Angas Hopkins
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regards
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ACHIEVING A BALANCE BETWEEN MINERAL RESOURCES AND RESERVES FOR BIODIVERSITY IN THE RANGELANDS OF WESTERN AUSTRALIA

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Abstract

The Rangelands of Western Australia comprise 85 percent of the State's land area. They provide the setting for the Western Australia and Commonwealth governments' Strategy to increase the extent of the land to be managed for biodiversity conservation. Crucially, they also contains operating mines, important mineral deposits, and extensive areas of relatively under-explored ground. WA legislation and State government policy stipulate that all land is accessible for exploration and resource development. Consequently, the Departments of Minerals and Energy and Conservation and Land Management are required to manage the competing demands of nature conservation and resource development. This situation is exemplified in the Gascoyne Murchison Region where the Department of Conservation and Land Management's program of purchasing pastoral leases for their biodiversity conservation values is being implemented in a manner that takes into account the need to maintain access for exploration and resource development.

Introduction

This paper outlines how the respective West Australian Departments of Minerals and Energy (DME), and Conservation and Land Management (CALM) review the resource potential and biodiversity values of pastoral leases within the Gascoyne-Murchison Region. Two examples of pastoral leases that have been purchased for addition to the CALM managed estate, have been chosen to illustrate the procedure and processes used by the two agencies. These examples show how both nature conservation and resource development objectives can be met. The lessons learnt are applicable to other rangeland regions.

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Western Australia's large and economically important resource sector depends upon the discovery of new mineral deposits and oil/gas fields to replace those which have been exploited and rehabilitated. Exploration is reiterative and land is made available to Industry, provided field activities are environmentally approved. This continued access enables Industry to take advantage of increased scientific understanding and new exploratory techniques as well as changing economic circumstances. (Ranford et al. [1996]).

DME administers the provisions of the Mining and Petroleum Acts which set out how exploration and resource development are to be conducted in WA. These Acts as well as Coalition government policies, allow access to all classes of land (including national parks) provided that environmental safeguards are adhered to. These safeguards relate to the risks posed by exploration and/or development. Exploration programs and development projects are reviewed by DME in consultation with CALM and, where necessary, are referred to the Environmental Protection Authority (EPA).

The procedures to be followed by Industry, DME, EPA and CALM are outlined in legislation and departmental publications. Ministerial consultation or concurrence about environmental conditions are required before exploration is allowed in environmentally sensitive areas. CALM is able to consult with the EPA and the Department of Environmental Protection when ground disturbing activities are proposed. Crucially, all proposals for new biodiversity reserves are screened by DME and are referred to the Minister for Mines. Government policy and the Mining Act gives the Minister for Mines the power of veto to ensure that geologically favourable lands are not sterilised.

CALM administers the Conservation and Land Management and the Wildlife Conservation Acts and is the lead agency with respect to biodiversity conservation. The CALM managed estate comprises 20 million hectares of which 14 million hectares are rangeland. (Batini [1999])

Since 1992, both the State and the Commowealth governments have encouraged the management of Australia's rangelands using environmentally sustainable development criteria. The two levels of government are cooperating to establish a Comprehensive, Adequate and Representative (CAR) reserve system in the Gascoyne Murchison Region (Brandis [1998], Batini and Brandis [1999]).

CALM and DME must work together to ascertain the overlap between conservation values and mineral and hydrocarbon propectivities and how these competing interests could be resolved to establish biodiversity reserves.

Currently the two agencies are dealing with resource access and tenure issues for 30 pastoral leases that are being considered for purchase. The proposed extensions to the Kennedy Range National Park and the proposed Muggon Conservation Park are two examples taken to illustrate how the competing interests of resource development and nature conservation are being addressed.

