Hamersley Range National Park

Draft Management Plan

May 1989

Department of Conservation
and Land Management

DRAFT MANAGEMENT PLAN

HAMERSLEY RANGE NATIONAL PARK

May 1989

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HAMERSLEY RANGE NATIONAL PARK

Draft Management Plan

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PREFACE

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

The NPNCA is responsible for the preparation of management plans for all land which is vested in it. These plans are prepared by officers of CALM and issued as draft plans by the Authority for public comment and final approval by the Minister.

Area plans for individual national parks and nature reserves are prepared on a priority basis. This draft plan is the first released by the NPNCA for the Pilbara Region.

ACKNOWLEDGEMENTS

Members of the project team which formulated and prepared this draft plan were Peter Sandell, Wally Edgecombe, Tony Start, Keith Cunningham, and Maitland Parker.

Much of the early data collection and documentation for the plan was conducted by Barry Muir, Tony Start, and Matt Cavana.

The format of the plan is based upon the draft plan of management - Watarrka National Park (Conservation Commission of the N.T., unpublished). Appendix 1 has been adapted directly from that draft plan.

The positive contributions of a number of public and private groups, and individuals, during the consultative process is gratefully acknowledged. In particular, the contribution of the W.A. Geological Survey and the Water Authority to the sections on geology and hydrology is acknowledged.

Wordprocessing was by Edcom Computer Services.

CALM Mapping Branch prepared all the maps.

Public Participation

Considerable effort has been directed towards obtaining public input during the preparation of the draft plan for Hamersley Range N.P. The Park attracts considerable visitation and has particular significance to Aboriginal people, tourist interests, the mining industry, and to conservation groups. Park development will have an influence on residents in surrounding towns and on pastoral leases. In the formulation of plan prescriptions CALM has attempted to solicit and address the full scope of Park management issues as they relate to the public interest.

Public consultation has taken the following forms:

- invitation of submissions from interested groups and individuals by means of advertisements in regional and state newspapers and by mail.
- briefings of local government and pastoral interests.
- public meetings in the adjacent towns of Wittenoom, Tom Price, Paraburdoo and Newman.
- meetings with local Aboriginal people at Onslow and in the Park.
- consultation with other Government agencies with interests in relation to the Park.
- A workshop at Curtin University of Technology with representatives of the Pilbara fire study group and the Mulga Research Centre.
- a workshop in Karratha on Park management in the context of local and regional interests.
- specific issue meetings in Perth with mining, tourist, and conservation interests.

Subsequent to the release of this draft plan, a statutory period of 2 months will apply for public submissions in accordance with the provisions of the CALM Act. These submissions will be considered in the preparation of the final plan.

Once the plan of management for Hamersley Range N.P. has come into operation, CALM will continue to seek public involvement in the management of the Park. Local interest groups will have an input into management practice through the avenue of advisory committees.

Index to Proposed Prescriptions

References are shown as the page number followed (in brackets) by the number of the prescription from the top of the page. Bold type denotes a principal reference.

Index to Proposed Prescriptions

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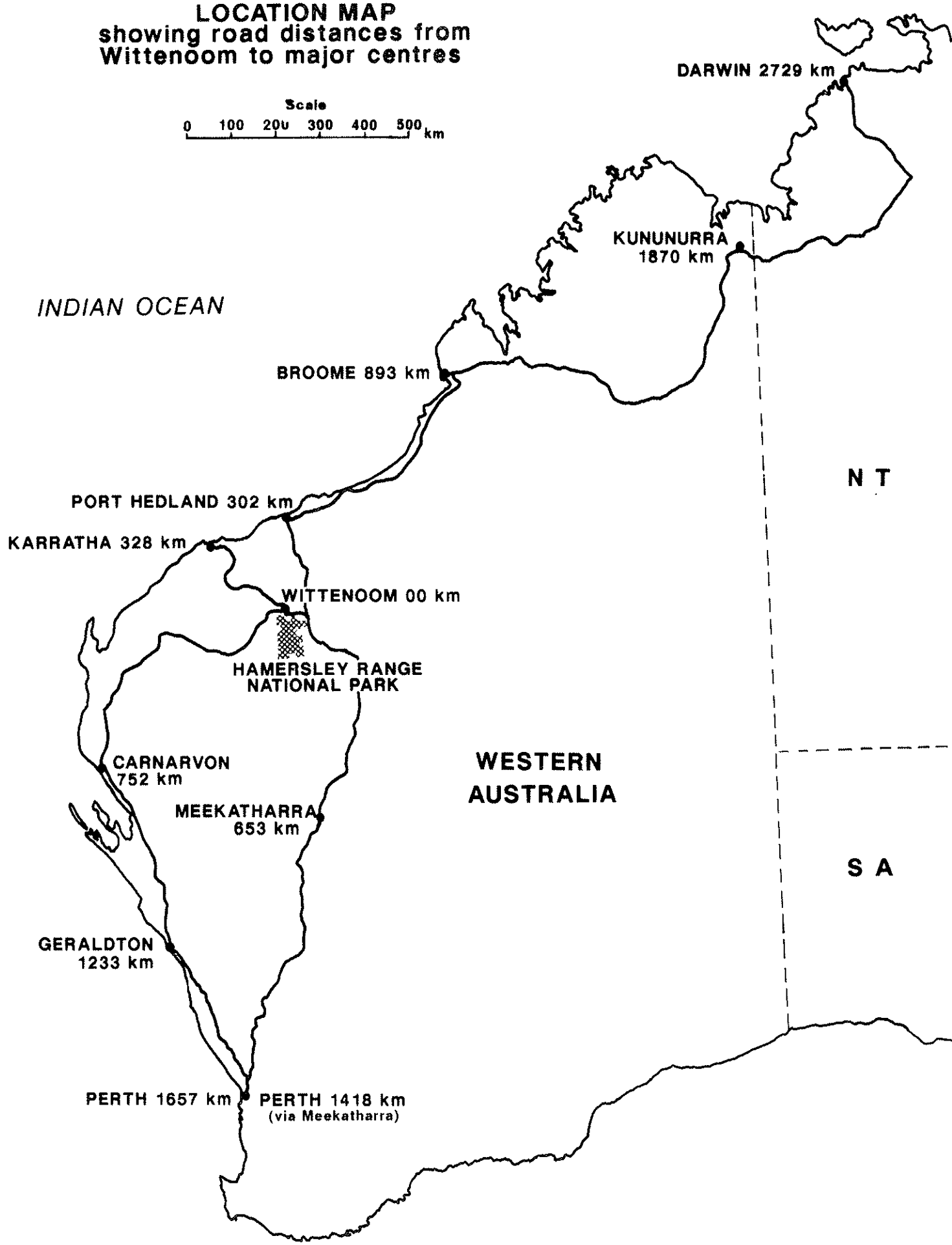

LOCATION MAP
showing road distances from
Wittenoom to major centres
Scale
0 100 200 300 400 500 km
DARWIN 2729 km
KUNUNURRA
1870 km
INDIAN OCEAN
BROOME 893 km
N T
PORT HEDLAND 302 km
KARRATHA 328 km
WITTENOOM 00 km
HAMERSLEY RANGE
NATIONAL PARK
CARNARVON
752 km
MEEKATHARRA
653 km
WESTERN
AUSTRALIA
S A
GERALDTON
1233 km
PERTH 1657 km
PERTH 1418 km
(via Meekatharra)

Map 1

A.1 PARK BACKGROUND

A.1.1 LOCATION

Hamersley Range National Park (HRNP) encompasses an area of 617 606 ha in the Hamersley Range of the Pilbara Region, Western Australia. All except 106 ha (containing Hamersley Gorge) is within a single block (Map.2.). A portion of Juna Downs Station is an enclave within the existing park boundaries. The maximum extent of the Park is from latitude 23°13'S to 22°13'S(approx. 110km) and from longitude 117°53'E to 118°45'E (approx. 70km). At the nearest point, the Park is approx. 200km from the coast.

Wittenoom is the closest town to the Park at a distance of some 60km from the Park H.Q. (via Yampire Gorge). Wittenoom is 1418km from Perth (via Meekatharra) or 1657km via Carnarvon (Map.1.). Other nearby centres are the mining towns of Tom Price, Paraburdoo, and Newman. Approx. 70% of the Park boundary adjoins the pastoral leases of Marillana, Juna Downs, Turee Creek, Rocklea, Hamersley, Mt Florance, and Mulga Downs (Map.2).

A.1.2 CONSERVATION VALUES

The Park contains a viable representative sample of the Fortescue Botanical District and a range of arid land ecosystems and habitats. The riverine ecosystems, associated with the gorges of the northern Hamersley Plateau and the springs in the Turee Ck catchment, support a diverse flora and fauna.

The Hamersley Range has had a relatively brief history of European settlement and pastoralism. It therefore remains in a relatively undisturbed condition. Four gazetted rare animals, two of which are endemic to the Pilbara, are known to occur in the Park.

The large size of the Park (second largest in W.A.) allows for the development of an adequate buffer against introduced agents of disturbance, e.g. feral animals. The necessity for reserves in the arid zone to be extensive is partly due to the fact that arid land ecosystems are subject to widespread natural disturbances such as fire and drought. Much of the diversity in these ecosystems can be attributed to the differing stages of succession post disturbance (EPA Red Book).

The geology of HRNP is a feature of great interest. The Park contains some of the oldest exposed rock formations on the Australian continent with implications for the investigation of Earth's earliest life forms.

A.1.3 LANDSCAPE

The Park has exceptional visual resources. There are few evident human-imposed alterations to a landscape characterised by naturalness, ruggedness, and diversity. Apart from high plains and plateaux, the upland landscape includes domed hills, bevelled ridges, and remnants of broad shallow valleys. Major peaks, such as Mt Bruce and Mt Barricade, are focal points by virtue of their height and relative isolation.

Waterforms of note occur primarily in association with the deeply incised gorges that delineate the northern edge of the Range. Erosional features and distinctive rock layering contrast with the colour and texture of gorge vegetation.

A.1.4 ABORIGINAL AFFILIATIONS

At the time of the first European settlement of the Hamersley district in the 1860's, the area of the Park was

occupied by the Panyjima people (Map.3.). The Panyjima community has subsequently been resettled in Onslow but they still closely associate with the area of the Park and culturally significant sites within it. Panyjima Law and traditions are still actively upheld.

A management emphasis for the Park will be the maintenance of its Aboriginal heritage including the protection of the physical evidence of earlier occupation. It is proposed that ongoing Panyjima involvement in Park management be formalized by the creation of an advisory committee.

Traditional land management practices will be documented and, where possible, incorporated in Park programmes. The Panyjima names for features in the Park are being recorded (Map.3.) and will be used where appropriate.

A.1.5 RECREATION AND TOURISM VALUES

HRNP is recognised as the principal tourist attraction in the Pilbara Region. Despite its remoteness from urban centres, the Park attracts considerable visitation during the winter months. Visitor interest is concentrated on the spectacular landscape of the northern escarpment with its sheer gorges and permanent pools.

The Park also offers visitors the opportunity to gain an appreciation and understanding of an arid environment with its unique landscape and specialized plants and animals.

A.1.6 HISTORY OF TENURE AND MANAGEMENT

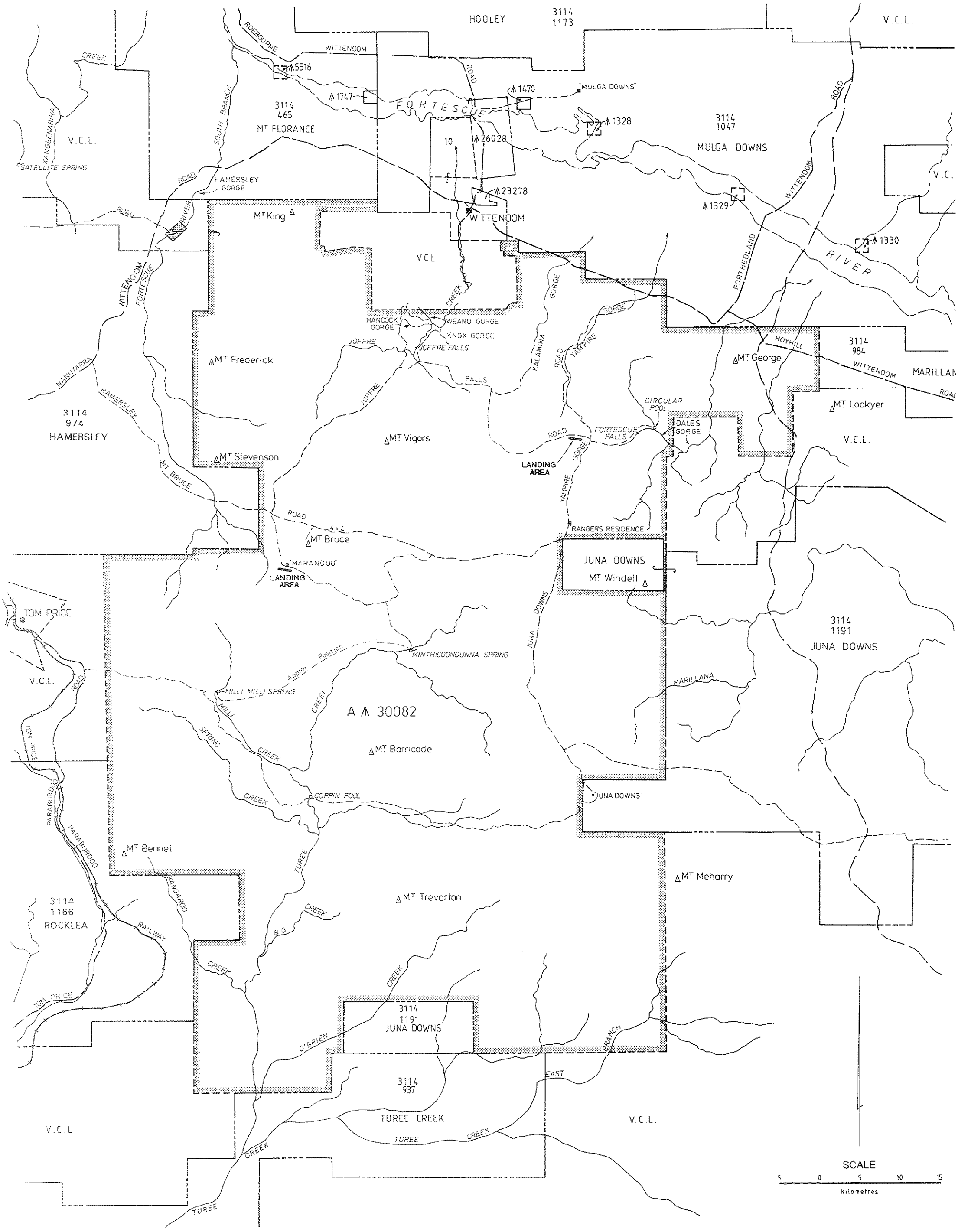
The first comprehensive proposal for a national park in the Hamersley Range area appeared in a report prepared by the Western Australian Sub-committee of the Australian Academy of Science Committee on National Parks in 1962. An area of 23 644 ha of the plateau had been reserved since 1956 as Dales Gorge 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 N.R.) was subsequently gazetted on 31 October 1969 (G.G. 31/10/69, p.3374) as 'A' Class Reserve No. 30082 (Dales Gorge National Park). It was vested in the National Parks Board of W.A. for the purpose of a national park. Subsequently the name of the park was changed to Hamersley Range N.P. (G.G. 10/4/70, p.1026). Hamersley Gorge was added to the Park as a separate area of 306 ha (G.G. 23/12/77 p.4693). The total area of the Park was later recalculated as 617 606 ha (G.G. 4/7/80 p.2124).

Some rationalization of the Park's northern and eastern boundaries has recently be proposed. These proposed changes are detailed in Section C.6 and in Map.7. of this draft management plan.

With the proclamation of the CALM Act in 1984, the Park was vested in the National Parks and Nature Conservation Authority (NPNCA) and CALM assumed responsibility for its management.

Active management of the Park dates back to the early 1970's when the first Park Ranger was resident in Wittenoom. In 1979 the Ranger transferred to a new house within the Park at the location of the present Park H.Q. He was assisted by a mobile Ranger during the tourist season. In 1984 a second permanent Ranger position was appointed to the Park and in 1987 another 2 positions were created.



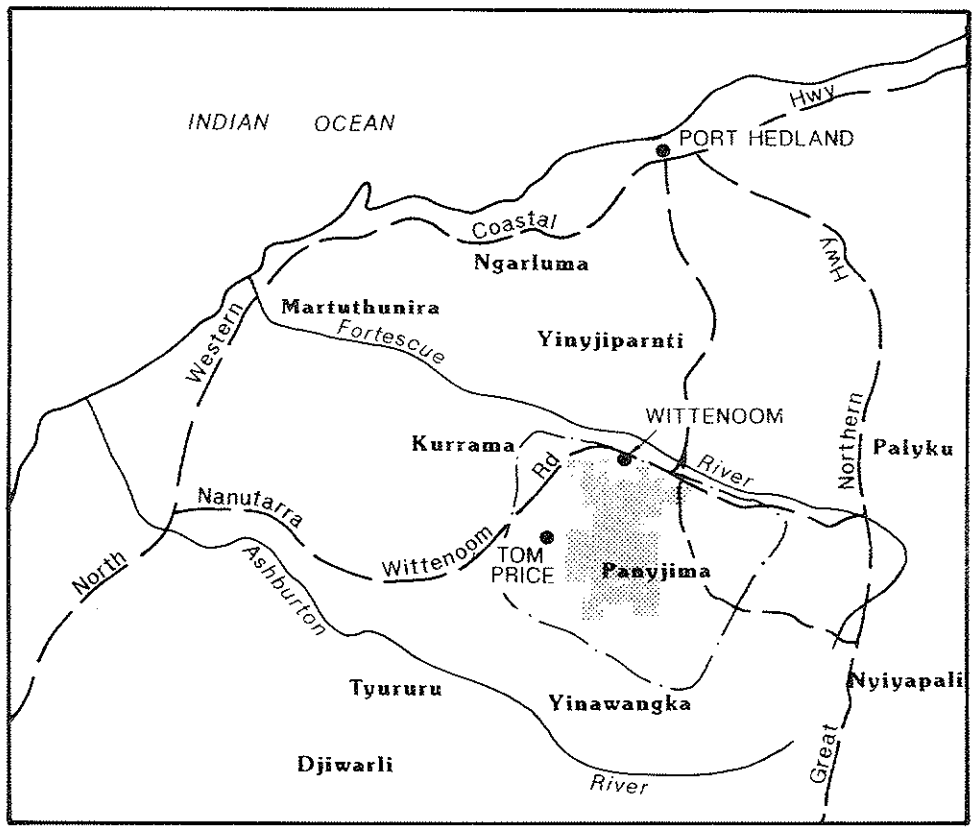
Hamersley Range National Park

Map 2

HOOLEY
3114
1173
V C L
ROEBOURNE
WITTENOOM
ROAD
5516
1747
FORTESCUE
1470
MULGA DOWNS
1328
3114
465
Mt FLORANCE
SOUTH BRANCH
KANGEENARINA
CREEK
V.C.L.
SATELLITE SPRING
10
26028
3114
1047
MULGA DOWNS
HAMERSLEY
GORGE
ROAD
RIVER
23278
WITTENOOM
1329
WITTENOOM
ROAD
V C L
Mt King
VCL
NHAMBIGUNHA
1330
RIVER
PORTHEDLAND
FORTESCUE
CREEK
GORGE
HANCOCK
GORGE
WEANG GORGE
KNOX GORGE
PILHINGUNHA
NHAMURRUNHA
JOFFRE
JOFFRE FALLS
JIJINGUNHA
KALAMINA
GARDIRDIGUNHA
GANBARRNGARNINHA
VAMPIRE
GORGE
ROAD
ROYHILL
3114
984
WITTENOOM
MARILLANA
ROAD
Mt George
NANUTARRA
HAMERSLEY
Mt Frederick
FALLS
JOFFRE
WALHIBINDIMINHA
BILLIRRBINHA
Mt Lockyer
CIRCULAR POOL
JUBULA
FORTESCUE FALLS
DALES GORGE
ROAD
Mt Vigors
V C L
BURDAMARRA
NYIRRIBUNGUNHA
THURDURUNHA
Mt Stevenson
MT BRUCE
ROAD
4 x 4
RANGER'S RESIDENCE
Mt Bruce
BUNURRUNHA
"MARANDOO"
JUNA DOWNS
Mt Windell
JUNA DOWNS
3114
1191
JUNA DOWNS

INSET : Location of Panyjima Territory and of Neighbouring Language Groups

Source: A.Dench(Anthropology U.W.A.)



SCALE

5 0 5 10 15

Kilometres

Hamersley Range National Park
Panyjima Place Names

Map 3

A.2 NATURAL ENVIRONMENT

A.2.1 CLIMATE

The Pilbara is located within the Australian arid zone which extends inland from the western coastline of the continent. Hamersley Range National Park (HRNP) experiences low rainfall which is both unreliable and seasonally distributed. Mean annual rainfall is in the range 200-350mm and falls predominantly in the summer months (November - April). January and February are, on average, the wettest months of the year whilst September and October are the driest. Humidities are 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. There can be a high diurnal range of temperature. Meterological records have been kept for a short period (8 years) at Marandoo in the middle of the Park. During that time the mean max. temperature for January was 38°c and the mean min. temperature for July 8.5°c. Mean annual rainfall was 330mm (Muir, 1983). In mid-summer daily temperatures as high as 48°c have been recorded. Very occasional frosts can 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 with a resultant drop in relative humidity. In the summer months, the high pressure belt moves southward and atmospheric conditions over the Pilbara become less stable.

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

Tropical cyclones form over the Indian Ocean usually between December and March each year. Their occurrence and path are essentially random and may not result in rainfall in a particular portion of the Pilbara for many seasons. When they do occur, daily rainfall totals of between 50 and 150mm are common. Winds moderate as a cyclone moves inland.

A.2.2 GEOLOGY

2.2.1 Introduction

Rocks within the Hamersley Range National Park are mainly Archaean, greater than 2500 million years (myr) in age, with lesser occurrences of Proterozoic (2300-2500 myr) and Cainozoic (less than 65 myr) rocks. A basement of metamorphoric and igneous(mainly granitic) rocks is overlain uncomformably by the somewhat younger sedimentary and igneous(mainly basaltic) rocks of the Fortescue Group and the dominantly sedimentary rocks of the Hamersley and Turee Creek Groups. The Fortescue, Hamersley and Turee Creek Groups were deposited on the older basement rocks in a water-covered shelf or basin, known as the Hamersley Basin. Collectively these groups comprise the Mt. Bruce Supergroup. Subsequent uplift and folding with associated erosion has formed the present massif which is called the Hamersley Range.

2.2.2 Basement rocks

The basement which underlies the Park is called the Pilbara Granite and Greenstone Terrain and is composed of granites, granitic gneisses and greenstones (altered basic igneous

rocks). These rocks are Archaean in age and are probably in excess of 2800 millions years old. The basement is generally better exposed north of the Hamersley Range but an outcrop (inlier) of the basement rock is exposed in the south eastern portion of the Hamersley Range National Park in the centre of the Milli Milli Dome (anticlinal structure).

2.2.3 Fortescue Group

The Fortescue Group is the lowest (oldest) unit of the Mt. Bruce Supergroup and rests unconformably upon the granite and greenstone basement. 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 Anticline.

2.2.4 Hamersley Group

The Hamersley Group is a thick sequence (approximately 2400 metres) 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 type making up these units are banded iron-formation (BIF), dolomite, siltstone and shale. Some banded iron-formations are composed of layers of iron oxides alternating with fine grained quartz (chert), while other BIFs are dominantly layers of different iron-magnesium silicates.

The Marra Mamba Iron Formation, forming the basal unit of the Hamersley Group, is primarily a banded iron formation containing bands of chert which are generally yellow to yellowish brown with a distinctive 'pinch and swell' structure (de la Hunty, 1965). Zones of iron enrichment are common and thin seams of crocidolite (blue asbestos) are poorly represented within the Hamersley Range National Park.

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 southwest corner of the Park, in the flanks of the Turee Creek Syncline.

