Resources Development) obligations are fulfilled. There are other tenements not the subject of Government Agreement Acts.

Tenements subject to Government Agreement Acts include all Temporary Reserves and Special Mining Leases. Many of these tenements pre-date the proclamation of the Park. Government Agreement Acts provide for the conversion of a temporary reserve or an exploration licence to a mining lease. Lease status is, however, generally subject to the provisions of the *Environmental Protection Act*.

Tenements in the north of the Park, north from Marandoo on an approximate Mt Bruce - Mt Windell axis and including those close to Dales Gorge in the Park's major recreational area, are currently the focus of renewed exploration activity.

Other Government Agreement Acts cover tenements within the Park and south of Karijini Drive. The *Iron Ore (Goldsworthy) Agreement Act* covers three tenements, and *Mt Bruce* and *Robe River Agreement Acts*, one each. Two exploration licences in the south-eastern corner of the Park, close to Mt Meharry, are not covered by a State Agreement Act (Map 3).

The CRA Wittenoom mining tenements (including Marandoo) were transferred from the *Iron Ore (Wittenoom) Agreement Act 1972* into the *Iron Ore (Hamersley Range) Agreement Amendment Act 1992*. This has left the Hancock Resources areas in the amended Wittenoom agreement.

Both the Government and Hancock Resources recognise that the current provisions contained in the Wittenoom Agreement are not suitable for the development of the remaining areas, as many of the provisions are either outdated or inappropriate.

All but two of the Wittenoom mining tenements are located within the Park. A provision of the *Iron Ore (Wittenoom) Agreement Act 1972*, for preservation and protection of the National Park, has been repeated in the *Hamersley Range Agreement* to ensure that these obligations continue to apply to all of the Wittenoom mining tenements.

Table 1. (See also Map 3)

KARIJINI NATIONAL PARK IRON ORE TENEMENTS

Tenement	Agreement / Legislation	Ownership
TR3156H	Goldsworthy/ Nimingarra	BHP Australia Coal Ltd, BHP Iron Pty Ltd, CI Minerals Australia Pty Ltd and Mitsui Iron Ore Corp. Pty Ltd.
TR5617H; TR5618H; TR5619H; TR5620H; TR 5624H; TR 5625H	Hamersley Range	Hamersley Iron Pty Limited
TR 5615H; TR5621H; TR 5622H	Wittenoom	Westraint Resources Pty Ltd
ML252SA (sect 6-10); ML252SA (sect 11-12)	Mt Bruce	Mount Bruce Mining Pty Ltd
ML 272SA	Mt Bruce	Hamersley Iron Pty Limited
ML248SA Sects 81, 84, 86, 87, 88, 95	Robe River	Robe River Ltd
E47/856		Acacia Resources Ltd
E47/14; E47/15; E47/17	Mining Act	BHP Minerals Pty Ltd; CI Minerals Australia Pty Ltd; Mitsui Iron Ore Corp. Pty Ltd
E47/864 E47/328; E47/421; E47/487; E47/525; E47/584; E47/631; E47/640; E47/641;	Mining Act	Tom Dukovic; Peter Hall; Dane Sorensen Hamersley Exploration Pty Limited
E47/538		Hamersley Iron Pty Limited; Hamersley Resources Limited
E47/753; E47/790; E47/791		Hamersley Iron Pty Limited
E47/709		Mitsui Iron Ore Development Pty Ltd; Nippon Steel Australia Pty Ltd; North Mining Ltd; Robe River Mining Co. Pty Ltd.
E47/731; E47/797; E47/798; E47/801; E47/802; E47/803		Mitsui Iron Ore Development Pty Ltd; Nippon Steel Australia Pty Ltd; North Mining Ltd; Robe River Mining Co. Pty Ltd; Sumitomo Metal Australia Pty Ltd
E47/847		Winterfall Pty Ltd
G47/029; G47/030; G47/031; G47/032; G47/033; G47/034; G47/035; G47/036; G47/038; G47/039; G47/040		Hamersley Iron Pty Ltd; Hamersley Resources Ltd
L47/041		Mitsui Iron Ore Development Pty Ltd; Nippon Steel Australia Pty Ltd; North Mining Ltd; Robe River Mining Co. Pty Ltd; Sumitomo Metal Australia Pty Ltd
L47/018		Hamersley Iron Pty Ltd; Hamersley Resources Ltd

Source: Department of Minerals and Energy 1998.

Tenement Types

TR Temporary Reserve
ML Mining Lease
E Exploration Licence
G General Purpose Lease
L Miscellaneous Licence

A.4.3 Conservation and Land Management Act 1984

With respect to mining and exploration proposals and activities, the CALM Act is subordinate to the Mining Act and the Government Agreement Acts, and both are subordinate to the Environmental Protection Act. Nevertheless, the State's statutory commitment to national parks as expressed in the CALM Act is to:

... fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna, and preservation of any feature of archaeological, historic or scientific interest.

A.4.4 Wildlife Conservation Act 1950

CALM is responsible for the conservation and protection of native flora and fauna on all land and in all waters within State boundaries under the *Wildlife Conservation Act 1950*.

A.4.5 Other Relevant Legislation, Policies and Processes

A proponent of mining will necessarily have such activity conditioned by the operation of one or more Acts of Parliament. Relevant provisions impinging upon mining activities include:

Mining Act 1978: the holder of a mining lease is subject to the provisions of this legislation.

Aboriginal Heritage Act 1972-80: any mining activity likely to disturb an Aboriginal site (as defined in the Act) is assessed by the Aboriginal Cultural and Material Committee. The Committee recommends places and objects which are of special significance to Aboriginal people, and should be preserved, acquired and managed. Appeals against the Committee's decisions are dealt with by the Minister for Aboriginal Affairs, who may recommend that the declaration of the protected area be varied or revoked.

Aboriginal Heritage (Marandoo) Act 1992: with the exception of three specified sites, this Act exempts the area of the Marandoo excision (Section A.1.3) from any of the provisions of the *Aboriginal Heritage Act 1972-80* and rescinds any previous conditions under the *Aboriginal Heritage Act 1972-80* which applied to the area of land within the excision.

Environmental Protection Act 1986: all development proposals with potential for environmental impact are subject to the provisions of this Act. When a mining proposal comes forward, the EPA makes an assessment and consequently recommends (upon approval) various conditions to the Minister. Appeals against the EPA's recommendations are heard through an Appeals Convener, and a decision is made by the Minister.

The operation of the above Acts must be understood against the provisions of the relevant Government Agreement Acts (Section A.4.2).

Approval was given for the Marandoo mine and central Pilbara railway, subject to environmental conditions. Further applications to excise National Park land would have to be approved by both Houses of Parliament. Proposals for significant ground-disturbing exploration or mining will be required to undergo formal environmental assessment by the EPA, and approval by Government will be necessary prior to the commencement of such activities.

A.5 PUBLIC USE

A.5.1 Management Zones

A.5.1.1 Zoning System

The zoning system proposed is based on the interaction between natural and cultural values and visitor use. The zoning categories proposed are:

- Wilderness
- Natural Environment
- Tourism and Recreation
  - intensive
  - intermediate
- Park Services

This classification is based upon the need to protect specific Park values, and the capacity of a given area to withstand visitor and management pressure. Patterns of visitor use and access have been taken into account to determine zone boundaries. The proposed zones also reflect the possible impacts of mining and other regional development upon the Park.

A.5.1.2 Implementation of Zoning

The following zones are proposed for Karijini National Park (Map 6):

Wilderness:
A wilderness zone can be defined as an area that is, or can be, restored to be:

- of sufficient size to enable long-term protection of its natural systems and biological diversity;
- substantially undisturbed by colonial or modern technological society;
- remote at its core from points of mechanised access and other evidence of colonial or modern technological society;
- able to provide solitude, inspiration and self reliant recreation.

Land in this category will be maintained as near as possible in its natural condition. All existing roads or tracks will be closed. Motorised access will only be allowed in exceptional circumstances, and a permit will be required. A permit system for pedestrian access may be considered in the future if excessive pressures adversely impact on the area. Non-vehicle access by Aboriginal traditional owners to sites or areas of significance which may be within a wilderness zone will not be precluded. No recreational facilities will be provided. A wilderness zone may also include areas within it where indigenous people live a traditional lifestyle and practice traditional land management.

Natural Environment: land in this category will be managed to preserve the abundance and diversity of native plant and animal species. Public access to this zone will not generally be restricted. Vehicle access will be allowed provided visitors keep to approved tracks. Walk tracks may be provided. This zone will cover most of the Park.

Although extensive areas of the Park are in natural condition, many areas contain mining tenements and road access. Management as a natural environment zone is considered to be the best option until the status of pre-existing tenements has been determined (Section B.5.2).

Recreation: Land in this category will be managed for appropriate public recreation and for the conservation of native flora and fauna. Recreation and interpretive facilities will be provided, and their use promoted. This zone will encompass the north-eastern corner of the Park, including the principal gorges and major access roads. Two types of recreational zone are provided.

The *intensive recreation zone* relates to major access roads, camping areas, gorge lookouts and walks, Mt Bruce and Mt Meharry.

The *intermediate recreation zone* includes the gorges and surrounding terrain, which is accessible for walking and other forms of passive recreation. Areas in the south-west of the Park which are commonly used by residents of Tom Price and Paraburdoo are included in this zone.

The northern gorges and the higher peaks, for example, the Mt Bruce area, contain a relatively high proportion of restricted plant species (van Leeuwen 1984). These landforms are also of the highest scenic value with consequent recreational opportunities. They are, therefore, represented in recreation, natural environment and wilderness zones.

Park Services: land in this category applies to any area set aside for Park administration, visitor services, or areas that are temporarily off-limits to Park visitors. Public access to this zone may be restricted.

Programs such as fire management and the control of exotic plants and animals will apply to all zones

with some operational differences. Visitor facilities and services will only be provided in the intensive recreation or park services zones.

The zoning plan may be amended with any formal review of the plan (Section B.12.3).

A.5.2 Access

A.5.2.1 Air Access

One operational airstrip (aircraft landing area) is located in the Park near the Joffre / Yampire Gorge road junction, and is adequate, in emergency situations, to evacuate the sick and injured. It is not suitable for sustained, regular commercial air charter traffic. The closest major aerodrome where F28 commercial aircraft can land is at Paraburdoo. There may be some changes to air access arrangements, and airstrip location following Government consideration of this issue. Air space over the Park is also used by helicopters (and fixed-wing aircraft) for scenic flights, mustering, 1080 baiting, aerial survey and fire management.

A.5.2.2 Road Access

Several roads give visitors access to the Park (Map 8). The National Highway route (Great Northern Highway) intersects the north-east corner of the Park at Munjina Gorge. It links Perth and Darwin and is fully sealed. Alternative road access is via the North-West Coastal Highway to Nanutarra and then inland via Tom Price to enter the Park near Marandoo. The Nanutarra - Tom Price road is sealed. A gravel road links Karratha with the Nanutarra - Roy Hill Road.

The major public access to the Park is via the Karijini Drive - Marandoo - Great Northern Highway Link which passes near Mt Bruce and Mt Windell.

A major transport/communication easement is required to support regional mining enterprises and this has been excised from the Park and vested in the NPNCA as a Section 5 (g) reserve. The railway to Marandoo uses this corridor and so should other proposed railways in the area such as the one for the West Angelas project. (Sections A.1.2, A.1.3).

At present one access to the Park is from the Nanutarra- Roy Hill Road via Yampire Gorge. The Yampire Gorge road has numerous crossings of Yampire Creek and can be flood damaged in some years. Road access via the creek is the cause of major disturbance to the Figtree Soak wetlands. The presence of crocidolite tailings in Yampire Gorge may be a public health risk (Sections A.5.4, B.9.3) and continued access via this route will be influenced by the recommendations of the Wittenoom Interdepartmental Committee and the Select Committee on Wittenoom. Government decided in 1994 to progressively close facilities at Wittenoom.

Three entry stations are in place on access points to the northern recreation area.

Most existing roads within the recreation zone are formed gravel. In dry conditions they are adequate for use by two wheel drive vehicles and caravans. Under wet conditions they become impassable. In other zones the roads are of a lesser standard and are generally only suitable for four wheel drive vehicles. Off-road driving is a potential problem, particularly in wilderness areas of the Park.

The existing road network in the northern part provides visitors with a circuit route of about 100 km (Map 8). The principal gorges, Mt Bruce, and the Park Headquarters are all located near the circuit road.

The Great Northern Highway, where it intersects the Park, is within an excised road reserve. A part of Banjima Drive is gazetted; other roads are not, but some are numbered for the purposes of Main Roads Department (MRD) road grants. Grants for road maintenance have been made by the MRD to both the Shire of Ashburton and to CALM; the Shire and CALM have also contributed funds. The Shire and CALM use these resources for road maintenance works.

A.5.2.3 Pedestrian Access

CALM has developed pedestrian access into selected areas of the northern gorges. Tracks lead down to Weano Gorge, Kalamina Falls, Fortescue Falls, Circular Pool and Hamersley Gorge. These tracks consist of stone or concrete steps with handrails along some sections. At other points, for example Joffre Falls and Oxers Lookout, gravel paths lead to vantage points that provide views of the gorges below. Safety railings are provided at some of these lookouts.

Access into some gorges is difficult, or impossible, for older or disabled persons. Kalamina Gorge offers the easiest access although steep steps need to be negotiated. Yampire Gorge is the only Park gorge with vehicular access.

Some visitors attempt longer walks along the bottom of the northern gorges, for example, Kalamina Gorge. Access along some gorges is restricted by long, deep pools, or by steep rock ledges. The taller peaks of the Hamersley Ranges are an attraction for some walkers. A formed walking track provides access to the summit of Mt Bruce and an unformed track provides access to Mt Meharry.

A.5.3 Existing Visitor Use Patterns

The Park is best known for the spectacular gorges in the northern section of the Park, and the gorge country is the focus for most visitors. Most visitors enter the Park via Karijini Drive. Smaller, but still significant numbers, enter from the west along the Mt Bruce Road and from the south-east along the Juna Downs Road.

Many visitors camp at Dales, and will camp at Savannah camp now that it has replaced Joffre and Weano for camping. Others make day trips from Tom Price and Auski. Mt Bruce, Mt Meharry and the

more remote country to the south are attracting more visitors as these areas of the Park become better known.

Indicators of visitor use patterns are based on traffic counter data and the observations of Park staff.

A.5.4 Public Health and Airborne Crocidolite

Blue asbestos (crocidolite) in its milled form is the major source of airborne fibres, and is known to cause a number of serious respiratory diseases. Wittenoom town and minesite are the principal sources of airborne asbestos in the Hamersleys. Public health authorities believe that naturally occurring asbestos does not constitute a risk. Asbestos mine tailings occur in the Park at Yampire Gorge. The road passing through Yampire Gorge in the vicinity of, and downstream from, the abandoned mine and mill contains visible amounts of blue asbestos fibres, which are probably from the milling process. The road has numerous crossings with the potential for disturbing fibres at each crossing. The risk from grading roads (or tourists driving their cars on the roads) where there are visible amounts of blue asbestos may be quite significant unless appropriate work procedures are adopted (Section B.9.2). Visitors who observe the warning signs in Yampire Gorge Road should not be at risk. No other sources of airborne fibre are known in the Park. Contamination from Wittenoom Gorge is a possibility (Sections B.7.2.1, B.9.3).

In the definitive EPA study (Ashton 1986) airborne asbestos levels were sampled at Wittenoom townsite, Wittenoom minesite and at distances 9 km and 43 km to the east of the townsite. Relatively high levels of "probable fibres"[7] were recorded at some monitors in the townsite. "Probable fibres" were also consistently recorded in Wittenoom Gorge near the minesite, albeit at a lower level than was generally the case in the townsite. The study did not find a correlation between wind direction or speed and atmospheric fibre levels. This would indicate that the sources of contamination are numerous and that contamination did not only originate from the minesite. Predominant winds during the study were from the north-west. Crocidolite fibres were observed in all samples taken at the townsite and minesite; this was not the case with the nine km and 43 km sites, although fibres were recorded on occasions at these sites (Ashton 1986). Oxers Lookout at Weano Gorge is five km from the Wittenoom minesite and 14 km from the townsite. Red Gorge Lookout is five km from the minesite and 15 km from the townsite.

Inter-departmental and Select Committees reviewed Government policy towards Wittenoom, and in 1994 Government determined that facilities in the town would be progressively downgraded, and the town closed. The outcome of this report is significant for Park management since Yampire Gorge has provided a major route of entry to the northern gorge area. (see also Section A.5.6)

[7] It can be assumed that a high percentage of fibre forms listed as "probable fibres" are crocidolite, these being fibres which based on fibre counting experience and scanning electron microscope analysis appear to be crocidolite (Ashton 1986, p34).

A.5.5 Recreation Management

Much of Karijini National Park's appeal is in its extensive areas of mountainous and arid terrain. This landscape is unfamiliar to many Park visitors who come from the more temperate parts of Australia or from overseas. The gorges of the northern escarpment, and to a lesser extent the higher mountains, are focal points because of their visual values and the opportunities they offer for walking, exploring, photographing, and other activities. The presence of water in some of the gorges enhances their appeal, offering opportunities to swim and appreciate the unusual arid zone plants and animals. Management for visitor use should continue to protect the natural and cultural environments of the Park that provide these recreational opportunities.

Visitor perceptions of the value of national parks are changing to include a desire to know more about the significance of a park's natural features to Aboriginal traditional people.

The management philosophy for the Park is to support low-key facilities and services which minimise changes to, and complement, the natural and cultural environment.

A.5.5.1 Camping

Camping is a popular activity in Karijini National Park. Facilities and services are provided at two separate locations: Dales Recreation Area and Savannah Camp. The previous Circular Pool, Joffre Falls Turnoff, Weano and Yampire Gorge camping areas have been closed and rehabilitated (Section B.7.3.2). Camping outside designated campgrounds is generally by permission of the Ranger in Charge. Organised groups of bushwalkers are able to explore the Park in this fashion. Residents of local towns occasionally camp at waterholes in the south of the Park. Aboriginal traditional owners periodically convene bush meetings in the Park.

A.5.5.2 Campfires

Campfires reinforce the outdoor experience and many people would prefer them as an accompaniment to camping. However, campfires increase the risk of wildfire within the Park, and wildfires can cause injury or loss of life and also loss of Park facilities. Frequent wildfire may damage vegetation composition and structure and have a deleterious effect on an area's normal biological diversity. Extensive cutting of firewood can denude fragile woodlands and reduce animal habitat. The productivity of arid lands is far less than that of temperate forests, and fallen or standing dead timber is essential to nutrient recycling and for habitat.

Current Park strategies on campfires are given in Section B.7.3.3.

A.5.5.3 Bushwalking

A small number of visitors take extended bushwalks. The rugged terrain and arid environment of the Park can make bushwalking hazardous for those who are inexperienced or unprepared. Water resources away from the gorges are very limited. Existing walk tracks in the Park are confined to the vicinity of the northern gorges. Other areas of the recreation zone offer scope to develop walk tracks. Mulga woodlands and sheltered gorges in the recreation zone are suitable sites to observe birds.

A.5.5.4 Nature Observation

Nature observation is a popular visitor activity. The Park offers a diversity of habitats within a relatively small area, providing numerous opportunities to explore the distinctive landscape and its unique landforms, flora and fauna (for example, through birdwatching, plant study and photography).

A.5.5.5 Aboriginal Cultural Heritage

The Aboriginal cultural history of the Park and surrounding areas represents a period of use of at least 26 000[8] years (Brown 1987). This date is likely to be extended further with future studies. An opportunity exists for appropriate guided activities and development of interpretive materials for visitors to learn about the Park's significance to Aboriginal people, including traditional use of plants, use of the landscape, and aspects of the social and philosophical relationships of the people to the land (Section B.7.6).

A.5.5.6 Adventure Sports

Park staff occasionally receive enquiries from visitors seeking approval to conduct adventure sports, such as abseiling and hang gliding. Much of the gorges' surface rocks are subject to erosion which poses additional risks to abseilers. Many suitable areas occur outside current and proposed Park boundaries for adventure sports. Notwithstanding this regional emphasis, some adventure sports may occasionally be permitted within the Park (Section B 7.3.5).

A.5.6 Visitor Facilities

The mining town of Wittenoom was traditionally the service centre for Park visitors. Commercial activity in Wittenoom was phased down following concerns about the health risks associated with airborne crocidolite fibres, and the government convened the Wittenoom Interdepartmental Committee to examine options for addressing public health and safety issues and the future of Wittenoom as a regional service centre. In 1994 the Government determined that facilities in Wittenoom be progressively down-graded and the town be closed. Tom Price and Newman service visitors to the Park, and Tom Price is increasingly being seen as the primary service centre.

[8] Date from a site in the Packsaddle Range just outside the Park's eastern boundary.

Access from both towns to the major visitor attractions will be enhanced when roads are improved. The Western Australian Tourism Commission has received complaints about the lack of motel type accommodation close to the Park. A tourism development plan for the Pilbara Region (Barrington and Partners 1986) identified Karijini National Park as the region's major attraction. The draft Pilbara 21 study recognises the importance of Karijini National Park to the development of tourism in the Pilbara, and contains general recommendations on tourism (Pilbara 21, 1992).

An area in the north-east corner of the Park has been excised for a roadhouse, motel, and caravan park development (Section A.1.1). Consideration has been given to other possible developments in the area between the eastern boundary of the Park and the National Highway.

The Park currently has basic camping facilities with gas barbecues and pit toilets. A visitor survey (Cavana 1986) indicated a strong demand for this type of facility in the Park. The survey identified a need for a drinking water supply and possibly showers. Visits and corresponding use of facilities follow a seasonal pattern, peaking between May and September. Changes in visitor patterns may result in more camping facilities being provided.

Existing campgrounds and car-parks are generally located adjacent to the major visitor attractions (Maps 9, 10). Overnight campers and day visitors are sometimes required to use the same picnic facilities. Picnic sites are provided at some sites. Separate campsites have been provided for coaches, similarly, separate areas are provided for campers who wish to use generators.

A.5.7 Commercial Tourist Operations

Tourism is an important regional industry with approximately $20 million spent by visitors to the Pilbara for the year 1984-85 (Barrington and Partners 1986). Tourism expenditure has doubled between 1985-86 and 1989-90, from $23 million to $48 million, with the Pilbara attracting 118 000 visitors in 1990-91 (Pilbara 21, 1992). One means of capitalising on this potential is the development of commercial concessions within one of the prime tourist attractions, Karijini National Park.

A commercial concession is defined as:

... a right granted by way of lease, licence, or permit for occupation or use of a part of an area of land or water entrusted to the Department, for the provision of appropriate facilities and services for visitors' use and enjoyment (CONCOM 1985).

Opportunities exist to develop appropriate tourism operations, taking account of the Park's diverse and fascinating natural and cultural environments. Concessions such as guided walks, camping, other camping options, nature study tours and

photographic/painting expeditions are activities which could greatly increase visitor interest in, and attract greater numbers of visitors to, the Park. This would boost local tourism and increase the community's economic return, as well as providing CALM and the Aboriginal traditional owners and others with an opportunity to develop economic enterprises.

The participation of Aboriginal traditional owners in promoting aspects of culture and lifestyle, including reference to medicinal and nutritional uses of native plants, is of enormous interest to visitors. The interpretation of Karijini National Park from the Aboriginal traditional owners' perspective must take place in a manner directed by the traditional owners (Section B.7.5).

Given the strong growth in nature-based tourism it is likely that demand for facilities, including permanent or semi-permanent accommodation, in or near the Park will increase (Section B.7.3.6). Proposals which encourage visitors' appreciation of the area and reflect the natural values of the Park will be considered on their merits.

A.5.8 Information, Interpretation and Education

Any visit to a park is improved by having an understanding of its facilities, resources and values. Karijini National Park contains a variety of fascinating natural and cultural characteristics, but some are subtle and might not at first be appreciated (refer for example to Map 11, showing some of the major Aboriginal place names in the Park). Visitors value information on the Park. Information includes the Park's services, features and hazards, as well as outlining the standards of behaviour expected. The informing process is accomplished by a communication plan consisting of three main parts (Department of Conservation and Environment, Victoria 1991):

Information. *Provides details of facilities, activities, and regulations, both prior to the visit and on-site.*

Interpretation. *Explains natural and cultural features and systems within the Park.*

Education. *Includes materials and programs designed to assist education groups at all levels.*

Limited interpretive services and facilities are currently provided in Karijini National Park, however Karijini Aboriginal Corporation operates a temporary visitor centre in the Park as part of a pilot program to assess the viability of establishing a permanent facility. Visitors, particularly those who camp within the Park, may enjoy personal contact with Rangers. A visitor guide provides brief information on the Park's values, facilities and geography. Other interpretive measures such as display panels are at most day use sites, camping areas, at trailheads and viewpoints.

Communication plans are comprehensive and would contain many stories relating to Karijini including the geological history of the Park; the study of the Earth's earliest life forms; Aboriginal heritage and culture; past land use (Aboriginal, pastoral, mining); and many others. A range of techniques may be employed in the interpretive program including ranger led activities; self guided nature walks; interpretive activities led by Aboriginal people; a variety of interpretive literature; and many others.