Methodology

CALM has been steadily purchasing pastoral leases in the region on the open market. It employs its comprehensive databases to determine whether the leases are suitable for nature conservation. Since December 1998, CALM has purchased eight leases and parts of nine other properties in the region totalling 1.9 million hectares. (McNamara et al. [1999])

The usual interagency procedure is for CALM to consult in turn with the Valuer General (to obtain advice and services), the WA Department of Land Administration (DOLA) (for survey and land title details), the WA Agriculture Department, the pastoralist and Pastoral Lands Board (range conditions, purchase price, infrastructure and approvals), the Shire or local government authority (usually with respect to access by the Shire to road-making materials) and DME (concerning geology, tenements, resource potential, proposed boundaries and land tenure). (Batini [1999])

In the case of very prospective pastoral leases, CALM contacts DME directly. Should DME confirm that it would be unable to recommend Ministerial approval under Section 16(3) of the Mining Act then CALM will either discontinue its acquisition of the lease or will endeavour to negotiate with DME concerning the tenure for the proposed biodiversity reserve. DOLA has to have approval in writing from DME and/or the Minister for Mines before the proposed biodiversity reserve can be created under the CALM Act.

When DME receives a request from CALM about the resource potential of a pastoral lease DME assembles and researches all available and relevant geological, geochemical and geophysical data. A draft report is prepared by DME and used in referrals to companies and individuals with exploration and development interests in the area. Every endeavour is made to be as current as practicable. Any data or information that is supplied by Industry is used - within the limits imposed by confidentiality - to revise the report before it passed to CALM.

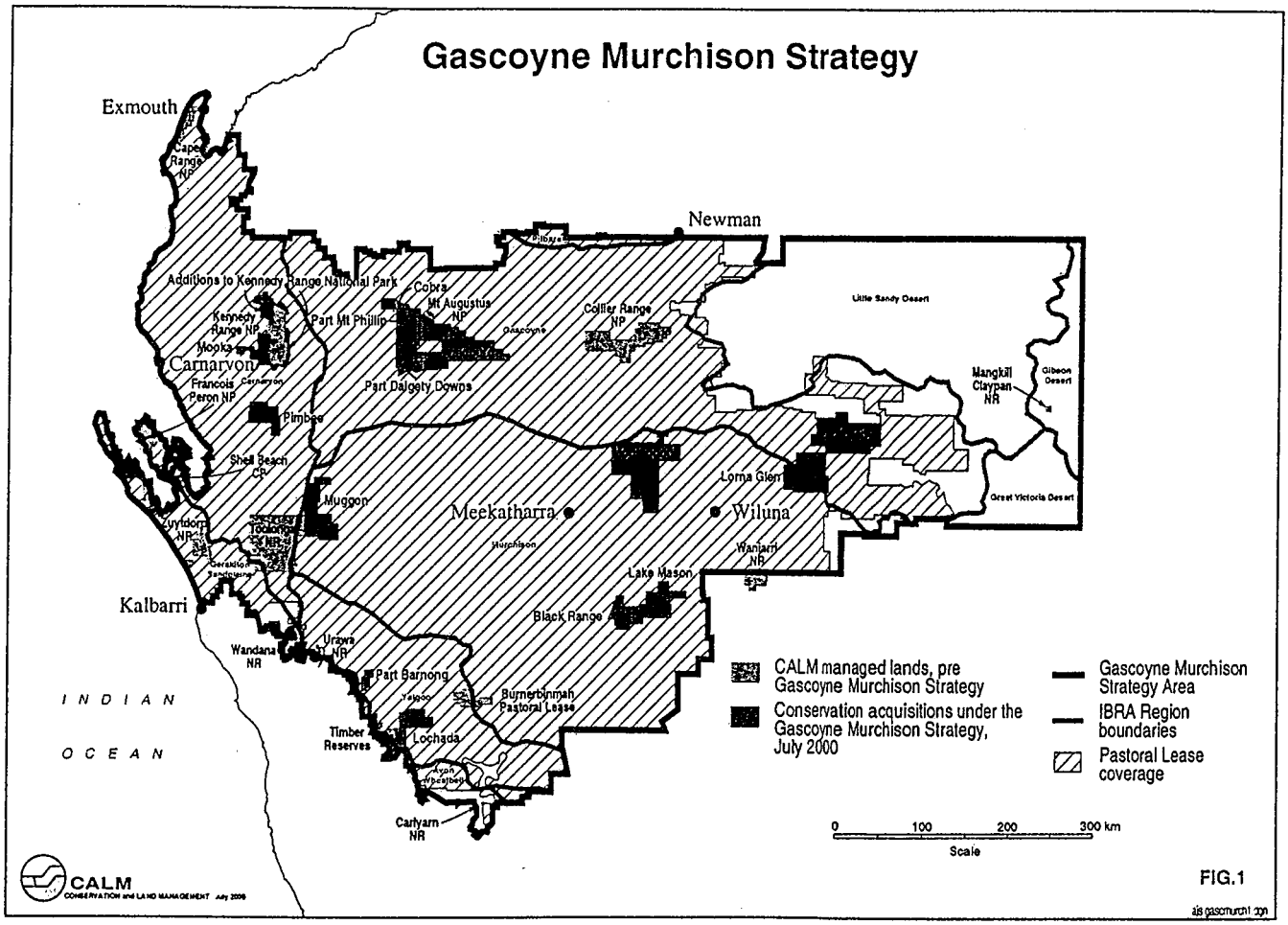
Each proposal is considered within the statutory and corporate policies under which the agencies operate. Industry is kept informed and has opportunities to provide comments throughout this procedure. In late March 2000 exploration, senior mining and prospecting industry representatives were briefed about the proposed extensions to the KRNP and creation of the Muggon Conservation Park and their comments were used to advise DME's Executive. In October 2000 field inspections were made and on-site meetings held with regionally based company personnel. All negotiated outcomes require referral by CALM and DME to industry, shires, and appropriate Aboriginal communities and corporations. Where necessary the proposals are refined and are then presented by CALM and DME for endorsement by their respective Executives and Ministers before approval by State Cabinet and gazettal by DOLA as biodiversity reserves.