2.2.6 Cainozoic Deposits

The Cainozoic deposits within the Hamersley Range National Park consist mainly of ferricrete which appears as a cemented iron-rich hematite (Fe_2O_3) gravel or duracrust which occurs over much of the Brockman Iron Formation. Isolated occurrences of the Robe Pisolite are present within the Park and appear as limonite gravel with silicified wood fragments

cemented with iron minerals. Valleys within the Park are filled with colluvial and alluvial deposits, some of the latter dating back to the Eocene Period (38 million years ago).

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

2.2.6 Mineralisation

Mineralisation within the Park includes iron ore and small deposits of gold, copper, lead and crocidolite. The Brockman Iron Formation contains most of the large hematite deposits in the Hamersley region. Fresh iron formation is composed of bands of magnetic iron oxide (magnetite, Fe_2O_4) and fine quartz (chert). Commercial iron ore deposits have been formed from this material by supergene processes (near surface weathering) with leaching of silica and carbonates and oxidation of magnetite to hematite. The ore bodies are generally between 15 and 60 metres thick but in exceptional cases may be over 150 metres thick; average ore grades 60% iron. The Marra Mamba iron ore deposit at Marandoo differs from the hematite ores in that much of the iron is mineral goethite (hematite bonded to water as Fe_2O_3 $3H_2O$). As a consequence this ore is friable and more difficult to process. Iron ore mining in the Pilbara is an industry of national importance contributing approximately 5% of Australia's export income.

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 in evidence.

Alluvial gold deposits are known to occur in the Turee Creek area. Gold was discovered in the area in the 1890's but the field was abandoned in 1896 as a consequence of drought. The original Turee Creek diggings were relocated as recently as 1986 and have become popular with fossickers.

A.2.3. LANDFORM

Hamersley Range National Park incorporates a large section of the Hamersley plateau, the most extensive elevated area of land in W.A. It can be broadly classified as being within the Hamersley Plateau geomorphic province (Payne et.al., 1982). There is a prominent scarp along the northern edge of the plateau which is indented by long spurs rising from the Fortescue River Plain. Superposed drainage has created deep dissections in the plateau and led to the formation of gorges such as Wittenoom Gorge, Yampire and Dales Gorges. The gorges of the plateau margin often follow fault lines (Texasgulf, 1979).

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 NW-SE axis. The hills are generally above 1000m in altitude whilst elevated plains are 700-800m ASL and the valley floors are in the range of 550-650m ASL (Map.5.) Turee Creek, in the southern section of the Park, is the lowest point at 500m ASL. The northern section of the Park is dominated by Mt. Vigors (1145m) whilst Mt. Bruce, in the middle of the Park, is the second highest peak in

W.A. at 1235m. The highest point in W.A. is Mt. Meharry (1245m) which lies just outside the Park's eastern boundary.

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. Although there is an escarpment on the southern side of the Range it is not as prominent as the northern scarp. The southern escarpment is associated with the Turee Creek Syncline.

A.2.4. SOILS

HRNP falls within the Pilbara soil - landscape province of the Western Region II (Bettenay, 1983) and the Hamersley Soil Region (Payne et.al.,1982). A typical cross section at Map 5 shows the relationship between soil type and elevation. In general, the Pilbara has a soil and drainage pattern which is largely controlled by basement geology. Soils have been formed in-situ by weathering of surface formations and by concentration of weathering products in lower parts of the landscape. The soil colour is generally closely linked to that of the parent rock.

The Hamersley Range has extensive upland areas of red lithosols (ie. weathered rock fragments) which are ferruginous, being derived from the Brockman Iron Formation. There are a minority of calcareous soils which 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 the other soils of the Park.

The upland soils of the Park on hills, ridges, and plateaux 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. Throughout the Park there are 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 *E.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.

HOOLEY 3114 1173

V.C.L.

ROEBOURNE

WITTENOOM

CREEK

5516

ROAD

1747

FORTESCUE

1470

"MULGA DOWNS"

1328

3114 465

MT FLORANCE

10

26028

3114 1047

MULGA DOWNS

ROAD

WITTENOOM

V.C.L.

SATELLITE SPRING

V.C.L.

SOUTH BRANCH

HAMERSLEY GORGE

ROAD

RIVER

23278

1329

WITTENOOM

1330

RIVER

PORTHEDLAND

Mt King

ROAD

FORTESCUE

CREEK

WEANO GORGE

KING GORGE

KALAMINA

ROAD

Mt Frederick

FALLS

George

3114 984

WITTENOOM

MARILLANA

ROAD

NANUTARRA

HAMERSLEY

Mt Lockyer

MT BRUCE

Mt Vigor

WALES GORGE

V.C.L.

Stevenson

ROAD

Bruce

JUNA DOWNS

TOM PRICE

3114 1191 JUNA DOWNS

MARILLANA

ROAD

30082

Mt Barricade

TOM PRICE

PARABURDOO

COPPIN POOL

NEWMAN

Mt Benner

Mt Meharry

KANGAROO

RAILWAY

Mt Trevorrow

TOM PRICE

3114 1191 JUNA DOWNS

EAST

LEGEND

V.C.L	YEARS BP	AGE	GROUP	FORMATION
	0-65myr	CAINOZOIC		Colluvium & Alluvium
				Colluvium –Limonite
TUREE	2300-2500myr	PROTEROZOIC	Wyloo	
			Hamersley	Brockman Iron Fm
				Mt. McRae Shale & Mt. Sylvia Fm
				Wittenoom Dolimite
				Marra Mamba Iron Fm
			Fortescue	Jeerinah Fm
				Mt. Jope Volcanics
				Hardey Sandstone
	>2500myr	ARCHAEAN		Pilbara Granite & Greenstone Terrain

Mt. Bruce Supergroup

SCALE

5 0 5 10 15

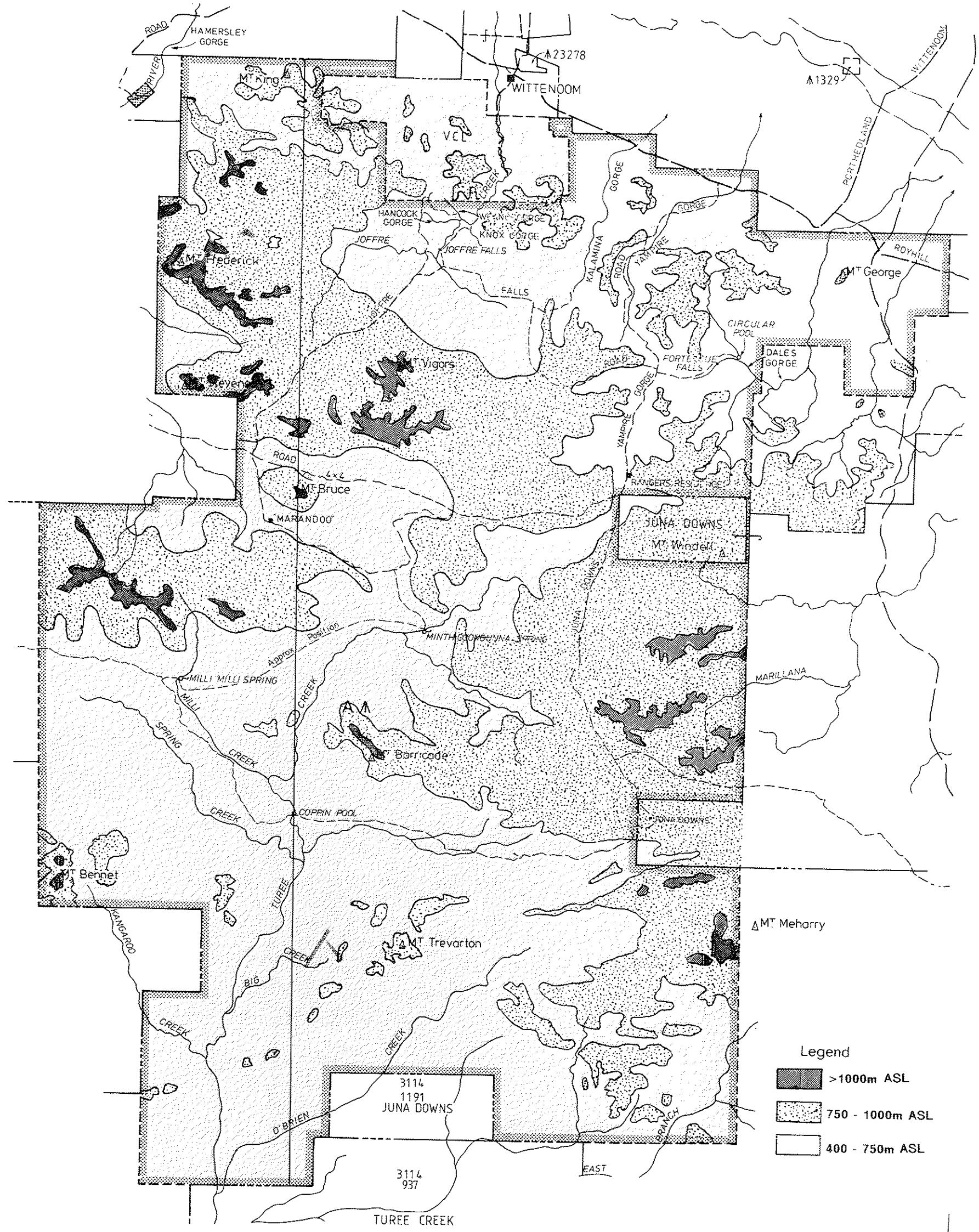
kilometres

Hamersley Range National Park

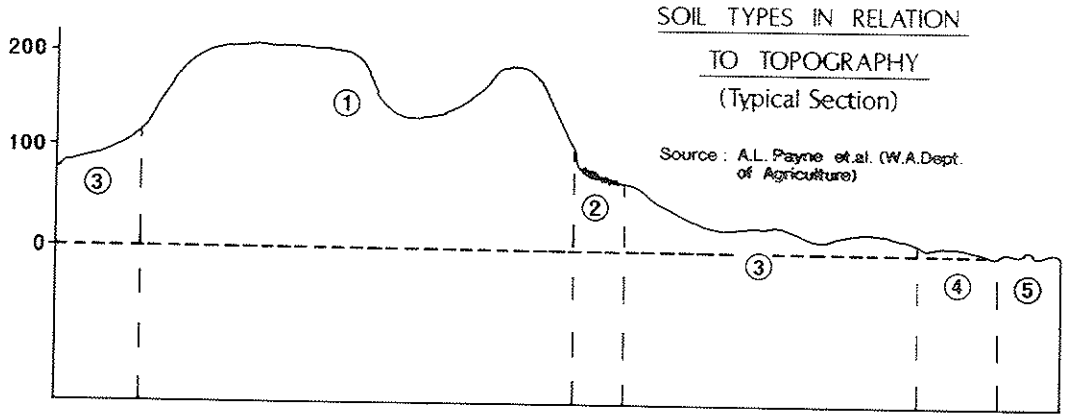
Geology

Source: Geological Survey of W.A. 1:250000 Geological Series(1965)

Map 4



SOIL TYPES IN RELATION TO TOPOGRAPHY
(Typical Section)



Source : A.L. Payne et.al. (W.A.Dept. of Agriculture)

Unit No.	Soil Description and Position
1	Skeletal soil (Banded ironstone hills)
2	Shallow stony loams (Dissected colluvial plains)
3	Shallow stony loams (Footslopes and interfluves)
4	Craking clays (Alluvial plains)
5	Medium depth loams (Flow zones, banks and channels)

Hamersley Range National Park
Topography and Soils

Map 5

A.2.5. HYDROLOGY

A.2.5.1 Surface Hydrology

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 events. Overall stream flow in the Park is low (generally less than 20mm per annum) and highly variable. The largest volume tends to occur between December and March in response to cyclonic rainfall.

Essentially, all surface water north of the central divide drains into the Fortescue River. 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 (e.g. Joffre and Kalamina Falls). Although none of the streams are perennial, most have permanent pools which are supplemented by groundwater seepages. 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. There are a number of permanent springs within the upper reaches of Turee Creek. The drainage lines in the southern catchment tend to be dendritic. This area slopes gently southward without a prominent escarpment.

A.2.5.2 Groundwater Hydrology

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.

Although the groundwater resources of the Park remain largely unproven, the largest inferred reserves are in the valley systems developed over Wittenoom dolomite. 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 Juna Downs and Marandoo. The Sth Fortescue borefield, just outside the Park boundary, supplies Tom Price town and mine. Water tables are generally deep (up to 30-40m) in the Marandoo - Sth Fortescue area.

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.

HRNP is within the proclaimed Pilbara Groundwater Area in which all groundwater abstraction (except for pastoral use) is required to be licensed. Substantial dewatering will be required for mining the Marandoo ore body which lies below the water table. Future development of ground water resources inferred to exist in the Turee Creek syncline, on the south east border of the Park, may be necessary to support adjoining mine developments.

A.2.6. FLORA

Hamersley Range National Park falls 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, 1986). There are estimated to be between 1250 and 1500 angiosperm species

within the Fortescue District, 481 of which are known to occur within HRNP(Trudgen, pers. comm.). There has been no published survey of the flora of the Park although a study has been conducted of *Acacia* species of the Hamersley Range area (Maslin, 1982), and a study conducted of flora of the Marandoo mining area (Texasgulf, 1979). Mattiske and Associates (1986) surveyed vegetation in the Mt. Channar area immediately to the south of the Park.

The flora of the Fortescue Botanical District is poor relative to that of the neighbouring Kimberleys. However there is considerable overlap (50%) between the two floras. With respect to the genus *Acacia,* 70% of species in the Fortescue District are shared with the South Kimberley Area and 72% are shared with the Central Eremaean area. Four major southern *Acacias (A.xiphophylla, A.victoriae, A.aneura and A.dictyophleba)* are at the northern margins of their range in the Pilbara and do not occur in the Kimberleys. Genera such as *Clerodendrum* and *Brachychiton* are relatively common in the Kimberleys but found in the Fortescue only in fire-protected situations such as rocky gullies.

Within the Pilbara there is a marked transition between *Acacia* dominated communities to the south of latitude 23°C and *Triodia* dominated communities to the north. This *Acacia-Triodia* line is a major phytogeographic boundary thought to be related to temperature rather than to any changes of substratum (Beard, 1975). The lower part of HRNP is in a transition zone above the *Acacia-Triodia* line. In this zone the southern *Acacias* continue to occupy patches of soil favourable to them. There are no extensive areas of mulga woodland in HRNP, the mulga dominated areas of the Park are essentially shrubland or low woodland formations.

The *Acacia* Flora (46 species) comprises mainly a mixture of wide-ranging arid zone and sub-tropical elements (Maslin, 1982). Only 4 species are endemic to the Hamersley Range : *A. daweana, A. effusa, A exilis and A. hamersleyensis.* With the exception of *A. daweana* (possibly a relict taxon) the 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 Quarternary. The resultant stresses were probably ideal conditions for speciation. The endemic *Acacia* species of the Hamersleys are therefore likely to have evolved recently and subsequently been confined to the Plateau.

A survey of rare and geographical restricted plants of the Fortescue District (van Leeuwen, 1984) has documented 65 species that are restricted to the District. Of these, 28 occur within conservation reserves and 10 have been recorded from HRNP. Localities within the Park that contain a high proportion of restricted species are the Mt. Bruce area and the gorges of the northern escarpment. The Park is not known to contain any gazetted plants although two occur adjacent to the boundaries of the Park in areas that may be reserved at a future date. A more intensive survey of the HRNP may reveal other species that warrant gazettal.

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 whilst the valley plains support shrublands of mulga *(A. aneura)* in association with *A. xiphophylla* (snakewood), *A. pruinocarpa, Cassia* and *Eremophila spp.* On the better soil types the

ground cover is predominantly comprised of ephemeral species which are replaced by *Triodia pungens* on the lower slopes, and by *Triodia wiseana* which becomes dominant on the hills and ridges.

Fire is a major factor in determining species distribution. 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 on a five year cycle. There is evidence that since European settlement the frequency of burning in the 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.

The major vegetation communities occuring within the Park can be summarised as follows:

i) **Hills, Ridges and Plateaux:**

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

(ii) **Gullies and Gorges:**

In sheltered gorges, elements of the Kimberley flora such as *Melaleuca leucadendron, Ficus virens,* and *Brachychiton* sp. can be found. The floors of some gorges contain permanent water sources and support a riverine woodland of *E. camaldulensis, E. terminalis, E. microtheca, A. pruinocarpa,* and *M. leucadendron.* The cliff faces of the gorges are a habitat that has been colonised by specialised plants. *Astrotricha hamptonii* (iron ore plant) is an unusual shrub that is otherwise only known from Queensland.

iii) **Lower Slopes and Valley Plains:**

On the lower slopes, and on some valley plains, the tree steppe changes with the addition of *E. terminalis* and *E. setosa* to the trees, and *T. pungens* to the spinifex layer. The valley plains are generally characterised by a low woodland, or shrubland, of mulga associated with *A. grasbyi, A. victoriae, A. tetragonophylla, A. xiphophylla* and *A. pruinocarpa.* There are frequent treeless open spaces. *Eremophila* and *Cassia* spp. form a sparse shrub layer. The ground cover consists mainly of *Triodia* spp. and ephemerals such as *Ptilotus* spp.

A.2.7 FAUNA

The known vertebrate fauna of HRNP includes 29 species of native mammal, 130 species of bird, 90 species of reptile and amphibian, and at least 8 species of fish. In addition there are known to be 6 species of feral mammal. The herpetofauna (frogs, lizards, and snakes) of the Park is particularly rich. Surveys of the fauna of the Hamersley Ranges were conducted in 1979 (Texasgulf, 1979),

1980 (Muir, 1983), and 1985 (Ninox Wildlife Consulting, 1985). Earlier studies in the region (particularly of mammals) date back to the 1920s.

The principal habitats within Park are the hummock grasslands, mulga low-woodlands, and the fringing vegetation of pools and streams. Many of the birds utilise the creekside and gorge vegetation which offers access to streams and permanent pools of freshwater. 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 wetland bird species.

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. This infers the use of fringing woodland as the primary roosting sites. The greatest diversity of fish species is to be found in the pools and springs associated with the major creek systems. These provide a greater variation of habitats than do the isolated pools of the northern gorges. The Flat-shelled Tortoise *(Chelodina steindachneri)*, on the other hand, has been recorded almost exclusively from the gorges.

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 *(Antechinus 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 found lizards (Johnstone, 1983). The spinifex hummocks provide shelter for these species from the extremes of climate and 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 *Neophnema bourkii)* and the Broad-tailed Thornbill *(Acanthiza apicalis)*. Amongst the small mammals the Ooldea Dunnart *(Sminthopsis ooldea)*, and the rare Long-tailed Dunnart *(Sminthopsis longicaudata)* have been recorded in mulga woodland south of the Park boundary. Their mulga habitats are not well represented in the Park and consequently these two species may be absent.

A.2.7.1 Rare Fauna

Of the vertebrate fauna known to occur in HRNP, only 4 species have been gazetted rare and/or in need of special protection under the Wildlife Conservation Act (1950-1983):

Pseudomys chapmani
Pebble-mound Mouse

Falco peregrinus
Peregrine Falcon

Falco hypoleucos
Grey Falcon

Liasis olivaceus barroni
Pilbara Olive Python

Scree slopes vegetated with mid-dense hummock grass with sparse emergent low shrubs or mallees are the preferred habitat of the Pebble-mound Mouse. This species has only recently been distinguished from the Sandy Inland Mouse *(P. hermannsburgensis)*. The Pebble-mound Mouse is restricted to the Pilbara and its range is thought to be contracting for reasons not clearly understood.

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 loss of small areas of habitat would not adversely affect the survival of the species as a whole. Similarly the Grey Falcon *(Falco hypoleucos)* is a scarce visitor to the area. Grey Falcons are widely distributed throughout W.A. except for the south-west forested areas.

The only gazetted rare species of reptile known to occur in the Park is the Pilbara Olive Python *(Liasis olivaceous barroni)*. This snake grows to about 4m long. It normally occurs near a source of permanent or semi-permanent water. Individuals have been recorded from Wittenoom, Marandoo, and Dales Gorge.

There are a number of species in the Park which, although not gazetted as rare, have declining populations and are now considered to be 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 those of intermediate size (45g - 5kg adult body weight). Pastoralism, changed fire regimes and predation by foxes are three factors thought to have contributed to the demise of these animals. The Spectacled Hare Wallaby *Largorchestes conspicillatus)* is a good example of a mammal whose population has declined dramatically in the Pilbara. There are no records 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 (Kinnear, pers. comm.). Fox predation is known to be a serious threat to these two species.

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 (Kinnear, pers. comm.).

The skeletal remains of 4 smaller mammals have been identified from the Marandoo area (Texasgulf, 1979). The Desert Mouse *(Pseudomys desertor)* has a limited distribution in central Australia. The Western Chestnut Mouse *(P. nanus)* is abundant in the Kimberleys 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)* at Marandoo could be the only record of this species from the Pilbara.

A.2.7.2 Role of Fire

The decline of many of the intermediate sized mammals has been attributed to changes in the fire regime since European settlement. The traditional Aboriginal practice of "mosaic" burning resulted in a patchwork of hummock grasslands at different stages of development. This pattern was of benefit to some mammal populations because older hummocks that provided shelter were frequently adjacent to regenerating areas that were productive in terms of food supply (Burbidge, 1985). The fire regime subsequent to European

settlement tended to result in extensive fires (often lit by lightning) and correspondingly large areas of regenerating spinifex or, alternatively, unproductive old hummocks. The habitat requirement for areas at the margins of both young and old spinifex was therefore rarely satisfied.

A.2.7.3 Invertebrate Fauna

Knowledge of the invertebrate fauna of the Pilbara is restricted to a few surveys conducted in the vicinity of HRNP. 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. However, some study has been carried out on termites *(Isoptera)* and Springtails *(Collembola)* in the West Angelas area to the SE of the Park.

The ant fauna of the Park is characteristic of arid Southern Australia although a few tropical elements are also present. A cumulative species count of 73, from 23 genera and 6 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) is at the southern limit of its distribution in the Pilbara. 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 and 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.

A survey of springs of the Pilbara for aquatic invertebrates (Ponder, 1987) did not reveal any endemic macro-invertebrates within the Park. The sites sampled were Circular Pool and Fortescue Falls.

Pin Cushion Millipedes *(Unixenus mjobergi)* 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 typically occur in late summer and can be a source of great annoyance to visitors.

A.2.7.4 Feral Animals

Introduced animals pose a serious management problem in Hamersley Range National Park. Those present include:

European Cattle
Bos taurus

Feral Cat
Felis catus

European Fox
Vulpes vulpes

House Mouse
Mus Musculus

Horse
Equus caballus

Donkey
Equus asinus

All of the above mentioned species are fairly common in the Park, with the possible exception of the European Fox. The presence of a single camel *(Camelus dromedarius)* has been recorded on one occasion. The Rabbit *(Oryctolagus cuniculus)* does not normally occur in the Park but given good rainfall conditions is capable of extending its range into the Park.

Feral carnivores (i.e. Fox and Cat) prey largely on small and intermediate sized mammals and reptiles. Feral herbivores are hooved animals and their impact is mainly the result of soil disturbance (particularly in riverine areas), competitive grazing and trampling, and the spread of weeds. Soil distrubance takes the form of overgrazing and compaction leading to sheet erosion and increased turbidity of streams. Wetland vegetation is particularly at risk from trampling.

The lack of fencing along the Park boundaries allows cattle from adjoining pastoral leases to graze within some areas. Horses and Donkeys are present in lesser numbers and can be culled by aerial shooting. The House Mouse is well adapted to the local environment and appears to have a similar habitat to that of the Sandy Inland Mouse*(Pseudomys hermannsburgensis)* and other native rodents. The extent of competition between these species has not been researched.

The Introduced Honey Bee *(Apis mellifera)* is the only feral invertebrate animal known to occur in the park. Populations are thought to be concentrated near sources of permanent water.

A.3 CULTURAL VALUES

A.3.1 ABORIGINAL HERITAGE

The Panyjima people occupied the Hamersley Range from a point west of Tom Price extending eastwards beyond the eastern boundary of the present Park (Map.3). The southernmost section of the Park may extend in to the traditional territory of the Yinhawangka language group. There are some linguistic differences (mainly grammatical) between the two groups (A. Dench, pers. comm.). The Panyjima language has been more extensively documented than Yinhawangka which is now spoken by very few people. The Panyjima name for Hamersley Range is Karijini. Other Panyjima names for landmarks in the Park are shown in Map 3.