A.5.9 Visitor Safety, Regulation and Monitoring

A.5.9.1 Visitor Safety

The sheer-sided gorges are the Park's principal natural hazard. In recent years several accidents resulting in serious injury or death have occurred. These accidents were generally either falls or heart failure brought on by exertion or shock. The very cold water in the gorges can also cause shock.

CALM maintains a comprehensive set of cliff rescue equipment including a CRUX 2000 lifting device. Park staff are trained in the use of cliff rescue equipment and in land search techniques. Police and the State Emergency Services at Tom Price provide additional equipment and expertise. The Park has a Royal Flying Doctor medical kit and Ranger vehicles are equipped with the Royal Flying Doctor Service (RFDS) radio frequency. The nearest doctor and ambulance are at Tom Price. Any rescue in the Park will be directed by the Police.

The climate of the Hamersley Ranges (high temperatures and low humidity) can cause problems for unwary visitors. Dehydration and heat stroke are possible consequences for visitors who do not protect themselves from the sun and fail to maintain fluid intake.

There may be risks associated with crocidolite mining and processing residues in or adjacent to the Park. Disused mine shafts at Yampire Gorge have been declared unsafe by the Department of Minerals and Energy (Section B 9.3) and entrances have been sealed.

A.5.9.2 Visitor Regulation

Visitors to all Western Australian national parks are required to comply with regulations designed to protect park conservation values and maintain the quality of the visitor experience. Relevant controls are contained in regulations under the CALM Act and CALM Policy Statements. Park rangers are authorised to enforce regulations. Entry and camping fees apply at Karijini National Park. CALM's policy is for visitors to contribute towards the cost of facilities where the collection of fees is practicable.

The Park zoning plan, as specified in this management plan, is designed to optimise conservation and recreation objectives (Sections

A.5.1, B.7.1).

A.5.9.3 Visitor Monitoring

Park visits have been monitored for a number of years by the use of traffic counters and by recording campground occupancy. Initially traffic counter data were not reliable, partly due to equipment failures, but recent data have been reliable. Camping units are considered to be a better overall indicator of visits. This measure shows a gradual increase in visits for 1981-87, with a high annual variability. Coach visits (mainly day use) increased steadily until 1987 when there was a marked decline. This fall may reflect the shortage of suitable accommodation and concerns about asbestos residues at Wittenoom.

A.6 LIVING AREAS FOR ABORIGINAL TRADITIONAL OWNERS

In 1990 in response to a submission by Aboriginal traditional owners of the Park, the then Government endorsed the principle of living areas within the Park. Both the NPNCA and CALM agreed in principle to proceed with the development of proposals which would formalise living areas within the Park.

The Karijini Aboriginal Corporation (KAC) was legally incorporated in 1991 to represent the land interests and pursue the land-based aspirations of the Aboriginal traditional owners of Karijini National Park and surrounding areas. Most members of KAC reside in Onslow, Karratha, Roebourne, Wickham and Port Hedland. Two KAC members have been employed by CALM as full-time Park Rangers and a number of KAC members are engaged on Park programs on a contract basis.

To date, KAC members have expressed their strong desire to formally establish living areas at up to three locations within the Park. It is not yet certain how many people may choose to take up permanent residence, nor whether all three living areas will be developed along the same lines. While KAC members are anxious to be able to reaffirm and maintain their links with the land by residing within the Park, the availability of employment and schooling have to be considered, as do basic facilities and services.

The primary objectives of KAC members in securing living areas within Karijini National Park have been to have their aspirations to reside on their traditional land acknowledged by Government, and to be able to pursue certain residential, cultural and economic needs and aspirations from a secure land base.

KAC members' relationships to the land have traditionally been the source of social and spiritual, as well as of economic sustenance. Although reliance on the food resources of the land has become modified over time, Aboriginal traditional owners continue to rely on the cultural and spiritual resources of their traditional lands. Access to these less tangible resources is essential for the continuity of traditional culture, the development of personal self esteem, the maintenance of the status and social integrity of senior men and women, and the preservation of Aboriginal traditional law (Section A.3.1).

An additional consideration is that the provision of living areas on their traditional land will enable KAC members to more effectively carry out their role in the management of Karijini National Park.

Aboriginal living area proposals may be approved where it can be demonstrated that no additional costs for the provision of essential services will be borne by the State Government.

A.6.1 Living Area Leases

In accordance with Section 100 of the CALM Act 1984, the Executive Director may, on such terms and conditions as he thinks fit, grant a lease in the National Park provided it conforms with a management plan and is approved by the Minister and the NPNCA.

Subject to Ministerial approval, CALM and the NPNCA have agreed to negotiate the leases under the terms of the CALM Act. At present it is proposed that up to three living areas be developed in the Park (Map 6), with each one requiring a master development plan. The proposed leases remain subject to the approval of the Minister.

A.6.2 Housing, Residential and Essential Services

Essential services required to develop living areas include housing, water, power, waste disposal, emergency medical services, education and communication. Boundaries also need to be finalised. Karijini Aboriginal Corporation aims to initiate community development infrastructure for the residential lease areas in ways which minimise the impact on Park values and which support Park goals and objectives (Sections B.8.1, B.8.2)

A.7 RESEARCH AND MONITORING

The purpose of monitoring is to identify any unforseen or deleterious impacts of management activities. Although monitoring and research are closely linked, research often establishes baseline data from which a monitoring program can develop and provides managers with data from which the state of a resource can be judged. Resources change over time and implementing a monitoring program will allow the extent of change to be measured and enable decisions about management actions to be undertaken so as to influence that change.

Monitoring will consist of programmed observing, recording and interpreting of data over time, designed to identify changes in natural and cultural systems of the Park. It will focus on the assessment of change in the condition of:

- biological and physical resources and values such as fauna, flora, vegetation, landscape, and exotic plants and feral animals;
- physical and cultural resources such as rock art and archaeological sites, sites of significance to Aboriginal people and sites of historic value;
- patterns and trends of visitor use and the satisfaction and perceptions of visitors;
- visitor facilities and infrastructure.

PART B. MANAGEMENT

B.1 PARK MANAGEMENT

B.1.1 Karijini Park Council

The objective is to provide the Aboriginal traditional owners with a mechanism for participating in the management of Karijini National Park.

In 1993 the Government reviewed the concept of Park Councils which offered Aboriginal people a role in the management of national parks located on lands over which they had traditional custodial responsibilities. It endorsed the formation of joint CALM/local Aboriginal committees to help resolve issues of concern relating specifically to Aboriginal people. The Government simultaneously endorsed the creation of a community Advisory Committee to represent wider community interests.

The functions of the Karijini Park Council will be:

- to assist in the preparation of management plans for approval by the NPNCA and Minister;
- to assist in the implementation of management plans approved by the NPNCA and Minister;
- to develop policy in relation to Aboriginal interests in the Park; and
- to advise the Minister on all matters relating to Aboriginal involvement in the Park (refer Introduction, Section 2.2).

Strategies

1. Establish the Karijini Park Council to reflect State Cabinet's 21 June 1993 decision endorsing the concept of joint CALM/Aboriginal committees and the role outlined above.
2. The members of the Karijini Park Council will comprise the tribal elders of each of the Panyjima, Yinhawangka and Kurrama people, the Director of Parks, Recreation and Planning, two other senior managers from CALM, and three Aboriginal representatives of the traditional owners who will be appointed by the KAC Executive Committee.
3. The Karijini Park Council will be independent of the Karijini National Park Advisory Committee and any other advisory committee established in respect of the Park.
4. The Karijini Park Council will formulate its own procedural guidelines which may include formally or informally seeking advice and opinion concerning Park matters from parties or organisations with interests or expertise in certain aspects.
5. The Karijini Park Council will refer any matter relating to Aboriginal cultural heritage to the Karijini Aboriginal Heritage Committee for advice and comment prior to making any determinations.
6. The Karijini Park Council will meet regularly.
7. The Karijini Park Council will make decisions by consensus of its voting members. Any matter on which agreement cannot be reached will be referred to the Minister for the Environment for direction.
8. The Karijini Park Council will brief the NPNCA and the Karijini National Park Advisory Committee on matters arising from the Karijini Park Council, so the NPNCA can consider such determinations and, if it sees fit, advise the Minister independently.

B.1.2 Karijini Aboriginal Heritage Committee

The objective is to provide an independent mechanism by which the Aboriginal traditional owners can advise the Karijini Park Council of the effects on the Aboriginal cultural heritage of the Park of any aspects of implementation of the plan.

- The Karijini Aboriginal Heritage Committee (KAHC) was proposed in 1991 at the direction of the Aboriginal traditional owners, and, as a Committee of the Karijini Aboriginal Corporation, is responsible to the KAC.
- The KAHC will function as an advisory committee to the Park Council on the effects on Aboriginal cultural heritage of management and policy matters.

Strategies

1. Membership of the Karijini Aboriginal Heritage Committee will comprise Aboriginal traditional owners who have been nominated by the KAC.
2. The Karijini Aboriginal Heritage Committee will determine its own procedural guidelines, and will meet at least four times a year.
3. The KAHC will be consulted by the Karijini Park Council on all matters that may have bearing on Aboriginal heritage.
4. The KAHC will provide the Park Council with advice and input based upon traditional knowledge and insights, for the formulation of Park programs such as interpretation, research, monitoring and conservation, rehabilitation, fire

and land management.

5. Neither the Karijini Aboriginal Corporation nor the KAHC will be required to divulge or otherwise compromise the confidentiality of any cultural information considered by traditional law to be restricted.

B.1.3 Karijini National Park Advisory Committee

The objective is to promote broad community participation in the implementation of the management plan.

· In its review of public participation structures in June 1993 Cabinet endorsed the role of joint CALM/local community advisory committees to deal with matters of local concern arising in the management of the Park.

· The Karijini National Park Advisory Committee will report directly to the Minister and be independent of the Karijini Park Council.

· Karijini National Park Advisory Committee members will be drawn from a wide spectrum of community interests relevant to the management of the Park (Introduction, Section 2.3).

· The Karijini National Park Advisory Committee will include Aboriginal representation being a nominee of the KAC.

Strategies

1. The Karijini National Park Advisory Committee will be established simultaneously with its members being appointed by the Minister.

2. Its functions will be:

· to advise the Minister on Park management issues of interest to the general community;

· to assist CALM in providing information to the public;

· to provide liaison between CALM, local government, the tourism industry and the general community;

· to provide advice to the Minister on issues referred to the Committee by CALM; and,

to assist in the preparation of management plans for approval by the NPNCA and Minister.

B.1.4 Environmental Assessment

The objective is to ensure that all developments are consistent with the environmental and cultural values of the Park.

· A need exists for environmental assessment by Regional/Park staff, when developments are proposed.

· Developments include all activities other than minor maintenance. These activities include construction and upgrading of roads, borrow pits, walk tracks, buildings and associated infrastructure.

· Surveys have identified a number of rare and restricted vegetation associations and species of flora and fauna which could be affected by developments.

· Developments in the Park can adversely impact on landscape, cultural heritage, drainage and run-off/run-on of adjacent areas. Through soil disturbance they can introduce and promote the spread of weeds.

· Some developments require energy resources which can impact on the environment through air and noise pollution; others require the use of structural materials from outside the Park.

· Modified areas need to be rehabilitated.

Strategies

1. New development proposals and some operations will require internal environmental assessment by CALM prior to implementation.

2. Major development proposals may be subject to formal assessment by the EPA.

3. Where internal environmental assessment is required, a written report will be prepared by CALM, and submitted to the Karijini Park Council and the Karijini National Park Advisory Committee.

4. The Karijini Aboriginal Heritage Committee will advise the Karijini Park Council on the impact of a proposed development or operation on Aboriginal heritage values of the Park.

5. Ensure developments are consistent with Park values and with related strategies proposed in this management plan, including siting and environmental criteria for commercial accommodation (Appendices 1 and 2).

B.2 PARK BOUNDARIES AND TENURE

B.2.1 Park Boundaries and Tenure

The objective is to ensure that land tenure and boundaries protect the Park's environmental and cultural values, and represent practical management boundaries.

- Selection of areas proposed for addition to the Park should take account of representativeness criteria, the integrity of current land systems within the Park, and the continuity of existing landscape and of natural and cultural patterns.
- Fencing of current boundaries is not an economic proposition.
- Visitors are generally unaware of the location of the Park boundaries.
- Dales Gorge has important conservation values, but is partially overlain by an exploration licence.
- Land excised from the Park for iron ore mining and associated infrastructure will produce new boundaries.
- Lands added to the Park will be identified as compensation for lands excised (Section B.5.3).
- Decisions about Park boundaries are ultimately made by Parliament, but prior to this, opinion will be sought from Departmental committees, lessees of adjacent pastoral properties, the NPNCA, Karijini Park Council and the Karijini National Park Advisory Committee.

Strategies

1. CALM will:
   i. provide advice to the Minister that where possible, the rationalisation and extension of boundaries should conform with major roads, or otherwise be aligned to allow the construction of fencing and the prevention of stock trespass.
   ii. seek to incorporate into the Park the catchments of Dales Gorge and Munjina Gorge as far east as the Great Northern Highway.
   iii. seek to include areas of high conservation value in the Mt Meharry area. Relevant criteria will include conservation values, ease of fencing, and the significance of the area to adjoining pastoral operations.
2. CALM will signpost Park boundaries at points of entry.
3. The NPNCA, Karijini Park Council and Karijini National Park Advisory Committee may advise the Minister on tenure and boundary issues related to Karijini National Park.

B.2.2 Living Area Leases

The objective is to provide Aboriginal traditional owners with living areas within the Park.

- Karijini Aboriginal Corporation has sought approval to establish residential areas in the Park.
- Pursuant to the CALM Act, the Executive Director can grant leases on such terms and conditions as he thinks fit, with the approval of the Minister and the NPNCA.
- CALM and the NPNCA have agreed in principle to establish residential lease areas in the Park.
- Aboriginal traditional owners choosing to live in the Park will require appropriate housing and services (Sections B.8.1, B.8.2).
- Aboriginal people residing in the Park will require appropriate access to the lease areas.
- Living area proposals are currently under review, and will be subject to final approval by the Minister.

Strategies

1. Up to three living areas are being sought for Aboriginal traditional owners within the Park. With the approval of the Minister and the NPNCA, the Executive Director will grant leases for three living areas for the maximum permissible term under the CALM Act at a peppercorn rent. The leases will include suitable terms and conditions which will seek to meet the aspirations of the aboriginal people whilst maintaining the values in the surrounding Park. These proposals will require Ministerial approval.
2. Provide access for Aboriginal residents to living areas.
3. Refer all planning, design and construction criteria for sites and access to the Karijini Park Council. These will be subject to an internal environmental assessment procedure (Section B.1.4) consistent with residents' requirements (Section B.8).
4. The Karijini Aboriginal Corporation assumes the responsibility for master development plans, including provision of housing, facilities and other services (Section B.8.1).
5. The Karijini Park Council will support Karijini Aboriginal Corporation in its establishment of appropriate community facilities, including assistance in the implementation of plans (including, for example, landscape planning,

safety, design and site suitability criteria).

B.3 MANAGEMENT OF NATURAL RESOURCES

B.3.1 Soils and Landform

The objectives are to:
Contain and minimise erosion, especially in areas of heavy use.
Ensure that visitors and residents as well as Park operations have a minimal impact on soil stability.
Rehabilitate areas degraded as a result of past and present land use.

- The erodibility of most soils requires that soil disturbance be kept to a minimum.
- Alluvial soil types are particularly erosion prone.
- The poor, shallow soils and specialised vegetation make rehabilitation a difficult and lengthy process.
- Seasonally hard-setting soils can become impassable to vehicles after rain.
- Alluvial soil types are poorly represented in the Park, and occur more extensively to the east and south of the current Park boundaries.

Strategies

1. Assess any proposed development of Park facilities to determine its impacts on soils (Section B.1.4).
2. Restrict soil disturbance to that essential to maintain and improve the existing services.
3. Establish guidelines for sound earthworks practice and issue them to any contractors working in the Park.
4. Prohibit off-road vehicle use except by authorised persons.
5. Avoid developments on alluvial soils and in other erosion prone areas.
6. Avoid the necessity for rehabilitation works wherever possible. (Rehabilitation techniques include scarification and the respread of local seedsoil material. Soil will not be imported for this purpose.)
7. Design road alignments to avoid low-lying areas.
8. Inform visitors of possible road closures after heavy rains.
9. Seek to incorporate a more representative range of soil types into the Park as opportunities to acquire additions to the Park arise.

B.3.2 Hydrology

The objectives are to:
Conserve ground and surface water resources.
Provide for a safe and sustainable water supply for Park residents and visitors.
Include unlicensed groundwater users when considering hydrological management.
Protect the Park's ecosystems from any adverse effects resulting from the lowering or raising of the watertable.

- Risks are associated with public use of pools in the northern gorges, because of slippery rocks and very cold water.
- Permanent pools in the Park support disjunct plant and animal populations.
- Feral stock numbers are highest near permanent pools in the southern areas of the Park. Impacts include trampling of vegetation and fouling of water.
- Vehicle based recreation can cause damage to springs.
- The sustainable yield of most aquifers is unproven but can be inferred from the geology.
- Groundwater reserves maintain the ecologically important surface pools.
- Effluent disposal and leachate from solid waste disposal sites are a potential source of groundwater contamination.
- Groundwater extraction and dewatering activities associated with exploration and mining activities in or near the Park and related catchments may impact on the Park's ecosystems.
- Roads and other developments can disrupt surface flow, resulting in water shadows. Plant communities, particularly mulga woodland, may be killed or seriously degraded by water shadowing.

Strategies

1. Assess any proposed development of Park facilities to determine the impact groundwater use has on surface waters and associated vegetation (Section B.1.4).
2. Assess proposed developments within the Park and related catchments to determine the potential impacts upon aquifers and dependent vegetation.
3. Inform visitors of the risks of using pools in gorges, and the importance of not using soap for

washing.

4. Sample pools in the recreation area, as required, for bacterial contamination.

5. Consider monitoring surface run-off from the Park to determine whether changes in water quality can be attributed to recreational or Park management activities.

6. Investigate the potential for localised, temporary fencing to protect springs from damage by feral animals and vehicles.

7. Survey groundwater resources in conjunction with the Water and Rivers Commission and the Geological Survey of Western Australia prior to major exploitation of aquifers or dewatering activities associated with mining.

8. Monitor areas of the Park likely to be impacted by drawdown of the groundwater resource through community and industrial activity.

9. Identify possible effects that groundwater extraction or dewatering might have on surface waters and associated vegetation.

10. Consult with relevant authorities on any proposals to dispose of effluent.

11. Management of hydrology should address all groundwater users including unlicensed ones.

B.3.3 Landscape

The objectives are to:
Minimise adverse impacts on the landscapes of the Park.
Plan all uses and management activities to complement the Park's landscape values.

· Visual changes to the landscape occur continually. Natural changes are generally subtle and harmonious. Human-imposed changes, however, can either visually dominate natural elements and appear discordant and alien, or enhance the surrounding landscape elements and provide an increase in scenic quality.

· Whether visual changes are perceived to be positive or negative depends on numerous factors, including viewer position, view duration, view distance, landform, soils, aspect and type of landscape alteration.

· The ability of landscapes to absorb change without loss of scenic value varies, depending on slope, soils and vegetation cover.

· Visual landscape management will involve extensive broad scale and onsite analysis, project impact evaluation, and sensitive site planning, design and construction methods.

· Landforms in the Park are of particular significance to the Aboriginal traditional owners, and aspects of traditional significance are an important subject for interpretation.

Strategies

1. Assess any proposed development of Park facilities to determine its impact on landscape values (Section B.1.4).

2. Incorporate aspects of Aboriginal significance of landforms into the interpretation program in cooperation with the KAHC (Section B.7.6).

3. Disallow developments with potentially adverse visual impact on principal skylines or in areas of outstanding cultural or landscape value, except where necessary for public safety.

4. Ensure appropriate input into the assessment of proposed mining and infrastructure developments that impact the Park's visual landscape values.

B.3.4 Flora and Vegetation

The objectives are to:
Conserve the native flora and vegetation of the Park.
Provide special protection to rare, endangered and restricted vegetation associations and species.
Use indigenous (local) species to restore disturbed areas to as near a natural state as possible.
Control, and if possible eradicate, weed species.

B.3.4.1 Native Flora

· Future completion of land system mapping will assist with planning and management.

· Disjunct plant populations occur within the areas of greatest recreational potential.

· The size of the Park means that a viable sample of the north-south vegetation transition is reserved where no major disturbances occur.

· A comprehensive published survey of the Park's flora would provide the basis to measure future changes in species diversity.

Strategies

1. Assess any proposed development of Park facilities to determine its impact on flora (Section B.1.4).

2. Document the Park's flora from data already collected. Conduct additional surveys especially for rare flora.

3. Monitor sensitive habitats and plant communities to ensure that recreational activities do not adversely affect them.

4. Highlight the significance of the Park's flora in interpretation programs (Section B.7.6).

5. Assess any proposals to adjust Park boundaries by reference to comprehensiveness, adequacy and representativeness criteria (including, for example, distribution and status of rare flora).

6. Conduct collections for the WA Herbarium and the Regional Herbarium on a systematic basis.

7. Encourage and facilitate research into traditional Aboriginal use and knowledge of the flora.

8. Observe all relevant provisions of the *Wildlife Conservation Act 1950* in the protection of declared rare (threatened) flora.

9. Liaise with the mining industry, Hamersley Iron and Agriculture WA in providing strategic support for future land system surveys.

B.3.4.2 Threats to Major Plant Communities

· The perennial hummock grasslands can be burnt on a cycle as short as five years. These communities have evolved with fire, which plays a role in nutrient recycling.

· Changes to underground aquifers can have a deleterious effect on riverine woodlands.

· Frequent fires and infrequent hot fires are a threat to mulga woodlands, *Callitris* stands and other fire sensitive communities.

· Weed invasion can eliminate herbs.

· Horses, donkeys and cattle damage vegetation communities through trampling, browsing and spreading weeds (Section B.3.4.4).

Strategies

1. Research a mosaic burning strategy and, if appropriate, implement it with the aim of encouraging the development of uneven-aged, productive stands of hummock grassland.

2. Independently assess any proposed developments within the immediate catchments of the northern scarp to determine the potential impacts upon aquifers and dependent vegetation (Section B.3.1).

3. Identify, map and manage selected areas supporting fire sensitive communities as no planned burn areas in order to maintain their viability or to provide control areas for long-term fire research (Section B.3.6).

4. Protect the ecosystems which are known to be sensitive to inappropriate fire regimes.

B.3.4.3 Rare and Restricted Plants

- Special habitat requirements of many restricted species are not known.

- *Thryptomene wittweri* (gazetted rare) occurs within the Mt Meharry area; *Lepidium catapycnon* (also gazetted rare) occurs immediately north and east of the Park, and may be located within the Park with further survey.

- Many restricted species in the Park occur in areas of high recreational potential (gorges and hill tops).

Strategies

1. Commission research to locate rare species and identify special habitat requirements of restricted species.

2. Observe all relevant provisions of the Wildlife Conservation Act in the protection of rare species.

3. Assess any proposed recreational developments in the Park to determine their likely impact upon the viability of restricted plants. Where an unfavourable impact is likely, modify or stop the development.

B.3.4.4 Weeds

- Weed control is a management objective, although the eradication of all weeds is not practicable. Resources should, therefore, be assigned to control weeds considered to be of the greatest threat.

- An effective control measure is to reduce both sources of soil disturbance and agents of weed infection.

- The impact of weeds is likely to be greatest in riverine areas which support a diversity of native species and are a major habitat.

- CALM has statutory obligations in relation to declared species in the Park.

- Park staff need to familiarise themselves with declared weeds that are known to occur in the Park or that occur in adjoining districts.

- Feral herbivores (cattle, horses, donkeys) may introduce and spread weeds.

- Control of some widespread weeds may not be practicable, particularly if they are plants valued by the pastoral industry. Chemical control of these species would be a very costly and probably futile exercise.

- Date palms pose a threat to reliable water supplies. They are susceptible to chemical control.

- The presence of date palms is of some historical interest.

Strategies

1. Maintain a register of weeds for the Park especially those mentioned in section A.2.6.4 and regularly survey areas considered to be susceptible to weed infestation. Include in the register details of distribution, relevant biological information, and a history of control measures.

2. Control weeds by mechanical methods, use of appropriate herbicides and by biological methods. Use selective herbicides in preference to broad spectrum herbicides. Consider the safety of both public and staff in determining the control methods to be used. Weed management will be in accordance with CALM policy, and herbicide use in accordance with the CALM handbook, *Chemical Users Manual* and the Agriculture WA handbook, *Declared Plant Control*.

3. Limit earthmoving and gravel extraction in the Park to the minimum area needed to minimise the risks of introducing or spreading weeds. Require that earthmoving plant be clean prior to entering the Park.

4. Aim to eradicate hoofed feral animals within the Park, and prevent their further entry into the Park, to prevent introduction of weeds by this means.

5. Rehabilitate disturbed areas with indigenous vegetation (using only local seed) in accordance with CALM policy.

6. Select tree introductions for amenity purposes in the intensive recreation zones (Map 6) according to the guidelines of the above policy. Introduced species will not be permitted in other zones.