Importantly for industry the array of environmental conditions that are imposed by the Minister for Mines on tenements occurring on CALM managed pastoral leases enable well conducted programs to proceed. (Refer Pamphlet 11 [Mineral Exploration and Mining] and November 1999 Guidelines [Petroleum Exploration and Protection]). Both

DME and CALM expect that industry will protect the biodiversity of these ecologically significant areas.

Gascoyne Murchison Region

The Gascoyne Murchison region, east of Carnarvon and north east of Geraldton, covers an area of approximately 34 million hectares (refer Figure 1). This arid region includes 253 pastoral leases and unallocated (or vacant) Crown land. The region is noted for its high biological diversity and contains 221 (or 25 percent) of the State's vegetation associations. To meet national conservation criteria between 10 and 15 percent of the region would need to be included in the CAR reserve system. However, prior to 1988 only three percent of the region was in the CALM managed conservation estate. (McNamara et al. [1999])


Gascoyne Murchison Strategy
Exmouth
Cape Range NP
Newman
Additions to Kennedy Range National Park
Kennedy Range NP
Mooka
Carnarvon
Francois Peron NP
Part Mt Phillip
Cobra
Mt Augustus NP
Part Dalgety Downs
Collier Range NP
Little Sandy Desert
Mangkili Claypan NR
Gibson Desert
Great Victoria Desert
Pimbee
Shell Beach CR
Muggon
Meekatharra
Wiluna
Lorna Glen
Wanjarri NR
Lake Mason
Black Range
Kalbarri
Wandana NR
Urawa NR
Part Barnong
Burnerbinmah Pastoral Lease
Timber Reserves
Lochada
Carlyarn NR
INDIAN
OCEAN
CALM managed lands, pre Gascoyne Murchison Strategy
Conservation acquisitions under the Gascoyne Murchison Strategy, July 2000
Gascoyne Murchison Strategy Area
IBRA Region boundaries
Pastoral Lease coverage
0 100 200 300 km
Scale
CALM
FIG.1