The Panyjima have linguistic ties and affinities of law with the desert people further east, particularly the Palyku (A. Dench, pers. comm.). In recent times the influence of the desert peoples has extended westward. This has been reflected in changes to some ceremonial rites. The Panyjima law (Wartirrpa) is still upheld. Although the Panyjima people are now mostly resident at Onslow and other coastal towns, they maintain a close association with the area encompassed by the Park. A number of the older Panyjima were born on pastoral properties that adjoin the Park and they subsequently worked in the pastoral industry or local mining operations. Either by direct employment as Rangers, or by representation on management committees, the Panyjima people will continue to act as custodians of the Park's Aboriginal heritage.

There are numerous Aboriginal sites within the Park. Some are thought to be of considerable archaeological importance and all are significant to the Panyjima either as part of their heritage or as sites associated with the living law and cultural beliefs. The W.A. Museum maintains a register of all recorded sites. It is probable that only a small proportion of sites have been recorded. The Panyjima wish most sites to remain confidential and therefore undisturbed. These wishes are respected in Park management. Aboriginal sites in the Park include artefact scatters, art sites, occupation sites, grinding patches on rocks ceremonial and burial sites. The principal art form is the petroglyph. Paintings are comparatively rare. Many of the sites associated with cultural beliefs may extend over large areas encompassing natural features such as trees and rock formations. The boundaries of such sites may be difficult to define.

A.3.2 EUROPEAN EXPLORATION AND SETTLEMENT

Initial European exploration of the Hamersley Ranges was 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 Ranges 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 the purpose of 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 it's 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 homestead but little

remains of the building which was constructed of cajeput timber. A stone hut near Joffre is particularly noteworthy. The origin of this structure is not known.

Several of the northern gorges were officially named only recently 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 1960's. He named Kalamina Gorge, Weano Gorge, Knox Gorge, and Circular Pool in the period 1959-63. Oxer's Lookout was subsequently named in recognition of his contribution to the development of the Park.

A.3.3 HISTORY OF MINING

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 Milli Milli Springs and Coppin Pool within the area now proclaimed as Park. The Turee field was abandoned in 1896 due to prevailing drought conditions. Evidence of mining activity, and some gravesites, remain in the area.

Blue asbestos (crocidolite) was first mined in the northern escarpment in 1936 by Leo Snell who was reportedly shown the seams of fibre by an Aboriginal named Weano. Mining commenced in Yampire Gorge, where workings and relics can be seen today, and in Dales Gorge at the junction of the Circular Pool tributary. Lang Hancock also mined in Yampire Gorge before transferring his operations to Wittenoom Gorge in 1937. The mines in Wittenoom Gorge operated until their closure in 1966.

In 1960 the Commonwealth Government lifted the embargo on iron ore exports. This action 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 Marandoo (C.R.A) located within the Park south of Mt Bruce, West Angelas (Cliffs Robe River) located to the SE of the Park, and Yandicoogina (C.R.A and B.H.P) located to the east of the Park. With the boom of the iron ore industry in the early 1960's, the population and infrastructure of the region have greatly expanded. Ten more towns were built during this period including Tom Price and Paraburdoo to the west of the Park, and Newman to the east.

B. OVERALL MANAGEMENT

B.1 Role of the NPNCA

The National Parks and Nature Conservation Authority (NPNCA) is the controlling body for all national parks, nature reserves, and marine parks in Western Australia. The Department of Conservation and Land Management (CALM) manages lands which are vested in the Authority. The functions of the NPNCA, as defined by the CALM Act, include the submission of proposed management plans to the Minister for Conservation and Land Management.

B.2 CALM Responsibility and Policy

B.2.1 CALM MISSION

The scope of the responsibilites of the Department of Conservation and Land Management (CALM) is represented by its mission:

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

B.2.2 LEGISLATIVE BASE

CALM operates under two principal legislative acts: the CALM Act and the Wildlife Conservation Act. These Acts place a number of statutory requirements on the way in which CALM manages land and wildlife. Those requirements include the following:

(i) Management must be in accordance with a published management plan and all management plans must be made available for public review and comment in the draft phase.

(ii) National parks must be managed to provide public recreation consistent with the conservation of flora, fauna, landscape and other features.

B.2.3 DEPARTMENTAL POLICY STATEMENTS

CALM inherited policies from the 3 agencies (National Parks Authority, Forests Department, Department of Fisheries and Wildlife) amalgamated to form CALM, and is now developing new policies on all Departmental

Policy statements relevant to HRNP include the following:

No.	Title
2	Basic raw materials
4	Departmental advisory committees
10	Rehabilitation of disturbed land
11	Protection of Aboriginal sites
14	Weeds on CALM land
18	Recreation
19	Fire management
21	Communications
25	Community education and interpretation
28	Reporting, monitoring and re-evaluation of ecosystems and ecosystem management.

management responsibilities. Policies are documented as policy statements and are available to the public.

B.3 CALM Management Structure

CALM has a regional system of management which ensures that CALM officers are on hand to interact with local communities. The CALM Pilbara regional office is located at Karratha. Day to day management of the Park is the responsibility of the Ranger-in-charge who is answerable to the Regional Manager (Pilbara). Requirements for technical expertise not available in the region are provided by specialist branches within CALM or by other Government agencies.

B.4 Park Management Goals and Objectives

The CALM Act requires that:

> 56 (1) "A controlling body shall, in the preparation of proposed management plans for any land, have the objective of achieving or promoting the purpose for which the land is vested in it, and in particular management plans shall be designed - "
>
> 56 (1) (c) "in the case of national parks and marine parks, 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 enviornment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest."

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

- **Management:** To 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:** To conserve the indigenous plant and animal species and environmental processes in natural habitats throughout the State.
- **Production:** To provide and regulate the supply of those renewable resources that Government decides should be used, on a sustained yield basis for the satisfaction of long term social and economic needs, and in a manner that minimises impact on other values.
- **Recreation:** To facilitate the public enjoyment of the natural attributes of public lands in a manner that does not compromise conservation and other management objectives.
- **Knowledge:** To seek a better understanding of the natural environment and to promote awareness and appreciation of its values.

Secondary management goals and specific objectives in relation to HRNP are expressed in the context of the relevant sections of this draft management plan.

B.5 Zoning Plan

B.5.1 OBJECTIVE OF ZONING PLAN

A zoning plan has been devised for the Park with the following objective:

> 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 the overall conservation objectives.

B.5.2 ADOPTED ZONING SYSTEM

The zoning system proposed by CALM is a resource-based approach. The zoning categories under this system are:

I Special preservation
II Wilderness
III Natural environment
IV Recreation
V Park Services

This classification is based upon the need to protect specific park values, and the capacity of a given area to withstand visitor pressure. In the case of HRNP, traditional patterns of visitor use and access have been taken into account when determining zone boundaries. The proposed zoning plan also reflects the possible impacts of mining and other regional development upon the Park.

B.5.3 IMPLEMENTATION OF ZONING

The following zoning categories are proposed for HRNP as shown in Map. 6:

Zone II Wilderness: Land in this category will be maintained as nearly as possible in its natural condition. All existing roads or tracks will be closed. Motorized access will be permitted only in exceptional circumstances. Pedestrian access will be subject to the issue of a permit (e.g. for scientific purposes). No recreational facilities will be provided. This zoning will encompass five separate areas representative of a diversity of landforms and habitats in near to natural condition.

Zone III Natural environment: The management priority will be the preservation of the present abundance and diversity of native plant and animal species. Public access to this zone will not generally be restricted although non-motorized access will be favoured. Recreation facilities will not be provided. This zoning will encompass the majority of the Park.

Zone IV Recreation: Land in this category will be managed jointly for appropriate public recreation and for the conservation of indigenous biota. Recreation and interpretive facilities will be provided, and their use promoted. This zoning will encompass the NE corner of the Park including the principal gorges.

Zone V Park Services: This category will apply to any land within the Park that is set aside for Park administration, visitor services, or areas that are temporarily off-limits to Park visitors. The purposes may include ranger housing and temporary minesite housing (e.g. Marandoo). Public access to this zone may be restricted.

It is not proposed that any area of the Park be zoned as category I (special preservation). It is considered that the cultural and biological features of the Park (e.g. gazetted rare fauna) are relatively widespread and zoning of specific areas for special preservation would not result in greater attainment of conservation objectives. The northern gorges and the higher peaks (e.g. Mt Bruce area) are thought to 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 both recreation and wilderness zones.

Although there are extensive areas of the Park in natural condition, many of these areas contain mining tenements and road access. Management as a natural environment zone, with limited vehicular access, is considered to be the best option until the status of

pre-existing tenements has been determined. The future option to convert some areas to wilderness zoning will be retained.

Programmes such as fire management and the control of exotic flora and fauna will apply to all zones with some operational differences. Visitor facilities and services will generally only be provided in zone IV (recreation).

The zoning plan may only be amended by referral to the NPNCA. The plan will not apply to any area that may be excised from the Park and vested in the NPNCA with a purpose other than national park.

B.6 Park Advisory Committees

It is proposed that two advisory committees be established to assist with the management of the Park. The HRNP Advisory Committee will be broadly based and provide an avenue for general community input into management. The Aboriginal Heritage Committee (AHC) will represent the interests of the Panyjima people in relation to the Aboriginal heritage of the Park.

Both committees will be established in accordance with CALM policy statement No.4 "Departmental advisory committees". Both committees will be advisory to the Executive Director(CALM) through the Regional Manager(Pilbara). Members will be appointed by the Minister for CALM. Meetings will generally be convened in response to a request from the CALM Regional Manager.

B.6.1 HRNP ADVISORY COMMITTEE

Membership of the HRNP Advisory Committee will be selected on the basis of expertise and experience, including that gained in local Government. Members will be drawn from local Government, the tourist industry, conservation organizations, and other community groups.

The primary role of the HRNP Advisory Committee will be to:

- Advise on the implementation or revision of the HRNP management plan.
- provide advice on issues referred to the Committee (via the Regional Manager) by the Department, the Minister, or the NPNCA.
- provide liaison between the Department, local government, and the community.

B.6.2 ABORIGINAL HERITAGE COMMITTEE

HRNP has particular significance for the Panyjima people who are the traditional custodians for most of the area now encompassed by the Park. Numerous occupation sites, artefact scatters, and art sites in the Park are tangible evidence of Aboriginal heritage dating back some 40,000 years. Although the Panyjima community is now mostly resident at Onslow, they still closely associate with their traditional lands. They have expressed a strong desire to be involved with the ongoing management of the area.

Two Panyjima men, chosen by their community, have trained and been employed as Rangers in the Park. These two CALM staff members and other Panyjima people will be actively encouraged to act as custodians of the Aboriginal cultural heritage in the Park. The Aboriginal Heritage Committee will be the mechanism by which the community can assist CALM in the future management of that heritage. Suggested membership is 4 Panyjima representatives and 1 or 2 CALM representatives.

The following ambit is defined for the AHC. The committee will:

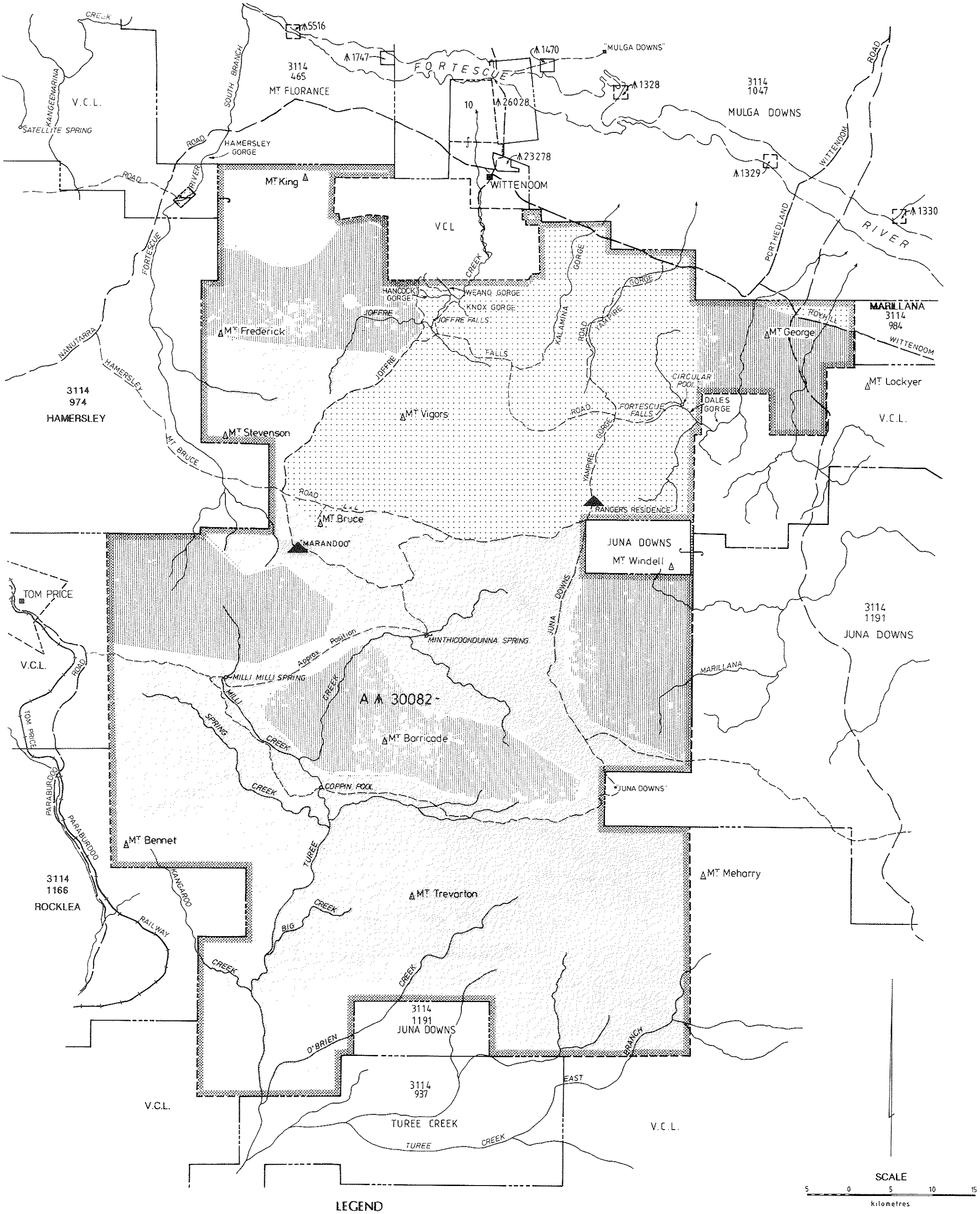
- be consulted on all matters that may have bearing on Aboriginal heritage, These will include major capital works, concessionary operations, exploration and mining, and Park programmes such as interpretation and fire management.

- with respect to major capital works and concessionary operations, advise the Executive Director of any Aboriginal concerns in relation to such works or operations and recommend against proposals which are considered to be in conflict with Aboriginal cultural values.

- with respect to proposed exploration and mining, advise the Executive Director of specific Aboriginal concerns in relation to exploration and mining proposals in order that CALM can represent those views to the NPNCA and the Minister.

- with respect to Park management programmes, provide advice and input during the formulation of programmes based upon traditional knowledge and insights.

- nominate an Aboriginal representative to serve on the HRNP Advisory Committee.



LEGEND

- Wilderness(Zone II)
- Natural Environment(Zone III)
- Recreation(Zone IV)
- Park Services(Zone V)

Hamersley Range National Park

Zones

Map 6

C. MANAGEMENT OF THE PARK'S NATURAL RESOURCES

MANAGEMENT GOALS

1. To conserve the relative abundance and diversity of the indigenous species and habitats, with particular emphasis on the protection of plant and animal species or communities that are restricted in their distribution.

2. To maintain the value of the Park as a representative component in a regional and statewide system of conservation reserves.

3. Where possible to exclude, or otherwise control, plant and animal species of ecological significance that are not indigenous to the Park.

4. To promote visitor awareness and appreciation of natural processes and the natural attributes of the Park.

5. To encourage biological surveys and applied research in the Park providing that activities are consistent with the maintenance of other values.

6. To minimize conflicts of interest that may arise from land management practices on the Park or on adjoining pastoral land.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.1 NATIVE FLORA	
The Park is situated within the Fortescue Botanical District. Land systems mapping has been conducted for that part of the Park within the Ashburton catchment but not for the Fortescue catchment.	■ Future completion of land system mapping will assist with Park planning and management.
The flora of the Park represents 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. There is also a phytogeographic transition associated with the *Acacia/Triodia* line. *Acacia* dominated communities tend to be more extensive in southern portions of the Park (depending on soil type) whilst *Triodia/Eucalyptus* associations are predominant in the northern half.	■ Disjunct plant populations occur within the areas of greatest recreational potential. ■ The huge size of the Park means that a viable sample of the N-S vegetation transition is reserved.
A total of 481 plant species have been recorded for the Park (Trudgen, pers. comm.) although there has been no documented general survey of the flora. The areas of greatest species diversity are the moist gullies of the northern scarp and creek systems generally (Mattiske, 1986).	■ There is a need for a comprehensive published survey of the Park flora. A documented flora would provide the basis for the measurement of any future changes in species diversity. Relevant species data cannot be readily accessed from the W.A. Herbarium.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will liaise with W.A. Department of Agriculture and provide strategic support for future land system surveys.

- Regular monitoring will be conducted in gorge habitats to ensure that recreational activities are not destructive of plant communities.
- The significance of disjunct populations will be highlighted in interpretive programmes.

- Any proposals to adjust Park boundaries will be assessed in the light of representativeness criteria.

- CALM will commission the documentation of a flora of HRNP based largely upon data that has already been collected.
- A Park herbarium collection will be maintained in cooperation with the W.A. Herbarium and the Pilbara Regional Herbarium. Collections for the herbaria will be conducted on a systematic basis by Park staff.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.1.1. MAJOR PLANT COMMUNITIES	
The northern plateaux and ridges of the Park are characterised by a tree steppe of scattered *E. leucophloia* over *Triodia wiseana.* The uplands of the southern tracts of the Park are typically shrub steppe *(A. aneura,* or *A. pyrifolia* over *T. pungens* and *T. basedowii)*	■ The perennial hummock grasslands are capable of burning on a cycle as short as 5 years. These communities have evolved with fire which plays a role in nutrient recycling.
The floors of some gorges support riverine woodlands of *E. camaldulensis, E. microtheca,* and *Melaleuca leucadendron.* These species are dependent upon permanent water resources.	■ Riverine woodlands could be deleteriously affected by changes to underground aquifers.
Lower slopes of the Park are typically tree steppe with the addition of *E. terminalis* and *E. setosa* to the trees, and *T. pungens* to the spinifex layer. The valley plains generally support a low woodland of mulga associated with *A. grasbyi, A. xiphophylla* and *A. pruinocarpa. Eremophila sp.* and *Cassia sp.* form a sparse shrub layer. *Callitris glaucophylla* occurs throughout the Park in small areas that are naturally protected from fire.	■ Mulga woodlands and *Callitris* stands are threatened by a regime of frequent fires.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- A mosaic burning strategy will be implemented with the aim of encouraging the development of uneven-aged, productive stands of spinifex.

- Any proposed developments within the immediate catchments of the northern scarp will be independently assessed to determine the potential impacts upon aquifers and dependent vegetation.

- Selected areas supporting fire sensitive communities will be identified, mapped, and then managed as no planned burn areas in order to maintain their viability or to provide control areas for long term fire research.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.1.2 RESTRICTED PLANTS	
Of the 64 species that are restricted to the Fortescue District, 10 are known to occur within the Park. Four species of *Acacia* are endemic to the Hamersley Range. No gazetted rare plants have been recorded for the Park although *Thryptomene wittweri* occurs on the Mt Meharry block (proposed for incorporation in Park) and *Lepidium catapycnon* occurs in Wittenoom Gorge immediately north of the Park. The Mt Bruce area and the northern gorges are localities that contain a high proportion of geographically restricted species.	■ Special habitat requirements (if any) of most restricted species are not known. ■ There is a possibility that two gazetted rare plants occur within the Park. ■ Most restricted species in the Park occur in areas of high recreational potential.
Fire is a major determinant of species distribution. There is strong evidence that the pattern of fire occurrence has changed since European settlement (Bolton & Latz, 1978). Fire sensitive species are often restricted to specialized habitats. Extensive summer wildfires (such as occurred in December 1986) have caused mulga woodlands to contract in favour of hummock grasslands. Winter burning, if followed by rain, may favour shrubs *(Cassia, Indigofera)* relative to grasses (Suijdendorp, 1980).	■ Changes in fire occurence since European settlement are continuing to alter the nature of Park vegetation. ■ Frequent and extensive wildfires have a long term adverse impact on some plant communities.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will commission research aimed at identifying any special habitat requirements of restricted species in the Park.
- Theories of local speciation will be highlighted in interpretive programmes.
- In the event of plants gazetted rare under the Wildlife Conservation Act 1950 being recorded in the Park, all relevant provisions of that Act will be enforced.

- Any proposed development of recreational opportunities in the Park will be assessed on the basis of likely impact upon the viability of restricted plants. Where an unfavourable impact is likely, the development will be modified or halted.

- A fire management programme will be implemented with the objective of returning the Park to a regime of 'mosaic' burning similar to that practiced by Aboriginal people (refer C.3.1).

- Protective measures will be taken to prevent the frequent occurrence of extensive wildfires. (refer C.3.1).
- Nominated areas of the Park will be managed as no planned burn areas. (refer C.1.1).
- The impacts of fire upon vegetation (particularly restricted plants) will be monitored in a long term research programme aimed at refining fire management strategies.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.2 NATIVE FAUNA	
The known vertebrate fauna of HRNP includes 29 species of native mammal, 130 species of bird, 90 species of reptile and amphibian, and at least 8 species of fish. In addition there are known to be 6 species of feral mammal (section C.3.4). The herpetofauna (frogs, lizards, snakes) of the Park is particularly rich.	■ The vertebrate fauna of the Park is reasonably well known and documented. ■ Development of the Park may have unintended impacts upon fauna.
C.2.1. COMMON SPECIES/HABITATS	
The principal habitats within the Park are the hummock grasslands, mulga low-woodlands, and the fringing vegetation of pools and watercourses. The creekside vegetation is very important for many bird species. Most bat records for the Park are from the vicinity of gorges or major watercourses. The greatest diversity of fish species is to be found in the pools and springs of the major creek systems rather than in gorges.	■ Conservation of fauna generally equates with 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 hummock grasslands are the preferred habitat 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 *(Antechinus rosamondae)* are common examples. Both are endemic to the Pilbara. Dragon-lizards *(Agamidae)* are the most commonly seen reptiles of the hummock grasslands.	■ The frequency of fire in hummock grasslands may determine its suitability as habitat for some animals.
Mulga low-woodlands are the preferred habitat of a number of species which tend to be at the northern margins of their range in the Hamersleys. Examples include the Bourke Parrot *(Neophema bourkii)*, Desert Flyeater *(Gerygone fusca mungi)*, and the Broad-tailed Thornbill *(Acanthiza apicalis)*.	■ Bird observation is a recreational activity of some Park visitors ■ Mulga habitats, in particular, are at risk from changed fire regimes and grazing.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- A checklist of known vertebrate fauna will be published in a Park inventory of natural resources.

- Major developments in the Park will be assessed by CALM for their likely impact upon fauna. Internal fencing of the Park will only be permitted under extraordinary circumstances. (e.g. as a temporary environmental protection measure.

- The relationships of fauna and habitat will be explained in interpretive programmes. These programmes will highlight the need to avoid habitat disturbances in an inherently fragile environment.

- Feral animal control programmes (refer C.3.3) will address the need to protect stream habitats.
- Off-road driving will be discouraged in visitor information programmes and by the design of access.
- Weed control programmes (refer C.3.2) will be directed specifically at riverine areas.

- CALM will conduct research to determine the effect of the fire management strategy on fauna inhabiting hummock grasslands to ensure that adopted fire regimes are not to the disadvantage of particular components of the fauna.

- Provision will be made for bird (and mammal) observation both in information programmes and also in the construction of facilities (e.g. hides).