7. Locate Park facilities so as to minimise the risk of weeds escaping into watercourses.

8. Observe, where possible, relevant provisions of the *Agriculture and Related Resources Protection Act 1976* (ARRP Act) in the case of plants declared for the Pilbara under the Act.

9. Cooperate with the Agriculture WA Regional Office to identify and control all declared plants in the Park.

10. Minimise soil disturbance and other actions which may lead to the spread of introduced weeds such as buffel grass, kapok bush and ruby dock.

11. Consult with the pastoral industry on any proposed use of biological methods to control non-declared species.

12. Identify and eradicate all immature date palms and mature female date palms in the Park. This will be an ongoing process due to the presence of a seed store in the ground. Mature male trees may be retained for their historical value at selected sites.

13. Identify species of *Typha* within the Park, especially to determine which ones are native and which ones are exotic and map their distribution, distinguishing between the native *T. domingenis* and introduced *T. orientalis*. Monitor the spread of *T. orientalis* if present and take appropriate control measures if necessary.

14. Concentrate weed control programs in riverine habitats.

B.3.5 Fauna

The objectives are to:
Conserve native fauna populations.
Provide special protection to rare, threatened and restricted species of fauna and their habitats.
Control and, if possible, eradicate feral animal populations within the Park.
Reverse the decline of critical weight range mammals.

B.3.5.1 Native Fauna

- The vertebrate fauna of the Park is reasonably well known and documented.
- Development of Park facilities may have unintended impacts upon fauna.

Strategies

1. Assess any proposed development of Park facilities to determine its impact on fauna (Section B.1.4).
2. Compile an inventory of fauna in the Park (Section B.11.1).
3. Research species numbers, population levels and conservation status of fauna in the Park (Section B.11.2).
4. Encourage and facilitate research into traditional Aboriginal use and knowledge of the fauna.
5. Permit internal fencing of the Park only under extraordinary circumstances, for example, as a temporary environmental protection measure.
6. Review the potential to reintroduce gazetted rare species into the Park.

B.3.5.2 Common Species and Habitats

- Conservation of fauna depends upon conservation of habitat.
- The permanent springs of the Park and associated vegetation are important habitats for a large number of species. These habitats may be susceptible to trampling by feral stock and other disturbance.
- The frequency of fire in hummock grasslands may determine its suitability as habitat for some animals.
- Bird observation is a recreational activity for many Park visitors.
- Mulga habitats on lands adjoining the Park have generally been degraded by cattle and fire, but extensive remnants remain, including a large area of vacant Crown land south-east of the Park.
- Mulga habitats, in particular, are at risk from changed fire regimes and grazing.
- Important habitats of the adjoining Fortescue River and Ashburton drainage systems are not represented in the Park.
- The effect of environmental disturbance on invertebrate taxa has not been thoroughly investigated. Ants are known to be reliable indicators of ecological change.
- Termites in the Park can destroy timber structures.
- Safety/health issues may be associated with invertebrates at certain times.

Strategies

1. Explain the relationships of fauna and habitat in interpretation programs. Highlight the need to avoid habitat disturbances in an inherently fragile environment.
2. Address the need to protect stream habitats in feral animal control programs.
3. Advise that off-road driving is prohibited, using visitor information programs. Encourage proper use through the appropriate design of access roads.
4. Research the effect of the fire management strategy on fauna inhabiting hummock grasslands to ensure that adopted fire regimes do not disadvantage some species (Section B.3.6).
5. Build hides to observe birds and mammals in the Park. Provide information on species occurring in the Park.
6. Research the effects of fire and other disturbances

on mulga habitats.

7. Include in the Park, when the opportunity arises, lands from the Fortescue River Plain and Ashburton drainage system (particularly those which include mulga woodland habitats).

8. Survey the status of the invertebrate fauna to provide the basis for monitoring future changes (Section B.11.1).

9. Allow for the use of appropriate insecticides to protect historical structures from further termite attack.

10. Advise the public of precautions that should be taken in relation to insects or other invertebrates.

B.3.5.3 Threatened Fauna

· One vertebrate species, the Pilbara Olive Python is endemic to the Pilbara, is specially protected as Threatened Fauna and occurs in the Park.

· Fire management will have a major bearing on the ability of the Park to support any existing or future populations of critical weight range mammals.

· Foxes are rare or vagrant visitors to the Park and the extent of their predation on native mammals is not known but is unlikely to be significant in the face of 1080 baiting to control dingos.

· Certain areas of the Park have not been adequately surveyed to confirm the presence, or otherwise, of some mammals.

Strategies

1. Observe all relevant provisions of the Wildlife Conservation Act in the protection of gazetted rare species.

2. Research the specific habitat requirements of selected rare or restricted fauna (Section B.11.2).

3. Maintain records of sightings of rare or restricted fauna.

4. Consider the habitat requirements of rare or restricted fauna when preparing capital works and fire management proposals.

B.3.5.4 Critical Weight Range Mammals

· A number of species occur in the Park which, although not gazetted as rare, have declining populations and are now rare or absent over much of their former range.

· With respect to mammals, the decline in population and contraction in range of some species is most apparent in herbivores of intermediate size (35g - 5.5kg adult body weight). This group is referred to as the critical weight range (CWR) mammals.

· Changed fire regimes and predation by foxes and cats are two factors which have been implicated in the general decline of CWR mammals. An example is Rothschild's Rock Wallaby (*Petrogale rothschildii*), a species restricted to the Pilbara and eastern Gascoyne, which is now present in the Park only at very low densities.

· The Bilby (*Macrotis lagotis*) and the Northern Brushtail Possum (*Trichosurus arnhemensis*) are examples of mammals that have previously been recorded from the region but are probably now absent from the Park.

· Fire management and feral predator control will have a major bearing on the ability of the Park to support any existing or future populations of CWR mammals.

Strategies

1. Consider the impact of proposed Park facilities on CWR species through an internal environmental assessment procedure (Section B.1.4).

2. Aim to restore fire regimes that were in place prior to the decline of the CWR mammals as part of the Park's fire management program (Section B.3.6).

3. Review the potential to re-introduce CWR mammals into the Park.

4. Survey and monitor Rothschild's Rock Wallaby populations (Section B.11.2).

5. Conduct intensive surveys, particularly in southern areas of the Park, to determine whether previously recorded species still occur within the Park.

6. Record cat and fox sightings and document any information relating to their impact on native mammals. Support field studies of cat predation.

7. Implement broadscale feral predator (cat) control where feasible and necessary for fauna conservation.

B.3.5.5 Dingos

· The potential for conflict of interest exists between conservation management and pastoralism in relation to dingos.

· It is acknowledged that dingos from the Park prey upon sheep on adjoining properties and may, under unusual circumstances, kill calves.

· Approximately 70% of the Park's boundary adjoins pastoral land.

· The use of large "dried" meat baits (rather than "crackle" baits) to poison dingos is preferred from

the point of view of their impact on non-target mammals.

· Current technology makes it important that "dried" meat baits be injected, rather than mixed, with 1080 and that the baits be of adequate size.

· The impact of 1080 baiting on non-target species, for example, raptors, quolls, and monitors is under investigation.

· Eradicating dingos may increase cat populations (Section B.3.5).

Strategies

1. Maintain a viable purebred population of dingos in the Park, while minimising the impact of predation upon surrounding pastoral lands. To this end CALM will require that Agriculture WA prepare detailed proposals to manage dingos in areas of the Park that adjoin pastoral lands. Pastoralists will be consulted during the formulation of proposals. The results of research will be applied to dingo management in the Park, as applicable.

2. Proposals for baiting or trapping will need to be supported by research that shows dingos from the Park are having an impact on neighbours' pastoral properties. Each baiting operation will require the prior written authority of CALM.

3. Apply best practice methods for baiting dingos in the Park. At present this uses only "dried" meat baits which must be injected and distributed according to guidelines prescribed in the Agriculture WA management proposals. Park staff will monitor baiting to ensure that baits are of an approved type and are of adequate size. (No native mammals will be taken from the Park for the purpose of supplying bait material.)

4. Clearly mark the corners of the Park boundaries for the purposes of aerial baiting.

5. In the event of a mammal re-introduction program in the Park, institute limited dingo control measures, if necessary.

6. Cooperate with Agriculture WA and other researchers investigating the possible impacts of 1080 baiting on non-target populations.

B.3.5.6 Feral Animals

· Feral animals pose a serious threat to the natural environment of the Park. Specific data concerning their distribution and relative impacts is generally lacking.

· CALM has statutory obligations in relation to declared and exotic animals generally.

· Native fauna declared under the *Agriculture and Related Resources Protection Act 1976* (ARRP Act) but located in their normal range are not treated as declared within CALM managed lands unless a specific management program is approved.

· Unbranded cattle appearing to be over the age of 12 months and located on CALM managed land are the property of the Crown. Reasonable opportunity must be given to the owners of stock that have strayed from adjoining lands to recover their property.

· Feral stock can only be effectively controlled if fencing is installed. The Pilbara pastoral district is not declared free of tuberculosis and brucellosis, so quarantine measures apply.

· Control of house mice and introduced honey bees is not considered to be practicable with current methods.

Strategies

1. Formulate a feral animal control program to systematically control or eradicate feral animals according to established priorities. (The program will recognise the rights and responsibilities of pastoralists in relation to stock control. Before the program is instituted, adjoining pastoralists will be given the opportunity to muster cattle).

2. Maintain a register of all exotic animals in the Park. The register is to include details of distribution, relevant biological information, and a history of control measures.

3. Control feral animals in accordance with CALM operational guidelines and policy.

4. Observe relevant provisions of the ARRP Act, CALM Act, and other legislation concerning declared animals, feral animals, or straying stock.

5. Undertake control of cattle, with due consideration for ownership, as required in Section 108C of the Conservation and Land Management Act.

6. Prepare a strategic fencing program and identify the most cost-effective fence alignments to prevent stock from trespassing.

7. Strategies to control horses and donkeys will include ground or aerial shooting, and trapping. Mustering may be a strategy under certain conditions.

8. Undertake control of foxes and cats where evidence indicates that their predation is having a serious impact upon native species.

9. Give management priority to the control of house mice and introduced honey bees once practical and selective methods have been identified.

B.3.6 Fire

The objectives are to:

Protect community and environmental resources and values within the Park from damage or destruction by wildfire.

Use fire as a management tool to enhance habitat diversity and other land management objectives.

- CALM is conducting a long-term research program in the Park on the fire ecology of mulga woodland and spinifex communities.
- Fire is integral to the regeneration and maintenance of many arid zone plant communities.
- Before colonial settlement, Aboriginal burning practices were very important in maintaining a mosaic pattern across the landscape.
- CALM has statutory obligations to comply with the Bush Fires Act and the CALM Act in relation to the prevention and control of wildfires.
- Periodic prescribed burning is the most effective long-term method of confining wildfires in the Park and wildfires threatening the Park.
- Changes in wildfire occurrence since colonial settlement are continuing to alter the nature of Park vegetation.
- Frequent and extensive wildfires have a long-term adverse impact on some plant communities.
- Park neighbours can provide valued assistance in fighting fires, and have done so in the past.

Strategies

Fire Prevention

1. Prepare a fire operations plan based on the principles of Wildfire Threat Analysis and advice of the KAHC which will:
   i. give priority to the protection of community environmental and cultural values;
   ii. reflect spatial differences in fire ecology and be compatible with conservation objectives;
   iii. delineate 'no-planned-burn' areas on the basis of vegetation type, other values or research requirements and their ability to be protected from wildfires;
   iv. identify suitable fuel reduced buffers to protect designated areas, and for development of fire management cells within which wildfires are to be contained;
   v. include prescriptions to burn within buffers for vegetation management burns;
   vi. where appropriate ensure burning prescriptions within the Park take account of aboriginal priorities and relevant fire impacts research;
   vii. where they are known incorporate the principles and practice of Aboriginal traditional burning regimes;
   viii. include prescribed burning for habitat modification for fauna (Section B.3.5);
   ix. determine suitable seasonal (weather and fuel) conditions (based on previous research) for aerial burning;
   x. evaluate the effectiveness of prescribed burning operations to meet environmental and fire suppression objectives.
2. Park facility development must ensure adequate fire protection (Section B.1.4).
3. Consult the KAHC, adjoining landowners and other interested parties during preparation and implementation of the fire operations plan.
4. Develop cooperative arrangements with the Fire and Emergency Services authorities and Park neighbours.
5. Provide visitors with information on the effects of wildfires on the natural environment and the need to prevent wildfires. In particular use gas fires wherever possible and no fires to be allowed on days of Very High and Extreme fire danger as advised by the local government authority.
6. Protect developed sites and facilities eg campgrounds, day use sites and parking areas.
7. Train staff in fire suppression and prescribed burning operations.

Planned Use of Fire

8. Use aerial and ground-based prescribed burning to achieve fire management objectives.

Fire and Nature Conservation

9. Aim to establish and maintain a mosaic of vegetation at various stages of succession in the Park.
10. Protect selected long unburnt stands of different vegetation types to act as a reference point for fire research.
11. Monitor the impact of fire on the Park's vegetation (particularly threatened plants and mammals) as part of a long-term research program. Apply the findings to the fire operations plan.

Response to Fire

12. Aim to confine wildfires, provide a diversity of habitat and protect fire sensitive communities (especially mulga) and other values (Park installations, cultural sites). Particular fire management strategies will depend upon vegetation type.

13. Conduct wildfire suppression from existing roads where possible so as to minimise environmental damage. If necessary, construct fire breaks off roadsides in order to limit or confine wildfires to an acceptable size or to prevent the fire from damaging Park values.

14. Be aware of the importance of protecting human life in conducting wildfire suppression activities.

B.4 MANAGEMENT OF CULTURAL RESOURCES

B.4.1 Karijini Aboriginal Heritage Committee

The objectives are to:
Recognise, protect and promote Aboriginal cultural resources and values in the Park and adjacent areas.
Promote visitor awareness and appreciation of the Aboriginal cultural heritage of the Park.
Assist in the protection, preservation and management of all Aboriginal sites, objects and cultural information relevant to the Park and adjacent areas.

- The *Aboriginal Heritage Act 1972* protects all Aboriginal sites and cultural objects in Western Australia, including those sites and objects located within national parks.

- Under Aboriginal law, the traditional owners are responsible for the protection and management of sites and objects of cultural significance within the Park and adjacent areas. They are also responsible for information pertaining to those sites and objects. An important criterion for appropriate management of cultural information is confidentiality. The Aboriginal cultural environment is best interpreted and managed by the Aboriginal traditional owners.

- The Aboriginal traditional owners of the Karijini National Park and adjacent areas have established the Karijini Aboriginal Heritage Committee (KAHC) to consider any proposals in relation to the Park which may affect the Aboriginal cultural heritage of the area, and to advise the Karijini Park Council and, where necessary, the Minister for Aboriginal Affairs as to any adverse impact.

- The general public is interested in Aboriginal heritage, but little information is published about the Aboriginal heritage of Karijini National Park and surrounding areas.

- Some significant sites may be at risk because of their age or because they are located near existing or proposed developments or associated activities.

Strategies

1. The Karijini Park Council will refer all issues involving Aboriginal sites, objects and cultural information to the Karijini Aboriginal Heritage Committee.

2. The Karijini Park Council and CALM shall maintain the confidentiality of cultural heritage information, including that pertaining to formally recorded sites unless given written approval by the Karijini Aboriginal Heritage Committee.

3. The Karijini Aboriginal Heritage Committee (KAHC) will not be required to divulge information pertaining to sites of significance not currently recorded for the Park or adjacent areas, unless specifically required for purposes of advice to the Karijini Park Council on proposals before it.

4. The Karijini Park Council will ensure that the interpretation program (Section B.7.6) includes information acceptable to the KAHC pertaining to traditional Aboriginal significance of the Park, so as to increase public awareness and appreciation of the Park's cultural value.

5. Access to any site of significance will not be provided or encouraged unless specifically agreed to by the KAHC.

6. Refer applications for work or research permits for sites in the Park to the Karijini Aboriginal Heritage Committee for its advice. The conditions of such a permit will include monitoring by a Karijini Aboriginal Corporation member if appropriate Park staff are not available, as advised by the KAHC.

7. Where sites are thought to be at risk from processes of deterioration, the Karijini Park Council will request the Karijini Aboriginal Heritage Committee to liaise with the Aboriginal Affairs Department and other specialist agencies with a view to jointly formulating appropriate strategies to arrest the deterioration.

B.4.2 Traditional Aboriginal Activities

The objective is to provide the opportunity for Aboriginal people to maintain their social, economic and religious practices in harmony with the conservation and management of the natural and cultural resources of the Park.

- Traditional activities, such as hunting and gathering for economic as well as for ceremonial purposes, are important elements in the maintenance of Aboriginal cultural heritage, particularly within the context of transmitting traditional knowledge and practice to the young.

- Ceremonial visits to specific sites which may not be within, or adjacent to, residential areas are equally important to maintaining Aboriginal cultural heritage, and may occur from time to

time.

- According to the Wildlife Conservation Act, the Executive Director may consent to Aboriginal people taking flora or fauna for their own use but not for sale.

- It is an offence to carry or discharge any firearms in a reserve without permission (Regulations under the CALM Act).

- Regulations under the CALM Act stipulate that persons without authority may not drive a vehicle on any part of a reserve other than a formed road, a formal parking area, or a track approved for vehicular use.

Strategies

1. In consultation with the Karijini Aboriginal Heritage Committee, proposals for Aboriginal traditional owners to use areas within the Park for traditional activities such as hunting and gathering or ceremonial purposes will be referred to the Karijini Park Council and the Karijini National Park Advisory Committee.

2. In consultation with the KAHC, the Park Council shall develop guidelines pertaining to hunting and gathering, and to ceremonial activities, to ensure that:
   i. natural resources are not unduly depleted;
   ii. such activities are carried out away from visitor use areas;
   iii. the possibility of interruption or intrusion by visitors is minimised;
   iv. the confidentiality of locations or areas of ceremonial significance is maintained;
   v. any firearms in the Park would need to be registered with CALM's Regional Manager and operated within strict safety procedures (Section B.9);
   vi. suitable access is provided to areas established under Strategy 1 above;
   vii guidelines will be referred to the Karijini National Park Advisory Committee.

3. A system of monitoring the Park's natural resources will be developed in consultation with the Karijini Park Council and the Karijini National Park Advisory Committee and will be implemented by CALM.

B.4.3 Colonial Heritage

The objective is to protect the colonial heritage of the Park.

- The colonial history of the area is characterised by expansion into the north-west of Western Australia by the pastoral industry and by mineral exploration and development. Little recorded information is available, particularly of the rise and fall of pastoralism during the late 1800s and early 1900s.

- Various signs of early pastoral and mining activities remain in the Park and surrounding areas, while the nearby mining towns of Paraburdoo and Tom Price are recent developments of the iron-ore industry.

- Considerable information exists about mineral exploration and the mining of gold, asbestos and iron ore, but there is a lack of recorded information concerning the nature of the relationships between Aboriginal people and the pastoral and mining industries.

- Aboriginal families have had long associations with both the pastoral and the mining industry, and there is still much oral history material available.

- The early exploration and settlement of the east Pilbara area and the impacts on Aboriginal people are likely to be of interest to visitors.

- Relics of Mt Bruce Station may be at risk from decay.

Strategies

1. Assess Park structures associated with early pastoral and mining activities. These might include wells, stockyards, buildings and gravesites. Adhere to the principles of the Burra Charter[9] in relation to the future preservation of structures considered to have archaeological value.

2. Encourage and facilitate research into the pastoral and mining industries in the Hamersley Range and surrounding areas with a view towards including such information in information programs. Research might include:

   i. the history of early exploration and settlement;
   ii. the history of early mineral exploration and development;
   iii. the history of Aboriginal populations in the area;
   iv. the relationships between Aboriginal groups and the pastoral and mineral industries.

3. The Karijini Park Council will refer proposals for such research to the Karijini Aboriginal Heritage Committee.

4. Take into account areas of land important for colonial history when considering additions to the Park
   (Section B.2.1).

5. Restrict access, if necessary, where management cannot protect sites.

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[9] The Australia ICOMOS Charter for the Conservation of Places of Cultural Significance (the Burra Charter) contains principles concerning the preservation of structures considered to have historical value.

6. Use appropriate insecticides, if considered necessary, to protect historical structures from further termite attack.

B.5 MINING AND EXPLORATION

B.5.1 Mining

The objective is to protect the Park from the impacts of exploration and mining.

- Existing mineral tenements in Karijini National Park will be managed according to the Mining Act or relevant Agreement Act. Additional tenement applications will be dealt with in accordance with Government policy.

- Development of mining infrastructure in the Park may have serious implications for the achievement of the stated goals and objectives of Park management.

- The Karijini Park Council, Karijini National Park Advisory Committee, NPNCA, CALM and the EPA would be involved in the environmental assessment of any proposal for infrastructure development in the Park.

- CALM would retain a management and supervisory role for any section 5 (g) reserves (Sections A.1.2, A.1.3) created as enclaves within the Park.

- The NPNCA will act within its powers to rationalise such development and seek to ensure that where infrastructure is installed, it is done in a manner that minimises long term adverse impacts upon the Park.

- It is probable that conditions above and beyond those established by any approved management plan for a particular exploration or mining program, will be required to manage and protect the Park (for example, refer Section B.6).

Strategies

1. CALM, the Karijini Park Council, Karijini National Park Advisory Committee and the NPNCA may advise the Minister on all mining and exploration proposals within Karijini National Park, and in areas proposed for addition or excision (or previously excised).

2. Refer any mining proposal to the Karijini Aboriginal Heritage Committee to provide advice on possible impacts on Aboriginal cultural sites.

3. Consider proposed easements for transport or utilities within the Park in accordance with the CALM Act, Mining Act, Environmental Protection Act, Aboriginal Heritage Act, Wildlife Conservation Act, ratified Government Agreements, and the existing administrative arrangements between the Department of Minerals and Energy, Department of Resources Development, CALM, Karijini Park Council and the Karijini National Park Advisory Committee.

4. The Karijini Park Council, Karijini National Park Advisory Committee and CALM will provide advice on any environmental study aimed at identifying easement alignment(s) which will minimise adverse impacts upon the Park.

B.5.2 Exploration

The objective is to minimise the impact exploration has on the Park.

- The process to rationalise tenements - mining leases, exploration licences, temporary reserves - within the Park requires that the current tenements undergo initial non-ground disturbing exploration, possibly followed by drilling, to prove the geological and economic status of the tenement. Non-prospective areas would be relinquished. Additional tenement applications would be dealt with in accordance with Government policy.

- Government policy requires all tenement applications to be dealt with in accordance with the *Mining Act 1978*, the Environmental Protection Act and appropriate State Agreement Acts. All mining exploration activity is overseen by the Department of Minerals and Energy. Applications will be considered on a case by case basis giving consideration to the impacts of exploration on conservation values.

- Appropriate measures to protect Aboriginal sites of significance will be undertaken in accordance with the *Aboriginal Heritage Act 1972*.

Strategies

1. New exploration proposals will require the appropriate level of approval. Significant ground disturbing activities will be assessed by the National Parks and Nature Conservation Authority and the Department of Environmental Protection will be notified.

2. Exploration to prove the viability of current tenements will be conducted in accordance with the *Aboriginal Heritage Act 1972*.

3. CALM will seek to implement its policy for recouping fees and charges for services provided to the private sector.

4. Oversee exploration activities to ensure that the strategies outlined in this management plan are achieved

B.5.3 Compensating Additions

The objectives are to:
Identify preferred areas to be added to the Park as compensation for losses of Park values from iron ore mining and associated infrastructure.
Ensure that areas to be added have natural and cultural resources worthy of inclusion in the Park.

- Seek additions to the Park of land having similar conservation value to compensate for land excised for mining and associated infrastructure.
- Areas proposed to be added to the Park will need to be identified, and resource and biological assessments undertaken.
- Such areas should not simply be added on an area for area basis, but should take into account representativeness criteria, the integrity of current land systems within the Park, and continuity of existing landscapes and of natural and cultural patterns.
- The Karijini Park Council and the Karijini National Park Advisory Committee have a role in identifying areas of land which may be added to the Park.

Strategies

1. The Karijini Park Council and the Karijini National Park Advisory Committee will assist CALM in identifying preferred lands for addition to the Park. Any proposal will be referred to the NPNCA and the Karijini Aboriginal Heritage Committee for their consideration.
2. The Karijini Park Council and the Karijini National Park Advisory Committee may advise the Minister on areas of land which they determine should be added to the Park.

B.5.4 Basic Raw Materials

The objective is to limit the extraction of gravel, sand and stone from the Park to areas where such activity will have minimal impact on Park values.

- CALM policy (derived from relevant mining statutes) allows CALM or its authorised agents to use gravel from public lands managed by CALM for Park operations. There is a continuing need for gravel, primarily in road maintenance.
- The extraction of gravel, sand and stone can have negative impacts on Park values.