The scientific framework for CAR is the Interim Biogeographical Regionalisation of Australia (IBRA). Eight of these bioregions are represented in the Gascoyne Murchison region and studies by CALM indicate that 90 percent of the region's vegetation types are under-represented in reserves. In April 1998, under the Gascoyne Murchison Strategy, CALM was allocated $6.8 million over six years by the Coalition government to purchase pastoral leases as they came on the market for creation as biodiversity reserves. The Commonwealth government has also made funds available under the auspices of the National Reserves System Program of the Natural Heritage Trust. (Batini and Brandis (1999])

In geological terms the Gascoyne Murchison region comprises the northern fifth of the Yilgarn Craton, the major part of the Carnarvon Basin and the southern half of the Capricorn Orogen. The region includes the major greenstone belts of the Murchison and Southern Cross terranes.

The Mid West Minerals Province covers the western two thirds of the region. In 1998 the WA Department of Resources Development (DRD) commissioned the Geological Survey Division of DME and consultants to investigate the province's geology and mineral resources (including oil and gas). This geological work forms the basis of an infrastructure study by the Snowy Mountains Engineering Commission. Both studies form part of the Commonwealth Government's Regional Minerals Program. This is a partnership between Industry, State and Commonwealth governments. The studies have significant links with the Gascoyne Murchison Strategy.

The DME/DRD study reveals that resource development in the province in 1997/1998 totalled $912 million. Gold production contributed 56 percent of this figure. DME's databases for this study record over 1800 resource occurrences. Important mines and prospects are centred around Mt Magnet, Meekatharra and Wiluna. Major gold operations occur at Paynes Find, Dalgaranga and Plutonic and base metals at Golden Grove. Mining and exploration expenditure in the province over the past eight years amounted to $4.2 billion (or 16 percent) of the State's total. After the Eastern Goldfields, the Mid-West is the second largest gold producing area and presents major opportunities for further exploration and new discoveries. Exploration for other commodities has fluctuated over the past two to three decades. In the 1970's, for example, there was strong interest in exploring for uranium while the focus has recently been upon looking for iron-ore and vanadium. (Flint et al. [1999])

