VEGETATION SURVEY OF THE LAKE CAMPION NATURE RESERVE (NO. 24789) AND RESERVE NO. 21759

Prepared for: Department of Conservation and Land Management Western Australia

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PLEASE NOTE - AREA COVERED BY SURVEY

This vegetation survey includes Reserve No. 24789 (Conservation of Flora and Fauna) except for the western section of the reserve; Reserve No. 21759 (Common) and Reserve No. 35963 (Recreation).

The boundaries of the last two mentioned are shown in Figure 3.

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1.0 INTRODUCTION

1.1 Project Description

In a regional context approximately 30% of Nature Reserves in the Wheatbelt Region are associated with salt lakes or saline drainage systems. Although this landform class accounts for a significant part of Department of Conservation and Land Management's estate in the Wheatbelt, little biological data is available. It is planned to target nature reserves representative of saline drainage systems/salt lake systems in the Wheatbelt for biological survey to:

(i) provide base data on both important individual reserves and to assess their significance within the "salt lake" reserve system as a whole. Once these base line surveys have been completed, CALM operational staff should be able to complete the biological surveys of the smaller "salt lake" reserves and evaluate areas proposed as reserves;

(ii) identify areas and vegetation types being adversely effected by agricultural clearing and related disturbance. As this landform occurs in the lowest part of the landscape, changes in regional water tables and their effect upon natural vegetation associations will show up first in these reserves; and

(iii) improve the data base used to evaluate mining tenements. Both gypsum and alunite occur, often as pure material, in lower dunes on the eastern and south eastern shorelines of the salt lakes. The selective mining of these low dunes may eliminate this habitat type within the reserve system, as well as on suitable areas on privately owned land. It is important to have base line information on the flora of the dunes and surrounding vegetation types which may be dependant on the dunes for protection from the elements. This will enable the flora conservation importance of these habitats to be defined.

Lake Campion Nature Reserve No. 24789 is situated about 40 kilometres north of Merredin and covers an area of 10 751.8529 hectares. The western half of the Reserve encompasses Lake Brown which is a bare lake with a narrow band of bushland along the edge. A large part of the eastern and southern edges of Lake Brown have been alienated for gypsum and alunite mining. The eastern half of the Reserve, known as 'Lake Campion' is a naturally saline affected area encompassing an irregular drainage line and numerous small salt lakes where water accumulates in wet seasons. The salt lakes are bare, usually bordered by a band of samphire flats and a shallow belt of shrubland further up slope. Woodland then develops on higher ground (Beard 1980). Therefore the Lake Campion area is a mosaic of vegetation types associated with small topographical changes. Gypsum mining leases also occur in this eastern section of the Reserve.

There are numerous small pockets of uncleared land continuous with the lakes on the Reserve and some extensive areas where salt affected land penetrates onto adjacent farmland. In addition three extensive areas of uncleared bushland adjoin the Reserve (Unvested Reserve No. 21759, Common; Location 14001 and the old Chandler Townsite).

Due to the mosaic pattern of lake beds, fringing samphire flats, shrublands and woodlands, detailed mapping of vegetation types is necessary. Lake Campion Nature Reserve will be mapped at 1:25 000. Two selected sections of the reserve to be mapped in detail to:

(i) represent the vegetation on the reserve;

(ii) cover existing and proposed Mining Leases for gypsum and alunite; and

(iii) map the Unvested Reserve No. 21759 (Common) which has been recommended previously to become part of the Nature Reserve.

1.2 Project Requirements

The specific objectives of this project are to:

(i) produce a vegetation map of Lake Campion Nature Reserve at a scale of 1:25 000;

(ii) write one or more association descriptions, based on the classification system of B Muir, which typify the vegetation categories mapped as in (i) above. The site of each description must be accurately recorded on the vegetation map, and each description will be accompanied by a photograph;

(iii) accurately map locations of declared and other rare flora encountered during field work;

(iv) collect and identify a representative sample of the flora encountered and lodge field specimens with CALM's Merredin Office and samples of less common species with the W A Herbarium; and

(v) compile a detailed flora species list for the reserve and other areas.

1.3 History of the Reserves Surveyed

a) Lake Campion Nature Reserve (24789)

Reserve No. 24789 was originally set aside on 6 September 1957 for the purpose of "Conservation of Flora" with an area of ca 688 hectares. It was increased to ca 1 025 hectares on 18 August 1967, ca 1 241 hectares on 1 November 1968 and to 10 071 hectares on 29 November 1968. The area was then decreased by the installation of road number 15200 to an area of 10 070 hectares on 12 September 1975 then increased again to 10 070.99 hectares on 19 November 1976.