Strategies

1. All extraction of gravel, sand or stone within the Park will be authorised by CALM in accordance with CALM policy and relevant statutes.
2. Apply an internal environmental assessment procedure to proposed borrow pits (Section B.1.4). Refer all proposals to the Karijini Aboriginal Heritage Committee.
3. Minimise the number of new gravel pits in the Park and require that contractors or Shire employees extracting gravel comply with CALM guidelines.
4. Limit pits supplying gravel, sand or stone to recreation zones. Ensure pits are not visible from roads, tracks and paths (Section B.3.3).
5. Rehabilitate all pits once extraction is completed. Topsoil should be separately stored and removed for use in rehabilitation work.
6. Excavate and stockpile gravel and rehabilitate pits with local native species. No topsoil will be imported into the Park to rehabilitate pits.

B.5.5 Fossicking

The objective is to ensure that fossicking does not occur within the Park.

- Under the terms of the Mining Act, a Miner's Right does not confer the right to prospect or fossick on land reserved as a park or reserve.
- Fossicking in national parks is forbidden in accordance with the CALM Act and CALM's Policy Statement No 18 - Recreation, Tourism and Visitor Services.

Strategy

1. Ensure that visitors are aware that fossicking and the use of metal detectors are not permitted in the Park.

B.6 MARANDOO

B.6.1 Infrastructure

The objective is to minimise the impact of construction activities, buildings, mining and associated activities, and transport and power supply on the natural and cultural values of the Park.

- The Marandoo mining lease is an enclave within Karijini National Park, sited at the foot of Mt Bruce. The view of the natural landscape from Mt Bruce will be affected by the Marandoo development.

- The railway west from Marandoo runs to Rosella Siding on the Tom Price - Dampier line. The proposed Central Pilbara Railway will run from Marandoo to the eastern boundary of the Park near Juna Downs homestead. These sections are an excision from the Park and consist of a linear easement one km wide by approximately 80 km long. This excision is vested in the NPNCA and managed through this management plan (Sections A.1.2, A.1.3). The high perimeter to area ratio of the corridors magnifies potential impacts on the Park.

- The presence of infrastructure including the proposed Central Pilbara Railway will have some long-term impact on landscape values of the Park.

- Significant natural and cultural values exist within these excisions, including habitat for threatened species, and the presence of areas of significance to Aboriginal traditional owners. Protection of these values has been addressed in the Ministerial conditions for approval of the project (refer Appendix 6).

- The *Aboriginal Heritage (Marandoo) Act 1992* applies to the Marandoo mining lease area only.

- The Marandoo iron ore mine and the central Pilbara railway were approved on October 6 1992, subject to Ministerial conditions on protection of the environment (refer Appendix 6).

Strategies

1. Liaise with Hamersley Iron to ensure that conditions set by any approved management program, and management strategies contained within this Plan, are adhered to in so far as they relate to impacts on the Park's natural and cultural values of the construction, operation and maintenance of mining infrastructure.

2. Ensure that statutory obligations by way of the CALM Act, Regulations under the CALM Act and Wildlife Conservation Act are adhered to. (The Minister for Aboriginal Affairs is responsible for the Aboriginal Heritage Act and the Aboriginal Heritage (Marandoo) Act).

3. Monitor the impact of infrastructure and its use on the Park.

4. Encourage the integration of infrastructure into corridors.

B.6.2 Access to Marandoo

The objective is to minimise any adverse impacts that access to Marandoo has on the Park.

- The recently completed bitumen road from Tom Price to Marandoo will make Tom Price a viable base to develop tourism infrastructure for people visiting Karijini National Park. It will also substantially alter visitor traffic patterns in the Park.

- The proposed service road along the railway easement within the infrastructure corridor could encourage access by workforce and maintenance personnel to parts of the Park currently not accessible to vehicle traffic.

- It will be important that workforce personnel are aware of possible impacts on the Park of access from the corridors and minesites. An education program would be likely to improve understanding of these impacts and to lessen such access.

Strategies

1. Liaise with Hamersley Iron and representatives of the workforce to ensure that conditions set by any approved management program, and management strategies contained within this plan are adhered to in so far as they relate to impacts upon the Park resulting from improved access.

2. Liaise with Hamersley Iron and representatives of the workforce to initiate an education program which will highlight the potential impacts improved access will have on the Park.

3. Monitor the impacts improved access to the lease area and along the corridor have on the Park.

4. Disallow unauthorised vehicle access from the corridors into the Park.

B.6.3 Environmental Assessment and Monitoring

The objective is to minimise the impacts mining and infrastructure developments associated with Marandoo have on the Park.

- The Marandoo iron ore mine and central Pilbara railway were approved on 6 October 1992, subject to Ministerial conditions on protection of the environment.

- CALM and Hamersley Iron have developed a Statement of Mutual Understanding (Hamersley Iron 1992) which allows for cooperative management of impacts of the project on conservation values of the Park (refer Appendix 5). This has implications for the Karijini Park Council with respect to Park management.

Strategies

1. Work in association with Hamersley Iron in accordance with the Statement of Mutual Understanding (Appendix 5) to ensure there are minimal impacts on the Park from mining and infrastructure. The Ministerial conditions attached to Government approval of the project will need

to be referred to (Appendix 6).

2. Monitor the impacts of mining and associated activities on the Park. CALM will refer results and implications of monitoring to the Karijini Park Council and the Karijini National Park Advisory Committee.

B.6.4 Rehabilitation

The objective is to ensure that rehabilitation is consistent with EPA conditions and with the proper restoration of Park ecosystems.

· The Marandoo ore deposit will be mined using conventional benching methods. After mining is completed a substantial pit will still remain.

· It is intended to revegetate waste as final surfaces are established, and that progressive rehabilitation to control appearance of disturbed areas will ameliorate the impact on landscape values.

· It is expected that rehabilitated land will be returned to the National Park once the mining program is completed.

Strategies

1. Liaise with Hamersley Iron to ensure that conditions of any approved mining management program with respect to rehabilitation are adhered to. Rehabilitation should also be consistent with relevant conditions of this management plan.

2. Ensure that local species are used to revegetate the minesite, borrow pits and any other disturbed land.

B.7 MANAGEMENT FOR PUBLIC USE

B.7.1 Management Zones

The objective is to provide a basis for the regulation of activities within defined zones, so that the human uses of the Park do not conflict with each other and are compatible with conservation objectives.

· The use of management zones will assist in protecting the Park's unique natural and cultural environment.

· Management zones will meet the needs of Park visitors, Park residents and Aboriginal traditional owners in an equitable way by providing the largest possible range of activities while minimising conflicts.

· Management zones will be reviewed in any interim review of the plan following gazettal (Section B.12.3), and will take account of changes in mining tenements resulting from the rationalisation of tenements (Section B.5.2).

Strategies

1. Use the zoning scheme for the Park (Section A.5.1, Map 6) as a guide to future management.

2. The Karijini Park Council will develop a policy by which access to sites and areas of cultural significance to KAC members may be facilitated within the context of Park management goals (Section B.4.2).
3. Review the Park's management zones with any interim review of the plan (Section B.12.3).

B.7.2 Access

The objective is to provide access which is consistent with the maintenance of conservation and cultural values, and with the diverse range of visitor needs.

B.7.2.1 Road Access

· Further improvement of the Pilbara regional road network will create opportunities for increased visits.

· As the region develops there are likely to be proposals to construct new regional roads.

· Environmental and public safety considerations mitigate against the long-term maintenance of Yampire Gorge as an access route to the Park, unless the road is upgraded and mine sites and tailings are made safe (Section B.9.3). The road passes through a wetland, which would need to be considered in the event of any road works.

· Entry stations provide an initial contact with visitors and facilitate the distribution of public information.

· The internal Park roads, although adequate, are dusty and are gradually being graded below the level of the surrounding landscape.

· Vehicles driving off established roads and tracks are a potential cause of severe environmental impact including erosion and weed dispersal.

· Access strategies are required for the Mt Meharry area.

Strategies

1. Liaise with the Main Roads Department (MRD) to ensure that regional road development facilitates visitor access to the Park (Map 8).

2. Refer regional road development proposals to the Karijini Park Council and the Karijini National Park Advisory Committee. Subject proposals to environmental assessment in accordance with the Environmental Protection Act, and to independent cost-benefit analysis of likely impacts upon Park values.

3. Establish staffed entry stations in the Park as necessary and as resources permit.

4. Liaise with appropriate Government departments and other parties on ways to minimise the impact of mining infrastructure upon the Park.

5. The future of Yampire Gorge road will be re-assessed in the light of recommendations to the Government by the Wittenoom Interdepartmental Committee and the Select Committee on Wittenoom. If the road is recommended to remain open, it is likely to require extensive rehabilitation of the road surface and mine surrounds to stabilise crocidolite fibres and should also be subject to ongoing evaluation of environmental impacts on the sensitive wetland areas in the gorge.

6. Develop strategies for visitor access to Mt Meharry.

7. As funds allow, progressively seal roads along existing alignments in the recreation zone.

8. Introduce Park speed limits on certain roads.

9. Prohibit vehicles driving off established roads and tracks except by authorised persons in exceptional circumstances.

10. Jointly manage numbered roads with the Shire of Ashburton and negotiate formal arrangements governing future funding and management responsibility.

B.7.2.2 Air Access

· Landing areas in the Park are required for medical evacuation, and to facilitate public demand for access and scenic flights over the park. Existing airstrips, while adequate for emergency evacuations and intermittent use, are not of a standard suitable for regular charter flights.

· Demand for scenic and recreational flights (helicopters and fixed-wing) over the Park is likely to increase, and aerial access will be managed to meet the public's requirements while preserving the Park's natural values.

· Aircraft flying low over the gorges can disturb other visitors and may constitute a safety hazard.

Strategies

1. Ensure that airstrips meet the Civil Aviation Safety Authority and Royal Flying Doctor Service standards for Authorised Landing Areas. Alternative airstrip sites within the Park which may be better suited for regular charter and RFDS use will be considered.

2. Permit helicopters to land only at Authorised Landing Areas, except in emergency or rescue situations, or where permission has been given pursuant to a geoscientific permit, or otherwise by the Regional Manager.

3. Develop guidelines to control commercial aircraft flying over the Park. Develop these guidelines in accordance with CALM policy, Civil Aviation Safety Authority Regulations, and Regulations under the CALM Act.

4. Ensure that the activities of operators of scenic flights are consistent with management goals for the Park.

B.7.2.3 Pedestrian Access to Popular Features

· Walking in and around the northern gorges is the most popular visitor activity in the Park and facilities and information should cater for this activity or be provided.

· Public safety is the overriding consideration in relation to the siting and design of walking access to the northern gorges.

· Visitors undertaking extended walks in the gorges are liable to dehydration and other risks to personal safety.

· Further walk tracks may be developed including at Fortescue Falls, Circular Pool, Kalamina Gorge, Weano Gorge, Knox Gorge, Oxers Lookout, Hamersley Gorge, Joffre Lookout and Falls, Hancock Gorge, Mt Bruce, Mt Meharry and mulga woodland habitat.

Strategies

1. Provide walk tracks to reduce the risk to Park visitors and to protect Park values. Refer all proposals for new tracks to the Karijini Park Council, Karijini National Park Advisory Committee and Karijini Aboriginal Heritage Committee.

2. Construct walk tracks to a range of standards to suit user requirements. Signpost tracks to indicate their degree of difficulty.

3. Develop safety and aesthetic standards for the design of walk tracks and lookouts.

4. Investigate the potential for wheelchair access to lookouts as part of the overall walk track program.

B.7.3 Recreation

The objectives are to:
Encourage appropriate recreational use of the Park.
Provide facilities and services to increase visitor awareness and enjoyment of the natural and cultural values of the Park.

B.7.3.1 Recreational Opportunities and Land Suitability

· Karijini National Park has outstanding recreational values stemming mainly from the spectacular arid landscape and the deep gorges of the northern escarpment.

· The principal recreational opportunities in the Park are camping, sightseeing, bushwalking, and photography.

· Increasing visitor use of the Park may lead to adverse environmental impacts and conflicts between user groups.

Strategies

1. Provide nature-based recreation facilities and opportunities as guided by a master development plan.

2. Promote recreation activities that enhance visitor appreciation and understanding of the Park.

3. Use the zoning plan (Section A.5.1, Map 6) as the basis for the development of recreation in the Park so that adverse impacts and conflicts are minimised.

4. Monitor the impacts of recreation on the Park (Section B.11.2).

B.7.3.2 Camping

· Visitors prefer to camp near major Park attractions.

· There is a need to rationalise and upgrade existing camping and day-use facilities to provide for increases in visitor numbers.

· Campers travelling in groups or in 'camper vans' or with roof-top tents will also be provided for where appropriate.

Strategies

1. Provide facilities and services for people who wish to camp in the designated campgrounds. Vehicle-based camping outside the designated campgrounds will require the prior consent of the Ranger in Charge and will need to comply with certain conditions, including:
   i. adherence to campfire policy
   ii. removal of rubbish and other evidence of occupation
   iii. adherence to existing road access.

2. Relocate and upgrade camping facilities in the recreation zone in accordance with appropriate development plans coordinated by CALM.

3. Investigate the development and management of campgrounds including, where appropriate, by commercial operators.

4. Designate sites for groups of vehicles touring together and camper vans and roof-top tent vehicles.

B.7.3.3 Campfires

· Fires in the recreation zones in the northern portion of the Park should only be permitted where there is a resident caretaker/manager at the campground and where firewood is supplied and then only in designated fireplaces.

· Fireplaces provided in camping areas elsewhere will be designed and located to minimise the risk of wildfire.

Strategies

1. Campfires will not be permitted in the Park on days of very high or extreme fire danger.

2. Fires in designated camping areas in the northern portion of the Park will only be permitted where there is a resident caretaker/manager at the campground and where firewood is supplied and then only in designated fireplaces.

3. Regulate the use of campfires outside designated camping areas as follows :
   i. Campfires are not permitted north of Karijini Drive. Bushwalkers in this area will be required to carry stoves.
   ii. Campfires south of Karijini Drive will be allowed at the discretion of the Ranger in Charge.
   iii. Campfires in wilderness zones may be allowed in exceptional circumstances at the discretion of the Ranger in Charge.

4. Provide information on safe use of campfires by visitors to the Park.

B.7.3.4 Bushwalking

· The Park allows for the development of a range of appropriate walks which can focus on unique ecosystems, Aboriginal culture and diverse landscapes.

Strategies

1. Bushwalkers should register their intentions in log books or with a Ranger.

2. Advise bushwalkers by notice, brochure or ranger contact of guidelines which apply to bushwalking and gorge walking within the Park. These guidelines will include:
   i. recommended party size
   ii. route advice
   iii. campfire policy (Section B.7.3.3).
   iv. what to do in an emergency.

3. Provide information on the need to prepare

properly for walks in arid environments and gorges.

4. Encourage visitors embarking upon extended walks to conform with safety guidelines.

B.7.3.5 Adventure Sports

· Adventure sports (including abseiling and rock climbing) entail high risks to participants. They may conflict with other visitor activities and also be detrimental to Park values.

Strategies

1. Manage adventure sports in accordance with CALM policy and regulations under the CALM Act.

2. Permit adventure sports only where it can be demonstrated to the satisfaction of CALM staff that they can be conducted without conflict with, or risk to, other Park users and will not be detrimental to Park values.

3. Those authorised to conduct adventure sports will be required to indemnify CALM.

B.7.3.6 Commercial Visitor Accommodation

· Any commercial visitor accommodation should facilitate visitor appreciation of the natural and cultural environment of the Park.

· The development of commercial accommodation facilities may be considered for location(s) within the Park or for areas that adjoin the Park.

· Development of commercial accommodation must accord with access proposals as outlined in Section B.7.2.

Strategies

1. Identify demand for accommodation and assess the most suitable location. Any proposal for commercial visitor accommodation may be located near Park boundaries, although appropriate proposals within the Park which reflect the Park's natural and cultural values will be considered on their merits.

2. Any proposal to establish a commercial accommodation facility within the Park will be referred to the Karijini Park Council and the Karijini National Park Advisory Committee for comment. All proposals shall satisfy siting and environmental criteria (Section B.1.4; Appendices 1 and 2).

3. Once siting criteria have been satisfied, the proposal may be referred for independent environmental assessment. Any assessment will include a public review process and will address specific matters in relation to the development of commercial accommodation within the Park (Appendix 2).

4. If a proposal satisfies the siting criteria and environmental assessment, consideration will be given to leasing the site under the terms of the CALM Act, and by reference to CALM policy. Each proposal will be referred to the Karijini Park Council and the Karijini National Park Advisory Committee and will require the approval of the NPNCA and the Minister. (Section B.7.5)

5. Fire management and control of introduced plants and animals, as expressed in this plan, will apply to any such development.

6. In the event of a commercial accommodation facility being developed in the Park (or in an area that adjoins the Park), CALM will liaise closely with any developer or operator to ensure that facilities, services and activities are integrated with the goals of Park management.

7. In preparing development plans consider:
   i. adoption of a flexible design approach that will cater for specified user groups, for example, families, coaches and schools; the pattern of visits (winter peak); and making provision for predicted trends in visits.
   ii. appropriate location of facilities.

8. Any proposal for commercial visitor accommodation must clearly identify any service requirements including staff accommodation and facilities. The requirements for servicing tourism accommodation will be encouraged to be provided from outside the Park. However there may be a need to provide some essential services within the Park. The location and mode of delivery of these services will be carefully determined on their merits.

B.7.4 Pets

The objectives are to:
Protect native fauna and Park users from the impacts of domestic pets, especially dogs and cats.
Continue to exclude dogs from the Park, except in designated areas.

· Dogs, cats and other domestic animals are, according to CALM policy, prohibited from national parks except for guide and search and rescue dogs or where specified zones are designated. No such areas will be designated unless proper facilities for pets are available.

Strategies

1. Allow domestic pets in the National Park only under conditions of permit as provided by the Executive Director. Cats will not be allowed in the Park (Section A.2.7.6). Examples where

permits may be provided are:
   i. Park residents (who must undertake that pets are under strict control and confined to residential areas)
   ii. guide dogs
   iii. dogs associated with search and rescue operations
   iv. specific areas which may in future be approved for such activity.

2. Resident staff may keep family pets (including watchdogs) with the approval of the Regional Manager, provided the animals are confined at all times to the area rented by the staff member. Any pets kept in the Park that are a threat to wildlife must be neutered.

3. Promote the use of kennel facilities in neighbouring towns.

4. Inform visitors of the negative impacts domestic pets have on the environment of the Park.

B.7.5 Commercial Concessions

The objective is to ensure that commercial operations in the Park are encouraged, but conducted in such a way as to promote and enhance visitor experiences while maintaining Park values.

· The suitability of a concessionary proposal should be determined by reference to the wider public interest, and the conservation objectives of the Park.

· Commercial concessions which protect Park values and promote a better appreciation of the Park's natural and cultural values will be encouraged.

· Aboriginal participation in appropriate commercial enterprises will be encouraged.

· Aboriginal heritage material is best managed by the Aboriginal traditional owners themselves, and, through KAC, the traditional owners have primary responsibility for the interpretation of Aboriginal culture within the Park.

Strategies

1. Consider any application for commercial concessions (including visitor accommodation - refer Section B.7.3.6) within the Park in accordance with the provisions of the CALM Act and CALM policy. Proposals for commercial development will be referred to the Karijini Park Council and the Karijini National Park Advisory Committee and will require the approval of the NPNCA and the Minister.

2. Due consideration will be given to the interests and aspirations of the Aboriginal traditional owners, and appropriate Aboriginal commercial initiatives will be encouraged. Where commercial tour operations contain substantial commentary on Aboriginal cultural matters the interpretive material will be referred to the Karijini Park Council for comment prior to being used in the tour.

3. Subject any development proposed in relation to commercial activities to the appropriate environmental assessment (Sections B.1.4, B.7.3.6). Siting and environmental criteria will have to be satisfied (Appendices 1 and 2).

4. The granting of any concession will be subject to conditions of compliance and provision of indemnities.

5. The Karijini Park Council will develop a policy to promote the Aboriginal traditional owners' participation in commercial activities within the Park.

6. Develop a Commercial Operators' Manual to provide information, advice and regulations for operators in the Park. Review and update this manual as necessary.

7. Fees for concessions will be set consistent with the full cost recovery principle and may include provision for public benefit.

B.7.6 Information, Education and Interpretation

The objective is to provide visitors with information which will enhance their safety, understanding, appreciation and enjoyment of the natural and cultural values of the Park and region.

· A need exists to increase Ranger participation in interpretation activities.

· Increased visitor awareness and understanding is the key to enhancing visitor experience and achieving management objectives.

· A communication plan and program provides the opportunity to explain Park management programs and regulations.

· The enduring relationship of Aboriginal traditional owners with the Park will provide a basis for the interpretation of natural and cultural resources and values of the Park.

· Communication programs need to be cost effective with most effort directed where it can be expected to achieve the greatest benefit.

· A need exists for a Karijini National Park Visitor Centre to inform visitors of the natural and cultural heritage of the Park and its management

strategies.

Strategies

1. Prepare a communication plan with programs involving information, education and interpretation for Karijini National Park (Section A.5.8). Include information on: natural resources (including biological diversity, and evolutionary and ecological processes); cultural resources; conservation issues; historical material; mineral exploration and development of the Park.

2. Relate interpretive themes to management objectives and Park regulations and provide this information to the public. Incorporate information on public safety, fire, weed and feral animal control, access, and recreation activities.

3. Wherever the Karijini Park Council considers it relevant, the Karijini Aboriginal Heritage Committee shall advise on information, education and interpretation programs and their implementation.

4. Aboriginal cultural information used in the interpretive program shall be treated sensitively and will be approved by the Karijini Aboriginal Heritage Committee prior to public release.

5. The Karijini Aboriginal Corporation will be contracted to assist in the preparation of suitable interpretive material addressing Aboriginal cultural heritage.

6. The Karijini Park Council will develop a policy concerning recompense to traditional owners for the public use of Aboriginal cultural information.

7. Locate interpretive facilities at selected sites in the recreation zone, including picnic areas and campgrounds where visitors can study displays at their leisure. Entry stations (as developed) will become the points of initial contact with visitors, and will serve as distribution points for Park information and literature.

8 Make provision for a Karijini Visitor Centre which will provide essential Park information, interpretive displays and exhibits addressing the Park's natural, historical and Aboriginal cultural heritage and other Park values, and a suitable commercial outlet.

9. Increase staff numbers as resources permit to enable Rangers to concentrate a greater effort on interpretive activities.

B.7.7 Regulation and Monitoring

The objective is to ensure that public use of the Park is sustainable and in accordance with the management plan and statutory regulations.

· Statutory mechanisms to regulate use of the Park include the CALM Act, Wildlife Conservation Act, Aboriginal Heritage Act and this management plan.

· Accurate visitor statistics are the basis of sound management planning. Traffic counting is a cost effective means of collecting data. Increased Park use can be expected to generate increased levels of environmental impact.

· Visitor statistics will be collected and recorded in accordance with established CALM guidelines on the collection of visitor information statistics (VISTAT).

· Park Rangers have powers of enforcement through Regulations under the CALM Act.

· Users of the Park will generally both respect and support the management efforts towards enforcement, which will enable a code of ethics to evolve whereby the community participates in effective management. This can achieve cost benefits as staff concentrate on their primary roles of protecting the Park and assisting and guiding visitors.

Strategies

1. Require visitors to Karijini National Park to comply with existing regulations.

2. Levy Park fees in accordance with CALM policy.

3. Manage the Park by reference to the proposed zoning system (Sections A.5.1, B.7.1; Map 6).

4. Continue to monitor visitor use of the Park (particularly upon the gorge ecosystems), and periodically survey visitor needs.

5. Maintain a system, such as traffic counters, that ensures the collection of reliable visitor data.

B.8 MANAGEMENT FOR RESIDENTS

B.8.1 Housing

The objective is to allow suitable housing and service arrangements to support the needs of residents within the Park.

· There has been an inadequate understanding of the requirements that people have for housing in remote areas, and an associated lack of proper planning and materials. An opportunity exists in Karijini National Park to develop housing and services that are sympathetic to the needs of residents and reflect Park values.

· Diesel fuel used for power generation is a major cost to the Park.

Strategies

1. Present residential development plans to meet the special needs of residents for consideration by the Karijini Park Council and the Karijini National Park Advisory Committee. Ensure these plans are compatible with the overall planning philosophy for the Park and sympathetic to environmental and cultural values.

2. Subject residential development plans, including the provision of housing, facilities and other essential services, to an internal environmental assessment procedure (Section B.1.4) and monitor their implementation. Refer the results of such monitoring to the Karijini Park Council and the Karijini National Park Advisory Committee.

3. Ensure building design is consistent with Park standards, and adopts energy efficient principles and materials appropriate to the environment whenever feasible.

4. Ensure building designs use rainwater storage tanks wherever possible, to promote groundwater conservation.

5. Transport materials and implement capital works programs at such a time, and in such a manner as to minimise the disturbance to vegetation and soil and not to cause erosion.

6. Practice waste minimisation (reduce, reuse, refuse, recycle).

7. Prepare a list of plants suitable for residents' gardens, taking into account the potential for these to spread.

8. Investigate alternative power generation technologies (for example, diesel with battery backup, solar with auxiliary generator, wind with auxiliary generator or a combination of these) for new facilities.