Proposed extensions to the Kennedy Range National Park

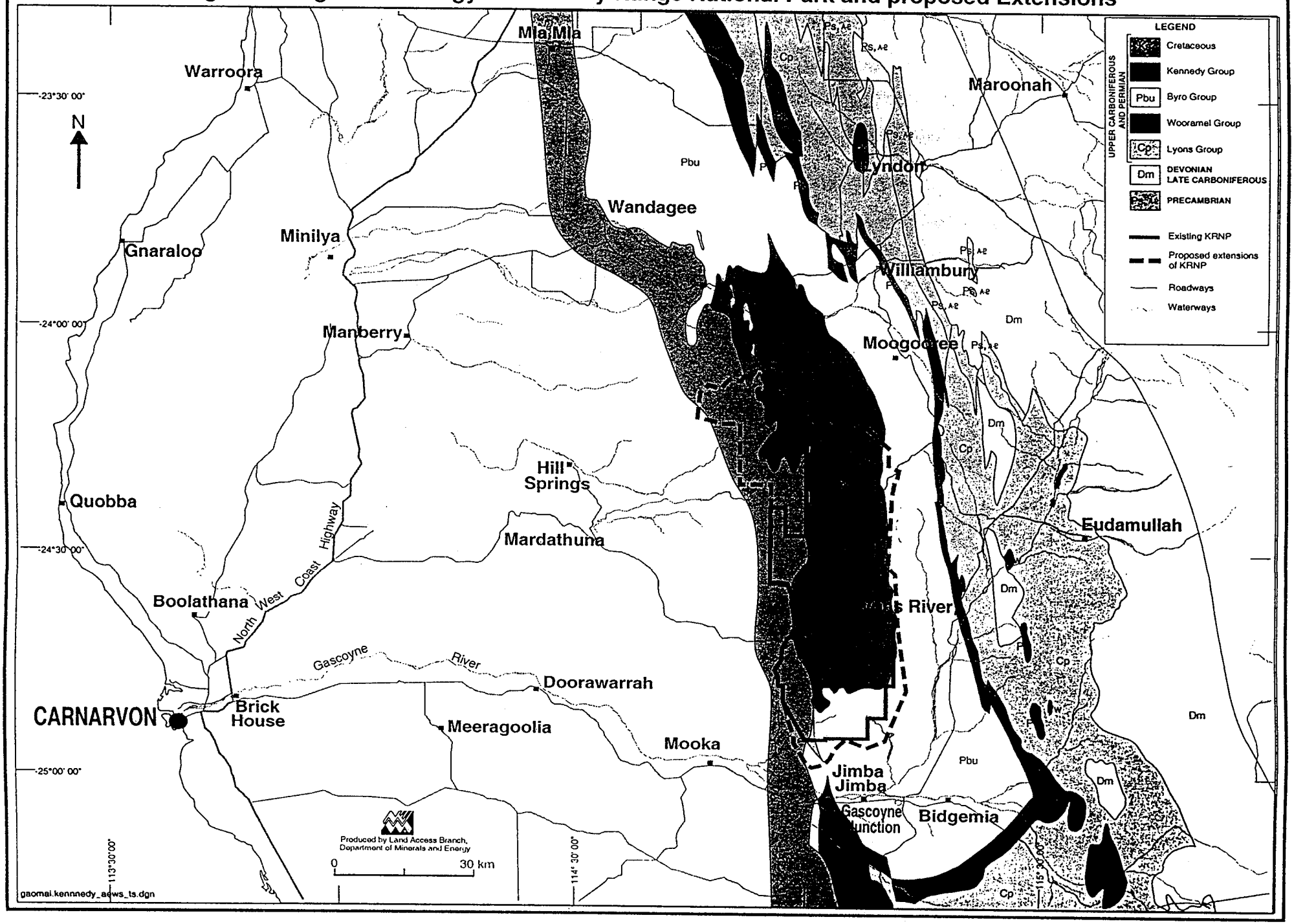
The Kennedy Range National Park (KRNP) is approximately 150 kilometres east of Carnarvon within the Shires of Carnarvon and Upper Gascoyne. The KRNP covers an area of 141,660 hectares and is a large sandstone plateau which is an isolated remnant of the Victoria Plateau. The Kennedy Range stretches 75 kilometres from north to south and is 25 kilometres wide. Red sand dunes trending east to-west and south-east to north west lie on top of the range. The present boundaries of the KRNP were determined following investigations and negotiations by CALM and DME during 1989-1992. (Ferguson et al. [1992])

The KRNP was gazetted on 8 January 1993 and is located in one of the fastest growing tourist areas in the Gascoyne Region. It lies roughly within the centre of the Carnarvon bioregion. However, significant landscape, geological and palaeontological (fossil-rich) features located on adjacent pastoral leases and occurring on the slopes, gorges and foothills of the Kennedy Range were not included in the original KRNP. Since the WA Environmental Protection Authority Red Book review of the mid-1970's it has long been the intention of successive State governments that the final park boundaries would encompass these important features. The vegetation is mainly acacia. These vegetation associations are not well represented elsewhere in the conservation estate in the region. Taken together, the proposed extensions would improve the biodiveristy conservation value of the existing KRNP as well as improving the long-term viability, and hence, meet the adequacy component of CAR. The area's general manageability with respect to tourism will also be improved. (Brandis [1997]; McNamara et al. [1999])

Geologically, the KRNP and its proposed extensions, lie entirely within the sandstones and shales of the Merlinleigh Sub-Basin of the Carnarvon Basin. The Kennedy Range itself is at the core of a large, north-south trending syncline, which is the deepest part of the Merlinleigh Sub-Basin. The Carnarvon Basin as a whole extends 1000 kilometres along the west and north west coastline of Western Australia. It is up to 300 kilometres-wide and contains sediments ranging from Silurian to Quaternary in age. Onshore these sediments are up to 7 kilometres in thickness and extend up to 15 kilometres offshore.