On 16 March 1979 Avon Location 28637 (122.5 hectares) was excluded from the reserve to be set aside as Reserve No. 35963 for the purpose of "Recreation" and vested in the Shire of Nungarin. Recreational activities to be pursued on Lake Campion (where water depth permits) and in the area excised as a recreation reserve included camping, swimming, water skiing and sailing. The Shire Council constructed a dam across the channel connecting Lake Campion to Lake Brown to raise the water level. On 18 May 1969 Reserve No. 24789 was classified as a shooting and hunting area under Section 12B of the Wildlife Conservation Act.

In 1978 B Muir recommended that Reserves Nos 21759, 24789 and 24507 be amalgamated. Reserve No. 24507 was originally gazetted on 3 August 1956 for "Conservation of Flora". The Reserve was described as containing excellent stands of woodland and being perhaps the most south western block of extensive woodland to penetrate into the wheatbelt from the Goldfields. On 12 October 1979, Reserve No. 24507 was therefore cancelled and the contained land included in Reserve No. 24789 bringing the total area of 24789 to 10 751.85 hectares, the current area. On the same date the total area was vested in the W A Wildlife Authority (now the National Parks and Nature Conservation Authority) for the purpose of "Conservation of Flora and Fauna".

Reserve No. 24789 was named "Lake Campion Nature Reserve" on 19 December 1986. The soil conservation value of this nature reserve has formally been recognised since 1961 when a grazing lease on Avon Locations 27888 and 24817 in the eastern section of the reserve was refused because of the risk of further salt encroachment and the effect of grazing "on a source area for desirable salt tolerant plants". A very definite salt tendency was noted for the locality. Muir (1978) also emphasised the importance of the area for soil conservation for the control of both soil salinity and wind erosion.

b) Reserve No. 21759 (Common)

Reserve No. 21759 was set aside on 17 September 1937 for the purpose of "Common" with an area of 761.6 hectares. The area remains unvested. Muir (1978) recommended that this reserve be amalgamated with Reserve No. 24789 and No. 24507. However this was not carried out due to the request by the Department of Mines that Reserve No. 21759 remain as common. The reserve is situated adjacent to the mineral claims at the edge of Lake Brown and contains the shore based plant and general access to the gypsum workings.

On 28 January 1987 Reserve No. 21759 and the enclosed vacant Crown Land was surveyed by Department of Conservation and Land Management's Reserve Officer, R Brazell. Mr Brazell recommended that "Considering the relatively undisturbed condition of this area; its large tract of bush area to lake area, which is lacking on the adjoining portions of Nature Reserve No. 24789, this would be an ideal addition to the nature reserve complex of the area". This proposal was put to the Nungarin Shire Council for support. The Shire's initial response has been negative due to a misconception that the numbers of foxes, rabbits, emus and kangaroos would increase if the area was "handed over" to the Department.

1.4 Physical Environment

a) Climate

The area has a typical wheatbelt climate with hot dry summers and mild wet winters. Rainfall recorded at the Merredin Shire Council between 1903 and 1989 gives a mean annual rainfall of 326 mm. Lake Campion is situated approximately 40 kilometres north of Merredin just north of the 275 mm isohyet and would therefore be expected to have a mean annual rainfall less than Merredin and closer to 275 mm. Most of the rain falls in winter from May to August with some summer rain from thunderstorms but this is rarely very effective.

The temperature regime is one of mild winters and hot summers. Data recorded at the Merredin Shire Council over a 23 year period indicates that winters are mild with the mean temperature of the coldest month above 10°C but light frosts may be experienced on winter nights in clear weather. The mean temperature of the hottest month exceeds 25°C with mean maximum temperatures for the hottest month reaching 33.5°C.