B.8.2 Services

The objective is to provide adequate health, education and communication facilities for Park residents.

· Medical emergencies may pose serious problems due to the long road journey to the nearest medical facility.

· Residents will need practical access to some form of continuing health care service and education facilities.

· A communications system may require the construction of towers and receiving dishes near the telephone service points.

Strategies

1. Provide secure storage for emergency medical supplies and maintain a RFDS radio service.

2. Provision of community facilities within the Park will be restricted to essential services including emergency health/medical services.

3. Provide a suitable location for a 'service centre' and support the provision of medical and education services for park visitors and residents.

4. Ensure that all major construction or building proposals are subject to an internal environmental assessment (Section B.1.4).

B.9 SAFETY

B.9.1 Visitor and Resident Safety

The objectives are to:
Plan and provide for the safety of Park visitors and Park residents.
Provide procedures for responding to emergencies which may occur in, or threaten, the Park.

· A need exists to develop visitor awareness of hazards, including the risks associated with excessive exertion and swimming in pools where the water is very cold.

· A need exists to emphasise accident prevention while maintaining rescue and medical capabilities.

· Visitors most at risk from dehydration and heat stroke are those who embark upon extended walks without adequate preparation.

· Health risks from crocidolite are greatest where fibres occur in the milled form (Section A.5.4).

· Some disused mine shafts have become important bat habitats.

Strategies

1. Highlight the risks associated with recreation near the gorges and emphasise visitor responsibilities in relation to personal safety. Install and maintain signs at points of known hazards.

2. Maintain the current level of preparedness in relation to Park rescue and medical services. CALM will continue to cooperate with State Emergency Services, Police, Royal Flying Doctor Service and other bodies in order to assist the public in emergency situations.

3. Close mine shafts, and post warning signs at each entrance. (CALM will negotiate through the Department of Minerals and Energy with the current tenement holder regarding closure in a

manner which will allow continued access for bats.)

4. Upgrade Park facilities, particularly walk tracks and lookouts (Section B.7.2.3).

5. Locate campground and day-use areas away from the rims of gorges, where possible, in accordance with an overall Master Development Plan for visitor facilities.

6. Potentially hazardous activities (for example adventure sports, Section B.7.3.5) will not generally be permitted in the Park .

7. Specific management guidelines addressing safety issues will be applied to bushwalking parties. These guidelines will be promoted by means of the Park communication plan and program (Section B.7.6).

8. Supply drinking water in campgrounds and erect shade shelters where appropriate.

B.9.2 Occupational Health, Safety and Welfare

The objective is to plan and provide for the occupational health, safety and welfare of Park staff and residents.

· CALM is committed to ensuring the highest possible standards of occupational health and safety for its staff.

· The Department will provide safe working conditions by making every effort to avoid, remove or remedy the causes of industrial accidents or occupational ill-health.

· Each individual has a responsibility to develop safe and healthy work practices and conditions.

· A need exists for Park staff and residents to be trained in health and safety practices.

Strategies

1. Train all Park staff in first aid, occupational safety, basic bushcraft and survival skills, radio communications, search and rescue, fire control and the safe use of firearms. This program will be offered to other residents of the Park.

2. Safe work practices should be adopted when disturbing soil contaminated with blue asbestos. These practices should include the use of protective clothing, recirculating internal air and keeping windows of vehicles closed, working in still conditions, wetting down the work area, and washing down vehicles (Sections A.5.4, B.7.7).

B.9.3 Public Health and Airborne Crocidolite

The objective is to recognise potential hazards to public health relating to past extraction of blue asbestos, particularly with respect to Yampire Gorge.

· Present evidence (Ashton 1986) indicates that any risk associated with airborne asbestos in the Park is likely to be related either to the distance from Wittenoom townsite and minesite or to exposure to asbestos at the Yampire Gorge minesite. However, no measurements have been made of airborne fibre at sites within the Park.

· Mine tailings in Yampire Gorge are now considered to be a significant source of airborne crocidolite although no sampling is known to have been conducted in the area. Disturbed tailings are found at specific sites near the mine, including the road surface, milling plant, and at creek crossings (Section A.5.4).

· People who disturb the Yampire Gorge mine tailings may expose themselves and possibly others to a health risk.

· The risk to CALM employees (and their families) is likely to be related to the nature of an employee's activities and the period of exposure.

Strategies

1. Cooperate with other Government agencies to assess the health risks in areas of the Park that are closest to Wittenoom.

2. Advise visitors, staff and residents by means of Park literature and road signs, of possible risks associated with asbestos at Yampire Gorge or any other area of the Park.

3. Cooperate with other Government agencies to determine the nature of risks posed by tailings in Yampire Gorge and, where necessary, restrict access.

4. Maintain warning signs at both entries to Yampire Gorge advising of alternative Park access.

5. Review the future of the Yampire Gorge access road in accordance with any Government directive to fulfil its duty of care to visitors, staff and residents (Section B.7.2.1).

6. Erect signs to advise visitors, staff and residents of possible risks associated with disturbing mine tailings.

7. Prepare an issue plan to deal with the Park's asbestos problem in consultation with the Department of Occupational Health, Safety and Welfare, and the Department of Minerals and Energy.

B.10 PARK ADMINISTRATION

B.10.1 Staffing

The objectives are to:
Ensure that sufficient numbers of adequately trained staff are appointed to implement the plan.
Provide opportunities for Aboriginal people to be employed in the Park wherever possible.

- The implementation of this management plan will place substantial demands on Park, Regional and District staff and on members of the Karijini Park Council, particularly in relation to planning, design, supervision and interpretation activities. To maximise Aboriginal employment in the management of the Park, working hours and conditions may need to be structured to meet the cultural obligations of Aboriginal staff and contract workers.

- Currently four CALM staff are employed in the Park and regional (Karratha) and specialist branch (Perth based) staff give support. One of these positions is Ranger in Charge. Minimum staffing levels are largely governed by the requirements of visitor management (for example, communication, maintenance of facilities, regulation) during the peak season.

- Staff leave during the peak visitor season limits management effectiveness.

Strategies

1. Monitor staff requirements to ensure the Park is properly protected and managed.

2. Seek to increase staffing levels in the Park in response to increasing management demands. Consider recruitment upon the basis of maintaining, or improving, the present staff to visitor ratio for the Park.

3. Ensure selection guidelines attend to the principles of equal employment opportunity as expressed in CALM policy.

4. The Karijini Park Council will investigate additional categories of employment for Aboriginal people including consultancies and other forms of full-time, seasonal, or part-time employment.

5. Schedule accrued leave during the off-peak visitor period (summer months).

B.10.2 Staff Training

The objectives are to:
Ensure that all Park staff demonstrate the ability to work in a cross-cultural environment.

- In addition to the Aboriginal Trainee Ranger Program, CALM has developed (in conjunction with TAFE) a general certificate course for all Rangers which should enhance their performance, satisfaction and career path.

- Staff will be encouraged to participate in training and personal development courses.

- Staff need good communication skills, cross-cultural awareness and interpretive ability.

Strategies

1. Provide staff training and development programs for all Park staff. This will include training in cross-cultural awareness within guidelines developed by the Karijini Park Council.

2. Encourage inter-agency co-operation in the development of Aboriginal training and community development programs for Karijini National Park.

3. Where staff requirements and finances permit, provide training programs for Aboriginal people to be employed in all aspects of Park Management. Training programs will be designed by CALM in conjunction with KAC in accordance with guidelines developed by the Karijini Park Council.

B.10.3 Location of Ranger Stations

The objective is to locate ranger stations to achieve optimal management of the Park.

- Park ranger staff (and their families) are housed either at the Park Headquarters in the south-east corner of the recreation zone or in Tom Price. Servicing of facilities and visitors at Weano Gorge, for instance, entails a 114 km round trip from Park Headquarters. Visitors entering the Park via Tom Price and the Joffre Falls Road are unlikely to make initial contact with rangers.

- Some facilities will be duplicated if a second ranger station is developed.

- The centralisation of staff facilities at the Park Headquarters reduces the ability to service visitors at the western end of the recreation zone.

- Extensions to Park boundaries will further limit the staff's effectiveness.

Strategy

1. According to need and available resources, develop a second ranger station in the western portion of the Park.

B.10.4 Communication Links

The objective is to provide and coordinate communication links which will assist the management of the Park in an effective and cost efficient manner.

· A multiple line telephone link to the Park is used by staff and the public. A public telephone receiver is situated outside the Park office. A fax and telephone have been installed in the Park office.

· The Park is equipped with both HF and VHF radio systems. Base sets are located at the Park Headquarters with mobile units in vehicles. The HF system is used for long distance transmissions within and outside the Park. Both CALM and Royal Flying Doctor Service frequencies are available.

Strategies

1. Develop a communication links plan for the Park. Ensure further development of radio communications is in accordance with CALM policy.

2. Subject any proposed development to an internal environmental assessment procedure (Section B.1.4).

B.10.5 Park Headquarters

The objective is to provide adequate facilities for Park management which are compatible with Park values and consistent with principles of energy efficient design.

· Existing facilities at the Park Headquarters include three staff houses, visiting staff accommodation, diesel generator, workshop, and a demountable office.

Strategies

1. Produce a Park Headquarters development plan, and justify each facility.

2. Prepare site development plans before the construction of management facilities as identified in the development plan.

3. Subject all proposed developments to an internal environmental assessment procedure (Section B.1.4).

B.11 RESEARCH AND MONITORING

B.11.1 Inventory of Park Resources

The objective is to compile an inventory of the Park's natural and cultural resources.

· The compilation of resource information, including regular updates, would facilitate more informed management.

· Information should be stored so that it is easily retrieved and disseminated appropriately.

· Certain cultural information is sensitive and will not be available to the public.

· The Karijini Aboriginal Corporation is responsible for the collection and control of Aboriginal cultural information. KAC will be responsible for the storage and release of Aboriginal cultural information.

Strategies

1. Compile data relating to natural and cultural resources of the Park and update as new information becomes available.

2. Survey the status of the Park's plants and animals (including invertebrates), in order to acquire baseline information on appropriate segments of the plants and animals, which will provide a basis for monitoring programs.

3. Compile bird and plant checklists that are specific to the Park. (This information may be published in a complete inventory of Park resources.)

4. Maintain records of rare or restricted fauna and flora.

5. Store resource documentation in a geographic information system data base, and make available, as appropriate, to interested individuals or organisations.

6. Seek the advice of the Karijini Aboriginal Heritage Committee whenever the compilation or release of culturally sensitive information is considered.

7. Continue to develop and maintain the VISTAT data base of visitor information.

B.11.2 Research and Monitoring

The objective is to conduct research and monitoring which will enhance the

knowledge and understanding of the Park and provide information relevant to management.

- A need exists to increase knowledge of the Park's cultural and natural resources to develop more effective management practices. Information is also required to identify the extent of anticipated tourism growth in the Pilbara, and subsequent increases in Park visitation. It is likely that proposals for research will exceed CALM's resources.

- The provision and use of cultural information will be subject to approval by the Karijini Aboriginal Heritage Committee.

- Permits are currently required for research involving Aboriginal sites under Section 16 of the *Aboriginal Heritage Act*; applications are assessed by the Aboriginal Cultural Materials Committee administered by the Aboriginal Affairs Department.

- Permits for research dealing with Aboriginal cultural matters may be issued by the Karijini Aboriginal Corporation if the Aboriginal Cultural Materials Committee delegates powers to the Karijini Aboriginal Heritage Committee (Section B.1.2).

Strategies

1. Establish research and monitoring program priorities, and disseminate the results to appropriate people or agencies.

2. Refer all research proposals to the Karijini Park Council and the Karijini National Park Advisory Committee. Proposals will be referred to the Karijini Aboriginal Heritage Committee where matters of Aboriginal cultural heritage may be involved.

3. The monitoring program will aim to determine the impacts of management and human use on the Park, and changes in the natural environment and other natural processes.

4. Research proposals from outside CALM will require the applicant to apply for a permit which will specify conditions under which work may be carried out and results disseminated.

5. Conduct research to determine the effect of the fire management strategy on fauna inhabiting hummock grasslands (Section B.3.6).

6. Continue research on the role of fire and other disturbances in mulga habitats (Section B.3.6).

7. Conduct intensive surveys, particularly in southern areas of the Park, to determine whether critical weight range mammals remain (Sections A.2.7.3, B.3.5.4).

8. Survey and monitor Rothschild's Rock Wallaby populations (Section B.3.5.4).

9. Encourage and assist applied research projects that address the causes of the decline in the status of some species/communities under prevailing systems of management.

10. Conduct research into the specific habitat requirements of selected rare or restricted fauna.

11. Record all cat and fox sightings and document any information relating to their impact upon native mammals (Section B.3.5.6). Assistance will be given to field studies of cat and fox predation.

12. Identify and monitor selected long unburnt stands of different vegetation types to act as a reference point for fire research (Section B.3.6).

B.12 PLAN IMPLEMENTATION

B.12.1 Park Programs

The objective is to implement strategies for management on a priority basis.

- The plan includes a broad range of strategies designed to achieve optimum management of the Park, its resources, residents and visitors. These strategies require funding for their implementation; this will be achieved on a priority basis as funds become available.

- CALM is responsible for the allocation of funds to achieve management objectives for the Park.

Strategies

1. The Karijini Park Council and the Karijini National Park Advisory Committee will consider priorities for management strategies and assist CALM in developing a five-year implementation plan.

2. The implementation plan will be reviewed annually by the Karijini Park Council and the Karijini National Park Advisory Committee, and an annual progress report will be prepared by CALM Regional staff. The review should identify which strategies have been implemented and to what degree, and any new information which may affect Park management.

3. The NPNCA will monitor the implementation of the Karijini National Park Management Plan as required under the CALM Act.

4. Park works will be carried out by CALM staff or by contract. Where appropriate, contracts will be directed towards KAC. The Shire of Ashburton will maintain the roads, and tenders will be called for other contracts.

B.12.2 Community Participation

The objective is to enable the public to participate in implementing the Karijini National Park management plan.

- Karijini National Park is an important recreational focus for people living in towns of the inland and coastal Pilbara. With approximately half of the visitors to the Park arriving from interstate and overseas, the community benefits substantially from income associated with tourism. Community participation is important to promote and maintain the Park's values.
- When Cabinet reviewed the concepts of joint CALM/Aboriginal Park Councils and public participation in park management in 1993 it endorsed the creation of advisory committees to represent the general interests of the community.
- Representatives of the Pilbara community will be invited to provide advice to Park Management and the Minister on matters of broad community interest through membership of the Karijini National Park Advisory Committee.
- The Minister for the Environment will appoint the Committee which will be selected on the basis of expertise, experience, personal interest and community profile. Government representation will be kept to a minimum, and will usually be confined to one CALM officer.
- Potential exists for the public to become directly involved in implementing the plan by enrolling as volunteers (for example, as campground hosts).

Strategies

1. The Karijini National Park Advisory Committee will be established to provide for community input into management issues of interest to the general community.
2. The Karijini National Park Advisory Committee will be appointed by the Minister for the Environment.
3. The Karijini National Park Advisory Committee will meet to discuss aspects of Park management of interest to the general community.
4. Liaise regularly with Park neighbours, particularly regarding fire protection, feral animals, dingos and weed control.
5. Encourage community involvement in implementation of the plan by initiating and supporting volunteer activities.

B.12.3 Term of Plan

The objective is to implement, and if necessary review, the Plan according to the requirements of the CALM Act.

- This Plan has a 10 year planning horizon.
- Section 61 of the CALM Act provides for the plan to be amended as required. If proposed amendments mean major changes to the plan, the revised plan will be released for the statutory period of public review.

Strategies

1. Review the implementation of the Plan periodically to assess its progress and review the priority of its strategies.
2. Review strategies in the light of new information, particularly from research and monitoring programs. If a major change in the direction of the Plan is required, any proposed revision is subject to NPNCA approval and if approved will be released for public comment according to section 61 of the CALM Act, 1984.

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APPENDICES

APPENDIX 1.

SITING CRITERIA (COMMERCIAL ACCOMMODATION)

Siting criteria including the following will be applied to any proposal for the development of commercial visitor accommodation (Section B.7.3.6) within Karijini National Park:

Location
- within intensive recreation zones
- remote from northern gorges to reduce likelihood of prejudicing prime visual values
- remote from key recreation areas to avoid conflicts with other Park visitors
- in an area with potential for future expansion
- in an area with independent access consistent with other Park management objectives.
- in an area specifically sanctioned by the Karijini Aboriginal Heritage Committee.

Ecological
- within a widely occurring ecosystem
- not in an area where restricted species or habitats are known to occur
- not in an area where groundwater exploitation may have adverse effects upon gorge vegetation
- not in an area where soils are a major limitation.

Technical
- in an area with proven groundwater resources
- in an area that can be serviced by underground utilities
- not in a flood prone area
- not in an area where sewage disposal may cause environmental problems.

APPENDIX 2.

ENVIRONMENTAL CONSIDERATIONS (COMMERCIAL ACCOMMODATION)

Any environmental consideration of proposals for the development of commercial accommodation (Section B.7.3.6) in the Park will include reference to the following matters:

- adherence to appropriate design guidelines
- movements outside leasehold area (impact of vehicles and machinery)
- movements within the leasehold area (impact of vehicles and machinery)
- storage of materials, including allocation of work areas
- preservation of flora, including protection of trees and other plants within the construction area
- preservation of fauna, including restrictions on introduced species
- firearm restrictions
- preservation of ground surface
- disturbance of soil material
- disposal of waste
- noise
- borrow and gravel pits
- Aboriginal concerns
- environmental monitoring
- breaches of environmental protection provisions
- accommodation of personnel
- engagement and conduct of personnel.

APPENDIX 3.

AUSTRALIAN HERITAGE COMMISSION LISTING

Name of Place: Karijini National Park
010129 5/08/204/0003/01

Location/Boundaries: Park extends across the range from Wittenoom in the north, to Turee Creek in the south, and from Tom Price in the west to Mt Meharry and Dales Gorge in the east. 606 597 ha, 12 km east of Tom Price.

Title Information: Reserve A30082, Vested National Parks and Nature Conservation Authority

Statement of Significance: The Hamersley area contains extensive areas of pre-Cambrian formations and is part of one of the world's oldest land surfaces. The geology of the region also contains features related to the Permian ice ages.

The region contains large areas of wilderness and intact ecosystems, including distinct gorge systems within surrounding arid plains. Significant Aboriginal sites exist within the area, and include rare depictions of extinct species.

The Hamersley Ranges are also significant scientific study areas in the fields of archaeology, geology and ecology.

There is a wide diversity of landforms in the region which support a number of different vegetation communities, including important mulga woodland formations. Diversity of birdlife is also a significant feature, with over 120 species recorded.

The landforms and vegetation of the area are representative of the region, and include arid plains, escarpment, ridge and gorge formations.

The spectacular gorges, waterfalls and general landforms of the area give the region high aesthetic value, which is further enhanced by the seasonal proliferation of wildflowers. These features are major factors in the high recreational significance of the area.

(Criteria A.1, A.2, A.3, B.1, C.1, D.1, E.1, G.1 - refer Appendix 4).

Description: Large belt of elevated country between Fortescue and Ashburton Rivers. Erosion has formed a rugged landscape in the north. A long unbroken wall (Hamersley Scarp) occurs in the south. The central region is a high basin cut by intermittent streams, forming scenic gorges and waterfalls. Vegetation includes open woodland, northern mulga, and interesting plant communities on top of the mountains and the gorges.

Condition: Integrity altered by cattle grazing, iron ore mining.

(Adapted from Australian Heritage Commission 1992).

APPENDIX 4.

CRITERIA FOR THE REGISTER OF THE NATIONAL ESTATE

CRITERION	VALUE	RATING
A.1 Importance in the evolution of Australia's flora, fauna, landscapes or climate.	The Hamersley Ranges are the Australian geological type location for the Late Archaean banded iron formation. The area also contains extensive microfossil and plant/wood fossil remains (National Trust 1991). The area lies in both bioclimatic and phytogeographic cross-over zones. The northern section is cut by sheltered gorges which provide a set of environmental parameters substantially different to the surrounding landscape. The cooler temperatures, permanent water and protection from fire provide a habitat for a suite of species unable to survive on the exposed plateau in the central portion of the area. The species found in these sheltered areas in gorges and along drainage lines are more characteristic of the Torresian bioclimatic zone, and the plateau species of the central Eyrean zone. Phytogeographically, the area encompasses the southern end of the Fortescue Botanical Province, and the northern end of the Ashburton Botanical Province (CALM 1989). The area is of interest ecologically as there has been a significant degree of local speciation in the genus *Acacia*. One hypothesis is that this is the result of isolation by sand dune systems some 30 000 yrs ago (Randell and Symon 1977) and continuing isolation from species mixing by the Great Sandy Desert to the north, the Little Sandy Desert to the east, and the Ashburton basin to the south. The process of local speciation appears to be continuing, with differences in local morphology observed within species such as *Acacia bivenosa* (Maslin 1982).	High
A.2 Importance in maintaining existing processes or natural systems at the regional or national scale.	Karijini National Park and associated geological formations represent a complete north-south transverse section of the Hamersley Ranges, traversing the southern end of the Fortescue Botanical Province and the northern end of the Ashburton Botanical Province. Karijini National Park is one of the few large areas of land in the Pilbara that is only minimally modified by grazing, and is sufficiently large for the maintenance of natural ecological processes (CALM 1989).	Very High
A.3 Importance in exhibiting unusual richness or diversity of flora, fauna, landscapes or cultural features.	The area encompasses the bioclimatic transition zone between the Torresian and central Eyrean zones, and phytogeographic transition zone between the Fortescue and Ashburton Botanical Provinces. This make the species composition more diverse than in adjoining areas (CALM 1989). The area is especially rich in reptiles, with 86 species recorded from surveys of the National Park. There is a high raptor species diversity, with 19 birds of prey amongst the 133 species of bird recorded (Johnstone 1983). The plateau area is especially rich in species of the genus *Acacia* (Maslin and Pedley 1982).	High
B.1 Importance for rare, endangered or uncommon flora, fauna, communities, ecosystems, natural landscapes or phenomena, or as a wilderness.	Eight species of flora recorded from Karijini National Park are listed as rare, poorly known or of restricted distribution in either the national list of Rare and Threatened Plants (Leigh and Briggs 1988) or the Western Australian Declared Rare and Priority Flora List (CALM 1991). One further species, the recently discovered *Olearia fluvialis*, is to be entered in the national list as 'poorly known' (Briggs pers comm 1992).	High

CRITERION	VALUE	RATING
	Detailed botanical surveys at Marandoo in the central-western portion of Karijini National Park have found, in addition to 6 of the above plant species, a further 37 species which are considered to be geographically restricted, uncommon, poorly known, poorly collected or at the limits of their distribution. Seven of these taxa are thought to be potentially new species (E M Mattiske and Associates 1992). Six vertebrate species found in Karijini National Park are gazetted as 'rare or in need of special protection' under the WA Wildlife Conservation Act. These are the Pebble-mound Mouse (*Pseudomys chapmani*), Bilby (*Macrotis lagotis*), Peregrine Falcon (*Falco peregrinus*), Grey Falcon (*Falco hypoleucus*), Grey Honeyeater (*Conopophila whitei*) and the Olive Python (*Liasis olivaceus*) (CALM 1989, Ninox 1991). The Pebble-mound Mouse and the Bilby are considered to be vulnerable. A further six species of vertebrate found in the area are considered to be sparse to rare or uncommon, or have a restricted or contracting distribution (CALM 1989). Five areas in the northern and central areas of Karijini National Park, varying in size from 20 000 hectares to more than 30 000 ha, have been identified as wilderness zones. These areas have not been substantially modified by mining, grazing or tourism, and do not support significant populations of feral cattle (CALM 1989).	
C.1 Importance for information contributing to wider understanding of Australian natural history, by virtue of their use as research sites, teaching sites, type localities, reference or benchmark sites.	The Hamersley Ranges are of research interest due to their great age (2.3 - 2.5 billion yrs old), their low degree of deformation, and the ease of access to the formations provided by deeply incised gorges. The area has provided the main source of information on the formation and stratigraphy of Precambrian Banded Iron Formations, and valuable information on the formation of crocidolite or blue asbestos (National Trust 1991). The region has been used extensively as a geological research and teaching site and was also the site of a field excursion for the 25th International Geological Congress. The area is also the subject of research into Aboriginal burning patterns, believed to have controlled the distribution of the fire tolerant spinifex and fire sensitive mulga communities (Start 1986).	Medium
D.1 Importance in demonstrating the principal characteristics of the range of landscapes, environments or ecosystems, the attributes of which identify them as being characteristic of their class.	Karijini National Park contains vegetation communities which represent the 'Mulga/Spinifex', and 'Mulga/Woodland' vegetation systems (Beard 1975) and, with the exception of the southern area of the park, is the area least affected by grazing in the Pilbara (CALM 1989). It is thus an important representative of these systems which exists relatively unmodified by European land management practices (Start 1986).	Very High
E.1 Importance for a community for aesthetic characteristics held in high esteem or otherwise valued by the community.	The northern section of the area contains steep-sided gorges which expose spectacular red and orange banded iron formations, and a series of permanent pools and waterfalls. Other features of aesthetic interest include Mt Bruce in the central-western portion of Karijini National Park, which is the second highest mountain in WA, and the permanent pools in the southern part of the area. Karijini National Park and the gorges immediately to the north of the park are the focus of tourist visitation to the Pilbara. Visitor surveys have recorded a high level of interest in walking, observing the vegetation (especially wildflowers) and birdlife (CALM 1989).	High

CRITERION	VALUE	RATING
G.1 Importance as a place highly valued by a community for reasons of religious, spiritual, symbolic, cultural, educational, or social associations.	The Panyjima, Yinhawangka and Kurrama Aboriginal people inhabited the area until the 1960's. These people, who are now represented by the Karijini Aboriginal Corporation, maintain strong ties with the area. Their laws and cultural beliefs are still upheld and sacred sites within the area are still respected. Petroglyphs are common in the area, with rock paintings less common. The area is of archaeological interest as it has been occupied for close to the entire period of human occupation in Australia (CALM 1989).	High
I.1 Overall assessment.	Karijini National Park comprises a complete north-south tranverse section of the Hamersley Ranges. The area's value as a representative example of the Hamersley Ranges is enhanced by most of the area being relatively unmodified by pastoralism or large-scale mining operations. There are five large identified wilderness areas within the park. The park is a geological type locality, and contains extensive deposits of fossil material. The northern gorges and escarpment have been used extensively for geological research and teaching. The area shows considerable biological diversity. It is especially rich in species of the genus *Acacia*, with 46 of the 54 *Acacia* species which occur in the Pilbara region. Many other flora and fauna species of special significance occur at Karijini National Park. The area contains populations of eight species of flora considered as rare, poorly known or of restricted distribution at either the national or State level. Two mammals recorded from Karijini National Park, the Pebble-mound Mouse and the Bilby, are considered vulnerable at the national level. These species, along with a further four mammals and birds, are gazetted as rare and endangered under the WA Wildlife Conservation Act. The area is scenically outstanding. The landscape is characterised by naturalness, ruggedness and diversity. Steep sided orange and red banded gorges in the north provide the setting for a series of waterfalls and deep permanent pools, whilst peaks such as Mt Bruce provide vistas of green-gold hummock grassland and grey-green mulga woodland. The area and its Aboriginal sites of significance are highly valued by the Panyjima, Yinhawangka and Kurrama Aboriginal people.	High

(Adapted from Australian Heritage Commission 1992)

APPENDIX 5.