- CALM will conduct further research specifically directed at the role of fire and other disturbances in mulga habitats.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
There are species that 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). Examples amongst the mammals are the Ooldea Dunnart *(Sminthopsis ooldea)*, and the rare Long-tailed Dunnart *(Sminthopsis longicaudata)*. Both have been recorded south of the Park in mulga habitats which are not well represented in HRNP. Similarly a number of reptiles from the Ashburton drainage do not extend into the Park.	■ Important habitats of the adjoining Fortescue River and Asburton drainage are not represented in the Park ■ Mulga habitats on lands adjoining the Park have generally been degraded by cattle and fire.
Knowledge of the invertebrate fauna of HRNP is limited to a few specific surveys. The ant fauna is characteristic of arid Southern Australia although a few tropical elements are also present. Termites play an important role in the production and flow of energy and nutrients in arid systems. *Mastotermes darwiniensis* (a serious pest termite of Northern Australia) is at the southern limit of its distribution in the Pilbara. Pin Cushion Millipedes *(Unixenus myobergi)* can occur in plague proportions rendering rocks and paths slippery underfoot. 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, and the season of greatest risk is late summer.	■ The effect of environmental disturbance on invertebrate taxa has not been thoroughly investigated. Ants are known to be good indicators of ecological change. ■ Termites of the Park are capable of destroying timber structures. ■ Safety/health issues may be associated with invertebrates at certain times.
C.2.2 RARE OR RESTRICTED FAUNA Of the vertebrate fauna known to occur in HRNP, only 4 species have been gazetted rare and/or in need of special protection under the Wildlife Conservation Act 1950: *Pseudomys chapmani* (Pebble-mound Mouse) *Falco peregrinus* (Peregrine Falcon) *Falco hypoleucos* (Grey Falcon) *Liasis olivaceus barroni* (Pilbara Olive Python)	■ Two species (Pebble-mound Mouse and Pilbara Olive Python) endemic to the Pilbara, and gazetted rare, occur in the Park. ■ The range of the Pebble-mound Mouse is thought to be contracting for reasons not well understood. ■ The Pilbara Olive Python is an attractive species to collectors or dealers in reptiles.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- In the event of adjoining land from the Fortescue River Plain or the Ashburton drainage becoming available for inclusion in the Park such an acquisition should be given high priority on the grounds of habitat representativeness. This particularly applies to mulga woodland habitats (refer C.6).

- The status of the invertebrate fauna will be surveyed as resources allow to provide the basis for the monitoring of any future changes.

- Insecticides may be used to protect historical structures from further termite attack (refer D.1.4).

- Public information programmes will advise of any precautions that should be taken in relation to insects or other invertebrates.

- All relevant provisions of the Wildlife Conservation Act 1950 will be observed in the protection of gazetted rare species.
- Research will be conducted into the specific habitat requirements of selected rare or restricted fauna.
- Park staff will maintain records of sightings of rare or restricted fauna.
- The habitat requirements of rare or restricted fauna will be taken into consideration when preparing capital works proposals.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
There are a number of species in the Park which, although not gazetted as rare, have declining populations and are now considered to be 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 (45g - 5kg adult body weight). This group is referred to as the critical weight range (or CWR) mammals. Changed fire regimes and predation by foxes are two factors thought to have contributed to the decline of these species. An example is Rothschild's Rock Wallaby (*Petrogale rothschildii*), a species retricted to the Pilbara and eastern Gascoyne, which is now only present in the Park 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 now thought to be absent from the Park.	■ The impact of 1080 baiting on non-target species (e.g. Raptors, Dasyurids, and Varanids) is under investigation. ■ Fire management will have a major bearing on the ability of the Park to support any existing or future populations of CWR mammals. ■ Fox numbers in the Park are thought to be very low but the extent of their predation on native mammals is not known. ■ Certain areas of the Park have not been adequately surveyed to enable confirmation of the presence, or otherwise, of some mammals.
C.2.3 DINGOES Purebred Dingoes occur throughout HRNP. There has been little interbreeding with domestic dogs as has occurred in more closely settled areas. The Dingo (*Canis familiaris dingo*), although a declared animal under the Agriculture and Related Resources Protection Act, has been afforded some protection on CALM lands. It is a native animal within its natural range. HRNP is one of the few settled areas of W.A. where it is feasible to protect Dingoes. Considerable research has been conducted into the behaviour of Dingoes in the Pilbara region. The average diameter of a Dingoes' range in the lower Fortescue area has been determined as 10-15km although individual dogs may disperse away from their home territory (Thomson, 1984). Dingoes are most likely to use watercourses as routes to and from the Park. The most effective method of controlling dingoes is baiting with 1080 poison. 1080 is a toxin specific to mammals but may also harm Varanids (Monitor Lizards). Due to physiological differences, birds are much less at risk. The nature of the bait used determines the risk to animals other than Dingoes. Two types of bait are commonly used. Laboratory studies	■ There is potential for conflict of interest between conservation management and pastoralism in relation to Dingoes. ■ It is acknowledged that Dingoes from the Park predate upon sheep and may, under unusual circumstances, kill calves on adjoining properties. ■ Approximately 70% of the Park boundary adjoins pastoral land. ■ The use of large "fresh" meat baits (rather than "crackle" baits) is far preferable from the point of view of impact upon non-target mammals.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Park staff will cooperate with APB (Agricultural Protection Board) and other researchers investigating the possible impacts of 1080 baiting on non-target populations (refer C.3.3).

- The Park fire management programme (refer C.3.1) will aim to restore fire regimes that were in place prior to the decline of the CWR mammals.

- The potential for re-introduction of CWR mammals will be reviewed by CALM.

- Park staff will record all cat and fox sightings and document any information relating to their impact upon native mammals. Assistance will be given to field studies of cat and fox predation.

- Intensive surveys will be conducted, particularly in southern areas of the Park, to determine whether previously recorded species occur within HRNP.

- The objectives of Dingo management in the Park will be to maintain a viable population of purebred Dingoes whilst minimizing the impact of Dingo predation upon surrounding pastoral lands. To this end CALM will require that the Agriculture Protection Board (APB) prepare detailed proposals for Dingo management in areas of the Park that adjoin pastoral lands, for consideration by CALM. Pastoralists are to be consulted during the formulation of proposals.

- The findings of APB Dingo research will be applied to Dingo management in the Park.

- Pending agreement between CALM and APB on Dingo management within the Park, CALM may decline any application for the baiting of Dingoes.

- Any joint agreement on Dingo control will be in accordance with the ARRP Act, and the 'Guidelines for Control of Declared Native Animals on CALM Lands'.

- CALM will not agree to trapping of Dingoes within the Park.
- CALM may agree to baiting of specified buffer areas of the Park given clear evidence that Dingoes from the Park are having an adverse impact upon neighbouring pastoral properties.

- Each baiting operation will be subject to an approval process and will require the prior written authority of CALM.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
with manufactured (or crackle) baits indicate that, in theory, up to 50% of native carnivorous mammals are at risk from this type of bait. The larger "fresh" meat baits, however, are less toxic in terms of dosage/gm and the dried outer layer of these baits makes it difficult for insectivorous mammals to consume them. Theoretically only two species of native animal (other than Dingoes) are capable of ingesting a lethal dose. Field trials in the Fortescue Valley have indicated that this does not occur under field conditions.	■ It is important that "fresh" meat baits be injected, rather than mixed, with 1080 and that the baits be of adequate size.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Only "fresh" meat baits will be used for Dingo control in the Park. Baits must be injected and distributed according to guidelines prescribed in the management programme. Park staff will monitor baiting to ensure that baits are of an approved type and are of adequate size.
- Native mammals will not be taken from the Park for the purpose of supplying bait material.
- The corners of the Park boundaries will be clearly marked for the purposes of aerial baiting.

- In the event of a mammal re-introduction programme in the Park, it may be necessary to institute limited Dingo control measures in conjunction with that programme.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS

C.3 ENVIRONMENTAL PROTECTION

C.3.1 FIRE

Specific Objectives:

(i) To develop, by the use of fire as a management tool, traditional mosaic patterns of vegetation at various stages of post-fire succession.

(ii) To protect the Park (and specific communities/habitats within it) from wildfires which, by virtue of their frequency or extent, are considered to be contributing to the long term degradation of conservation values.

Fire history records have been kept for HRNP since 1976, otherwise little research has been conducted into fire ecology or fire behaviour within the Park. Records indicate that lightning was responsible for over 90% of the area burnt in the past 10 years. The incidence of lightning in the Pilbara is high relative to other regions of W.A. Fires ignited by lightning in recent years have tended to be extensive due to the uniform fuel loads. This is probably in contrast to the previous regime of Aboriginal burning which resulted in a mosaic of spinifex at differing stages of succession. In December 1986 a severe wildfire originating from an adjoining pastoral lease burnt approximately 25% of the total Park area.

- Little empirical data has been recorded concerning fire ecology or fire behaviour in the Park although it may be valid to extrapolate from other areas.

- Fire is an inherent part of the landscape and is generally initiated by lightning strikes. Fire is integral to the regeneration and maintenance of most arid zone plant communities.

The nature of the primary fuel in the Park (spinifex) is such that it will only carry a fire after a return period of about 5 years. Spinifex will burn under most weather conditions but fire behaviour is particularly sensitive to wind strength.

Fires that regularly encroach into mulga and other fire sensitive communities can reduce the occurence and long term viability of these vegetation types.

- The fire operations plan will need to reflect spatial differences in fire ecology and must be compatible with conservation objectives.

- CALM Research Division is conducting a fire study in hummock grasslands at Queen Victoria Spring Nature Reserve.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM staff will continue to maintain fire records for the Park. Remote sensing data (satellite imagery) will be employed in this process.
- CALM will continue to seek and record the advice of the Panyjima people concerning previous fire history.

- CALM will develop a fire operations plan for the Park (refer to prescription 40(6)). The plan will be in accordance with CALM Policy No.19 "Fire Management".
- The primary strategy of fire management operations will be to establish and maintain a mosaic of vegetation at various stages of succession after fire in fire climax communities (e.g. spinifex). It will aim to provide a diversity of habitat, confine wildfires, protect fire sensitive communities (e.g. mulga) and other values (e.g. park installations, cultural sites). Fire will be used as a major tool of management.
- In a wildfire situation, the protection of life and property will remain the primary consideration. Staff training in fire suppression will be a component of the fire operations plan.

- Different fire management strategies will be employed depending upon vegetation type (refer C.1.2).
- Permanent plots will be established to allow long term monitoring of the environmental effects of fire management. Monitoring will be conducted in accordance with guidelines established in CALM Policy No. 28 "Reporting, monitoring and re-evaluation of ecosystems and ecosystem management."

- The findings of CALM research in relation to both fire ecology (e.g. fire sensitivity of species and communities) and fire behaviour will be applied in the fire operations plan.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
The terrain of the Park and the inaccessibility of its boundaries make it impossible to construct or maintain conventional fire breaks. The existing tracks and roads have been used for the purposes of fire control.	■ Periodic prescribed burning is the most effective long term method of confining wildfires in the Park. ■ Fire suppression activities may cause environmental damage.
Approximately 70% of the Park boundary adjoins pastoral leases where fire control may be practiced in order to protect stock and pastoral improvements.	■ CALM has statutary obligations to comply with the Bush Fires Act and the CALM Act in relation to the prevention and control of wildfires.
Park records indicate that visitors/campers are a relatively minor cause of fires.	■ Park visitors may not be aware of the flammable nature of hummock grasslands.
The use of fire is a critical management responsibility and a major area of public concern. Based upon our current understanding of Aboriginal fire regimes and arid zone ecology, burning needs to be practiced to maintain species diversity. However prescribed burning is not warranted in all circumstances and can be detrimental in some areas.	■ The fire operations plan needs to give priority to the protection of existing environmental and cultural values.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Wherever possible, aerial prescribed burning will be employed to achieve fire management objectives. The use of vehicles will be minimized although initial burning will be conducted from the existing network of tracks and roads in order to develop secure edges or buffers.

- Wildfire suppression (where considered necessary) will be conducted from existing roads. New fire breaks and tracks will be constructed for the purpose of fire control only as an emergency measure.

- Adjoining landowners and other interested parties will be consulted during preparation and implementation of the fire operations plan.
- Relevant sections of the Bush Fires Act and the CALM Act in relation to fire prevention and control will be observed.

- The interpretive programme will emphasize the need for caution with fire.

- The proposed brief for the development of a comprehensive fire operations plan is as follows:

  - delineation of no planned burn areas on the basis of vegetation type, other values or research requirements;
  - identification of suitable buffers for the protection of designated areas;
  - preparation of prescriptions for burning within buffers;
  - preparation of prescriptions for aerial burning of other areas of the Park following consultation with the Aboriginal Heritage Committee;
  - development of guidelines (based on previous research) in relation to suitable weather and fuel conditions for aerial burning operations; and
  - establishment of mechanisms for evaluating the effectiveness of prescribed burning operations.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.3.2 EXOTIC FLORA Hamersley Range N.P. is relatively free from serious infestations of exotic plants. There are, however, a few introductions that 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 of the Park. It was presumably introduced via the clothing or equipment of campers.	■ Control of weeds is a management objective although it is acknowledged that eradication of all weeds is not practicable. Resources should therefore be assigned to those weeds considered to be of the greatest ecological significance.
	■ An effective control measure is the reduction of both sources of soil disturbance, and agents of weed infection.
Species recorded for the Park and declared under the Agriculture and Related Resources (ARRP) Act 1976 include *Argemone mexicana* (Mexican poppy), *Carthamus lanatus* (saffron thistle), and *Datura sp.* (thornapple). The Mexican poppy, in particular, is known to be a very difficult species to eradicate due primarily to the long dormancy period of its seeds. It has a control category P.3 under the ARRP Act.	■ The impact of weed competition 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 on the Park.
Declared species that have not yet been recorded for the Park, but which represent potential threats, are *Xanthium occidentale* (Noogoora burr), and *Salvinia molesta*.	■ Park Staff need to familiarize themselves with declared weeds that are known to occur in the Park or that occur in adjoining districts.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM staff will maintain a register of weeds for the Park and will regularly survey areas considered to be susceptible to weed infestation. The register will include details of distribution, relevant biological information, and a history of control measures.
- Ongoing control methods may include mechanical removal of plants, use of appropriate herbicides, and biological control. Selective herbicides will be used in preference to those that are broad spectrum. The safety of both public and staff will be an important consideration in determining the control methods to be used. Weed management will be in accordance with the CALM Policy No.14 "Weeds on CALM Lands", herbicide use in accordance with the CALM "Chemical Users Manual", and the APB Handbook "Declared Plant Control".

- Earth moving and gravel extraction in the Park will be limited to the minimum area needed to achieve other Park objectives (refer E.1). CALM may require that earthmoving plant be cleaned prior to entering the Park.
- The feral animal control programme will aim to eradicate hooved feral animals and to prevent further entry (refer C.3.3).
- Where possible, disturbed areas will be rehabilitated with native vegetation according to the CALM Policy No.10 "Rehabilitation of Disturbed Land". Tree introductions for amenity purposes in the recreation and special purpose zones are to be selected according to the guidelines of the above Policy. No plant introductions will be permitted in the natural environment zone.

- Park facilities will be located so as to minimize the risk of weeds (introduced inadvertently) escaping into watercourses.

- In the case of plants declared for the Pilbara under the Agriculture and Related Resources Protection Act 1976, relevant provisions of the Act will be observed where possible.

- Park staff will cooperate with the APB Regional Office in the identification and control of all declared plants on the Park.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Cenchrus ciliaris (buffel grass) and *Aerva javanica* (kapok bush) are widespread colonizers of disturbed areas, particularly along watercourses. Buffel grass was introduced as a perennial pasture species. It is well adapted to conditions of drought and fire but does not compete with spinifex on poorer sites. Kapok bush is an aggressive colonizer of watercourses. It is not susceptible to selective herbicides. Another species that has recently colonized disturbed areas is *Rumex vesicarius* (ruby dock). It is a winter weed that sprouts in the cooler months but remains dormant over summer.	■ Control of some widespread introductions may not be practicable, particularly where they are plants valued by the pastoral industry. Chemical control of these species would be a very costly and probably futile exercise.
Phoenix dactylifera (date palm) is the only introduced woody plant recorded for the Park. Date palms occur adjacent to several permanent and semi-permanent pools and springs on the Turee Creek system. They are thought to have been introduced by early cameleers.	■ Date palms pose a threat to areas of reliable water supply. They are not susceptible to chemical control. ■ The presence of date palms is of some historical interest.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Widespread introductions such as buffel grass, kapok bush, and ruby dock will only be controlled indirectly by preventing soil disturbance or other conditions which may predispose their spread.
- Any proposed use of biological methods of control for non-declared species will be subject to consultation with the pastoral industry.

- All immature and female date palms (species is dioecious) in the Park will be identified and mechanically removed. 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.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS

C.3.3 EXOTIC FAUNA

Six species of exotic vertebrate animal (all mammals) are known to occur in the Park:

European Cattle	*Bos taurus*
Feral Cat	*Felis catus*
European Fox	*Vulpes vulpes*
House Mouse	*Mus musculus*
Horse	*Equus caballus*
Donkey	*Equus asinus*

All are fairly common in HRNP, with the exception of the Fox. Cattle and Horses probably have the greatest environmental impact upon the Park. Strategic fencing has already limited the impact in some areas.

Rabbits (*Oryctolagus cuniculus*) are not present but given good rainfall conditions may be capable of extending their range into the Park. Domestic Dogs (*Canis familiaris*) or Dogs that are crossbred with Dingoes may occasionally occur in the Park. A solitary Camel (*Camelus dromedarius*) has been recorded on one occasion.

The question of domestic pets in the Park is addressed in section E.5.

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. Populations are concentrated near sources of permanent water.

- Feral animals pose a serious threat to the natural environment of HRNP. Specific data concerning their distribution and relative impacts is generally lacking.
- CALM has statutory obligations in relation to declared animals and exotic fauna generally.
- Native fauna declared under the ARRP Act but in their normal range are not treated as *declared* within CALM lands unless a specific management programme is approved (refer C.2.3).
- Cattle are protected by Common Law and are not legally 'feral animals'.
- Control of feral stock can only be effectively addressed once fencing has effectively prevented further trespass. The Pilbara pastoral district is declared free of TB and Brucellosis. Quarantine measures therefore do not apply.
- Eradication of small feral mammals is not feasible.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- A feral animal control programme will be formulated with the primary objective of systematically controlling or eradicating feral animals according to established priorities. Control measures will preferably be by non-toxic means unless no other effective means is available. The programme will recognize the rights and responsibilities of pastoralists in relation to stock control. Before the programme is instituted, adjoining pastoralists will be given the opportunity to muster under conditions as specified by CALM.
- CALM staff will 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.

- All control of feral animals will be in accordance with CALM operational guidelines "Control of Feral Animals on CALM Land".

- Relevant provisions of the ARRP Act, CALM Act, and other legislation concerning declared animals, feral animals, or straying stock will be observed.

- Control of cattle will be undertaken with due consideration for ownership.

- A fencing programme will be prepared whereby the most cost-effective fence alignments will be identified for the puposes of preventing stock trespass.

- Strategies for control of Horses and Donkeys will include ground or aerial shooting, and trapping. Mustering may be a strategy under certain conditions.

- Foxes and Cats will only be locally controlled where there is evidence to indicate that their predation is having a serious impact upon species of native fauna. In the case of Foxes, 1080 will be used once it has been determined that poisoning can be conducted without endangering non-target species. Cats will be controlled by cage trapping.
- Control of House Mice and introduced Honey Bees will be afforded a low management priority.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.4 PHYSICAL RESOURCES	
C.4.1 GEOLOGY, LANDFORM, AND MINERALIZATION:	
The geology of the Park is of interest because of the interaction between the rock types and the processes of erosion which have exposed the underlying rock units and produced the surface expression of peaks and valleys, ridges and escarpments. 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.	■ The geology and geomorphology of the Park are important subjects for interpretation and education
The formations which overlie the Archaean basement within the Park are called the Fortescue, Hamersley and Turee Creek Groups which comprise the Mt Bruce Supergroup. These are composed primarily of sedimentary rocks with interbedded igneous units which were deposited onto a water covered shelf or basin. The Fortescue and Hamerley Groups form the dominant outcrop of rocks within the Park.	■ Landforms in the Park are of particular significance to the Panyjima people.
HRNP incorporates a large section of the Hamersley Plateau, the most elevated area of land in WA. The Plateau is traversed by a series of hills trending NW to SE. The northern section is dominated by Mt Vigors (1145m ASL), whilst Mt Bruce, on the central divide, is the second highest peak in WA at 1235m. The highest point in WA is Mt Meharry (1245m) which lies just outside the Park's eastern boundary. Most of the hills and prominent topographic features of the park are capped by the highly resistant Brockman Iron Formation of the Hamersley Group.	■ There is likely to be demand from visitors for access to vantage points in the Park.
The prominent scarp along the northern boundary of the Park is an extensively	■ Uncontrolled access adjacent to the steep gorges is a public safety concern.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- The interpretive programme for the Park will include an explanation of the geological development of the Park and its relationship to the present day topography. The geologic structure, mineralization and lithology of the Archaean rocks will be emphasized in this programme. The implications of fossil evidence of early life forms in the Proterozoic sedimentary rock units may be included.

- With the agreement of the Aboriginal Heritage Committee, the Panyjima names and Aboriginal traditions associated with landforms will be incorporated into the interpretive programme.

- Suitable access will be developed to some vantage points in the Park (including Mt. Bruce). Access will normally be via walking track and tracks will be aligned so as to prevent soil erosion.
- No developments with potentially adverse visual impact will be constructed on principal skylines or in areas of outstanding landscape value, except where necessary to preserve public safety.

- The development of pedestrian access adjacent to and into gorges will be designed to meet established standards. The safety of visitors and staff will be the paramount consideration (refer E.1.4).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
eroded fold structure associated with the Hamersley Range Synclinorium. 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 Brockman Iron Formation and the Marra Mamba Formation of the Hamersley Group are the loci of the iron ore deposits of the region. These formations are composed primarily of banded iron formation (BIF) which largely consists of alternating layers of iron oxide or iron/magnesium silicates and fine grained quartz (chert). Deposits of crocidolite (blue asbestos) occur within the Brookman Iron Formation of the Hamersley Group. Alluvial gold deposits occur in the Turee Creek system. Other mineralization identified within the Park includes copper and lead.	■ Iron ore exports from the Pilbara contribute some 5% to Australia's export income. The industry is therefore of national importance. ■ Significant commercial deposits of iron ore occur at Marandoo and other locations in the Park. ■ Mine tailings in Yampire Gorge may pose a health risk to visitors and staff. ■ There is likely to be demand for a fossicking area in the Park.
C.4.2. SOILS In common with other arid environments, soil development in the Pilbara is generally poor. The inherently fragile soil/vegetation system is susceptible to disturbance. The majority of soils in the Park are highly erodible. This particularly applies to the alluvial soils which are subject to gullying and sheet erosion. Other soil types are protected by a mantle of stones which if removed, can expose the soil to erosion.	■ The erodibility of most soils requires that soil disturbance be kept to a minimum. ■ Alluvial soil types are particularly erosion prone.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Park staff will liaise with the mining industry to ensure that the impact of mining, and associated infrastructure, upon the Park is minimized. Independent environmental assessment of development proposals will be required (refer F.1 and F.2).

- Refer Section F.1. (Mining).

- The visiting public will be adequately informed of any health risks associated with crocidolite tailings in Yampire Gorge. (refer F.3).
- Access to the Park via Yampire Gorge will be closed once suitable alternative access has been developed.

- Refer section F.1 (Mining).

- Soil disturbance will be restricted to that essential for the maintenance and improvement of the existing road network (refer E.1).
- Guidelines will be established for sound earthworks practice and these will be issued to any contractors working in the Park.
- Off-road vehicle use will be prohibited except by park Staff in emergency situations.
- Feral stock will be controlled in accordance with the feral animal control programme (refer C.3.3).