Mean maximum and minimum temperatures for each season taken from data recorded at the Merredin Shire Council and made available by the Bureau of Meterology (1990) are as follows:

	Maximum	Minimum
Autumn (March to May)	25.0°C	12.5°C
Winter (June to August)	16.7°C	6.0°C
Spring (September to November)	24.2°C	10.0°C
Summer (December to February)	32.7°C	17.1°C

The mean annual 0900 H recording of relative humidity is 50% with the highest recordings in July (80%) and the lowest in December (42%). This type of regime with a wet winter and dry summer is known as a Mediterranean climate and Beard (1980) classifies this area with its 7½ dry months as Dry Warm Mediterranean following the classification system of Bagnouls and Gaussen.

b) Geology and soils

The region is underlain by the Yilgarn Block, a very ancient rigid "shield" area composed mainly of Archaen granite and gneiss with some altered volcanics and sediments known as "greenstone belts". These granitic rocks are covered by alluvia in the major valleys and have been given ages varying from 2 200 to 3 100 million years (Beard, 1980). The region is bounded by the Darling Fault in the west and by the greenstone belts of the southern areas and Murchison provinces in the east.

The landscape is gently undulating and of low relief. Valleys are generally broad and flat bottomed and contain extensive chains of salt lakes with marginal lunette dunes. The peneplain may have originated in the Proterozoic, although extensive erosion probably took place during the Permian glaciation. An extensive cover of lateritic soil developed on the plateau during the late Cretaceous and Tertiary. This surface is still preserved along drainage divides but elsewhere it is extensively eroded to form an etchplain (Chin, 1986).

The palaeo drainage system which is thought to have developed during the late Cretaceous ceased regular flow in inland area by the mid-miocene (Chin, 1986) and the rivers degenerated to chains of salt lakes. As the rivers ceased to flow, silt could not be transported out of the area and it has instead been accumulating in the valleys which have been gradually filling up. Salt lake systems therefore represent remnants of former river systems. Beard (1980) describes a system of salt lakes which empty into the Avon River at the Yenyenning Lakes near Brookton with a northern branch running up via Baandee to Lake Brown.

During glacial periods of the Pleistocene, the climate seems to have been at times much drier and more windy than today so that surface deposits were extensively reworked. The yellow earthy sands of the sand plains have been reworked by wind but have not been transported far or they would have accumulated in the valleys. Valley sand plains do occur but can be seen to have originated from an adjacent river course or lake system. Dunes and lunettes are also commonly associated with the lake systems (Beard, 1980).

The information in figure 1 has been taken from the Kellerberrin grid square of the 1:250 000 Geological Survey series. From this figure it can be seen that the Lake Campion Nature Reserve and adjoining bushland occur on map units Qd and Ql with small areas of Qa and Ang. Map units Czs and Czl adjoin the south eastern section of the reserve.

Qa Alluvium - silt, sand and gravel in stream channels

Ql Lacustrine deposits - saline and gypsiferous clay and silt in playa lakes

Qd Eolian and alluvial deposits - silt and sand in sheets and dunes: gypsiferous near playa lakes

Czs Reworked sandplain - yellow and white sand containing locally abundant limonite pebbles

Czl Laterite - limonite cemented, nodular and massive duricrust overlying deeply weathered bedrock

Ang Heterogeneous, foliated and banded gneiss extensively intruded by leucocratic granite and adamellite

Recent alluvial sediments (Qa) are distinguished in the upper portions of drainage valleys and in more steeply sloping minor valleys. In major valleys they overlie Tertiary alluvium. Playa lakes and their sediments occur in many valleys, where the drainage is ponded, they generally overlie alluvium. The lakes are usually inundated after heavy rain and are centres of deposition of silt and clay (Ql). Evaporation leads to the concentrating of brine within the sediments, gypsum crystals are precipitated within the mud and a hard residual salt crust forms during dry periods (Chin, 1986). The salinas are also a source area of lime and alunite as well as common salt and gypsum.

Sediments have been deposited on low lunette dunes on the eastern and south eastern sides of playa lakes under the influence of west and north west winds. These stabilized dunes of quartzose and gypsiferous sand (Qd) are considered to have formed during a more arid period 15 000 to 20 000 years ago (Bowler, 1976). Areas of eolian silt and sand, with numerous small claypans and irregular meandering channels are also included in the unit Qd (Chin, 1986).

The composition of the lunette dunes varies from well sorted quartz sand, through clayey sand, gypseous sandy clay to almost pure gypsum with the percentage of gypsum increasing and becoming dominant in the highly saline environments of the more arid areas of the south west of Western Australia (Bowler, 1976). Soil formation has not been marked beyond the accumulation of moderate amounts of organic matter in the surface and the leaching of the more soluble salts (Bettenay and Hingston, 1961).