STATEMENT OF MUTUAL UNDERSTANDING

Conservation Management of the Marandoo Project

1. The Department of Conservation and Land Management ("CALM") is legally responsible under the Conservation and Land Management Act 1984 ("the Act") for the management of the land, flora and fauna in the Karijini National Park ("the Park") and Hamersley Iron Pty. Limited ("Hamersley") is the proponent of the Marandoo Project.

2. While recognising that the Marandoo mine and part of the railway corridor are not subject to the CALM Act, Hamersley and CALM agree on the need for understanding and co-operation in certain conservation matters of mutual interest.

3. In order to combine the objectives of operating an economically viable mining project and minimising environmental impact on the Park, Hamersley and CALM have agreed in principle on a consultative process to address issues of environmental impact arising from the project. This agreement does not limit in any way CALM's responsibilities under the Act, the Environmental Protection Act 1986 and the Wildlife Conservation Act 1950-1979, or its administrative responsibilities pursuant to a Cabinet decision supporting Karijini Aboriginal Corporation's contribution to the management of the Park. Issues identified to date are prescribed in Paragraphs 4 through 12. The scope of the consultative process will be reviewed as the project develops.

4. Continuing consultation on conservation and environmental research programs, with a view to improving their value and effectiveness.

5. Continuation of Hamersley's program of field work on the Pebble-mound Mouse, supplemented and guided by CALM. This program is studying the range and distribution of the species in the Pilbara, and is to provide specimens for taxonomic research by the WA Museum.

6. Development of a co-operative program of fire management and a regime for controlled burning at Marandoo.

7. Facilitation by CALM of Hamersley engineering and scientific research studies within the Park to assist in understanding matters of mutual interest such as the hydrogeological characteristics of the underground aquifers.

8. Consultation about an appropriate final land form for the Marandoo mine site, when detailed hydrology and engineering studies are completed by Hamersley.

9. Inclusion in the statement of rules for the Marandoo workforce of such measures as prohibition of firearms.

10. Inclusion by Hamersley in its employee induction and education programs of agreed information about the Park.

11. Development of a protocol for the handling of infringements of Park Regulations.

12. Assistance by Hamersley where appropriate in improving public awareness of matters pertaining to the relationship between the mine and Park.

APPENDIX 6.

MINISTERIAL CONDITIONS FOR MARANDOO AND THE CENTRAL PILBARA RAILWAY
Marandoo Iron Ore Mine and Central Pilbara Railway
Hamersley Iron Pty Limited

This proposal may proceed but shall be implemented subject to the following conditions:

1. Proponent Commitments

The proponent has made a number of environmental management commitments in order to protect the environment.

1-1 In implementing the project, the proponent shall fulfil the commitments (which are not inconsistent with the conditions or procedures contained in this statement) made in the Environmental Review and Management Program which are listed in Environmental Protection Authority Bulletin 643 as Appendix 1 and in its Statement of Mutual Understanding entered into with the Department of Conservation and Land Management

2. Implementation

The implementation of the Marandoo Project will proceed under the provisions of the Environmental Protection Act and in accordance with the Iron Ore (Hamersley Range) Agreement Act as amended, hereafter called "the Agreement". Reporting requirements or compliance with these environmental conditions shall be achieved through the requirements for environmental management proposals or reports under the Agreement by the Minister for State Development referring such proposals and reports to the Minister for the Environment.

2-2 Subject to these conditions, the manner of detailed implementation of the proposal shall conform in substance with that set out in any designs, specifications, plans or other technical material submitted by the proponent in project proposals pursuant to the Agreement ("the proposals"). Where, in the course of that detailed implementation, the proponent seeks to change those designs, specifications, plans or other technical material in any way that in the opinion of the Minister for State Development with the concurrence of the Minister for the Environment on the advice of the Environmental Protection Authority is not significant, those changes may be effected.

3. Environmental Management Program

An overall Environmental Management Program shall be submitted, describing in sufficient detail all aspects of the Central Pilbara Railway and Marandoo Iron Ore Mine and the integration of the proponent's commitments and the requirements of the conditions in this statement.

3-1 The proponent shall submit the Environmental Management Program in accordance with the Agreement to the Minister for State Development and to the Minister for the Environment for their approval prior to the commencement of construction.

3-2 The proponent shall prepare and submit the Environmental Management Program required by condition 3-1 in consultation with the Department of Conservation and Land Management. This Program shall contain, but not necessarily be limited to the following elements:

1. Protection of significant flora and fauna (condition 4);
2. Workforce management (condition 5);
3. Central Pilbara Railway (condition 6);
4. Drainage management (condition 7);
5. Management of groundwater abstraction (condition 8);
6. Management of weeds (condition 9);
7. Management of fire (condition 10);
8. Rehabilitation of the project area and decommissioning (conditions 11 and 15); and
9. Management of waste disposal sites (condition 13).

3-3 Subsequent revisions of the Environmental Management Program required by condition 3-1 will be prepared and submitted in consultation with the Department of Conservation and Land Management where appropriate and may form part of the annual and triennial reports pursuant to the Agreement.

3-4 Each element of the Environmental Management Program required by condition 3-1 shall where appropriate address: potential source of environmental impact; commitments; objectives; procedures; and reporting including monitoring.

3-5 The proponent shall implement the various elements of the Environmental Management Program required by conditions 3-1 to 3-4 to the satisfaction of the Minister for State Development and the Minister for the Environment.

3-6 In the event that monitoring shows unacceptable environmental impacts, the proponent shall in accordance with the Agreement prepare and subsequently implement a plan to mitigate these impacts to the satisfaction of the Minister for State Development and the Minister for the Environment.

4. Protection of Flora and Fauna

Rare, priority and geographically restricted species of flora and fauna in the project area shall be treated with special consideration.

4-1 The proponent shall provide details of the results of all surveys carried out on areas likely to be disturbed through construction and operational activity, to the satisfaction of the Minister for State Development and the Minister for the Environment on the advice of the Department of Conservation and Land Management, prior to those areas being disturbed.

4-2 Significant species of flora or fauna found in the surveys referred to in condition 4-1, shall be managed in accordance with the proponent's commitments and the Environmental Management Program referred to in condition 3.

5. Workforce Management

The proponent is responsible for the management of the constructional and operational workforce to ensure that environmental impacts on the Karijini National Park are minimised.

5-1 The proponent shall manage the workforce and assist the Department of Conservation and Land Management to ensure that environmental impacts on the Karijini National Park resulting from constructional, operational and recreational activities are minimised.

6. Central Pilbara Railway

The proponent may proceed to construct and operate the Central Pilbara Railway (from Marandoo to Homestead Junction) but shall do so in such a manner that reasonably minimises environmental impacts.

6-1 Prior to the construction of the Central Pilbara Railway the proponent shall prepare and subsequently implement in consultation with the Department of Conservation and Land Management an Environmental Management Program for this railway describing how the management measures for the railway will meet the requirements of this condition.

7. Drainage Management

The important vegetation communities in the area, in particular the coolibah and mulga woodlands, shall where possible be protected from drainage impacts associated with the development and operation of the project.

7-1 Prior to the commencement of construction, the proponent shall submit and subsequently implement a drainage management plan, setting out the measures to meet the requirements of this condition in consultation with the Department of Conservation and Land Management. This plan shall include a monitoring component to permit determination of its effectiveness.

8. Management of Groundwater Abstraction

There shall be no unacceptable impact on the conservation values of the Karijini National Park resulting from groundwater abstraction associated with the project, particularly the coolibah woodlands to the east of Mt Bruce.

8-1 Prior to commissioning of the Marandoo borefield, the proponent shall prepare and subsequently implement a groundwater management plan describing in sufficient detail the measures to meet the requirements of this condition in consultation with the Department of Conservation and Land Management and the Water Authority of Western Australia. This plan shall include a monitoring component to permit determination of its effectiveness.

9. Management of Weeds

The spread of weeds resulting from the development and operation of the project shall be minimised.

9-1 Prior to the commencement of construction, the proponent shall prepare and subsequently implement a weed management plan describing in sufficient detail measures to meet the requirements of this condition, in consultation with the Department of Conservation and Land Management. This plan shall prescribe monitoring and control measures and shall include a monitoring component to permit determination of its effectiveness.

10. Management of Fire

The development and operation of the project shall not lead to a significantly increased fire risk within the Karijini National Park.

10-1 Prior to the commencement of construction, the proponent shall develop and subsequently implement a fire management plan describing in sufficient detail the measures to meet the requirements of this condition, in consultation with the Department of Conservation and Land Management. This plan shall include a monitoring component to permit determination of its effectiveness.

10-2 The proponent shall develop the fire management plan required by condition 10-1 to integrate fire management in the project area with the overall fire management requirements of the Karijini National Park.

11. Rehabilitation

The standard of rehabilitation of the project area shall where possible be consistent with local landscape values and if appropriate enable the return of the area to the Karijini National Park.

11-1 Prior to the commencement of construction and throughout the life of the development, the proponent shall prepare rehabilitation plans, in consultation with the Department of Conservation and Land Management and the Department of Minerals and Energy, to the satisfaction of the Minister for State Development and the Minister for the Environment. These plans shall include a monitoring component to permit determination of their effectiveness, and shall specify the sources of seed and species proposed for planting during rehabilitation.

11-2 The proponent shall subsequently implement the rehabilitation plans required by condition 11-1.

11-3 The proponent shall where possible only use plant material of local provenances for rehabilitation to the requirements of the Department of Conservation and Land Management.

12. Management of Visual Impact

The visual impact of the proposed development shall be minimised.

12-1 The proponent shall where possible mitigate the visual impact of the development in consultation with the Department of Conservation and Land Management. The location, design and colour of surface facilities will be chosen as far as practicable in sympathy with the landscape.

13. Management of Waste Disposal Sites

Domestic and industrial waste material from the project shall be managed to prevent scavenging by animals and pollution of groundwater.

13-1 Prior to the commencement of construction, the proponent shall develop and subsequently implement a plan describing in sufficient detail measures to manage the waste disposal sites to meet the requirements of this condition, in consultation with the Department of Conservation and Land Management and Health Department of Western Australia. This plan shall include provision for minimisation of scavenging by animals including birds, and contamination of groundwater. The plan shall also include a monitoring component to permit determination of its effectiveness.

14. Management of Community Impact

The proponent shall consult with relevant community groups to minimise the impact of the project on the community.

14-1 The proponent shall establish a consultative mechanism as referred to in the proponent's commitments.

15. Decommissioning

The satisfactory decommissioning of the project, removal of the plant and installations and final rehabilitation of the site and its environs is the responsibility of the proponent.

15-1 At least six months prior to the decommissioning, the proponent shall prepare and implement a decommissioning and final rehabilitation plan, in consultation with the Department of Conservation and Land Management and the Department of Minerals and Energy.

16. Proponent

The conditions in this statement apply to the nominated proponent.

16-1 No transfer of ownership, control or management of the project which would give rise to a need for the replacement of the proponent shall take place until the Minister for State Development with the concurrence of the Minister for the Environment has advised the proponent that approval has been given for the nomination of a replacement proponent. Any request for the exercise of that power of the Ministers shall be accompanied by a copy of this statement endorsed with an undertaking by the proposed replacement proponent to carry out the project in accordance with the conditions and procedures set out in the statement.

17. Time Limit on Approval

The environmental approval for the proposal is limited.

17-1 If the proponent has not substantially commenced the project within five years of the date of this statement, then the approval to implement the proposal as granted in this statement shall lapse and be void. The Minister for State Development with the concurrence of the Minister for the Environment shall determine any question as to whether the project has been substantially commenced. Any application to extend the period of five years referred to in this condition shall be made before the expiration of that period, to the Minister for the Environment by way of a request for a change in the condition under Section 46 of the Environmental Protection Act. (On expiration of the five year period, further consideration of the proposal can only occur following a new referral to the Environmental Protection Authority).

18. Compliance Auditing

In order to ensure that environmental conditions and commitments are met, an audit system is required.

18-1 The proponent shall prepare periodic "Progress and Compliance Reports" to help verify the environmental performance of this project to the requirements of the Minister for State Development and the Minister for the Environment pursuant to the Agreement.

Note 1.

In satisfying the requirements of conditions 4 to 14, the proponent should take cognisance of condition 3 so that integration of the separate parts of environmental management and staging of the preparation and implementation of the Environmental Management Program can be effected.

Note 2.

For the purposes of this statement the following definition applies:

1. "Prior to the commencement of construction" means prior to any ground-disturbing activity which is directly related to construction of the mine, railway, or associated infrastructure. It includes clearing of vegetation, but does not include survey work.

Note 3.

The proponent will be required to apply for a Works Approval and Licence for this project under the provisions of Part V of the Environmental Protection Act.

(Approval dated at 6 October 1992).

APPENDIX 7.

NPNCA POLICY STATEMENT

ABORIGINAL INVOLVEMENT IN NATIONAL PARKS AND NATURE CONSERVATION.

In relation to Aboriginal involvement in nature conservation, the NPNCA:

1. will ensure that Aboriginal relationships to land of cultural significance are recognised and maintained;

2. recognises that under Aboriginal customary law, traditional Aboriginal custodians have their own cultural rights and responsibilities to certain areas;

3. resolves to consult with Aboriginal people having special affinity to lands vested with the Authority regarding the management of those lands;

4. determines to negotiate on a case by case basis with each group of Aborigines having an affiliation to conservation lands to resolve such issues as availability of living areas;

5. acknowledges that the Aboriginal cultural environment is best understood by Aboriginal people, and, wherever possible, the Authority will involve Aborigines in the protection and management of cultural sites on conservation lands;

6. undertakes to address land management issues of interest to Aboriginal people so as to ensure equity for all public interest groups whilst carrying out its primary functions for the Wildlife Conservation Act (1950).

APPENDIX 8

DEFINITIONS OF TERMS AND ACRONYMS

AAD	Aboriginal Affairs Department
AGWA	Agriculture WA
ARRP Act	Agriculture and Related Resources Act 1976
BHP	Broken Hill Proprietary Co Ltd
BIF	Banded Iron formation
CALM	Department of Conservation and Land Management Western Australia
CALM Act	Conservation and Land Management Act 1984
CTRC	Conservation Through Reserves Committee
CWR	Critical Weight Range Mammals
DEP	Department of Environmental Protection
EPA	Environmental Protection Authority
Executive Director	Executive Director of Department of Conservation and Land Management
HF	High Frequency Radio System
KAC	Karijini Aboriginal Corporation
KAHC	Karijini Aboriginal Heritage Committee
KNPAC	Karijini National Park Advisory Committee
Minister	Minister for the Environment of Western Australia
ML	Mining Lease
MRD	Main Roads Department Western Australia
NPNCA	National Parks and Nature Conservation Authority
RFDS	Royal Flying Doctor Service
TR	Temporary Reserve
VHF	Very High Frequency Radio System
VISTAT	Visitor Information Statistics

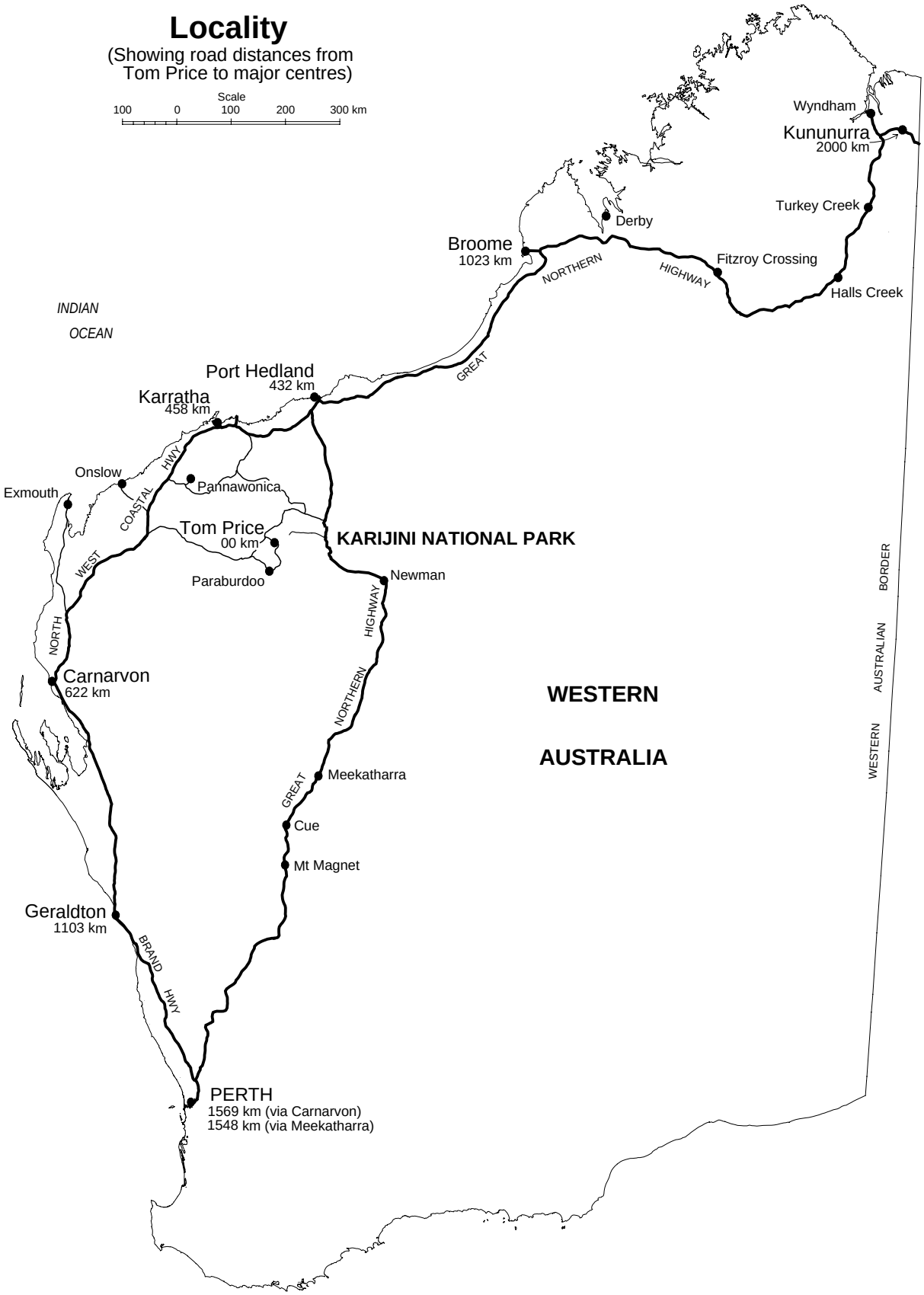
APPENDIX 9

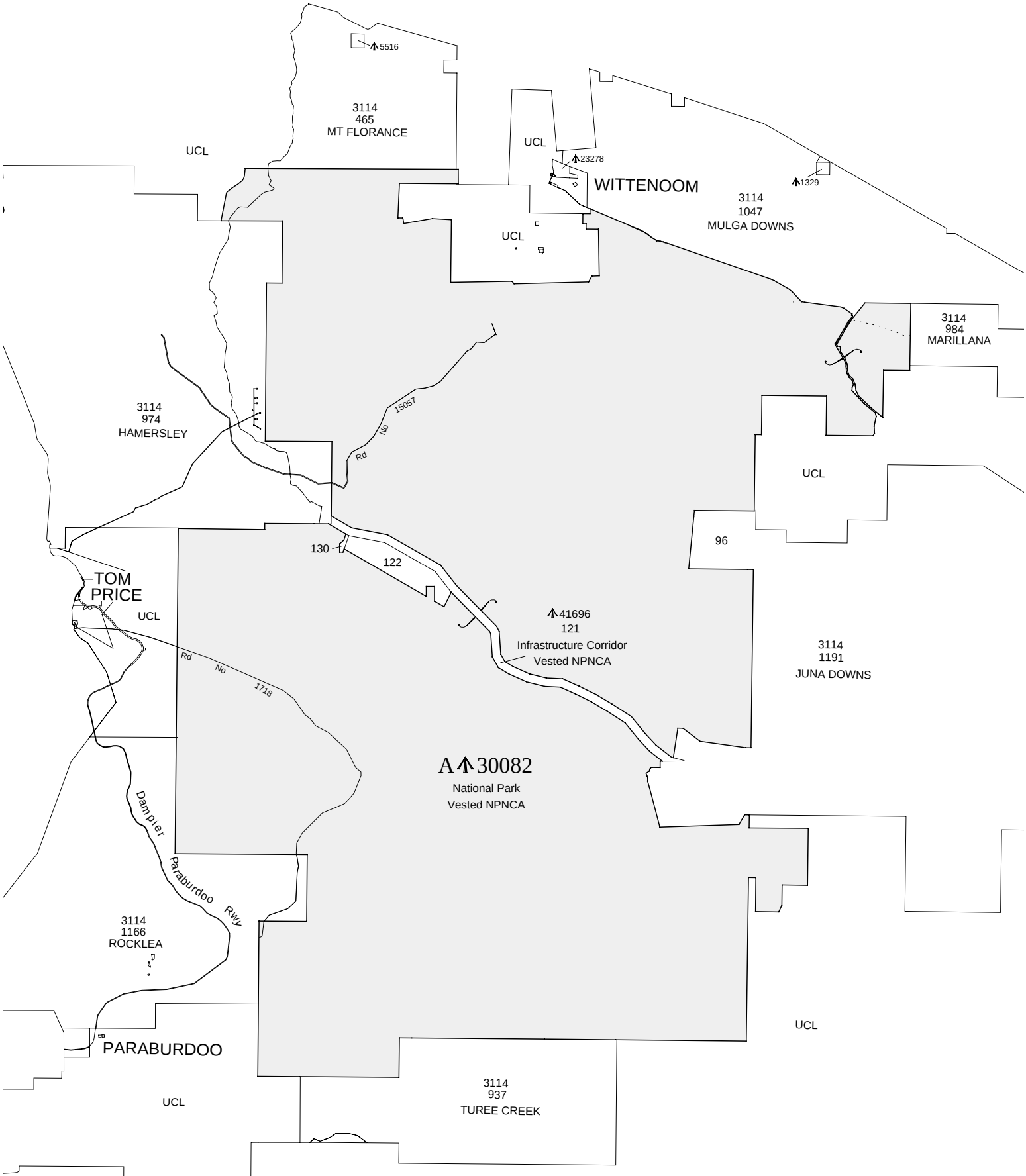
INDEX OF CALM POLICY STATEMENTS

NUMBER	TITLE	DATE ISSUED
1	Planning	January 1986
2	Local Government Authority Access To Basic Raw Materials From State Forest And Timber Reserves	February 1993
3	Phytophthora Dieback	January 1991
4	Cancelled	
5	Research And Technical Publications	August 1988
6	Staff Training And Career Development	January 1986
7	Cancelled	
8	Cancelled	
9	Conservation Of Threatened Flora In The Wild	December 1992
10	Rehabilitation Of Disturbed Land Conservation	November 1986
11	Not Issued	
12	Arbor Day	August 1986
13	Commercial Flora Harvesting	November 1993
14	Weeds On CALM Lands	November 1986
15	Community Involvement	May 1991
16	Computer Purchase And Use	December 1986
17	Housing	February 1987
18	Recreation, Tourism And Visitor Services	May 1991
19	Fire Management	May 1987
20	A Marine And Estuarine Reserves System In Western Australia	November 1990
21	Communications	August 1987
22	Taking, Keeping And Display Of Live Reptiles	November 1992
23	Conservation And Management Of Emus	May 1990
24	Conservation And Management Of Crocodiles	June 1993
25	Community Education And Interpretation	January 1988
26	Equal Employment Opportunity	August 1990
27	CALM's Role In Management Of Native Vegetation In Rural Areas	August 1990
28	Reporting, Monitoring And Re-Evaluation Of Ecosystems And Ecosystem Management	cancelled
29	Translocation Of Threatened Flora And Fauna	July 1995
30	Harassment In The Workplace	December 1988
31	Management Of Reserves For The Conservation Of Nature	March 1990
32	Cancelled	
33	Conservation Of Endangered And Specially Protected Fauna In The Wild	December 1991
34	Visual Resource Management Of Lands And Waters Managed By CALM	November 1989
35	Aboriginal Employment And Training	December 1991
36	Post Graduate Studies And Study Grants	January 1991
37	Filling Vacancies By Promotion Or Transfer	December 1990
38	Business Units	cancelled
39	Fees And Charges	cancelled
40	Road Management	November 1991
41	Beekeeping On Public Land	April 1992
42	Staff Counselling	April 1992
43	Occupational Rehabilitation	March 1992
44	Wildlife Management Programs	May 1992
45	Environmental Monitoring Of Pesticides Used By CALM	July 1992
46	External Funds	August 1992
47	Control Of Sirex Woodwasp In Pine Plantations	October 1992
48	Freedom In Information In CALM	September 1993
49	Radio Communications Facilities Policy	suspended
50	Setting Priorities For The Conservation Of Western Australia's Threatened Flora And Fauna	August 1994
51	Access For Commercial Fishing Through CALM Lands	November 1993
52	Management Of North West Islands For Conservation	June 1994
53	Visitor Risk Management Policy	March 1996
54	Defence Force Training On CALM Managed Lands And Waters	April 1996