- Development will be avoided on alluvial soils and in other erosion prone areas.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
The Hamersley Plateau is characterised by red lithosols derived from in-situ weathering of the BIF. Soils of the upland plateaux and hills are predominantly stony and skeletal loams of low fertility. On gently sloping footslopes these soils tend to have a higher clay content. In the valley plains earthy clays have developed with more pronounced sorting of components. These soils are seasonally hard-setting. Deeper brown clay loams generally support mulga woodlands.	■ The poor, shallow soils and specialized vegetation make rehabilitation a difficult and lengthy process. ■ Seasonally hard-setting soils may become impassable after rain.
Alluvial soils are not well represented in the Park although they do occur in lower parts of the landscape. They are normally clays and loams that are deeper and more fertile than the upland soils.	■ Alluvial soil types, poorly represented in the Park, occur more extensively to the east and south of the current boundaries.
C.4.3 HYDROLOGY Surface water can always be found at some locations throughout the Park. The central divide separates the catchments of the Fortescue River to the north and the Ashburton to the south. Surface discharge is highly variable. Although none of the gorges have perennial streams, most have permanent pools which are supplemented by groundwater seepages. The water in these pools remains at low temperatures.	■ There are risks associated with public use of pools in the northern gorges. ■ Surface water resources in the Park support disjunct plant and animal populations.
There are a number of permanent pools associated with springs on the upper reaches of Turee Ck. Milli Milli Spring, Minthicoondunna Spring, and Coppin Pool are all accessible to 4WD vehicles.	■ Feral stock numbers are highest in the vicinity of permanent pools in the southern areas of the Park. Impacts include trampling of vegetation and fouling of water. ■ Vehicle based recreation may cause damage to springs.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- The necessity for rehabilitation works will be avoided wherever possible. Rehabilitation techniques include scarification and the respread of local seedsoil material. Soil will not be imported for this purpose.

- Road alignments will be designed to avoid lowlying areas.
- Visitor information will advise of the possibility of lengthy road closures after cyclonic rains.

- Where the opportunity arises, CALM will seek to extend the Park to incorporate a more representative range of soil types (refer C.6).

- Visitor information will detail possible risks associated with the use of pools in gorges and the importance of not using soap for washing.
- Pools in the recreation area will be sampled as required for bacteriological contamination.

- CALM, in conjunction with WA Water Authority, will monitor the surface water resources of the Park to determine whether any long term changes can be attributed to Park management.

- The potential for localized fencing to protect springs from damage by feral animals and vehicles will be investigated.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Groundwater resources of HRNP remain largely unproven except for the area surrounding Marandoo. There are indications that good quality groundwater occurs throughout much of the hardrock area of the Fortescue catchment. Valley-fill sediments are the major aquifers in the Park. Yields are likely to be poor in areas underlain by shales or volcanic rocks.	■ The sustainable yield of most aquifers is unproven but can be inferred from the geology.
	■ Groundwater reserves maintain the ecologically important surface water resources.
The catchment of the Fortescue River (South Branch) is the recharge area for the South Fortescue borefield that supplies Tom Price. HRNP is within the Proclaimed Pilbara Groundwater Area.	■ Effluent disposal is a potential source of groundwater contamination.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Groundwater resource surveys will be conducted in conjunction with the W.A. Water Authority prior to major exploitation of aquifers.

- Surveys will identify any possible impacts of groundwater use upon surface waters and associated vegetation.

- The W.A. Water Authority and other relevant authorities will be consulted in relation to any proposals for effluent disposal.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
C.5 CLIMATE	
HRNP experiences an arid climate with a generally high diurnal range in temperature. In mid-summer daily temperatures as high as 48°C have been recorded. The mean maximum temperature for the hottest month (January) is approximately 38°C. Winter temperatures are milder although frosts can occur.	■ Dehydration and heat stroke are real dangers under the prevailing conditions of high temperature and low humidity. ■ Visitation is highly seasonal to take advantage of milder weather conditions.
Rainfall, although unreliable, typically exhibits both winter and summer peaks. Heavy cyclonic rainfall is possible during the period from November to April.	■ Summer and winter rainfall can limit access to the Park. ■ Lightning associated with summer storms is the major cause of fire ignition in the Park.
C.6 PARK BOUNDARIES	
Specific Objective: (i) To rationalize the existing boundaries of Hamersley Range N.P. on the bases of practicality of management and of biological integrity.	
The current boundaries of HRNP were 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. Detailed proposals have been formulated for an initial rationalization of the northern and eastern boundaries of the Park. These proposals are illustrated in Map 7. They have been agreed to by affected landholders and are in accord with EPA "Red book" recommendations.	■ Fencing of current boundaries is not an economic proposition. ■ Visitors are generally unaware of the points of entry to the park. ■ Current proposals for boundary rationalization are awaiting resolution by the Department of Land Administration (DOLA).

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Visitor information will emphasize the need for visitors to maintain fluid intakes and protect themselves from direct sunlight.
- Visitor facilities will incorporate adequate shade structures.

- Staffing and Park services (where possible) will be organized to cater for seasonal fluctuations in visitation.

- Refer section E.1.2 (Road access).

- Refer section C.3.1 (Fire).

- Boundaries will, where possible, be rationalized to conform with major roads or otherwise aligned to allow the construction of affordable fencing and the prevention of stock trespass.

- Boundaries will be signposted at points of entry to the Park.

- CALM will seek the implementation of proposals (currently before DOLA) for the initial rationalization of the northern and eastern boundaries (as shown at Map 7.). In brief these proposals are:
  - Land exchange with Juna Downs in relation to Digman's block and the Homestead block. Net loss to Park of approx. 300 ha.
  - Acquisition of Mt Meharry block (VCL). Addition of approx. 21,162 ha to Park.
  - Acquisition of lower portion of Dales Gorge and an eastern extension to the national highway. Addition of approx. 32,000 ha to Park.
  - Land exchange with Mulga Downs to conform with alignment of Wittenoom-Roy Hill Road. Net loss to Park of 2,475 ha.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
The 1974 report ("Green book") of the Conservation Through Reserves Committee (CTRC) recommended the reservation of additional areas not incorporated in the above proposals. These additional recommendations include the following: • addition of the disjunct southern portion of Juna Downs (O'Brien's block) if available for purchase. This area contains few improvements and is isolated from the remainder of the Station. • addition of VCL that separates Hamersley Gorge from the balance of the Park. The 1977 acquisition of 307 ha surrounding Hamersley Gorge represents only partial adoption of the CTRC 1974 recommendation.	■ O'Brien's block is within the poorly reserved Ashburton Botanical District. ■ Hamersley Gorge block has a high boundary to area ratio, making conservation management difficult.
Some adjoining land systems and vegetation types are poorly represented in the Park which is largely confined to the elevated plateau and areas of shallow soils. The management of some areas of the Park is constrained by the presence of pre-existing mining tenements which are subject to special agreements acts (refer F.1). There is scope for further rationalization of boundaries within the framework of Park goals and objectives.	■ Opportunities may arise in the future to reserve representative samples of alluvial land systems and mulga habitats. ■ The consideration of further boundary rationalization may best be achieved by the formation of a regional working group.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will, subject to the agreement of the affected lessees, seek to implement other reservation proposals as recommended by the CTRC. These areas are:
  - O'Brien's block (Juna Downs).
  - Area of VCL that separates Hamersley Gorge block from balance of the Park.

- Areas of adjoining land systems and habitats that are poorly reserved at present (refer C.1, C.2.1, and C.4.2) will be considered for reservation if and when they become available for purchase.
- In this context, CALM and the NPNCA will attach priority to the future reservation of the area between the Park's eastern boundary and the national highway.

- CALM and the NPNCA will support the formation of a broadly based regional working group for the purpose of reviewing Park boundaries in conjunction with the current "Red book" taskforce initiative. Cooperation will be on the basis that the review brief includes the following objectives:
  - to increase the overall area of the Park;
  - to make the Park more representative of Pilbara land systems and habitats;
  - to increase the cultural and landscape values of the Park; and
  - to improve the manageability of Park boundaries.

Hamersley Range National Park
Proposed Boundary Changes

Map 7

HOOLEY
3114
1173
V.C.L.
ROEBOURNE
WITTENOOM
ROAD
5516
1747
FORTESCUE
1470
'MULGA DOWNS'
1328
3114
465
MT FLORANCE
10
26028
3114
1047
MULGA DOWNS
ROAD
WITTENOOM
CREEK
KANGEENARINA
V.C.L.
SATELLITE SPRING
SOUTH BRANCH
HAMERSLEY GORGE
ROAD
RIVER
23278
WITTENOOM
1329
1330
RIVER
MT King
VCL
3114
974
AMERSLEY
FORTESCUE
CREEK
HANCOCK GORGE
WEANO GORGE
KNOX GORGE
JOFFRE
JOFFRE FALLS
KALAMINA GORGE
YAMPIRE GORGE
PORT HEDLAND
ROYHILL
3114
984
MT George
MARILLA
WITTENOOM
MT Frederick
NANUTARRA
HAMERSLEY
FALLS
JOFFRE
CIRCULAR POOL
WALES GORGE
FORTESCUE FALLS
ROAD
MT Lockyer
VCL
MT Vigors
MT Stevenson
MT BRUCE
ROAD
4×4
MT Bruce
YAMPIRE GORGE
RANGER'S RESIDENCE
MARANDOO
JUNA DOWNS
MT Wodell
JUNA DOWNS
TOM PRICE
3114
1191
JUNA DOWNS
MINTHICOONDUNNA SPRING
Approx Position
MILLI MILLI SPRING
MILLI MILLI SPRING CREEK
A 30082
MT Barricade
MARILLANA
TOM PRICE ROAD
PARABURDOO
COPPIN POOL
JUNA DOWNS
MT Bennet
KANGAROO CREEK
TUREE CREEK
MT Trevarton
MT Mahony
RAILWAY
TOM PRICE
BIG CREEK
CREEK
O'BRIEN CREEK
3114
1191
JUNA DOWNS
EAST BRANCH
3114
937
TUREE CREEK
TUREE CREEK
V.C.L.
V.C.L
TUREE CREEK

SCALE
5 0 5 10 15
kilometres

LEGEND
LAND EXCISION PROPOSAL
LAND ADDITION PROPOSAL

D. MANAGEMENT OF THE PARK'S CULTURAL RESOURCES

MANAGEMENT GOALS

1. To allow the pursuit of traditional cultural activities by Aboriginal people who have traditional affinities with lands contained within the Park provided that those activities are not in conflict with the conservation objectives of this management plan.

2. To protect features in the park that are of cultural, archaeological, historical, or scientific value.

3. To promote visitor awareness and appreciation of the cultural attributes of the Park.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
D.1 ABORIGINAL HERITAGE **SPECIFIC OBJECTIVES:** (i) To respect, in all aspects of management, the needs, values and aspirations of the Panyjima people provided that they are consistent with the maintenance of conservation values. (ii) To assist Aboriginal people to manage and protect sites in the Park which are significant to them.	
The Panyjima language group occupied the Hamersley Range from a point west of Tom Price extending beyond the eastern boundary of the Park (Map 3.). The southernmost section of the Park may extend into the traditional territory of the Yinhawangka language group. Panyjima has been more extensively documented than Yinhawangka which is now spoken by very few people. The Panyjima name for Hamersley Range is Karijini. Other Panyjima names for landmarks in the park are shown in Map 3.	■ The Panyjima people, by virtue of their long heritage in the Hamersley Range, have expressed the desire to be formally involved in management decisions that may effect their cultural values. ■ The use of Panyjima names would be appropriate in some situations and may be of interpretive value.
Although the Panyjima people are now mostly residents of Onslow, and other coastal towns, they maintain a close association with the area encompassed by the Park. The Panyjima Law (Wartirrpa) is still practiced. A number of the older Panyjima were born on pastoral properties that adjoin the Park and subsequently worked on the Hamersley Ranges in the pastoral or mining industries.	■ The Panyjima people can contribute specific skills and knowledge towards management of the Park. ■ Traditional custodians of Hamersley Range may wish to camp, hunt, or pursue other traditional practices in the Park.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will establish an Aboriginal Heritage Committee to be comprised of 4 Panyjima representatives and 1 or 2 CALM representatives. The committee will advise in several areas, including capital works, concessionary operations, and interpretive programmes. It will also nominate a Panyjima representative to serve on the HRNP Advisory Committee. The full ambit of the Aboriginal Heritage Commitee (AHC) is defined in section B.6 of this plan. Operation of the AHC will be in accordance with the CALM Policy 'Departmental Advisory Committees'.

- CALM will investigate the possibility of formally adopting Panyjima names where appropriate in the Park.
- With the approval of the AHC, Panyjima names will be used in interpretation of the Aboriginal heritage of the Park.

- CALM will continue the practice of employing suitably qualified Panyjima people as Park staff. One of their duties will be to assist with the protection of Aboriginal sites in the Park.
- Panyjima people will be given the opportunity to tender for works in the Park.

- A special use area will be set aside within the recreation zone for use by traditional custodians when they visit the Park for ceremonial purposes. People using the facility will be subject to all regulations that apply to visitors in a national park. The siting and management of the special use area will be determined after consultation with the AHC.

- Hunting will not normally be allowed within the Park. Gathering of traditional foods and materials by the Traditional Custodians will be permitted.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
There are numerous Aboriginal sites within the Park. Some are thought to be of considerable archaeological importance, and all are significant to the Panyjima either as part of their heritage or as sites associated with the Wartirrpa or their cultural beliefs. The W.A. Museum maintains a register of all recorded sites although it is probable that many sites have yet to be recorded. The Panyjima wish most sites to remain confidential and therefore undisturbed.	■ There is a need for confidentiality in relation to Aboriginal sites. ■ There is general public interest in Aboriginal heritage.
Aboriginal sites in the Park include artefact scatters, art sites, occupation sites, grinding patches on rocks, ceremonial and burial sites. The principal art form is the petroglyph; paintings are comparitively rare. The boundaries of some cultural sites are indeterminate.	■ Aboriginal sites may be at risk from accelerated processes of decay.
Aboriginal occupation of the Pilbara probably dates back some 40,000 years. Over that long period Aboriginal land management practices, such as 'fire stick farming', have undoubtedly helped to determine the nature of the flora and fauna to be found in the Park today. Aboriginal burning practice resulted in a diversity of vegetation types and stages of succession. This diversity maximized the suitability of habitats for a range of native animals.	■ Recent decline in the status of some species/communities partly reflects the change from Aboriginal to European land management practices.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Relevant provisions of the Aboriginal Heritage Act will be observed.
- CALM will maintain the confidentiality of all Aboriginal sites on the Park unless given express approval by the AHC to divulge information for purposes such as interpretation.

- Sites acceptable to the AHC may be opened for public inspection. Generally, however, access will not be provided or maintained to known Aboriginal sites.
- The Park interpretive programme will attempt to increase public awareness and appreciation of Aboriginal culture.

- Where sites are thought to be at risk from processes of deterioration, information will be forwarded via the AHC to the WA Museum with a view to jointly formulating appropriate strategies to arrest the deterioration (where possible).

- Traditional Aboriginal burning regimes will be approximated in the fire management programme. (refer C.3.1).
- Encouragement and assistance will be given to applied research projects that address the causes of the decline in the status of some species/communities under prevailing systems of management.
- CALM will seek to record the knowledge of Aboriginal people in relation to the natural environment and its management.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
D.2. EUROPEAN HERITAGE	
Initial European exploration of the Hamersley Ranges was in 1861 when F.T. Gregory led a party inland from Hearson Cove (near Dampier).	■ The early European exploration and settlement of the east Pilbara area is likely to be of interest to visitors.
Gregory named the Hamersley Ranges 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 grazing leases were mainly stocked with sheep. Camels were the major means of transport for supplies and wool throughout the Pilbara hinterland. Date palms planted at Milli Milli and Mindthicoonduna Springs are thought to have been introduced by the cameleers. Mt Bruce Station, which encompassed much of the present Park, was later relinquished because of its low pastoral productivity. The Park headquarters are on the site of the old Mt Bruce homestead although little remains of the original building. A noteworthy structure is a stone hut near Joffre Gorge. It is thought to have been an outstation for Mt. Bruce.	■ Little recorded information is available concerning the history of pastoralism and mining in the Hamersleys. ■ Relics of Mt Bruce Station may be at risk from accelerated processes of deterioration.
There is considerable evidence of previous mining activity in the Park. Alluvial gold was mined in Turee Creek until 1896 when drought forced the abandonment of the field. Some gravesites and diggings are still visible in the area. Blue asbestos (crocidolite) was first mined in the Hamersleys in 1936 by Leo Snell who was reportedly shown the seams of fibre by an Aboriginal named Weano. Mining commenced in Yampire Gorge, where relics can be seen today, and in Dales Gorge. Lang Hancock also mined in Yampire Gorge before transferring his operation to Wittenoom Gorge in 1937.	■ Fossicking activity in the Turee Ck area is a potential threat to environmental values in the area. ■ Mine tailings and open shafts in Yampire Gorge represent safety hazards. The shafts have become important bat habitats.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- The history of early exploration and settlement will be incorporated in interpretive programmes.

- Information concerning pastoralism and mining in the Hamersleys will be collected and recorded for possible use in interpretive programmes.

- CALM will sponsor an archaeological condition assessment of structures in the Park associated with early pastoral or mining activities. These might include wells, stockyards, buildings and gravesites.
- The principles of the Burra Charter will be adhered to in relation to the future management of structures considered to have archaeological value.
- Where management cannot ensure the ongoing protection of sites access may be restricted.

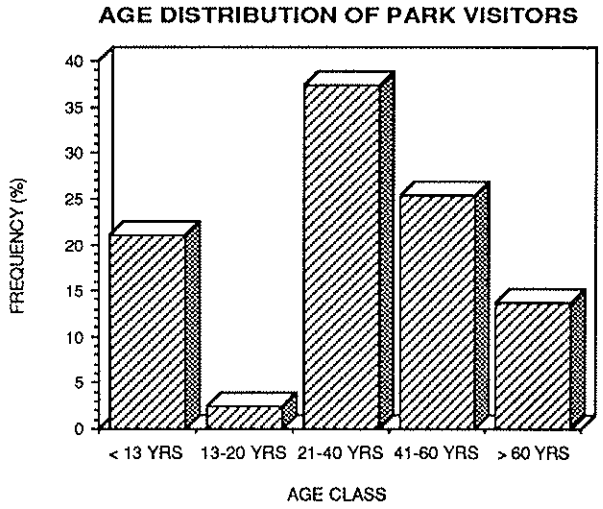
- Refer section F.1 (Mining).

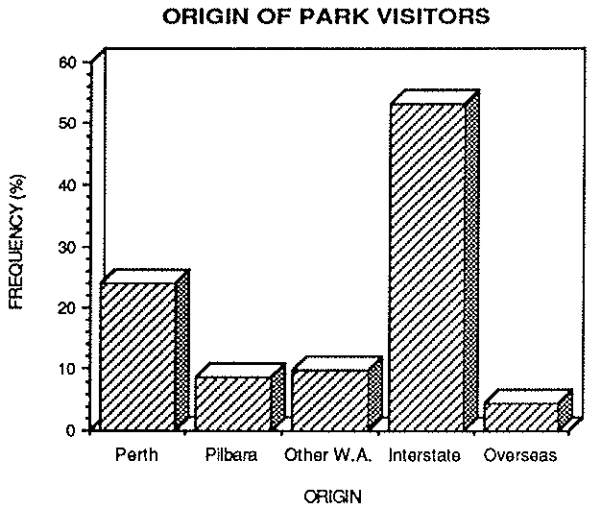
- Refer Section F.3. (Public health and airborne crocidolite fibre).
- Interpretation of the history of mining will be limited to areas where risks to public safety are minimal. Mine shafts will be either closed or posted with warning signs (refer E.4).
- Access to the Park via Yampire Gorge will be closed once suitable alternative access has been developed.

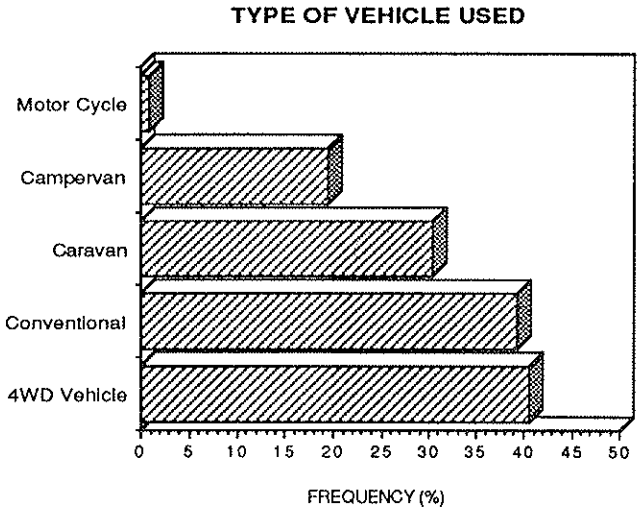
INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
In 1960 the Commonwealth Government lifted its embargo on the export of iron ore. This action led to the development of the Pilbara as a major iron ore production area. A number of Temporary Mineral Reserves were declared over the Hamersley Range prior to the proclamation of the Park in 1969. Although none of the Temporary Reserves within the Park have been mined, they remain current under the terms of Special Agreement Acts.	■ Approximately 18% of the Park is covered by mining tenements.

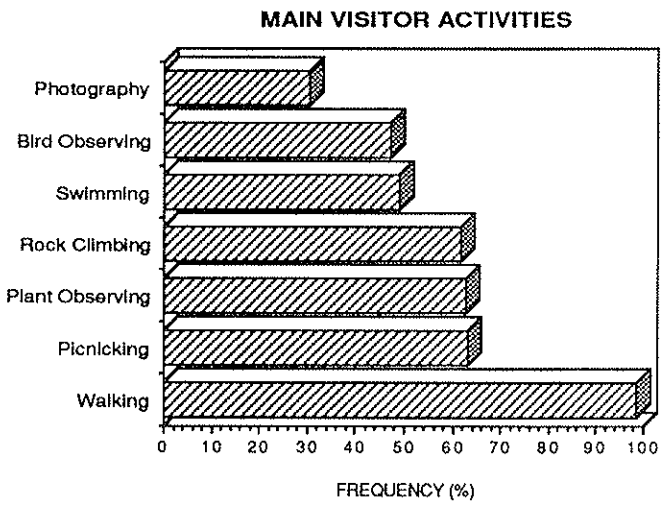
PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Refer section F.1 (mining).