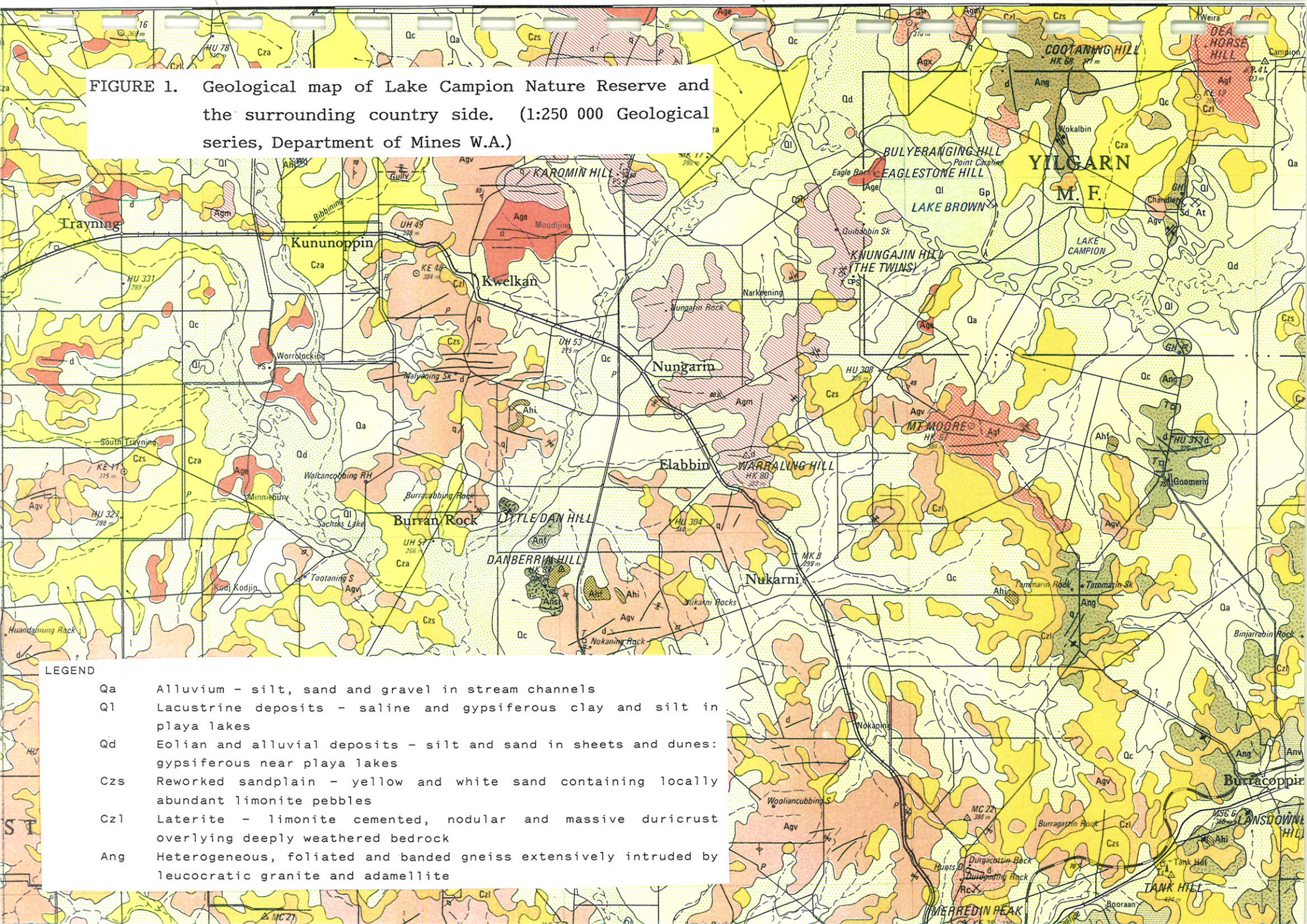


FIGURE 1. Geological map of Lake Campion Nature Reserve and the surrounding country side. (1:250 000 Geological series, Department of Mines W.A.)