INDEX OF POLICY AND POSITION STATEMENTS OF THE NATIONAL PARKS AND NATURE CONSERVATION AUTHORITY

No.	Policy Statements	Date
A1	Wilderness Policy	August 1989
A2	Aboriginal Involvement in National Parks and Nature Conservation	December 1991
A3	Mosquito Control	April 1993
A4	Drainage Policy	April 1994
A5	Basic Raw Materials Policy	May 1994
No	**Position Statements**	**Date**
P1	Mining in National Parks and Nature Reserves (Revised)	September 1993
P2	Petroleum Exploration and Production in National Parks and Nature Reserves (Revised)	September 1993
P3	Petroleum Exploration and Production in Marine Parks and Marine Nature Reserves	September 1993
P4	Guidelines for Flora and Fauna Surveys on NPNCA Vested Lands	October 1994
P4	Guidelines for Flora and Fauna Surveys on NPNCA Vested Lands	Amended August 1995
P5	Seminar and Workshop Program: Guidelines for Developing and Arranging an Annual Program	October 1996


Locality
(Showing road distances from Tom Price to major centres)
Scale
100 0 100 200 300 km
Wyndham
Kununurra
2000 km
Turkey Creek
Derby
Broome
1023 km
NORTHERN
HIGHWAY
Fitzroy Crossing
Halls Creek
INDIAN
OCEAN
Port Hedland
432 km
GREAT
Karratha
458 km
HWY
Onslow
COASTAL
Pannawonica
Exmouth
Tom Price
00 km
KARIJINI NATIONAL PARK
WEST
Paraburdoo
Newman
HIGHWAY
NORTH
NORTHERN
Carnarvon
622 km
WESTERN
AUSTRALIA
GREAT
Meekatharra
Cue
Mt Magnet
Geraldton
1103 km
BRAND
HWY
PERTH
1569 km (via Carnarvon)
1548 km (via Meekatharra)
WESTERN AUSTRALIAN BORDER

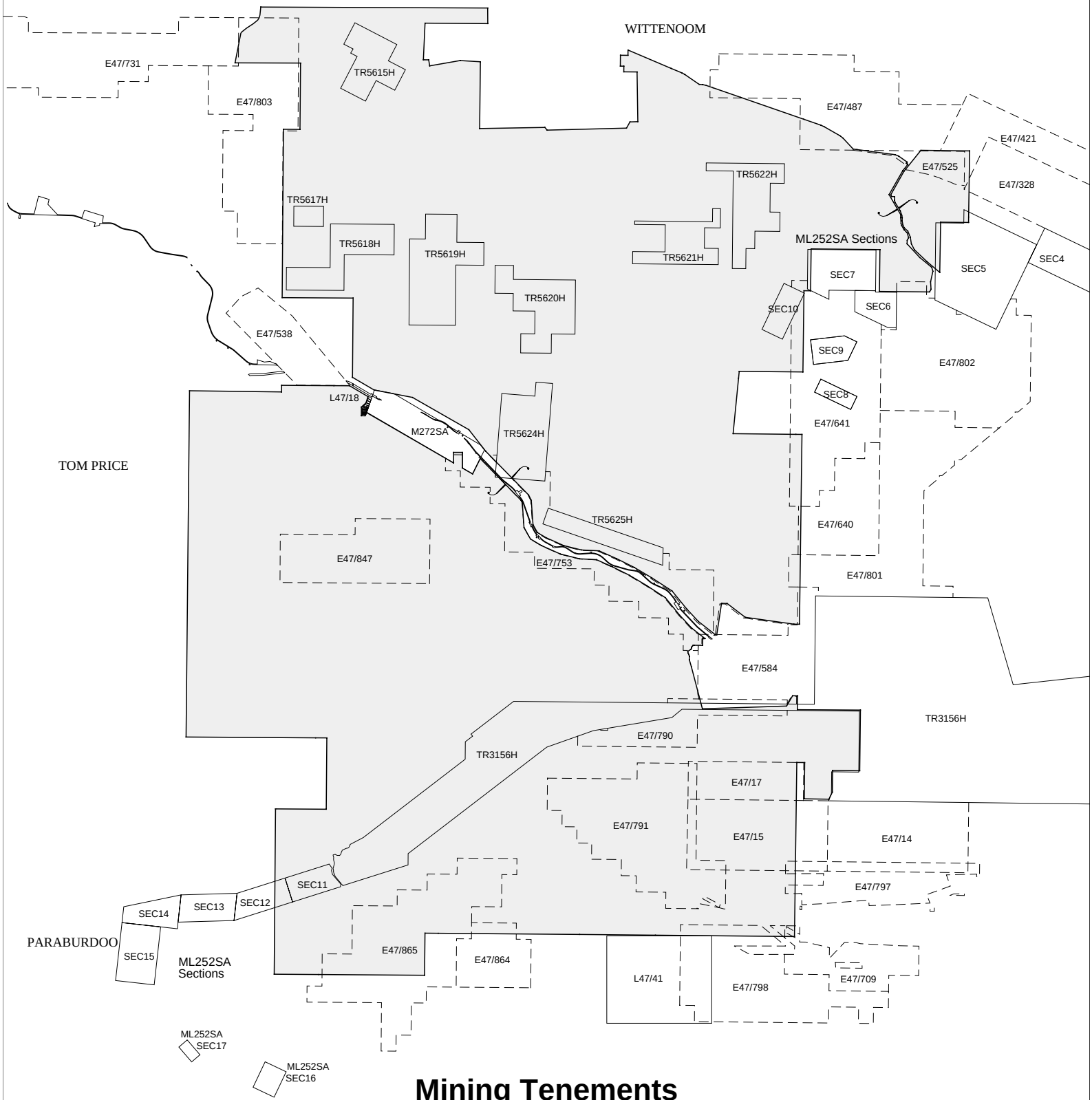


Tenure

Scale

6 0 6 12km

	National Park	3114 1166	Pastoral Lease
UCL	Unallocated Crown Land	ROCKLEA	Pastoral Lease Name
	Other Crown Reserve		



Mining Tenements

(as at August 1998)

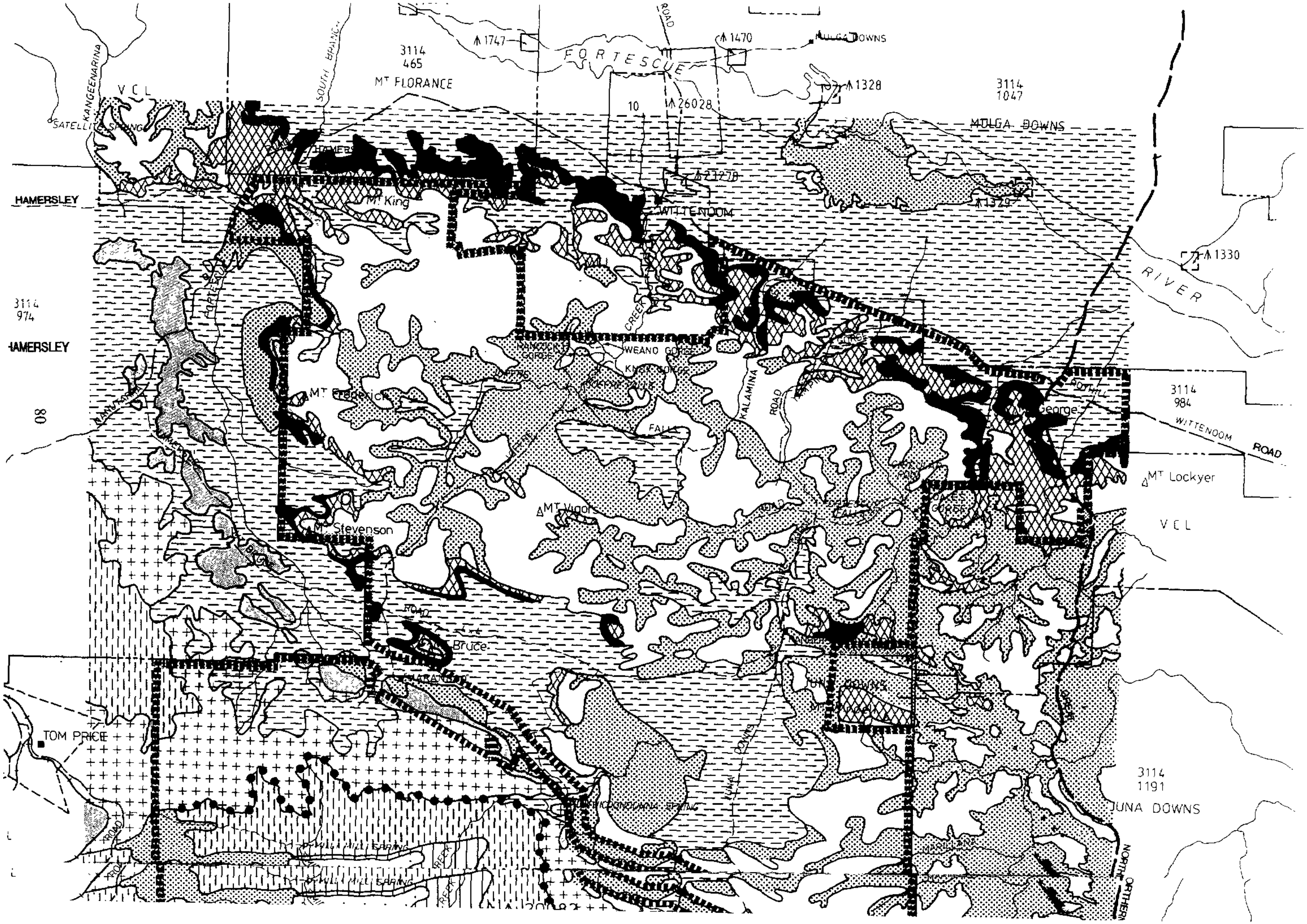
Scale

6 0 6 12km

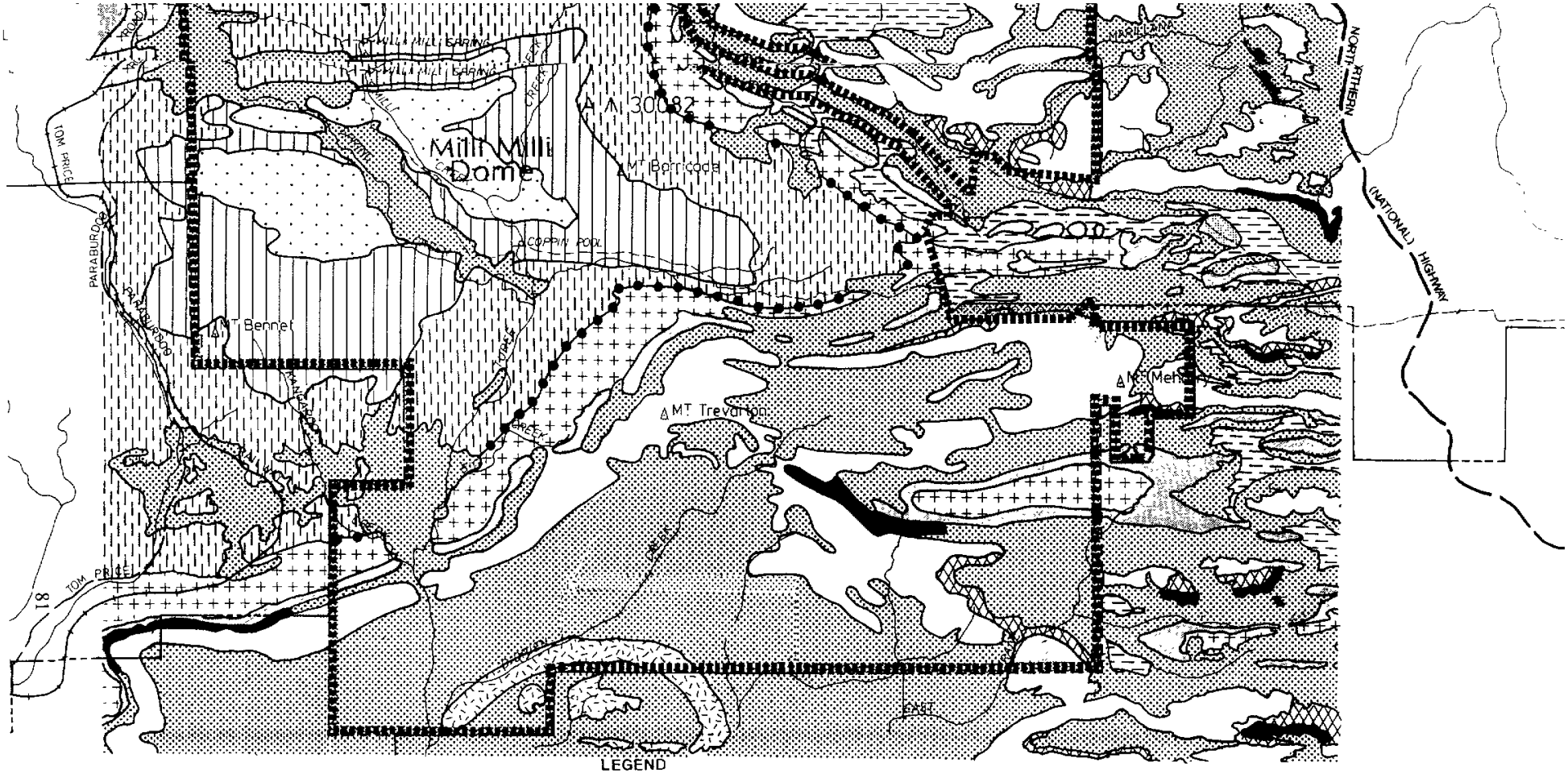
National Park

E	Exploration Licence	TR	Temporary Reserve
ML M	Mining Lease	G	General Mining Lease
SEC	Mining Lease Section	L	Miscellaneous Lease

Footnote: For details of tenement holder, refer to Table 1.



VCL
KANGEENARINA
SATELLITE SPRING
HAMERSLEY
3114
974
HAMERSLEY
3114
465
Mt FLORANCE
SOUTH BRANCH
1747
FORTESCUE
ROAD
1470
MULGA DOWNS
1328
10
26028
3114
1047
MULGA DOWNS
Mt King
WITTENOOM
1330
RIVER
CREEK
HANCOCK GORGE
WEANO GORGE
KNOX GORGE
KALAMINA
ROAD
FALLS
Mt Frederick
Mt Vigors
Mt Stevenson
Bruce
ROAD
3114
984
WITTENOOM
ROAD
George
Mt Lockyer
VCL
TOM PRICE
3114
1191
JUNA DOWNS
NORTHERN



V C L	YEARS BP	AGE	GROUP
	0-65myr	CAINOZOIC	
	2300-2800myr	PRECAMBRIAN	Mt Bruce Supergroup: Wyloo, Hamersley, Fortescue

FORMATION

- Colluvium & alluvium
- Colluvium - limonite
- Beasley River Quartzite
- Brockman Iron Fm
- Wittenoom Dolomite
- Mt McRae Shale & Mt Sylvia Fm
- Marra Mamba Iron Fm
- Jeerinan Fm
- Mt.Jope Volcanics
- Hardey Sandstone
- Pilbara Granite-greenstone terrain
- Milli Milli Dome

Geology

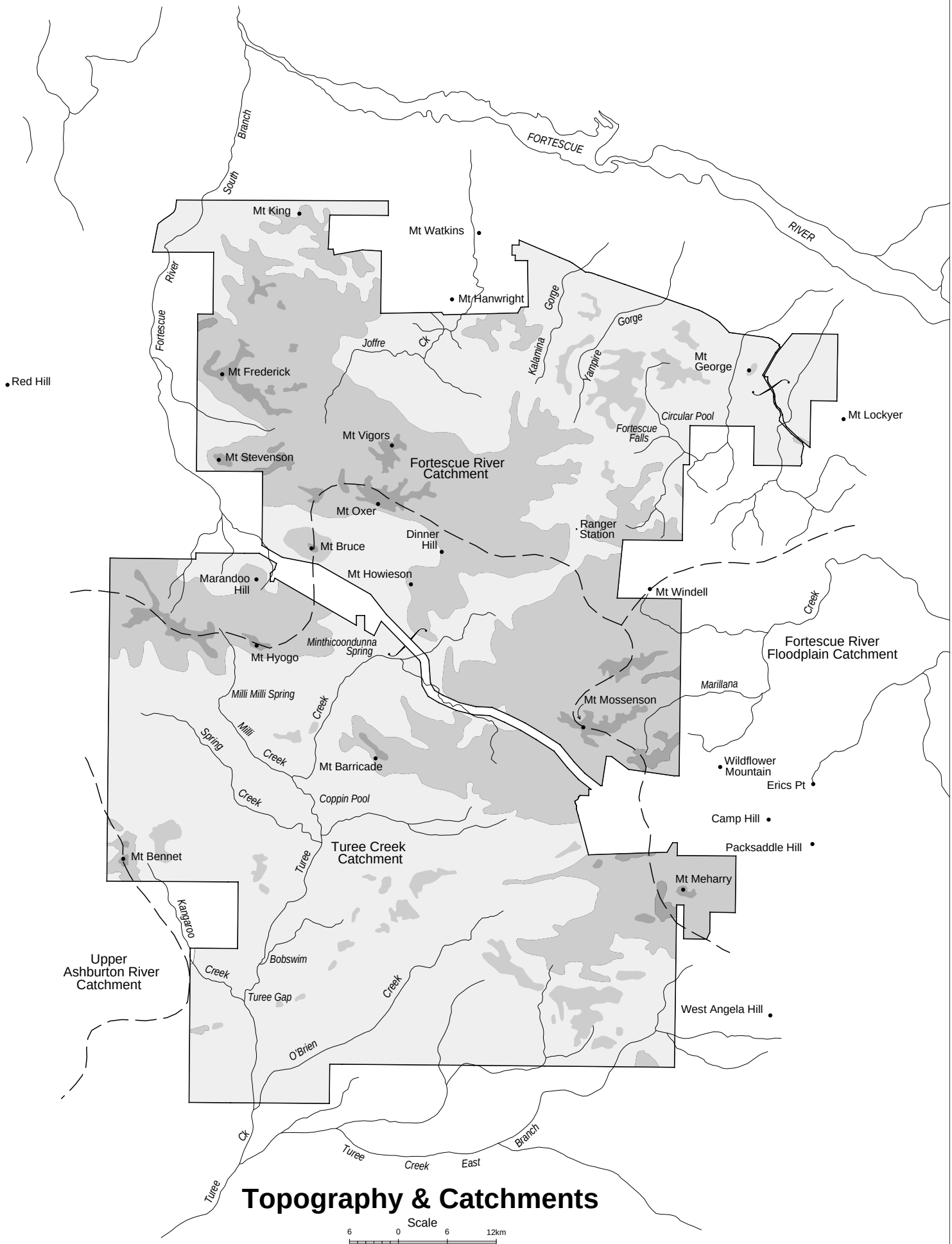
SCALE

5 0 5 10

kilometres

Source: Geological Survey of W.A.
1:250000 Geological Series 1965

Map 4



Topography & Catchments

Scale

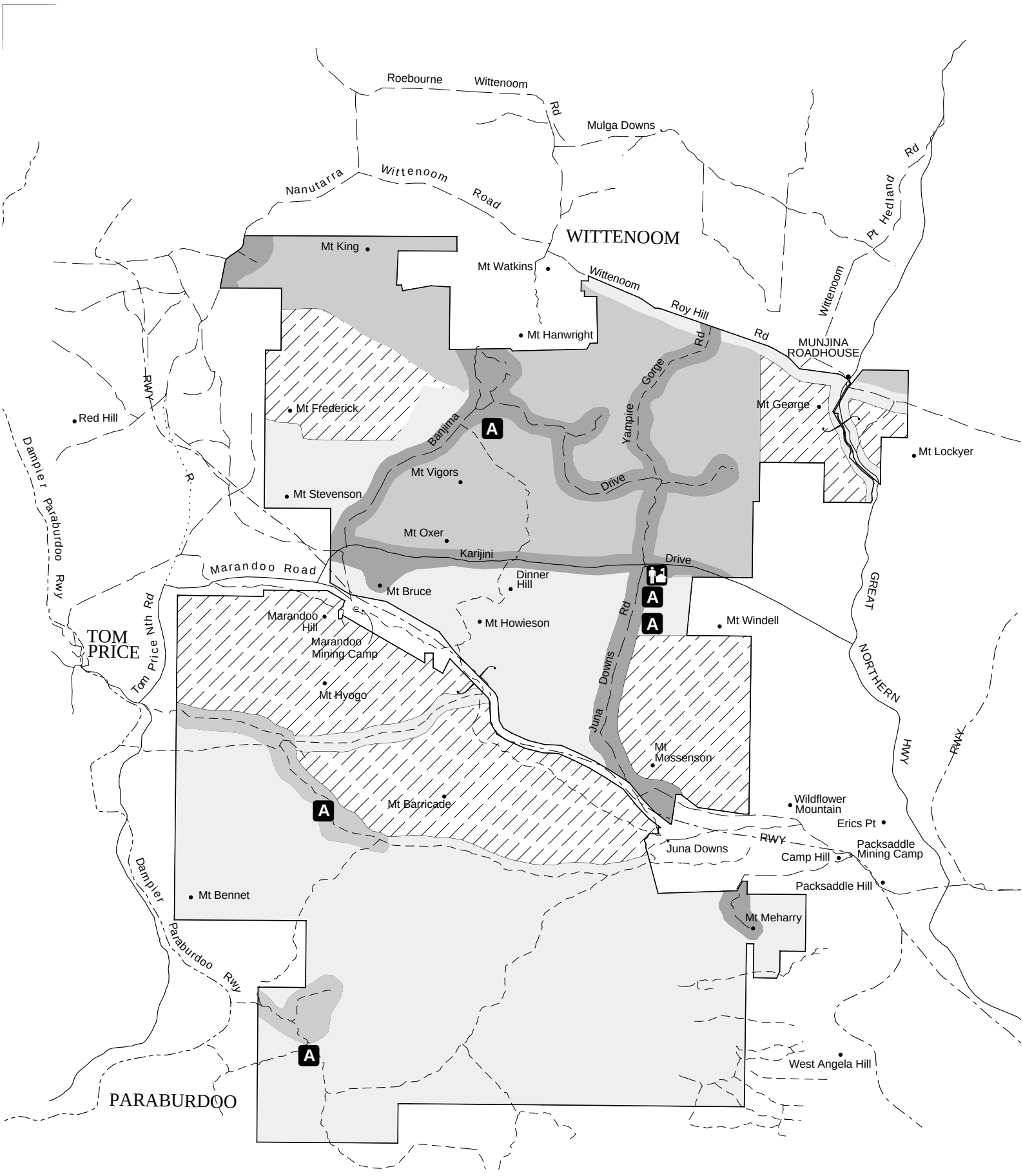
6 0 6 12km

400-750m A.S.L.