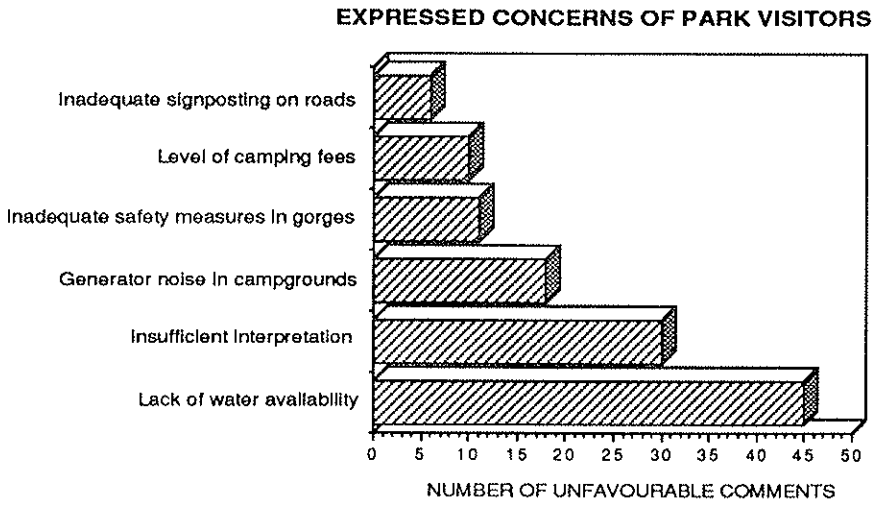
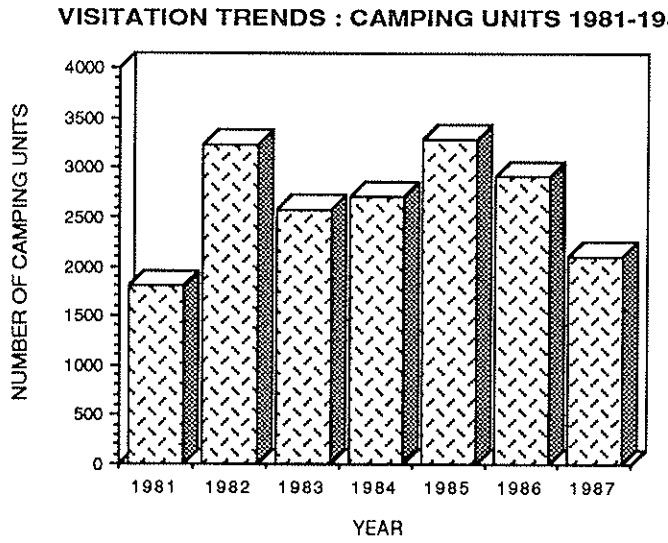
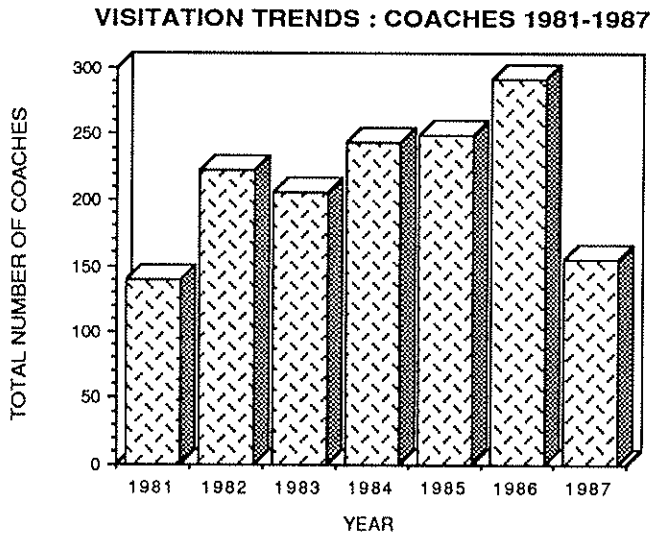


FIGURE 1. RESULTS OF 1984 VISITOR SURVEY





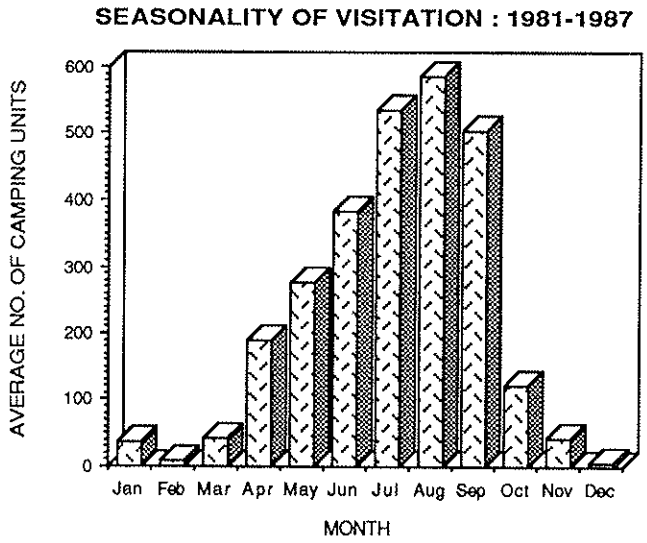


FIGURE 2. SUMMARY OF PARK VISITOR STATISTICS

E. MANAGEMENT FOR VISITOR USE

MANAGEMENT GOALS

1. To provide opportunities and facilities for public recreation consistent with the protection of environmental values and the minimization of Park use conflicts that could detract from the visitor experience.

2. To protect the lives and property of persons in the Park as far as it is practicable in a natural environment

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
E.1 PARK ACCESS	
SPECIFIC OBJECTIVES:	
(i) To provide appropriate access routes in the context of Park goals and regional road development.	
E.1.1 AIR ACCESS	
There are two operational airstrips (authorized landing areas) in the Park. They are located at Dales Gorge and Marandoo. These airstrips are generally suitable for medical evacuation purposes.	■ Landing areas in the Park are required primarily for the purpose of medical evacuation.
The closest regional aerodrome is at Wittenoom. This airstrip is adequate for F28 commercial aircraft. It is possible that another commercial aerodrome will be built east of the Park to service the proposed Yandicoogina townsite.	■ Improvements in regional air services will increase the accessibility of the Park to overseas and other long distance visitors.
Fixed wing scenic flights are conducted over the northern gorges by an operator based at Wittenoom.	■ Demand for scenic and recreational flying over the Park may increase.
Air space over the Park is also used by helicopters (and fixed wing aircraft) for the purposes of mustering, 1080 baiting, and aerial survey.	■ Low flying aircraft in the vicinity of the gorges are likely to cause annoyance to other visitors.
E.1.2 ROAD ACCESS	
Visitors to the Park have currently several options with regard to road access (Map 2.). The National highway route (future Gt. Northern Highway) intersects the NE corner of the Park at Munjina Gorge. It provides a high standard link between Perth and Darwin. It is fully sealed except for the section between Munjina Gorge and White Springs (scheduled for completion in 1990). Alternative road access is available via the NW coastal highway to Nanutarra and thence inland via Tom Price to enter the Park near Marandoo. All but the last 225 km are sealed. An unformed road links Karratha with Wittenoom. Access to the	■ Further improvement of the Pilbara regional road network will create opportunities for increased visitation. ■ There are distinct management advantages in maintaining only two Park entry points in the long term.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will seek the advice of the Civil Aviation Authority (CAA) and the Royal Flying Doctor Service (RFDS) and ensure that airstrips intended for use meet the standards for Authorized Landing Areas.
- Helicopters will only be permitted to land at Authorized Landing Areas, except in emergency or rescue situations.

- CALM will make representations to relevant Government agencies to ensure that consideration is given to suitable road access from new aerodrome developments to the Park.
- Interpretive programmes and general facilities in the Park will be developed to cater for the likelihood that overseas visitation will steadily increase.

- Guidelines will be developed for the control of all flying (both powered and non-powered) over the Park. These guidelines will be developed in accordance with CALM Policy, CAA Regulations, and Regulations under the CALM Act.

- CALM will consult with the operators of scenic flights to ensure that their activities are consistent with management goals for the Park.

- CALM will liaise with the Main Roads Department (MRD) to ensure that regional road development facilitates visitor access to suitable Park entry points (Map 8.).

- CALM will liaise with MRD and other authorities to achieve long term rationalization of the number of Park entry points.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Park from Wittenoom is via Yampire Gorge. The Pilbara road development strategy (MRD, 1988) has identified the need for a regional route through the Park to link Paraburdoo and Tom Price with the National highway. The indicated route is via Marandoo and Mt Windell (Map 8.).	■ The development of a Marandoo - Mt Windell regional route would be in accordance with CALM proposals for the maintenance of two major points of access into the Park.
The Department of Resources Development (DRD) has identified a possible requirement for two major transport/communication corridors in support of regional mining enterprises (Map 9.).	■ Rationalisation of utilities, road, and rail links within a single corridor would minimize the loss of conservation values.
At present the principal access to the Park is from the Wittenoom - Roy Hill road via Yampire Gorge. The Yampire Gorge road crisscrosses Yampire Creek about 40 times and is subject to severe flood damage in most years. Road access via the creek is the cause of major disturbance to the wetland habitat of the Gorge. The presence of crocidolite tailings in Yampire Gorge may be a public health risk.	■ Environmental and public safety considerations mitigate against the long term maintenance of Yampire Gorge as an access route to the Park.
None of the present entry points to the Park contains an entry station with information relevant to the Park and its management.	■ Entry stations provide an intitial contact with visitors and facilitate the distribution of public information.
Existing roads within the recreation zone are formed gravel. In dry conditions they are adequate for use by 2WD vehicles and caravans. Under wet conditions they may become impassable. In the natural environment zone the roads are of a lesser standard and are generally only suitable for 4WD vehicles. Off-road driving is a potential problem, particularly in remote areas of the Park.	■ The internal Park roads, although adequate, are dusty and are gradually being graded below the level of the surrounding landscape. ■ Off-road driving is a potential cause of severe environmental impacts.
The existing road network in the recreation zone provides visitors with a circuit route of some 105 km (Map 10.). The principal gorges, Mt Bruce, and the Park Headquarters are all located near the circuit road.	■ Any extension of the existing internal road network is likely to be detrimental to cultural or conservation values.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will liaise with MRD to promote the development of the Marandoo - Mt Windell regional highway as the major route of entry to the Park (Map 8.).
- Alignment of the Marandoo - Mt Windell highway will be dependent upon the agreement of the Aboriginal Heritage Committee, and upon the road meeting environmental and aesthetic standards as determined by CALM. The highway proposal will also be subjected to such environmental review processes as are deemed appropriate by the Environmental Protection Authority (EPA) under the terms of the Environmental Protection Act, 1986.

- CALM will liaise with DRD and other relevant interests to minimize the impact of mining infrastructure upon the Park (refer F.2).

- Once alternative formed entry roads have been developed to the Park, CALM will act to effect the closure of Yampire Gorge as an access route.
- CALM will seek expert advice on the nature and extent of any health risks posed by crocidolite fibre in Yampire Gorge (refer section F.3).

- Entry stations will be established at strategic locations in the Park. The stations will be manned according to public demand and staff availability.

- As funds allow, the roads in the recreation zone will be progressively sealed along existing (low speed) alignments.
- Park speed limits may be nominated on certain roads.

- Off-road driving will be prohibited except by Park staff in emergency situations.

- The existing circuit route within the recreation zone will be maintained.
- It is not envisaged that the overall Park road network will be extended (except for the proposed E-W regional highway) during the life of this plan. Any other proposed extension would need to be justified on environmental grounds and sanctioned by the Aboriginal Heritage Committee.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
E.1.3 ROAD MAINTENANCE The national highway, where it intersects the Park, is within an excised road reserve. The maintenance of Park roads is otherwise a CALM responsibility. Road grants for the Park are administered by the Shire of Ashburton. The Shire also provides its workforce for specific road maintenance projects.	■ The proposed E-W regional highway is likely to be a Main Roads Department (MRD) responsibility and be contained within a road reserve.
E.1.4 PEDESTRIAN ACCESS Pedestrian access has been developed by CALM into selected areas of the northern gorges. Tracks lead down to Weano Gorge, Kalamina Falls, Fortescue Falls, and Circular Pool. These tracks generally consist of stone or concrete steps with handrails along some sections. At other points (e.g. Joffre Falls and Oxers Lookout) gravel paths lead to vantage points that provide views of the gorges below. Safety railings are not provided at these lookouts. Inadequate safety measures and warnings in the vicinity of the gorges was an expressed concern of some visitors in response to a 1984 visitor survey (Fig 1.).	■ Walking in and around the northern gorges is the most popular visitor activity in the Park (Fig 1.) and should be catered for by the provision of facilities and information. ■ Public safety is the overriding consideration in relation to the siting and design of walking access to the northern gorges.
Walking access into the gorges is difficult, or impossible, for older or disabled persons. Kalamina Gorge offers the easiest access although it still requires the negotiation of steep steps. Yampire is the only gorge within the Park with vehicular access.	■ Yampire is the only gorge with any prospect for wheelchair access.
Some visitors attempt longer walks along the bottom of the northern gorges (e.g. Wittenoom and Kalamina). Access along some gorges is restricted by long, deep pools, or by steep rock ledges. The taller peaks of the Hamersley Ranges (Mt Bruce and Mt Meharry) are also a walking attraction for some visitors. There is an unformed walking track up Mt Bruce and 4WD access to the top of Mt Meharry.	■ Unregulated 4WD vehicle access to the top of Mt Meharry (outside Park) is causing gully erosion. ■ Visitors undertaking extended walks in the gorges expose themselves to certain risks.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will seek to retain autonomy over Park roads (other than those which are a MRD responsibility) and maintain them in cooperation with the Shire of Ashburton.

- Walking track access will be provided in areas of the Park where there is sufficient public demand and where it is considered that access can be provided with a minimum of risk to the user. A preliminary survey has identified the following areas as having potential for the further development of safe walking access: Fortescue Falls, Circular Pool, Kalamina Gorge, Weano Gorge, Knox Gorge, Oxers Lookout, Hamersley Gorge, Joffre Lookout and Falls and Hancock Gorge.

- The construction of safer walking tracks will assume the highest priority in the Park works programme. CALM will prepare engineering briefs for the design and specification of walkways and lookouts to high safety and aesthetic standards. Implementation will be in accordance with available resources and priorities assigned by CALM. As an interim measure, graphic signs will be installed to clearly identify the risks associated with walking in and around the gorges.

- Once the Yampire Gorge entry road has been closed, road access will be maintained from within the Park to the southern end of Yampire as a service to disabled or infirm visitors. The potential for development of wheelchair access to lookouts will be investigated as part of the overall walking track programme.

- CALM will conduct a study of alternative access routes to the summits of both Mt Bruce and Mt Meharry. The objective will be to design and construct walking access that will have minimal environmental and visual impacts. Vehicle access will be limited to the base of both mountains.

- Visitors embarking upon extended walks will be encouraged (via the information programme) to conform with safety guidelines and make their intentions known to Park staff (refer E.2.2).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS

E.2 RECREATIONAL OPPORTUNITIES AND LAND SUITABILITY

SPECIFIC OBJECTIVE:

(i) 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 the overall conservation objectives.

Much of the appeal of HRNP is derived from the extensive areas of more or less pristine, mountainous, and arid terrain. This landscape, clothed in plants that are highly adapted to the environment, is exotic to the large proportion of Park visitors who come from the more temperate parts of Australia or from overseas (Fig 1.).

The gorges of the northern escarpment, and to a lesser extent the higher mountains, are focal points for visitors because of their dramatic appearance and the opportunities they present for walking, exploring, photography, and other activities.

The appeal of many of the gorges is enhanced by the presence of permanent water which offers opportunities for swimming and the appreciation of animals and plants that are unusual in the context of the arid zone.

- HRNP 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 (Fig 1.).
- Increasing visitor use of the Park may lead to adverse environmental impacts and conflicts between user groups.

E.2.1 CAMPING

Camping is a popular activity of visitors to Hamersley Range N.P. (Fig 1.). In the past, facilities and services have been provided for campers at 4 separate locations: Circular Pool, Yampire Gorge, Weano Gorge, and Joffre Falls turnoff. The existing campgrounds also serve as day-use areas.

- There will always be a demand for camping in the Park near the major visitor attractions.
- There is a need to rationalize and upgrade existing camping and day-use facilities.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Management effort will be directed at catering for nature-oriented recreational pursuits. Those forms of recreation relating to the scenery and biology of the Park will be favoured. The development of visitor facilities and programmes will reflect this emphasis.

- Information programmes will promote appropriate recreational opportunities to enhance the visitor appreciation and understanding of the Park (refer E.5).
- Recreational opportunities will be created by the development of safe facilities (refer E.4).

- The Park zoning plan (refer B.5) will address the development of recreational opportunities such that adverse impacts and conflicts are minimized. In essence there will be 4 zones:
  (i) **Wilderness** zones will be maintained as nearly as possible in their natural state with a minimum of management intervention or use.
  (ii) **Natural environment:** The management priority will be the preservation of the present abundance and diversity of native flora and fauna.
  (iii) **Recreation:** This zone will be managed jointly for appropriate public recreation and for the conservation of indigenous biota.
  (iv) **Park services:** Applies to land that is set aside for Park administration, visitor services, or temporarily off-limits to Park visitors.
- The environmental impacts of recreation will be monitored in accordance with the CALM Policy "Reporting, monitoring, and re-evaluation of ecosystems and ecosystem management".

- CALM will continue to provide facilities and services to those who wish to camp in the designated campgrounds (refer E.3.1.). Vehicle-based camping outside the designated campgrounds will require the prior consent of the Ranger-in-charge and compliance with specified conditions. The conditions may include:
  - limit of one night on duration of stay;
  - no campfires;
  - remove own rubbish and other evidence of occupation; and
  - camp only at authorized sites with existing road access.

- Camping facilities in the recreation zone will be relocated and upgraded in accordance with a development plan co-ordinated by CALM Recreation and Landscape Branch (refer E.3.1).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
E.2.2 BUSHWALKING Extended bushwalks are an activity of a small minority of visitors. 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.	■ Bushwalking can be a rewarding experience for visitors as long as safety precautions are followed.
E.2.3 ADVENTURE SPORTS Park staff occasionally receive enquires from visitors seeking approval to conduct adventure sports, such as abseiling and hang gliding, in the Park. The erodible nature of much of the surface rock of the gorges poses additional risks in relation to abseiling. It is considered that there are many suitable areas outside the Park for adventure sports.	■ Adventure sports in the context of HRNP entail high risks to participants and may conflict with other visitor activities. They may also be detrimental to environmental values.
E.2.4 NATURE OBSERVATION Nature observation (birdwatching and plant study) is a popular visitor activity (Fig 1.). The Park offers a diversity of habitats within a relatively small area.	■ Nature-oriented recreational pursuits accord with the overall management philosophy for the Park.
E.2.5 CONCESSIONARY OPERATIONS Tourism is an important regional industry. Tourist expenditure in the Pilbara for the year 84/85 was estimated at approximately $20 million (Barrington & Partners, 1985). One means of capitalizing on this potential is the development of commercial concessions within one of the prime tourist attractions - Hamersley Range N.P. A commercial concession in the context of a National Park is defined as: "a right granted by way of lease, licence, or permit for occupation or use of a part of an	■ The suitability, or otherwise, of a concessionary proposal should be determined in the light of the wider public interest, and the conservation objectives of the Park.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Bushwalkers will be required to make prior contact with the Ranger-in-charge and obtain a permit to walk in the remote sections of the Park. Issue of the permit may be conditional upon the following:
  - walkers advising of intended route and time of return;
  - minimum party size;
  - no campfires;
  - agreement to observe any area limits;
  - evidence of adequate equipment; and
  - removal of all litter.

- CALM will prepare a visitor information pamphlet on the need for preparedness when walking in an arid environment.

- Management of adventure sports will be in accordance with CALM Regulations and CALM policy statement No.18 'Recreation'.
- Adventure sports will be permitted only where it can be demonstrated to the satisfaction of the Ranger-in-charge that they can be conducted without conflict with, or risk to, other park users and without detriment to the environment. People who are authorized to conduct adventure sports will be required to indemnify CALM.

- CALM will compile bird and plant checklists that are specific to HRNP. This information may be published in a complete inventory of Park resources.
- CALM may install bird hides within selected natural habitats (refer E.3.2). Wheelchair access will be provided to one of these facilities.

- The consideration of any application for commercial consessions within the Park will be in accordance with the provisions of the CALM Act and CALM policy statement No.18 'Recreation'. This policy states in part:
  "Each proposal for a concession .... will require the approval of the National Parks and Nature Conservation Authority ... and the Minister."
- The granting of any concession may be subject to conditions such as compliance with environmental criteria, and the provision of indemnities.
- The issue of Park concessions for the provision of Visitor accommodation is specifically addressed in Section E.3 (Visitor Facilities).
- The advice of the HRNP Advisory Committee and the Aboriginal Heritage Committee will be sought in relation to major concessionary proposals.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
area of land or water entrusted to the Department, for the provision of appropriate facilities for visitor use and enjoyment" (CONCOM, 1985). Interest has been expressed in the conduct of camel treks within the Park although no formal proposal has been received.	■ There is potential for environmental damage associated with camel trekking and agistment. Particular problems include browsing pressure, erosion along pads, and introduction of weeds via feed hay.

E.3 VISITOR FACILITIES

SPECIFIC OBJECTIVES:

(i) To provide and maintain low-key public campground facilities in the Park without detriment to conservation or other values.

(ii) To represent the full scope of public interests in relation to any proposals received by CALM for the development of accommodation in the Park beyond existing standards.

E.3.1 ACCOMMODATION	
The mining town of Wittenoom has traditionally been the service centre for visitors to HRNP. Wittenoom is 60 km from Dales Gorge (via Yampire Gorge). Recent concerns about the health risks associated with air-borne crocidolite fibres have caused the W.A. Government to adopt a strategy of phasing down activity in Wittenoom. New tourist facilities have yet to be developed at an alternative location. The slow rate of visitor growth in recent years (Fig 2.) may reflect the shortage of suitable accommodation facilities. Tom Price and Newman also service visitors to the Park although both towns are relatively remote from the major visitor attractions within the recreation zone of the Park. The W.A. Tourism Commission has received complaints about the lack of motel type accommodation within close proximity to the Park. A recent tourism development plan for the Pilbara Region (Barrington and Partners, 1985) identified	■ It is likely that there will be commercial interest in the development of additional accommodation facilities to service the Park within the life of this plan (10 years). The development of commercial facilities may be proposed for location(s) within the Park or for areas that adjoin the Park.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- For the purposes of Park management, any area of the Park leased for a commercial concession will be zoned "Park services" (refer B.5).

- Any application for camel treks would be considered in accordance with the above procedures. If an application were granted, the following conditions are considered appropriate:
  - treks to follow existing tracks or roads
  - no overnight stops within the Park; and
  - no grazing of native vegetation.

- The NPNCA position on commercial visitor accommodation is that such facilities should preferably be constructed outside park boundaries although individual proposals may be considered on their merits.
- Any proponent of a commercial accommodation facility within the Park will need to initially satisfy CALM that the site proposed for development meets specified siting criteria. These criteria are summarized at Appendix IA.
- 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. These matters are listed at Appendix IB.
- If a proposal satisfies the siting criteria and environmental assessment, CALM will give consideration to leasing the site under the terms of the CALM Act, and the CALM Recreation policy. For Park management purposes, the site would be zoned "park services".
- Fire management and control of introduced plants and animals will apply to park services zones.
- In the event of a commercial accommodation facility being developed within a park services zone (or in an area that adjoins the Park), CALM will liaise closely with any developer/operator to ensure that facilities and activities are integrated with the goals of Park management.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Hamersley Range N.P. as the major attraction in the region. An area adjacent to the NE corner of the Park has been leased for the purposes of a roadhouse, motel, and caravan park development. 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 in 1984 indicated that there is a strong demand for this type of facility in the Park. The survey identified the major unfilled need as a requirement for a drinking water supply and possibly showers (Fig 1.). Visitation and therefore use of facilities, follows a highly seasonal pattern with peak use being in the period May-September (Fig 2.). Changes in the patterns of visitation may result in an increase in the camping sector of the market. Existing campgrounds and car parks are generally located adjacent to the major visitor attractions. Overnight campers and day visitors are required to use the same picnic facilities. Some allowance has been made for coaches by the provision of separate campsites. Similarly, separate areas are provided for campers who wish to use generators. An area has been set aside for the use of secondary schools to conduct courses.	■ Development of commercial accommodation outside the eastern boundary of the Park accords with access proposals as outlined in section E.1.2. ■ The standard of existing campground facilities generally meets with public approval although there is an expectation that drinking water should be supplied. ■ Visitor facilities need to be carefully designed so that they cater for the marked seasonality of visitation and for a probable expansion in the overall level of visitation. ■ The locations of existing campgrounds and carparks do not generally meet the standards for facility design established on other CALM parks and reserves.
E.3.2 OTHER FACILITIES Camping outside designated campgrounds is generally dependent upon the prior consent of the Ranger-in-charge. Consent is usually given for the purposes of bushwalking by organized parties. Residents of local towns occasionally camp at waterholes in the southern half of the Park.	■ There may be demand for facilities or services in remote areas of the Park.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Prospective developers of accommodation near the Park will be fully briefed on the long term Park access proposals.

- CALM will continue to provide low-key public camping facilities in the Park.
- The existing standard of facilities will be improved by the addition of drinking water supplies where feasible, and the provision of shade.
- No particular provision will be made for caravans or campervans although they will be able to use campground facilities.

- CALM will prepare a plan for the development of visitor facilities such that basic public needs are met without undue detriment to environmental and aesthetic values. In the preparation of the development plan consideration will be given to the following:
  - adoption of a flexible design approach that will cater for existing user groups (e.g. families, coaches, schools), patterns of visitation (winter peak), and also provide for predicted trends in visitation.
  - location of facilities with the designated areas such that they do not impinge upon the natural values of the major visitor attractions, and yet provide attractive settings for camping or picknicking in the Park.
  - separation of facilities on the basis of intended use so as to avoid possible conflicts that may detract from overall visitor experience. The areas designated for facilities are as shown in Map 10.

- In the design of new campgrounds, consideration will be given to the installation of fire rings for campfires. These facilities will be centrally located with the objective of minimizing the impacts of firewood collection upon the Park. Campfires will not be permitted other than in the fire rings provided for that purpose.