LEGEND

Qa	Alluvium - silt, sand and gravel in stream channels
Ql	Lacustrine deposits - saline and gypsiferous clay and silt in playa lakes
Qd	Eolian and alluvial deposits - silt and sand in sheets and dunes: gypsiferous near playa lakes
Czs	Reworked sandplain - yellow and white sand containing locally abundant limonite pebbles
Czl	Laterite - limonite cemented, nodular and massive duricrust overlying deeply weathered bedrock
Ang	Heterogeneous, foliated and banded gneiss extensively intruded by leucocratic granite and adamellite

Figure 2 illustrates the three types of lake margin deposits found in the salt lake system at Hines Hill approximately 55 kilometres south south west of Lake Campion Nature Reserve. (Bettenay, 1962). The illustration has been traced from an aerial photograph of the area. Close to the salt there is typically a dune of coarse crystalline gypsum. This is of recent origin and is being added to at the present time from material crystallizing on the lake surface. Further from the salt lakes are lunette dunes which are much larger than the present gypsum dunes. Further again from the salinas and usually not specific to any one salt lake is a zone of silty and clayey material forming a more or less continuous sheet, blanketing other land forms and varying in thickness from over a metre to a few centimetres (Bettenay, 1962).

The soils of the area have been mapped in Sheet 5 of the Atlas of Australian Soils (Northcote *et al,* 1967). The landscape/map unit covering most of the area of the reserve and adjoining land is Sv1 with some Oc31 and small areas of Oc33 and Va66.

"Sv1 Saline valleys and salt lakes - salt lake channels, mostly devoid of true soils, and their fringing areas; few freshwater lakes: common soils are gypseous and saline loams (Um 1.1 and Um 1.2) on riverine wash and usually underlain by clayey or sandy strata by about 12 in. Associated are various resalinized (Dy) soils such as (Dy 4.83) on fringe areas, and dunes and lunettes of various sandy (Uc), silty (Um), and clayey (Uf) soils of slight profile development. Deposits of common salt, gypsum, lime and alunite occur as do remnants of the old lateritic profile and occasionally outcrops of country rock.

Oc31 Broad flat valleys: chief soils are hard alkaline red soils (Dr 2.33) with acid clay strata below about 5-6 ft depth. Associated are small areas of other soils including gilgai formations along drainage ways."

(Northcote *et al,* 1967).