750-1000m A.S.L.

>1000m A.S.L.

Catchment Bdy



Management Zones

Scale

6 0 6 12km

Intensive Recreation

Intermediate Recreation

Possible Aboriginal Living Areas A

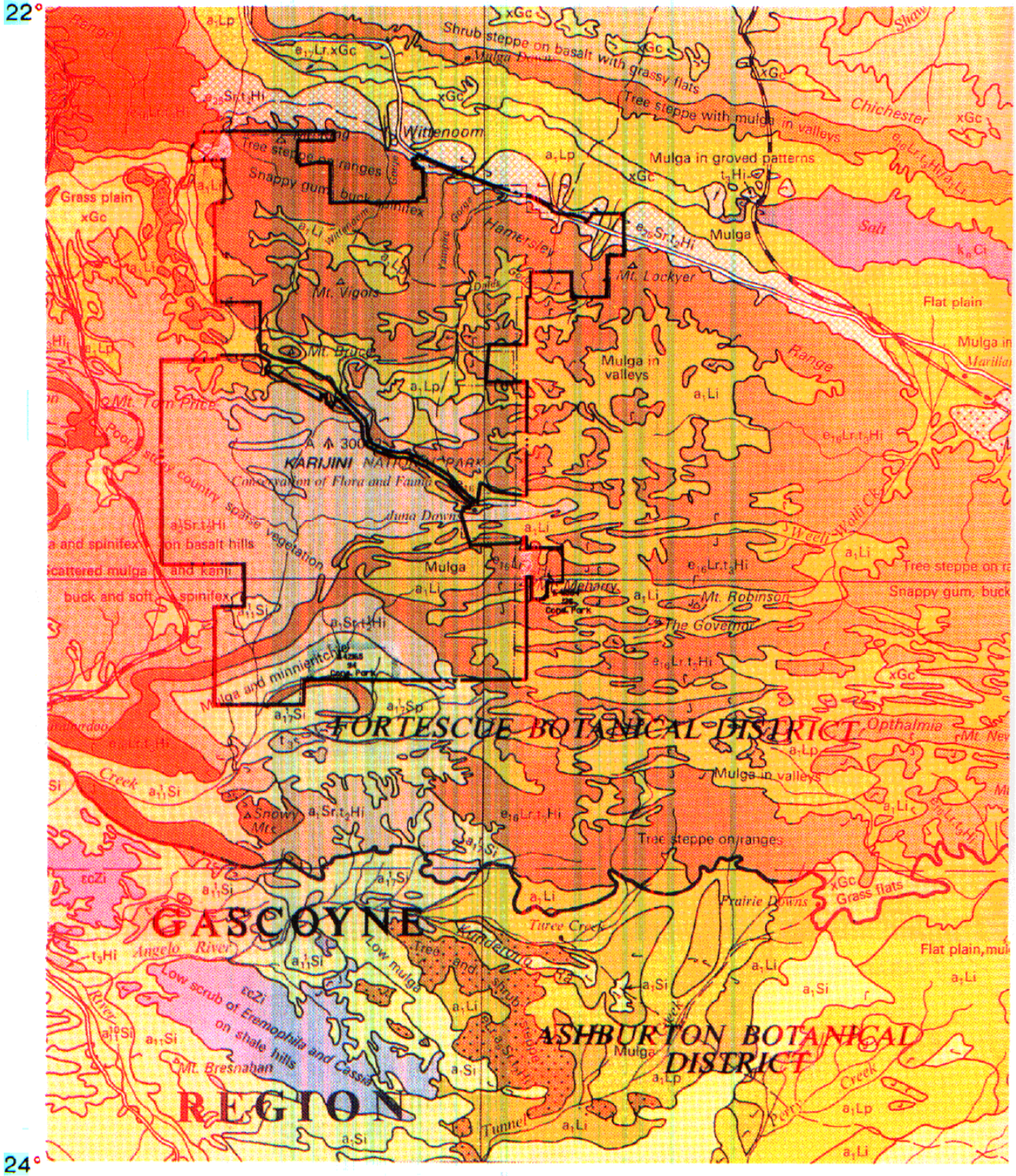
Natural Environment

Wilderness

Ranger Station

Footnote: Living Area locations are approximate, 3 of which will be subject to formal lease arrangements between KAC and Executive Director, CALM.

KARIJINI NATIONAL PARK
Vegetation



KEY

Steppe (Hummock grassland)

Tree steppe

- cMr.tHi — Desert oak — *Casuarina decaisneana*
- oLr.t_3Hi — Desert walnut and spinifex
- e_{16}Lr.t_3Hi — Snappy gum and spinifex
- e_{24}Lr.tHi — Bloodwoods and spinifex
- e_{24}Lb.tHi — Ditto, trees sparse

Shrub steppe

- xSi.tZHi — Shrub steppe with mixed heath and spinifex
- $a_{?}$Sr.tHi — Scattered shrubs and spinifex
- a_1Sr.tHi — Mulga and spinifex
- a_2Sr.t_1Hi — Kanji and spinifex
- a_5Sr.t_1Hi — *A. pachycarpa* and spinifex
- a_{11}Sr.$t\frac{1}{3}$Hi — Snakewood and spinifex
- e_{25}Sr.t_2Hi — *E. gamophylla* and spinifex
- aSb.tHi — Sparse shrubs and spinifex

Grass steppe

- tHi — Spinifex, no trees or shrubs

Succulent steppe

- cC — Lightly wooded succulent steppe
- kC — Unwooded succulent steppe; saltbush, bluebush, samphire

Dwarf-shrub steppe

- aZr.tHi — Dwarf shrubs and spinifex

Scrub

- a_1Si — Mulga shrubland, continuous
- aSr — Ditto, shrubs sparse
- aSp — Ditto, shrubs in groves or patches
- a_{11}^{1}Si mSi — Snakewood and other mixed wattle shrubland, or teatree.
- Mangrove — Mangrove; stature variable, normally scrub on this coast

Dwarf scrub

- eZi — Open shrubland <1 m tall

Savanna (Bunch grassland)

- eMr×Gc aSp×Gc — Tree savanna, shrub savanna
- xGc — Short grassland

Low woodland

- aLi — Mulga low woodland, continuous
- a_{16}^{2}Li a_{11}^{10}Li — Other *Acacia* low woodland
- aLr — Mulga, trees sparse
- aLp — Mulga, trees in groves or patches

List of species designated in mapping

a_1	= *Acacia aneura*, mulga	e_{16}	= *Eucalyptus brevifolia*, snappy gum
a_2	= *A. pyrifolia*, kanji	e_{17}	= *E. microtheca*, coolabah
a_3	= *A. coriacea*, waterwood	e_{18}	= *E. camaldulensis*, river gum
a_5	= *A. pachycarpa*	e_{22}	= *E. oleosa*
a_6	= *A. bivenosa*	e_{24}	= *E. dichromophloia*, bloodwood
a_7	= *A. trachycarpa*	e_{25}	= *E. gamophylla*
a_8	= *A. sclerosperma*	e_{40}	= *E.* sp. aff. *aspera*
a_9	= *A. ramulosa*, bowgada	k_1	= *Atriplex* spp, saltbush
a_{10}	= *A. victoriae*	k_2	= *Kochia* spp, bluebush
a_{11}	= *A. xiphophylla*, snakewood	k_3	= *Arthrocnemum* etc., samphire
a_{14}	= *A. quadrimarginea*	k_n	= *Halophytes, various*
a_{16}	= *A. subtessarogona*	m	= *Melaleuca* spp., tea tree
a_{17}	= *A. grasbyi*, minnieritchie	o	= *Owenia reticulata*, desert walnut
a_{18}	= *A. translucens*	p	= *Plectrachne*, feather top spinifex
a_n	= *Acacia*, numerous species	t_1	= *Triodia pungens*, soft spinifex
c_1	= *Casuarina decaisneana*, desert oak	t_2	= *T. basedowii*, buck spinifex
c	= *Cassia* spp.	t_3	= *T. wiseana*, buck spinifex
x	= *Heterogeneous*	t_6	= *T. brizoides* buck spinifex
ε	= *Eremophila* spp.	$t_?$	= *T.* sp. inedit. aff. *angusta*

Rivers

Main road

Local road

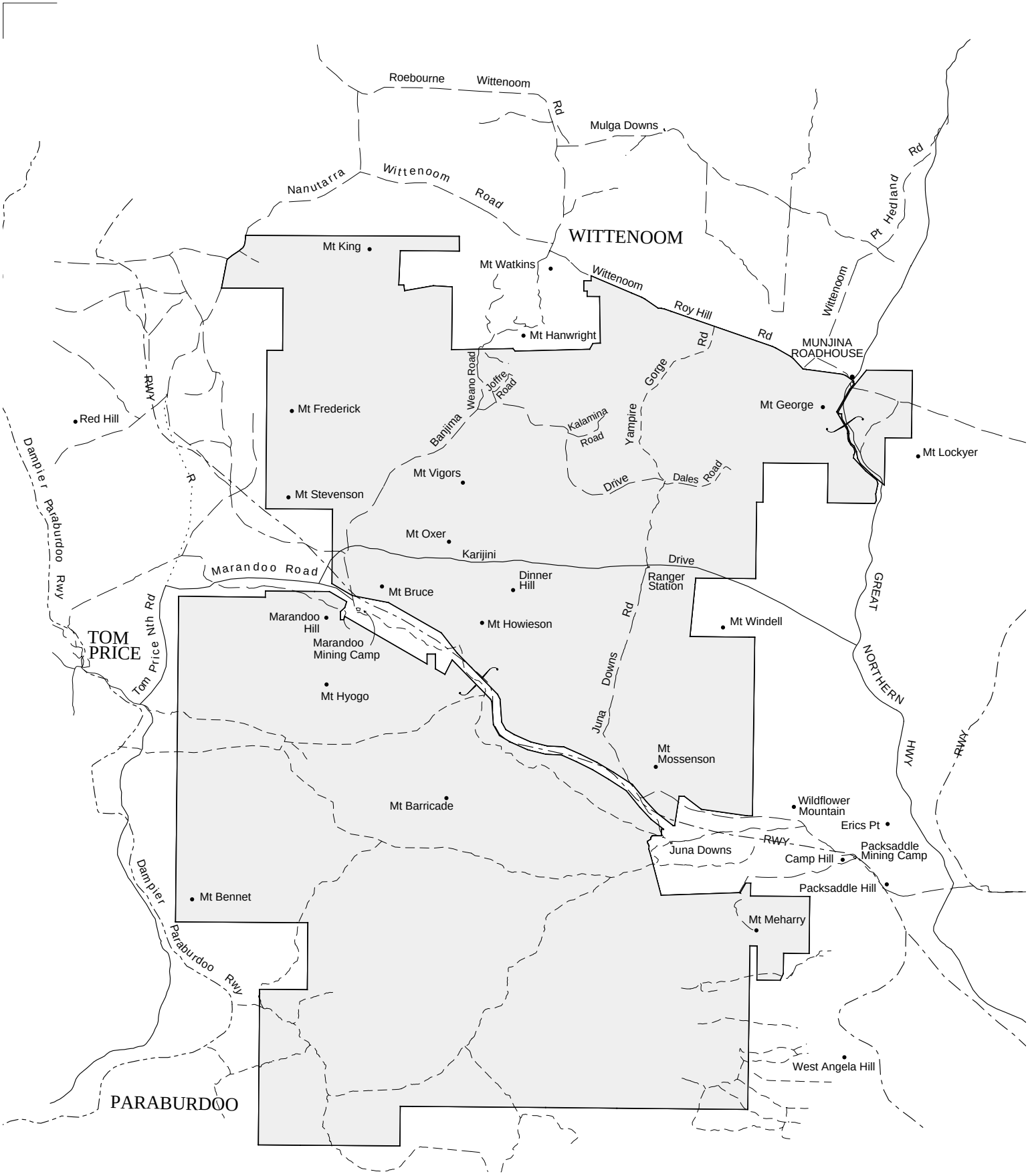
Railway 4′ 8½″ gauge

Boundary of botanical district

Boundary of vegetation type

Boundary of Karijini National Park

Extract from Pilbara 1:1000000
Vegetation Series



Access

Scale

6 0 6 12km

Sealed Roads

Unsealed Roads

Tracks

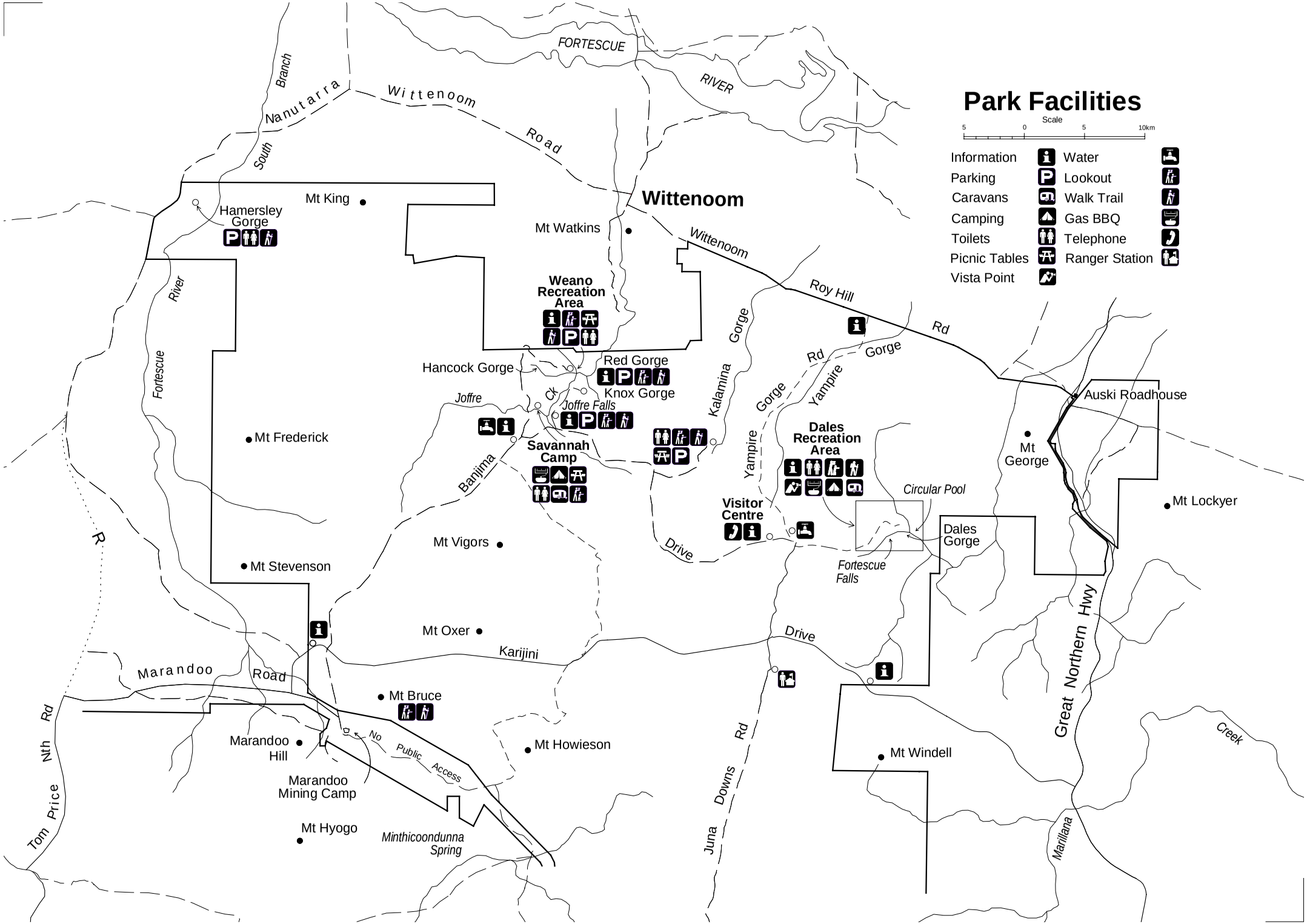
Route Under Investigation

Future Railway Requirements

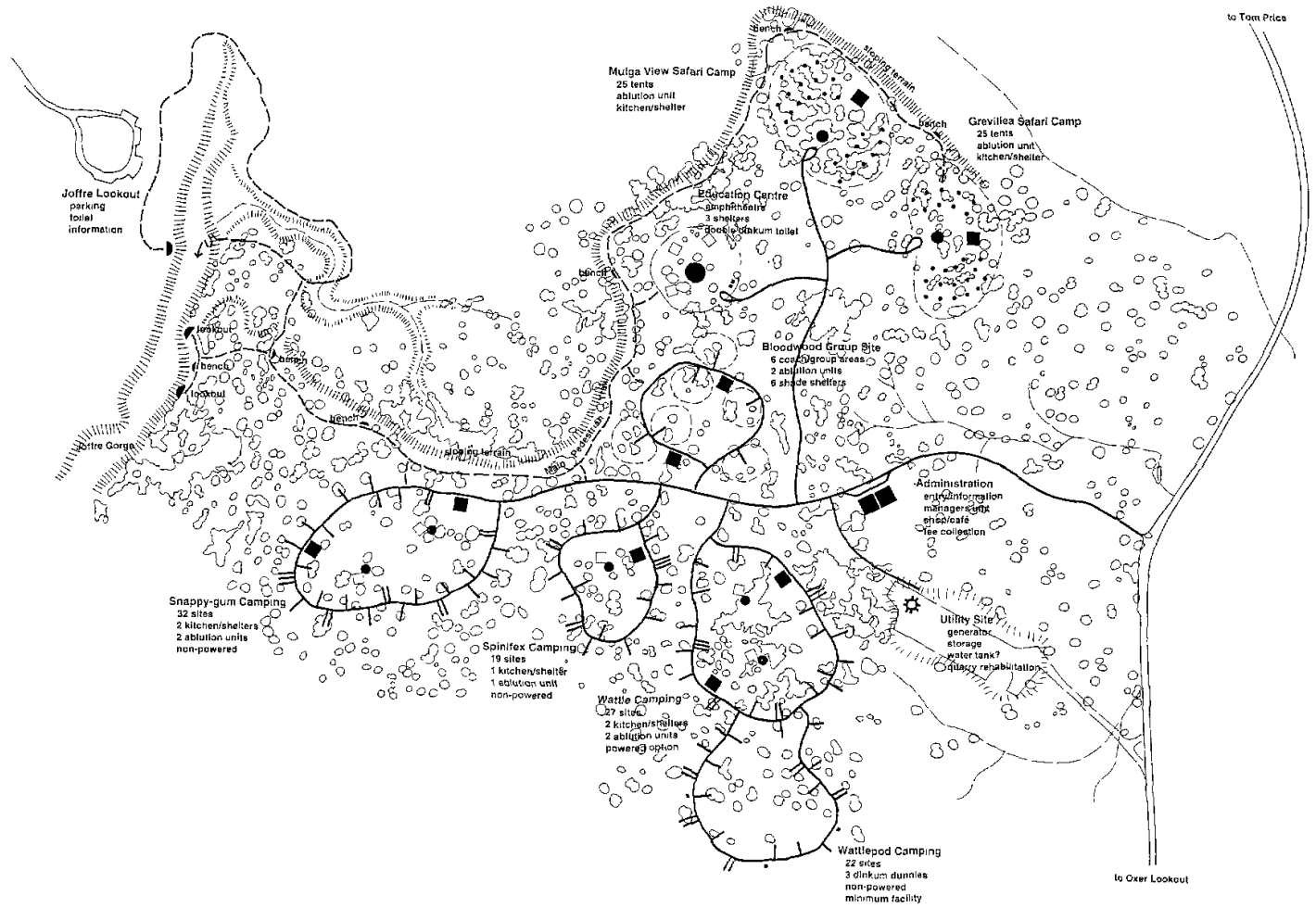
Railway

R

RWY


Park Facilities
Scale
5 0 5 10km
Information
Parking
Caravans
Camping
Toilets
Picnic Tables
Vista Point
Water
Lookout
Walk Trail
Gas BBQ
Telephone
Ranger Station
Wittenoom
Mt King
Hamersley Gorge
Mt Watkins
Weano Recreation Area
Hancock Gorge
Red Gorge
Knox Gorge
Joffre Falls
Joffre Ck
Savannah Camp
Mt Frederick
Banjima
Mt Vigors
Mt Stevenson
Mt Oxer
Karijini Drive
Visitor Centre
Dales Recreation Area
Circular Pool
Dales Gorge
Fortescue Falls
Yampire Gorge Rd
Kalamina Gorge Rd
Roy Hill Rd
Auski Roadhouse
Mt George
Mt Lockyer
Great Northern Hwy
Marandoo Road
Mt Bruce
Marandoo Hill
Marandoo Mining Camp
No Public Access
Mt Howieson
Mt Hyogo
Minthicoondunna Spring
Tom Price Rd
Juna Downs Rd
Mt Windell
Marillana Creek
Nanutarra Wittenoom Road South Branch
Fortescue River
FORTESCUE RIVER

Map 10



Karijini National Park

SAVANNAH CAMP

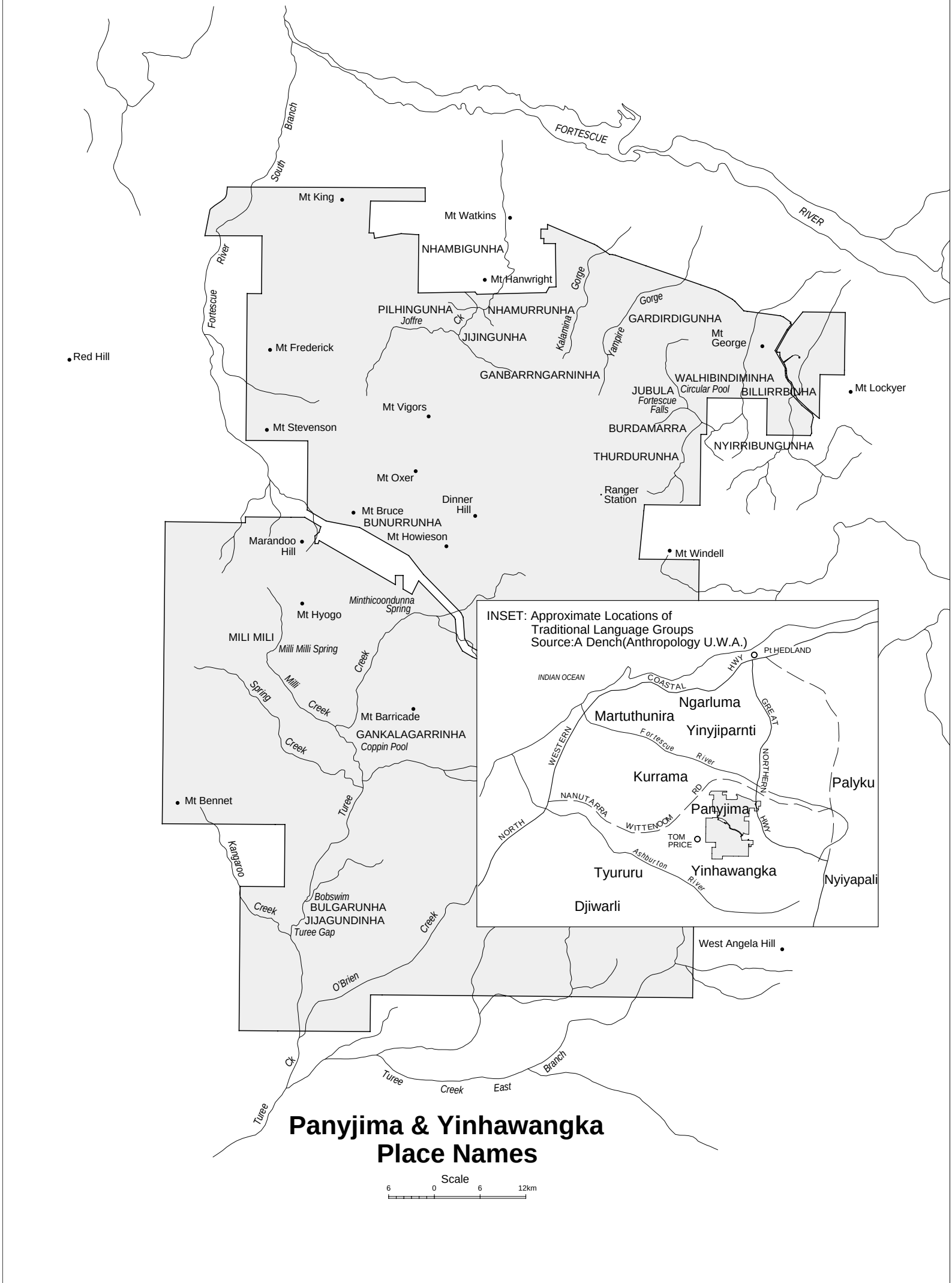
Concept Development Plan

- *Ablution unit*
- Camper's kitchen
- Shelter
- Safari tent unit
- Lookout platform
- *Bench*

scale 1 : 1000

north

Recreation Planning and Design Section – July 1998



Panyjima & Yinhawangka Place Names

Scale

6 0 6 12km