- Visitor facilities and services will only be provided in designated areas of the recreation zone. People who wish to camp outside the designated areas will be required to conform with conditions as determined by the Ranger-in-charge (refer E.2.1).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Campfires are currently not permitted in the public campgrounds of the Park. Gas barbecues are provided free of charge to the user.	■ The collection of firewood for campfires can be destructive of local vegetation and habitats.
Pit toilets are provided in campgrounds.	■ Water borne toilets are not practicable given the limited water resources and possible disposal problems.
Existing walking tracks in the Park are confined to the vicinity of the northern gorges. Other areas of the recreation zone offer scope for the development walking trails.	■ Some existing tracks require engineering work to meet safety standards. ■ Development of new walking tracks in the recreation zone can be co-ordinated with Park interpretation objectives.
There are bird habitats in the recreation zone that lend themselves to bird observation. These include mulga low-woodlands and sheltered gorges.	■ Bird watching and photography are popular visitor activities in the Park.
Park interpretation and public information facilities comprise two display boards located at Fortescue turnoff and Joffre Falls. Inadequate interpretation was an expressed concern of some visitors surveyed in 1984 (Fig 1.).	■ Dispersed interpretive displays (or signs) and ranger contacts are considered to be the most effective methods of interpreting the Park to the public.
E.4 VISITOR SAFETY	
The sheer-sided gorges are the principal natural hazards of the Park. In recent years there have been several accidents resulting in serious injury or death.	■ There is a need to develop visitor awareness of hazards including the risks associated with excessive exertion and swimming in cold water pools.
These incidents were generally of the nature of falls, or heart failure brought on by exertion or shock. The low temperature of water in the gorges can induce shock symptoms.	
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. Additional equipment and expertise is available from the resources	■ There is a need for greater emphasis on accident prevention whilst maintaining rescue and medical capabilities.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Gas barbeques will continue to be provided free-of-charge in designated campgrounds and picnic areas. Wood campfires will not be permitted pending the development of appropriate facilities (fire rings) and the implementation of satisfactory arrangements for the supply of fire wood.

- Pit toilets will continue to be provided in the campgrounds and picnic areas. The feasibility of alternative facilities such as self-composting toilets will be investigated, particularly in areas where groundwater pollution is a possibility.

- Refer E.1.4 (Walking access).

- New walking track development in the recreation zone will be planned in the context of the Park Interpretive programme (refer E.6).

- Bird hides may be established at selected points in the recreation zone.

- Information will be made available to the public both by means of entry stations and by displays (and signs) to be developed in accordance with an overall Park interpretive programme (refer E.6). CALM will investigate the possible development of an outdoor centre for public lectures and films (refer G.4).

- The Park information programme will highlight the risks associated with recreation in the vicinity of the gorges and emphasize visitor responsibilities in relation to personal safety. Adequate signage will be installed at points of known hazards.

- The current level of preparedness will be maintained in relation to Park rescue and medical services. CALM will continue to cooperate with SES, Police, RFDS and other bodies in order to assist the public in emergency situations. Response to emergencies, both within and outside the Park, will be in accordance with procedures to be documented by CALM.
- Park facilities, particularly walking tracks and lookouts, will be upgraded to safer standards where necessary (refer E.1.4).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
Services (SES) at Tom Price and Wittenoom. The Park has a Royal Flying Doctor Medical Kit and vehicles are equipped with the RFDS radio frequency. The airstrip at Marandoo is suitable for night landings by RFDS aircraft based at Port Hedland. The nearest doctor and ambulance are at Tom Price.	
The climate of the Hamersley Ranges (high temperatures and low humidities) 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.	■ Visitors most at risk from dehydration and heat stroke are those that embark upon extended walks without adequate preparation.
There may be risks associated with crocidolite mining and processing residues in, or adjacent to the Park.	■ Health risks from crocidolite are greatest where the fibre occurs in the milled form.
Disused mine shafts in Yampire Gorge have been declared unsafe by inspectors from the Mines Department.	■ Some disused mine shafts have become important bat habitats.
E.5 VISITOR REGULATION	
Visitors to all W.A. National Parks are required to comply with regulations designed to protect park conservation values and maintain visitor experience. Relevant controls are contained in the CALM Regulations, the CALM Act, 1984, and CALM Policy Statements. Park rangers are authorized to enforce regulations.	■ Most regulations apply uniformly to all W.A. National Parks. ■ Regulations applying to domestic pets are a contentious issue with some visitors.
Camping fees are levied at HRNP, the current fee being $2 per adult per night. CALM Policy is for visitors to pay a contribution towards the cost of facilities where collection of fees is practicable.	■ Entry fees are a fairer system of recouping park management costs.
The Park zoning plan, as specified in this management plan, is designed to optimize recreational and conservation objectives.	■ Park zoning is a system of regulation based largely upon land suitability.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Where it is considered that existing facilities are unsafe, those facilities will be closed to the public.
- Campgrounds and day-use areas will generally be relocated away from the rims of gorges in accordance with an overall development plan for visitor facilities (refer E.3.1.).
- Potentially hazardous activities (e.g. adventure sports) will not generally be permitted in the Park (refer E.2.3).

- Specific management guidelines will be applied to bushwalking parties (refer E.2.2). These guidelines will be promoted by means of the Park information programme.
- Public campgrounds will be equipped with shade structures and drinking water supplies.

- Refer section F.3 (Public health and air-borne crocidolite).

- CALM will post warning signs at the entrances to the mine shafts.
- CALM will negotiate through the Mines Department with the current tenement holder regarding closure of the shafts to the public in a manner that will allow continued access for bats.
- In the long term, closure of the Yampire Gorge entry road will limit the public accessibility of mine shafts.

- Visitors to HRNP will be required to comply with existing regulations (as specified in relevant Acts and Regulations) that provide for the protection, management, and control of national parks.

- Dogs, cats, and other domestic animals are prohibited from national parks except for seeing eye dogs or where specified zones are designated (CALM Policy No.18 'Recreation'). The Executive Director may designate an area of HRNP where visitors' pets can be placed under control. No such areas will be designated until proper facilities for pets are available. Pets (other than guide dogs) will not be permitted elsewhere in the Park.

- CALM will encourage the development of kennel facilities in neighbouring towns.

- Park fees will be levied in accordance with standing CALM Policy. The adopted system will be designed to recoup some of the Park management costs on an equitable basis.

- Refer Section E.2 (Recreational opportunities and land suitability; and Section B.4 (Zoning plan).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
E.6 EDUCATION AND INTERPRETATION Limited interpretive services and facilities are currently provided at HRNP. Management emphasis is placed upon making personal contacts with visitors, particularly those who camp within the Park. A visitor pamphlet provides brief information on the Park's values, facilities, and geography. Other interpretive measures, such as the installation of display panels, are progressively being implemented. The lack of adequate interpretive services was an expressed concern of some visitors surveyed in 1984 (Fig 1.). The following subjects are seen as major opportunities for interpretation in HRNP: • the geological history of the Park. The great age of rock formations and the possible implications for the study of the Earth's earliest life forms. • the plant and animal adaptations to conditions or aridity, fire etc. • the Aboriginal heritage including traditional management of natural resources. There is no venue in the Park for public lectures or for temporary displays	■ Increased visitor awareness and understanding is the key to the enhancement of the visitor experience and the achievement of management objectives. ■ The interpretive programme provides the opportunity to explain Park management programmes and regulations in a positive light. ■ Interpretation needs to be cost effective with most effort directed where it can be expected to achieve the greatest benefit. ■ Aboriginal themes in the interpretive programme need to be treated sensitively and unauthorized disclosures must be avoided. ■ The lack of a suitable venue for public lectures and displays is a current obstacle to such activities.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- An interpretive programme for HRNP will be prepared by CALM. The plan will detail the themes to be addressed and methods to be employed. Continued emphasis will be given to visitor contact as an integral component of the interpretive programme.

- The Park interpretive programme will include a public information component relating interpretive themes with management objectives and park regulations. Advice concerning issues such as public safety, fire, weed and feral animal control, access, and recreation will be incorporated in the interpretive programme.

- Interpretive facilities will be located at selected sites in the recreation zone (e.g. picnic areas) where visitors can study displays at their leisure. Entry stations (when staffed) will be the points of initial contact with visitors, and will otherwise serve as distribution points for park literature. The construction of a centralized visitor centre is not envisaged.
- Appropriate methods and media that may be employed in the interpretive programme include:
  - ranger-led activities;
  - self-guided nature walks;
  - visitor displays in campgrounds, picnic areas, and entry stations;
  - self-explanatory signs or panels at sites of natural or cultural significance;
  - hides for bird observation; and
  - a variety of literature such as self-guiding brochures, biological checklists, and information leaflets.

- The Aboriginal Heritage Committee and the W.A. Museum will be consulted during the formulation of the interpretive programme.

- CALM will develop an expanded Park office for public displays, and will investigate the development of an outdoor facility for lectures or films (refer G.4).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
E.7 VISITOR MONITORING Park visitation has been monitored for a number of years by the use of traffic counters and by recording campground occupancy. Traffic count data has not been reliable, due partly to equipment failures, and camping units are considered to be a better indicator of visitation (Fig 2.). This measure shows a gradual increase in visitation for the period 1981-87 with high annual variability. Coach visitation (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 survey of Park visitors was conducted in 1984 (Cavana, 1986). The survey employed a mailback questionnaire to determine demographic data, the preferred activities, and expressed concerns of Park visitors. A summary of results is shown at Fig 1.	■ Accurate visitor statistics are the basis of sound management planning. ■ Traffic counting is a cost effective means of collecting visitation data. ■ Increased park visitation can be expected to generate environmental impacts.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will continue to monitor visitor usage of the Park, and periodically survey visitor needs. Information will be collected and recorded in accordance with established CALM guidelines on the collection of visitor information statistics (VISTAT).

- Traffic counters will be maintained at each of the Park entry stations.

- The impacts of increasing visitation, particularly upon the gorge ecosystems, will be monitored in accordance with the standing policy on the monitoring of CALM lands.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
F. EXTERNAL FACTORS	
F.1 MINING	
SPECIFIC OBJECTIVE: (i) To liaise with mining interests and relevant Government agencies to ensure that the impacts of mining and associated infrastructure within the Park are kept to a minimum and that, if possible, transport and communication links are contained within a single corridor.	
F.1.1 PRE-EXISTING TENEMENTS	
A number of mining (iron ore) tenements within HRNP pre-date the proclamation of the Park in 1969. These tenements are classified as Temporary Reserves (TR) under the terms of the Mining Act, 1904 and are shown at Map 11.	■ Considerable areas of the park have Temporary Reserve status.
Special agreements acts (e.g. Iron Ore (Wittenoom) Agreement Act) provide that TR's shall remain in force as long as prescribed fees are maintained.	
These Acts provide for the conversion of a Temporary Reserve to a Mining Lease (ML). The progression to ML status is generally subject to the provisions of the EP Act.	■ The transition of a Temporary Reserve to a Mining Lease may be subject to environmental review.
F.1.2 OTHER MINING TENEMENTS	
Other areas of the Park are covered by existing Exploration Licences (EL) or Mining Leases (ML). Current ML's are subject to agreement acts. These tenements are shown at Map 11.	■ CALM and the Department of Mines have in place joint arrangements that specify standard conditions in relation to mining tenements on CALM Lands.
The holder of a Mining Lease has the right to mine subject to the provisions of the lease conditions and under the terms of the Mining Act, 1978, the Environmental Protection Act, 1986 and relevant Agreement Act. Review of mining proposals will follow the Environmental Impact Assessment (EIA) Process (under the E. P. Act 1986). The level at which any proposal is assessed will be determined by	

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will liaise with the Mining industry, the Department of Resources Development (DRD), and the Department of Mines to determine which areas of pre-existing tenements are likely to be mined, and what is the possible timescale of development.

- Where there is a probability of mine development within the life of this plan (10 years), CALM will not undertake the development of any facilities in the affected areas.

- Where an environmental review process is applicable, CALM will prepare a submission for the EPA concerning the likely environmental and park management implications of mine development in the Park.

- CALM will make representation to the Department of Mines to review the conditions of existing tenements in HRNP and ensure that they accord with the conditions specified in current joint arrangements.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
the Environmental Protection Authority and may involve the preparation of an Environmental Review and Management Programme (ERMP). If approval is granted, the mine area may be excised from the Park and vested in the NPNCA with a purpose other than national park.	■ Miners will be required to comply with the environmental conditions as specified in an ERMP and the lease conditions set by CALM and DOMWA.
Any application to convert an existing tenement in the Park from EL to ML status is subject to consideration under the terms of the Mining Act, 1978 and Government Policy relating to mining in national parks. The current procedures applicable to ML applications are summarized at Appendix IIB. Final issue of a Mining Lease in the Park (under this process) is dependent upon the consent of both Houses of Parliament.	■ CALM and the NPNCA have input into the process whereby ML applications are considered.
F.1.3 NEW EXPLORATION PROPOSALS	
Current Government Policy (and recent amendments to the Mining Act) states that National Parks shall remain closed to mining unless a Park, or parts thereof, has been specifically declared open to exploration.	■ HRNP is currently closed to new exploration although this does not preclude the issue of permits for geoscientific survey.
The Department of Mines or another proponent can, on the basis of a Parks' high prospectivity, formally propose the opening of that Park to exploration. The EPA, in conjunction with CALM and Mines, will then conduct a programme of research and evaluation to determine whether the area in question has outstanding biological or landscape values that warrant its continued closure to exploration.	■ HRNP is an area of high prospectivity and is likely to be the subject of future EL applications. ■ CALM has an input into the process of review which applies to EL applications in the Park.
If HRNP (or portion thereof) is declared open, individual EL applications will be considered in accordance with the process shown at Appendix IIA. Final approval of an application is dependent upon the agreement of the Department of Mines and CALM. The EPA will arbitrate in the event of a disagreement. Any exploration programme is likely to be subject to conditions.	

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will fulfill any requirements as defined by the Minister for Environment in relation to mining developments in the Park.

- CALM will consider each application for a Mining Lease in the Park, particularly with regard to the wider environmental and Park management implications. Relevant recommendations will be forwarded to the NPNCA. In the case of a successful lease application, CALM will make recommendations concerning appropriate environmental safeguards, rehabilitation measures, and other conditions that may be applied to the lease.

- CALM will liaise with the Department of Mines to ensure that holders of geoscientific survey permits comply with permit conditions. These conditions will include:
  - the necessity for prior contact with the Ranger-in-charge.
  - no pets, firearms, base camps, or fuel dumps in the Park.
  - access to be generally restricted to existing roads although, where it is essential to leave the road, a single vehicle pass may be permitted.

- CALM will participate in the process whereby HRNP is assessed for biological or landscape values that may cause all, or parts of the Park to remain closed to new exploration. The evaluation will be in accordance with guidelines established in current Government policy.

- CALM will participate in the review process in relation to applications for Exploration Licences. Both the HRNP Advisory Committee and the AHC will be consulted during the preparation of submissions to the NPNCA and the Minister for CALM.

- If approval is given to proceed with an exploration programme in the Park, CALM will formulate appropriate conditions for consideration by the Minister for CALM.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
F.1.4 FOSSICKING Gold fossicking has been a visitor activity in southern areas of the Park. Under the terms of Mining Act, 1978, a Miners Right cannot be granted over land reserved as a park or reserve. In additon, the legal use of a metal detector requires the issue of an Exploration Licence.	■ Some visitors may expect to be able to use metal detectors in the area of the old Turee Creek goldfields.
F.1.5 GRAVEL EXTRACTION Gravel is classified as a mineral under the Mining Act, 1978. Section 9 of the Act allows CALM or its authorized agents to use gravel from its own land for the purposes of park operations.	■ CALM has an ongoing requirement for gravel, primarily to maintain Park roads.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will liaise with the Department of Mines to ensure that Park visitors are made aware of the provisions of the Mining Act, 1978 in relation to fossicking and the use of metal detectors. Fossicking in the Park is prohibited in accordance with the Mining Act, 1978.

- Extraction of gravel, sand, or stone within the Park will be subject to authorization by CALM in accordance with the CALM policy statement 'Basic raw materials' and the Mining Act.

- A minimum of new gravel pits will be constructed in the Park and contractors, or Shire employees, extracting gravel will be required to comply with guidelines as determined by CALM.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
F.2. MINING INFRASTRUCTURE The Department of Resources Development (DRD) has indicated to CALM that it will be necessary to develop infrastructure inside the Park (outside existing tenements) in support of such mining developments as may proceed. The proposed mines may be located either within the Park (e.g. Marandoo) or beyond the existing boundaries (e.g. Yandicoogina or West Angelas). Infrastructure may take the form of a townsite, but is more likely to be a rail link and utilities contained within one or more easements. DRD (in consultation with the mining industry) has identified an easement within which it is most probable that a rail link will be required to service mines to the east of the Park (refer to Map 9). One or more of the possible service easements may be the subject of an application for a special lease under the Land Act. Any application for a special lease in the Park would be subject to an environmental review process. If approval is granted, the easement(s) may be excised from the Park.	■ Development of mining infrastructure in the Park may have serious implications for the achievement of the stated goals and objectives of Park management. ■ Development within a single easement is likely to have less impact upon the conservation values and management of the Park than is development along a number of service easements. ■ The NPNCA and CALM would be involved in the environmental assessment of any proposal for infrastructure development in the Park. The approximate easement alignment (as shown in Map 9) may be subject to alteration on the basis of environmental considerations.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- The NPNCA recognizes the necessity for infrastructural support to iron ore mines. In the case of approved mines within current Park boundaries, the development of infrastructure through the Park is unavoidable. Nevertheless the NPNCA will act within its powers to achieve a rationalization of such development and to ensure that where infrastructure is installed, it is done in a manner that minimizes long term adverse impacts upon the Park. The NPNCA will oppose any proposal to develop a permanent townsite in the Park.
- The NPNCA will seek a full appraisal of any options that may allow development of infrastructure outside the Park as an alternative to development within existing Park boundaries.
- Proposed easements for transport or utilities within the Park will be considered in accordance with the Mining Act, the Environmental Protection Act, the Land Act, special agreements acts, and the existing administrative arrangements between the Mines Department, Department of Resources Development, and CALM.

- With respect to any requirement for infrastructure in the Park to service mines outside the Park, the NPNCA position (pending any independent environmental study) is that all such development should be contained within a single easement.
- CALM will cooperate fully with any environmental study aimed at identifying easement alignment(s) which will minimize adverse impacts upon the Park.

- The NPNCA will recommend the application of appropriate conditions to any development of transport links or utilities within the Park. Such conditions might include:
  - environmental safeguards to apply during the construction and maintenance phases;
  - design of infrastructure such that wider ecological impacts are not generated beyond the immediate easement, and such that visual impacts from the Park are within acceptable limits;
  - specification of acceptable rehabilitation clauses;
  - provision of adequate rights of way across easements;
  - provision of fencing to CALM specifications;
  - effective restriction of public access along service roads;
  - compensation for any additional Park management costs that may be incurred as a result of infrastructure development; and
  - location so as to minimize the impact upon landscape values.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
F.3 PUBLIC HEALTH AND AIRBORNE CROCIDOLITE Blue asbestos (or crocidolite) in its milled form is the major source of airborne fibres. These fibres are now known to be the cause of a number of serious respiratory diseases. Wittenoom town and mill site are the principal sources of airborne asbestos in the Hamersleys. Public health authorities advise that naturally occurring asbestos is not believed to constitute a risk. There are asbestos mine tailings in the Park at Yampire Gorge although extensive milling did not occur at this site. No other possible sources of airborne fibre are known to originate from the Park. Contamination from Wittenoom Gorge is a possibility. In an EPA study (Ashton, 1986) airborne asbestos levels were sampled in Wittenoom and at distances 9km and 43km to the east of the townsite. Although crocidolite fibres were observed in all samples taken at the townsite; this was not the case at the 9km and 43km sites where "probable" fibres were observed on relatively few occasions (Ashton, 1986).	■ Mine tailings in Yampire Gorge (unless disturbed) are not thought to be a significant source of airborne crocidolite although no sampling is known to have been conducted in the area. ■ Children (and others) who disturb the Yampire Gorge mine tailings may expose themselves to a risk. CALM has a responsibility to exercise a duty of care in relation to visitors and staff. ■ Present evidence (EPA study) indicates that airborne asbestos levels within the Park pose negligible risks to staff or visitors.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- CALM will seek the assistance of relevant authorities (e.g. Health Department and EPA) in the determination of the nature of any risks posed by tailings in Yampire Gorge and, if necessary, restrict access.

- CALM will erect signs to advise visitors of possible risks associated with the disturbance of mine tailings.
- The Yampire Gorge access road will be closed once alternative Park access has been developed.
- CALM will, by means of Park literature, advise visitors of any risks associated with asbestos at both Wittenoom and Yampire Gorge.

- CALM will cooperate with relevant authorities in future assessments of the health risks, if any, in areas of the Park that are closest to Wittenoom.

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
G. PARK ADMINISTRATION	
G.1. LOCATION OF RANGER STATIONS	
The ranger staff in the Park (and their families) are all housed at the Park Headquarters in the SE corner of the recreation zone. Servicing of facilities and visitors at Weano Gorge, for instance, entails a 114km round trip from the ranger station. Visitors entering the Park via Tom Price and the Joffre Falls Road are unlikely to make an initial contact with Park rangers.	■ The centralization of staff facilities at the Park Headquarters effectively reduces the capacity to service visitors at the western end of the recreation zone.
G.2 STAFFING LEVELS	
The current staff complement is 4 rangers with regional (Karratha) and specialist branch (Perth based) support. One of these positions is Ranger-in-charge of the Park. Minimum staffing levels are largely governed by the requirements of visitor management (e.g. interpretation, maintenance of facilities, regulation) during the peak season. A minimum of 3 staff are needed in the event of a rescue operation.	■ The workload on staff is related to the level of Park visitation. Visitation can be expected to increase, particularly if new accommodation is developed to service the Park. ■ Staff absences during the peak season limit management effectiveness.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- As resources allow, CALM will develop a second ranger station in the Joffre Falls area. As an interim measure mobile rangers will be stationed at Joffre Falls for the duration of the peak season, depending on staff availability.
- CALM will investigate the option of housing a ranger in Tom Price as a means of managing southern areas of the Park and other CALM interests in the region.

- CALM will seek to increase staffing levels for the Park in response to increasing management demands. Consideration will be given to recruitment upon the basis of maintaining, or improving, the present staff: visitor ratio for the Park.

- Accrued leave will be scheduled during the off-peak period (summer months).

INFORMATION SUMMARY	MANAGEMENT IMPLICATIONS
G.3 STAFF HOUSING AND FACILITIES Existing facilities at the Park Headquarters include 4 staff houses, visiting staff accommodation, diesel generator, workshop, and a demountable office.	■ The development of a second ranger station would require the duplication of some facilities. ■ Diesel fuel used for power generation is a major cost to the Park (approx. $40,000 in 1987/88).
G.4 PUBLIC BUILDINGS There are currently no public buildings in the Park. The existing Park office is inadequate for public purposes. There is no venue for public lectures or displays.	■ Entry stations are a necessary facility for the purposes of public information. ■ Expansion of the existing office may allow it to be used for both Park administration and public display purposes.
G.5 COMMUNICATIONS There is a single line telephone link to the Park for use by staff and the public. A public telephone receiver is situated outside 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 RFDS frequencies are available. The VHF system is for Park communication and is dependent upon a temporary repeater station located in the recreation zone.	■ Telephone communication facilities need to be upgraded to avoid conflicts between CALM and public demands. ■ The installation of a permanent VHF repeater station would improve the reliability of Park communications.

PROPOSED PRESCRIPTIONS (OR OTHER REFERENCE)

- Assuming that additional staff are recruited to the Park, the following staff facilities will be constructed at Joffre:
  - staff housing
  - generator
- CALM may seek the assistance of Hamersley Iron in accommodating an additional ranger at Tom Price.

- CALM will investigate alternative power generation technologies (e.g. diesel with battery backup or solar with auxillary generator) for new ranger facilities.