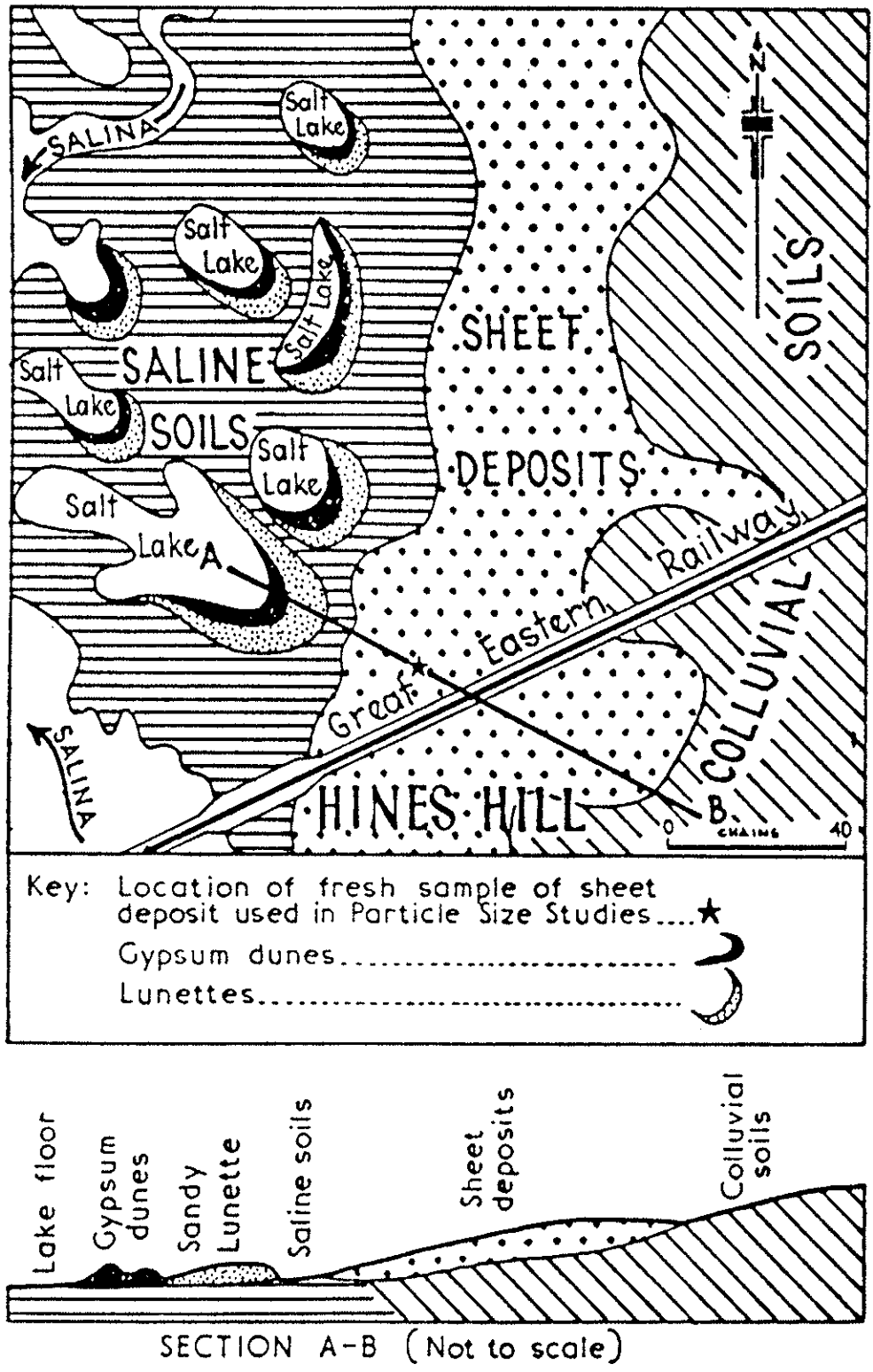


FIG. 2. The salt lake system at Hines Hill, and its associated marginal deposits.

c) Economic Geology

The best sources of high grade gypsum are seed and granular gypsum occurring in dunes (generally capped by kopi i.e. gypsum dust), as low banks, and as shoreline deposits around lake margins. Beds of crystalline gypsum also occur in lake sediments (Chin, 1986). Details of mining leases on and adjacent to the Lake Campion Nature Reserve are presented in Section 1.6.

Alunite occurs in light grey clay beds in the Lake Campion salt lake system. An alunite deposit at Lake Chandler produced 185 560 tonne between 1944 and 1949. Smaller operations at Lake Campion in 1940 and 1974 produced 30.48 tonne and 2.34 tonne respectively (Chin, 1986) (DeLaHunty and Low, 1958).

Salt has been extracted from lakes in the Lake Brown-Lake Campion area. The quality of salt at Lake Brown has been recorded at 93.5% NaCl (Chin, 1986). Miloschite (clay) and the heavy minerals rutile, ilmenite, zircon, andalusite, sillimanite, hornblende, leucoxene, epidote and tourmaline have also been reported from Lake Brown.

1.5 Physical Environment

a) Lake Campion Nature Reserve (No. 24789)

Lake Campion Nature Reserve is situated approximately 40 kilometres due north of Merredin township. The reserve covers a series of salt lakes with Lake Brown and Lake Campion the largest in size. The reserve is irregular in shape (Figure 3) following the boundaries of the salt lakes. The lake system included within the boundaries of the Nature Reserve is ca 27 kilometres long by ca 10 kilometres broad at the widest point. The total perimeter of the reserve is approximately 91 kilometres and its area is 10 070.99 hectares. Most of the reserve is situated in the Nungarin Shire with a section in the south east in the Merredin Shire.

Altitudinal variation across the reserve is small with most of the area at 280 metres. Dunes, ridges and lake margins rise 5-10 metres above the level of the lake floor with 290 metres marked on the maps for the larger dunes (Figure 3). Overall there is a very gradual increase in height to 290 metres in the south west corner.

After heavy rain water flows through the lake system. The Nungarin Shire has formed a dam across the channel connecting Lake Campion to Lake Brown. The dam has been constructed to raise the water level of Lake Campion for water sports. This has been achieved by raising the Stock Road Crossing (floodway) to a height of approximately 1.5 metres. An overflow culvert with an invert height of approximately 0.9 metres above the channel bed has been installed in the dam. The approximate maximum water depth retention capability is 1.4 metres in the southern arm of the lake.