Since 1970 more than 20 companies have explored in the general area (refer Figure 2). From an explorationist's viewpoint, the probable commodities are hyrocarbons (oil, gas and coal), lead, zinc, copper, silver, diamonds, gold and platinum, phosphate, titanium minerals and lapidary stone. This lengthy history of exploration aimed mainly at finding base metals, uranium and diamonds, did not result in any significant discovery.

Figure 2. Regional Geology of Kennedy Range National Park and proposed Extensions



Base metal potential lies principally in the Devonian - Carboniferous carbonate units. They outcrop at least 18 kilometres east of the KRNP. Consequently, if these units do exist beneath the KRNP and its proposed extensions, they would be present at great depth. Similar considerations are likely to apply to the resource potential for uranium in roll-front or penecontemporaneous target types. They would probably be sited near to the basin margin. The area's diamond potential has been downgraded due to poor results from Wandagee, located 35 kilometres north west of the KRNP. This prospect's geology comprises the Jurassic Wandagee alkaline lamprohyres which intrude the Palaeozoic sediments of the Merlinleigh Sub-Basin. Landsat imagery was studied and structural features interpreted. The exploration licence hosts six known pipes and seven small sills. These tuffaceous diatremes have been eroded and no crater facies are present.

The synclinal area under Kennedy Range remains largely unknown in terms of oil/gas potential because of sand cover and difficulties in obtaining good quality seismic data. However, several major faults cut the syncline, based on outcrop to the north on Middalaya and Williambury Stations, so there is potential for fault traps, which could jutaxpose source and reservoir.

Excluding the yet-to-be confirmed occurrences of hydrocarbons, the mineral resource potential of the pastoral leases purchased for extending the KRNP is considered on the basis of available geological evidence to be low (Ferguson et al. [1992]; Gao Mai [1999]). There is on-going interest by prospectors in lapidary stone. In early 2000, Herald Resources applied for two exploration licences on the Mooka pastoral lease southwest of the KRNP. The company is exploring for gold and base metals. Mooka was purchased by CALM in late August 2000 and may be added to the KRNP.

The proposed Muggon Conservation Park

Muggon Pastoral Lease is 216 km north of Mullewa and straddles the boundary between the Carnarvon and Murchison IBRA regions (refer Figure 1).