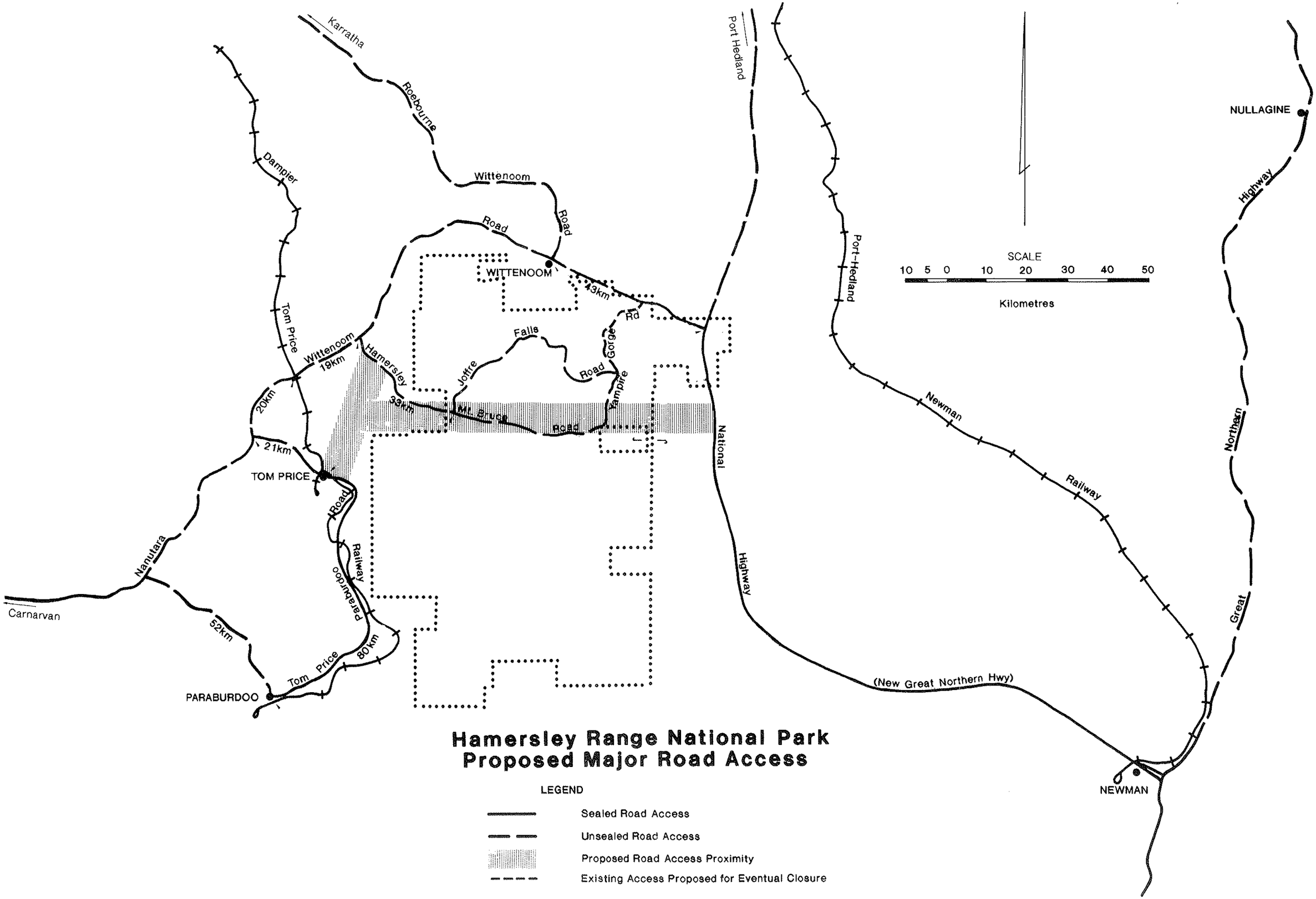
- Three entry stations will be built at the locations shown in Map 10.

- As resources allow, the Park office will be expanded into an effective administrative and public facility.
- CALM will investigate the potential for developing an outdoor interpretive centre for evening films, lectures etc.

- CALM will approach Telecom concerning the establishment of additional telephone lines to the Park.

- As resources allow, CALM will establish a permanent VHF repeater station at a strategic point in the Park.
- Further development of radio communications will be in accordance with CALM Policy Statement no.21 "Communications".

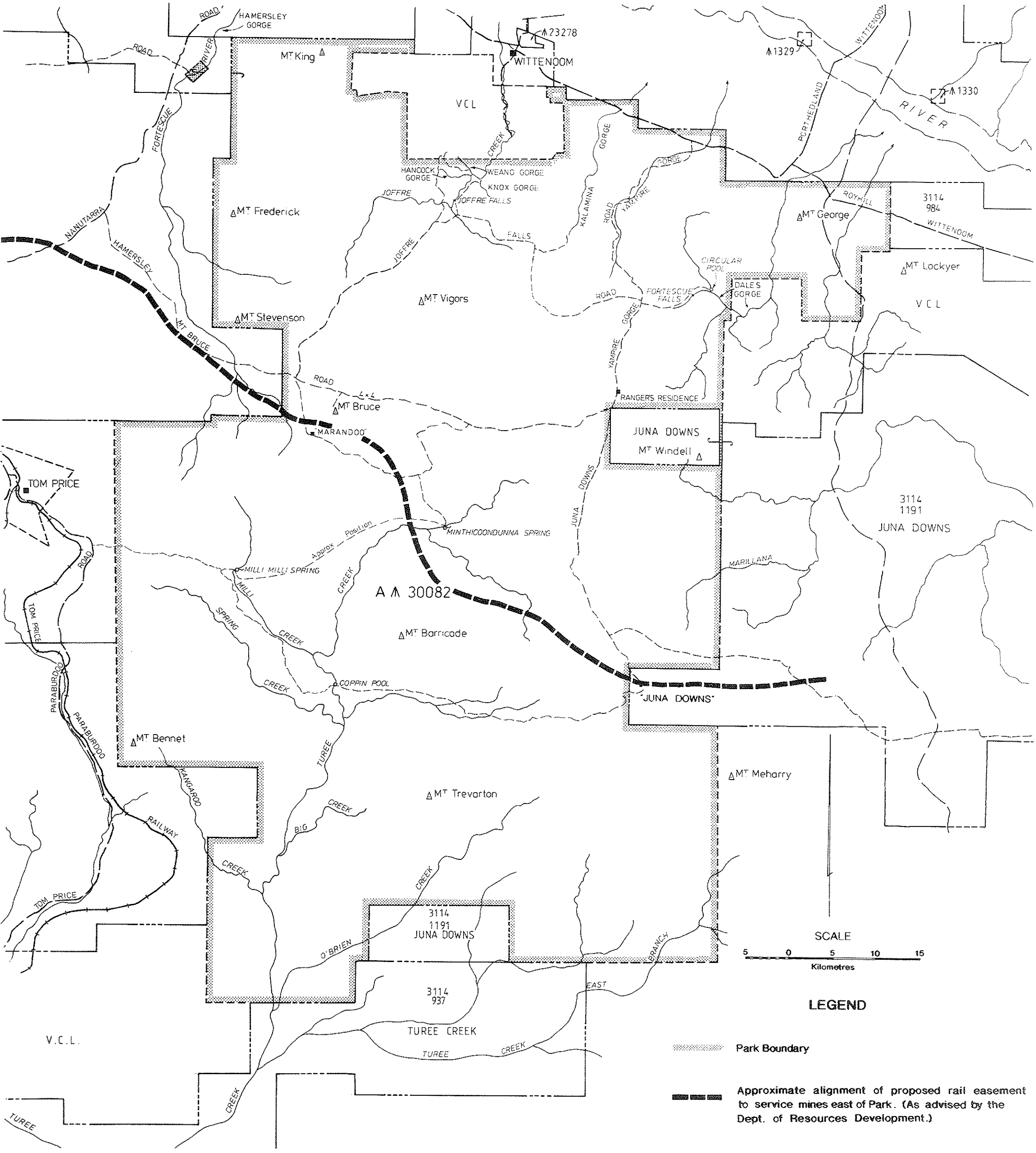
Hamersley Range National Park
Proposed Major Road Access



LEGEND

- Sealed Road Access
- Unsealed Road Access
- Proposed Road Access Proximity
- Existing Access Proposed for Eventual Closure

Map 8



Hamersley Range National Park
Possible Easement for Mining Infrastructure

Map 9

LEGEND

- Information
- Parking
- Caravans
- Camping
- Water
- Lookout
- Walking Trails
- Disabled Access
- Proposed Entry Stations

SCALE
5 0 5 10
Kilometres

WITTENOOM
Mt. King
Mt. Frederick
Mt. Vigors
Mt. Stevenson
Mt. Bruce
"MARANDOO"
Mt. George
WEANO GORGE
HANCOCK GORGE
RED GORGE
KNOX GORGE
JOFFRE FALLS
New Campground
Joffre Turnoff
CIRCULAR POOL
FORTESCUE FALLS
DALES GORGE
New Campground
Fortescue Turnoff
RANGER'S RESIDENCE
NANUTARRA ROAD
FORTESCUE RIVER
HAMERSLEY
MT. BRUCE ROAD
JOFFRE FALLS ROAD
PORT HEDLAND ROAD
KALAMINA GORGE ROAD
WITTENOOM GORGE ROAD
YAMPIRE GORGE ROAD
(New Great Northern Highway)
HIGHWAY
NATIONAL PARK
JUNA DOWNS

Hamersley Range National Park
Park Facilities

Hamersley Range National Park

Mining Tenements

Source:W.A. Dept. of Mines

Map 11

H. PARK PROGRAMMES

Actions to be taken as a consequence of the planning process have been grouped and summarized in the following table. Regulatory prescriptions, or actions conditional upon other developments, have not generally been included in this summary.

Priorities have been assigned as follows:

High Essential to the stated objectives of the management plan;

Medium Essential to the long term objectives of the plan but may be deferred pending the availability of resources;

Low Desirable but will only be undertaken when other demands on resources have been met.

References are shown as the page no. followed (in brackets) by the number of the prescription from the top of the page.

Proposed action	Priority	References
H.1 Management of natural resources		
■ Production of a Park inventory of fauna and flora resources.	H	24(5), 30(1), 78(5)
■ Development of a comprehensive fire operations plan incorporating the following elements:		38(3), 40(1-6)
• collection of fire history data following consultation with the Panyjima People.	H	38(1-2)
• development of an initial mosaic burning regime for buffers around no planned burn areas.	H	40(1-6), 26(3), 28(7)
• long term development of an aerial mosaic burning regime.	M	38(4)
• staff training in fire management.	H	38(3)
• establishment of mechanisms for evaluating the impact and effectiveness of fire management.	H	38(6), 40(6)

Proposed action	Priority	References
■ Development of a feral animal control programme incorporating the following elements:		46(1)
• maintenance of a register of all exotic animals in the Park.	H	46(2)
• preparation of a fencing programme.	H	46(6)
■ Ongoing weed control measures including the following:		42(2)
• maintenance of a register of weeds and control activities.	H	42(1)
• removal of all female date palms.	H	44(3)
• minimization of soil disturbance.	H	50(6)
• appropriate location of public facilities.	M	42(6)
■ Cooperation with APB in the development of Dingo management proposals.	H	34(6)
■ Demarcation of Park boundaries for the purposes of aerial baiting.	M	36(3)
■ Reservation of alluvial land systems and habitats.	L	58(1-3)
■ Collection and documentation of Aboriginal knowledge in relation to traditional land management and ecology.	H	63(8)
■ Preparation of guidelines for sound earthworks practice.	M	50(7)

H.2 Management of cultural resources

■ Establishment of an Aboriginal Heritage committee.	H	61(1)
■ Collection and documentation of the history of local mining and pastoralism.	M	65(2)

Proposed action	Priority	References
■ Archaelogical condition assessment of historical structures.	M	65(3)
■ Termite treatment of selected historical structures.	H	32(3)
■ Development of a special use area for visiting Traditional custodians.	M	61(6)

H.3 Management for visitor use

■ Development of an interpretive programme incorporating both interpretation and visitor information. The programme will include the following elements:		
• interpretation of plant ecology and evolution.	M	88(1-6)
• interpretation of the relationship between fauna and habitat.	M	30(3)
• selective interpretation of Park's Aboriginal heritage.	H	63(2)
• interpretation of European exploration and settlement.	M	61(1)
• information concerning Park regulations and and public safety issues - particularly in relation to the northern gorges.	H	74(3), 84(7), 88(2), 100(2&4)
• promotion of appropriate recreational opportunities and preparation of a pamphlet on bushwalking in the Park.	H	76(1), 78(2)
■ Implementation of Park zoning plan.	H	17-18, 76(4)
■ Design of facilities for wildlife observation.	L	78(6)
■ Preparation of operational guidelines for the regulation of low-flying aircraft over the Park.	M	70(5)

Proposed action	Priority	References
■ Coordination of field assessments of any risks associated with airborne asbestos.	H	100(1&5)
■ Safety assessment of existing walking tracks and lookouts. Closure of unsafe facilities.	H	84(9), 86(1)
■ Continued provision of facilities and services to campers and other Park visitors.	H	76(6), 82(2)
■ Preparation of a development plan for the relocation and improvement of camping and day-use facilities.	H	82(5)
■ Investigation of the potential development of an outdoor centre and expanded office for interpretive purposes.	L	84(6)
■ Documentation of emergency response procedures for search and rescue.	H	84(8)
■ Collection and analysis of visitor statistics according to VISTAT guidelines.	H	90(1-2)
■ Establishment of a HRNP Advisory Committee.	H	19

H.4 Research and monitoring

■ Monitoring of the impacts of recreation upon gorge ecosystems.	M	90(3)
■ Monitoring of the impacts of fire management upon vegetation and management.	M	38(6)
■ Research into the specific habitat requirements of restricted plants and animals.	H	32(6)
■ Maintenance of a Park herbarium.	M	24(6)

Proposed action	Priority	References
■ Maintenance of a register of all sightings of rare or restricted fauna.	M	32(7)
■ Survey of invertebrate fauna.	L	32(2)
■ Assist investigation (by APB) into the impacts of 1080 on non-target species.	M	34(1)
■ Investigation of possible re-introduction of CWR mammals.	L	34(3)
■ Sampling for previously recorded mammals.	M	34(5)
■ Investigation of alternative technologies in relation to power supply and sewage disposal in the Park.	M	104(3)

H.5 Capital works

■ Implementation of fencing programme.	H	46(6)
■ Design and construction of suitable pedestrian access to the summits of Mt Bruce and Mt Meharry.	L	74(5)
■ Construction of suitable shade structures in public areas.	M	86(5)
■ Construction of Park entry stations.	H	104(4)
■ Sealing of Park roads along existing alignments.	L	72(7)
■ Design and construction of gorge walking tracks and lookouts to improved safety standards.	H	74(2)
■ Development of wheelchair access to nominated vantage points.	H	74(4)

Proposed action	Priority	References
■ Construction of new campground and day-use facilities. Closure and rehabilitation of superseded facilities.	H	76(7), 82(5)
■ Improvements to communication facilities.	M	104(7-8)
■ Closure of Yampire Gorge access once high standard alternative road access has been developed.	M	72(4)
■ Construction of wildlife observation facilities.	L	78(6)
■ Erection of safety signs.	H	74(3), 84(7), 86(7), 100 (2)

I. IMPLEMENTATION AND REVISION

I.1 Implementation of the plan

The management plan will be implemented by CALM within the framework of available public resources. Priorities have been assigned to tasks from the perspective of Hamersley Range N.P. It is recognized that priorities might change in the light of changed circumstances or in response to other Regional or State priorities. CALM has yet to prepare a regional plan for the Pilbara.

It is proposed that the status of plan implementation be reviewed annually by CALM regional and branch personnel. Where it is considered that the Park is not being managed in accordance with the plan, steps will be taken to amend management practice or, alternatively, revise the plan.

I.2 Revision of the plan

The management plan will remain in force for a period of 10 years, expiring in 1999. Amendments may be made to the plan within this period. In the event of the plan being revoked before expiry, a new plan will be substituted in accordance with the provisions of the CALM Act.

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APPENDIX I

I.A Siting Criteria (commercial accommodation)

The following siting criteria will be applied to any proposal for the development of commercial visitor accommodation within HRNP.

Locational:

- within Park recreation zone
- 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.

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.

Aboriginal:

- in an area specifically sanctioned by the Aboriginal Heritage Committee.

Technical:

- not in an area where sewage disposal may cause environmental problems.
- in an area with proven groundwater resources.
- not in a flood prone area.
- in an area that can be serviced by underground utilities.

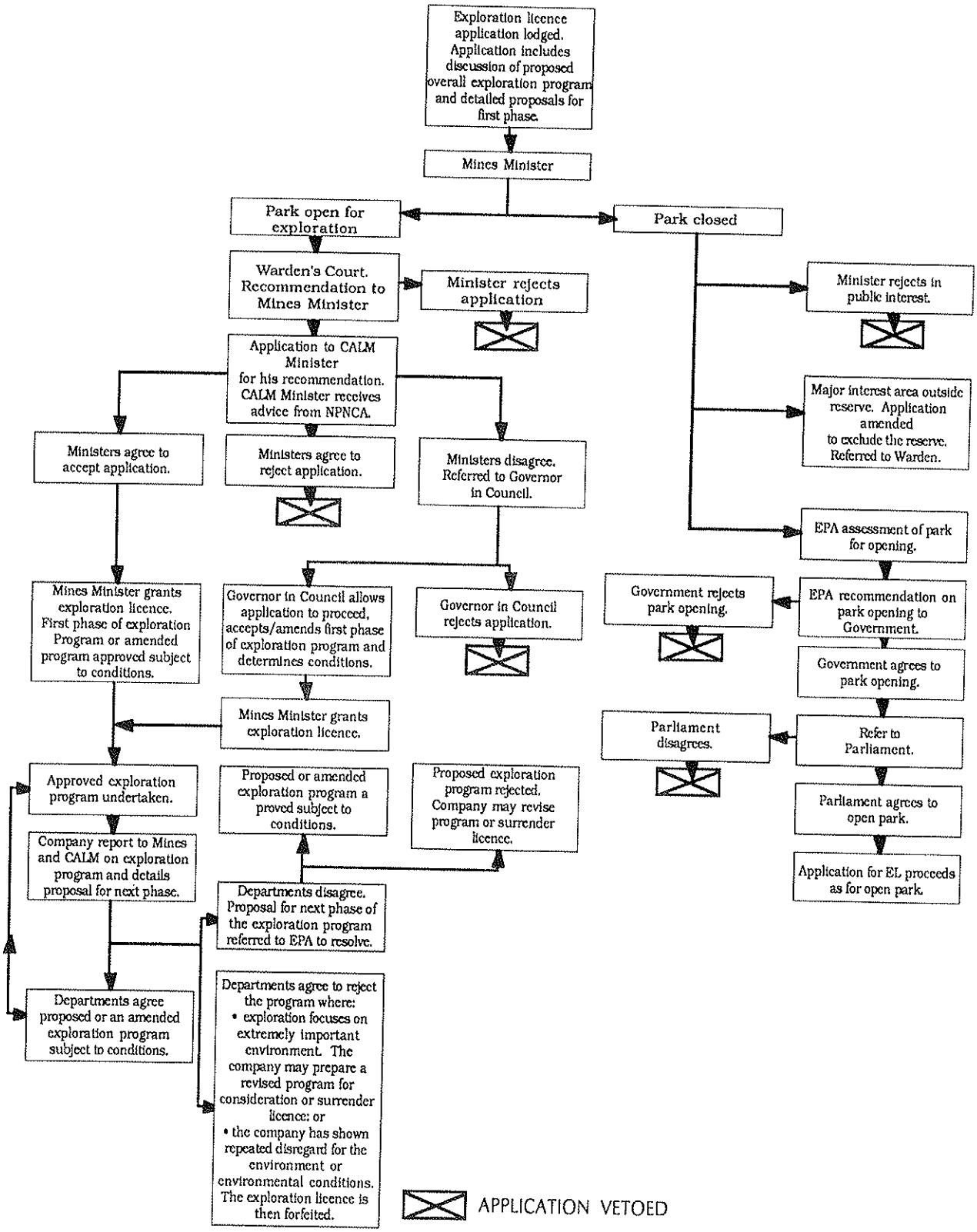
I.B Environmental considerations (commercial accommodation)

Any environmental consideration of proposals for the development of commercial accommodation in the Park will include consideration of 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 - restrictions on introduced species.
- Firearm restrictions.
- Preservation of ground surface.
- Disturbance of soil material.
- Disposal of waste, including toxic waste.
- Noise.
- Borrow and gravel pits.
- Aboriginal concerns.
- Environmental monitoring.
- Breaches of environmental protection provisions.
- Accommodation of personnel.
- Engagement and conduct of personnel.
- Orientation of workforce.

Appendix IIA

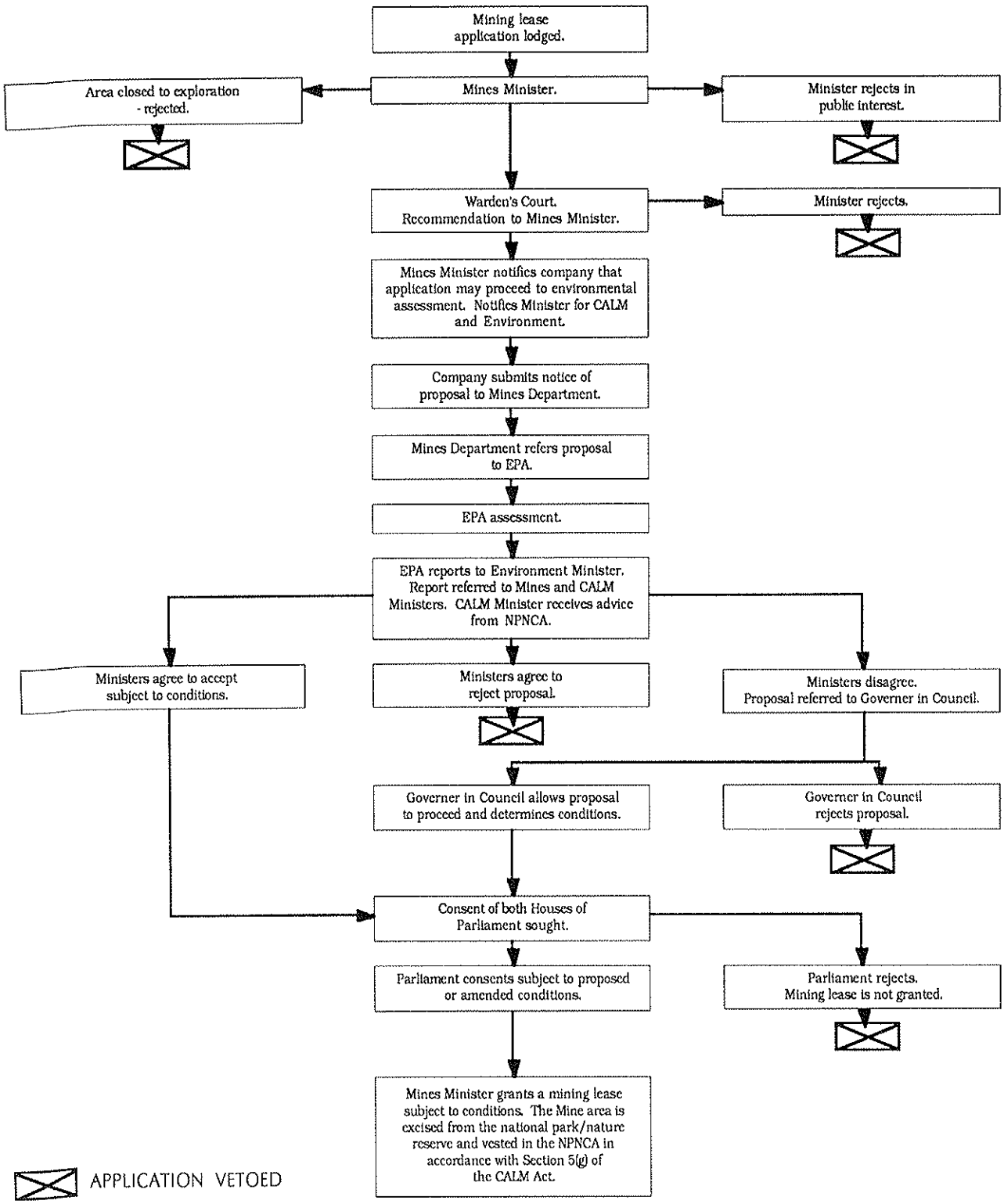
Summary of current procedures in relation to Exploration Licence applications in national parks.



Source: Mining and the Environment. Balancing the scales. A Western Australian Government Policy Report (undated).

Appendix IIB

Summary of current procedures in relation to Mining Lease applications in national parks.



Source: Mining and the Environment. Balancing the scales. A Western Australian Government Policy Report (undated).