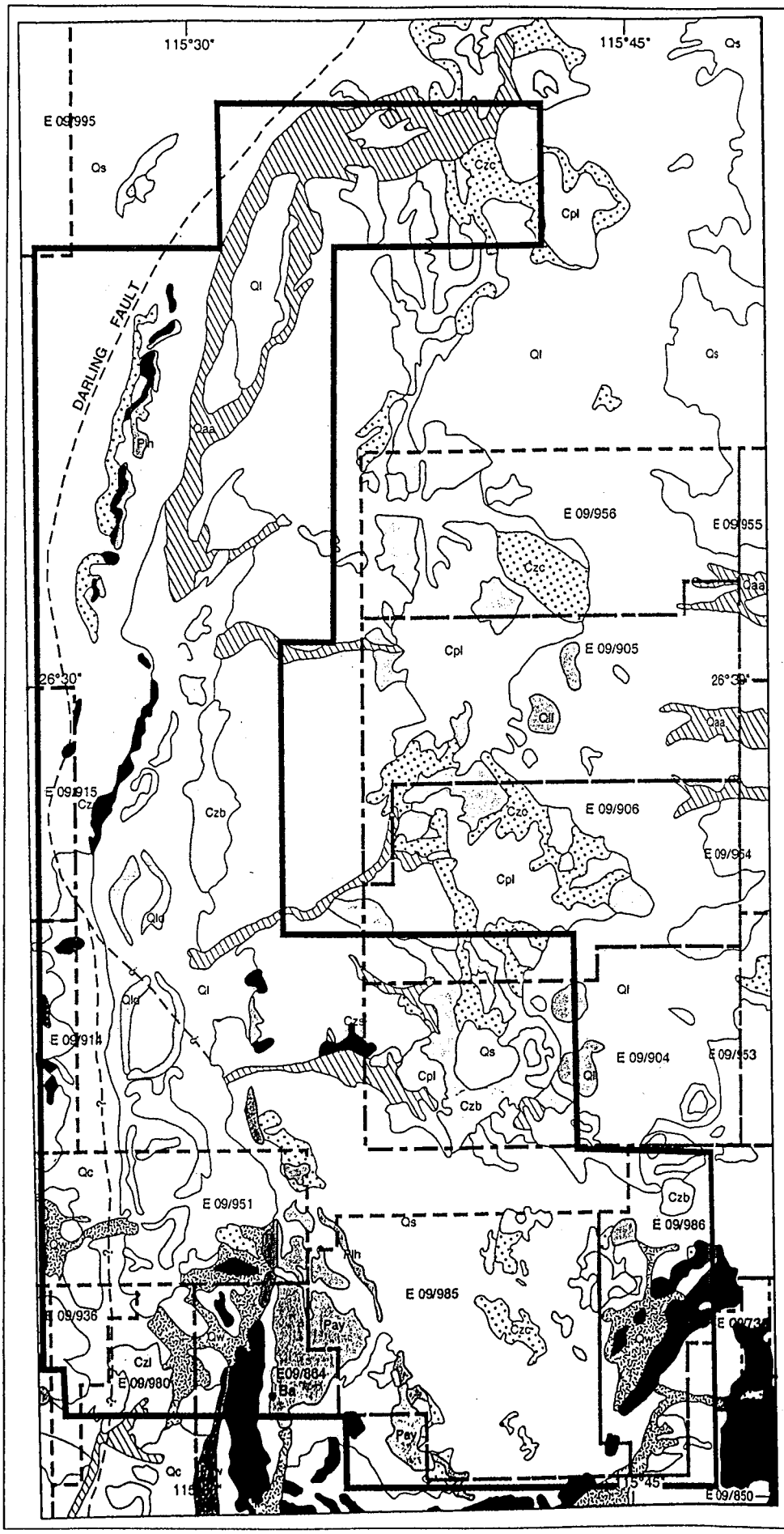
The purchase by CALM in February 1999 of Muggon was preceded by extensive mapping by CALM of the pastoral lease's vegetation types and by the WA Agriculture Department of its pastoral condition. The most extensive vegetation type within the Muggon Pastoral Lease is bowgada (*Acacia ramulosa)* covering approximately half of the lease's 182,743 hectares. The lease also has useful lakes frontages and wetland types. Acquisition of the lease was argued also on the basis of the differences between it and the adjoining Toolonga Nature Reserve (Brandis [1998]). Toolonga Nature Reserve was created after investigations and negotiations between CALM and DME in the early 1990's.

From the geological perspective, the Muggon Pastoral Lease is underlain by rocks of the Palaeozoic Lyons Formation (and Holmwood shale) and those of the Proterozoic Badgeradda Group. Most of the Palaeozoic rocks are situated within the Byro Sub-Basin which forms an embayment at the eastern margin of the Carnarvon Basin (Hocking [1987]). The Darling Fault, which is located close to the western boundary of the Muggon Pastoral Lease, defines the western boundary of the Byro Sub-Basin. (Refer Figure 3)

While there has been no recorded mineral production from the Muggon Pastoral Lease, there has been extensive exploration, mainly for diamonds, coal, base metals and gold in the general vincinity (refer Figure 3). Currently, there are four companies in the area actively exploring for diamonds and base metals.

The eastern part of the Muggon Pastoral Lease spans the north-western margin of the Archaean Yilgarn Craton where it is highly significant for diamond prospecting. There is significant potential for diamonds and there is some potential for base metal and gold. There is no hydrocarbon activity or potential. (Gao Mai [1999]).

FIG. 3 GEOLOGY OF THE MUGGON PASTORAL LEASE - 3114/866 AREA



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LEGEND

CAINOZOIC (QUATERNARY)

- Ql / Qld / Qll — Mixed salt lake (Qll) and dune (Qld terrain): saline in part
- Qaa — Alluvium-unconsolidated silt, sand, gravel; associated with drainage lines
- Qw — Alluvium-unconsolidated silt, sand in sheetwash and on piedmont plains, also overlies
- Qc — Colluvium-unconsolidated silt, sand and gravel in outwash fans and scree and talus slopes
- Qs — Eolian and residual sand

CAINOZOIC

- Czc — Hardpan-consolidated and semi-consolidated colluvium and alluvium, silt, sand, gravel
- Czb — Silcrete, "Billy" includes some silicified bedrock
- Czl — Laterite and ferruginous deposits
- Pindilya Formation: ranges from medium-grained to pebbly, poorly sorted sandstone

PALAEOZOIC (PERMIAN)

- Plh — Holmwood Shale: white weathering, micaceous calcareous to calcareous claystone, minor limestone, open marine
- Cpl — Lyons Formation: immature sandstone, siltstone,shale, tillite:contains numerous glacial erratics

BADGERGADDA GROUP

PROTEROZOIC

- Pay — Yarrawolyan Formation: siltstone, silty sandstone
- Coomberaie Formation: silty sandstone
- Paw — Woodrarrung Sandstone: cross-bedded, coarse-grained sandstone

- Granted Mining Act Tenements
- Pending Mining Act Tenements
- Darling Fault
- Ba — Barite

0 5 10 15 km

Land and Resource Access Branch
Department of Minerals and Energy
Sept. 2000

muggon_aerws_ts.dgn

Conclusions

The Western Australian processes are in keeping with the State government's policy of maintaining access for Industry to all geologically favourable areas in WA providing that environmental safeguards are followed.

CALM may decide in special situations to purchase the leases regardless of their resource prospectivities and DME is kept informed. This occurs where greenstone belts are involved because these geologically interesting sites are also attractive for their range and variety of plant and animal species. These vegetation types are often under-represented in the existing conservation estate.

DME's correspondence and reports form the basis for DME/CALM/DOLA negotiations concerning the probable boundaries, tenure and purpose of the proposed biodiversity reserves. Some of these may be extensions to existing national parks (eg Kennedy Range) or entirely new proposals (eg Muggon). In areas highly prospective for minerals it may be appropriate to establish other reserve types instead of a national park.

For Muggon Pastoral Lease which overlaps the diamond prospective ground of the Archaean Yilgarn Craton, DME has recommended to CALM that a conservation park would be appropriate.

In the case of the proposed extensions of the KRNP, DME agreed in September 2000 to these areas being added to the existing national park in view of the low resources potential of land involved.

CALM for its part facilitates Industry's access to proposed and existing biodiversity reserves. This is in the anticipation that well conducted programs may delineate areas of economic mineralisation or may determine that none exists. However, CALM expects that its pragmatic response to exploration and resource development engenders an acceptance by Industry and DME that additions to the CALM managed estate are beneficial.

The rangelands of Western Australia are experiencing immense changes with respect to the management of their wide range of economic, conservation, social and cultural values. This paper has concentrated upon the first two aspects to illustrate how seemingly opposite objectives can be accommodated and mutually acceptable outcomes achieved. The search for alternatives requires the painstaking marshalling of facts and a willingness to work within a multiple landuse context. Essentially everyone with a stake in the rangelands today is viewing, and dealing with, tomorrow in the making.

Acknowledgements

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