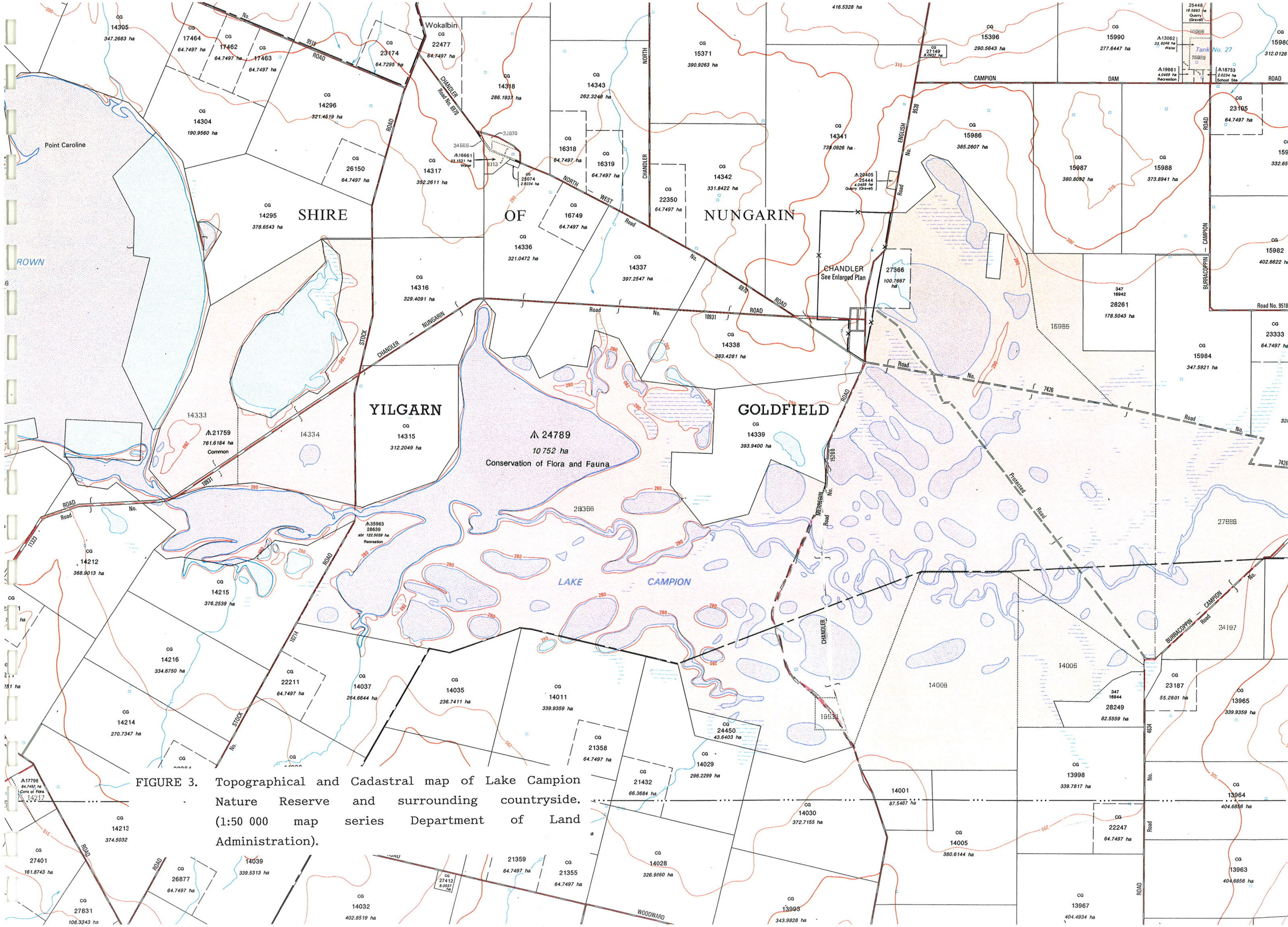


FIGURE 3. Topographical and Cadastral map of Lake Campion Nature Reserve and surrounding countryside. (1:50 000 map series Department of Land Administration).

Access through the reserve is provided by Stock Road (gravel), the Chandler-Nungarin Road (gravel) and the Chandler-Merredin Road (southern section sealed to the boarder of the Nungarin Shire). Stock Road and the Chandler-Merredin Road run approximately north south through the reserve. The Burracoppin-Campion Road (gravel) runs through the south east corner. There are numerous tracks in the reserve, most are rough and not suitable for on road vehicles but provide access for trail bikes or four wheel drive vehicles.

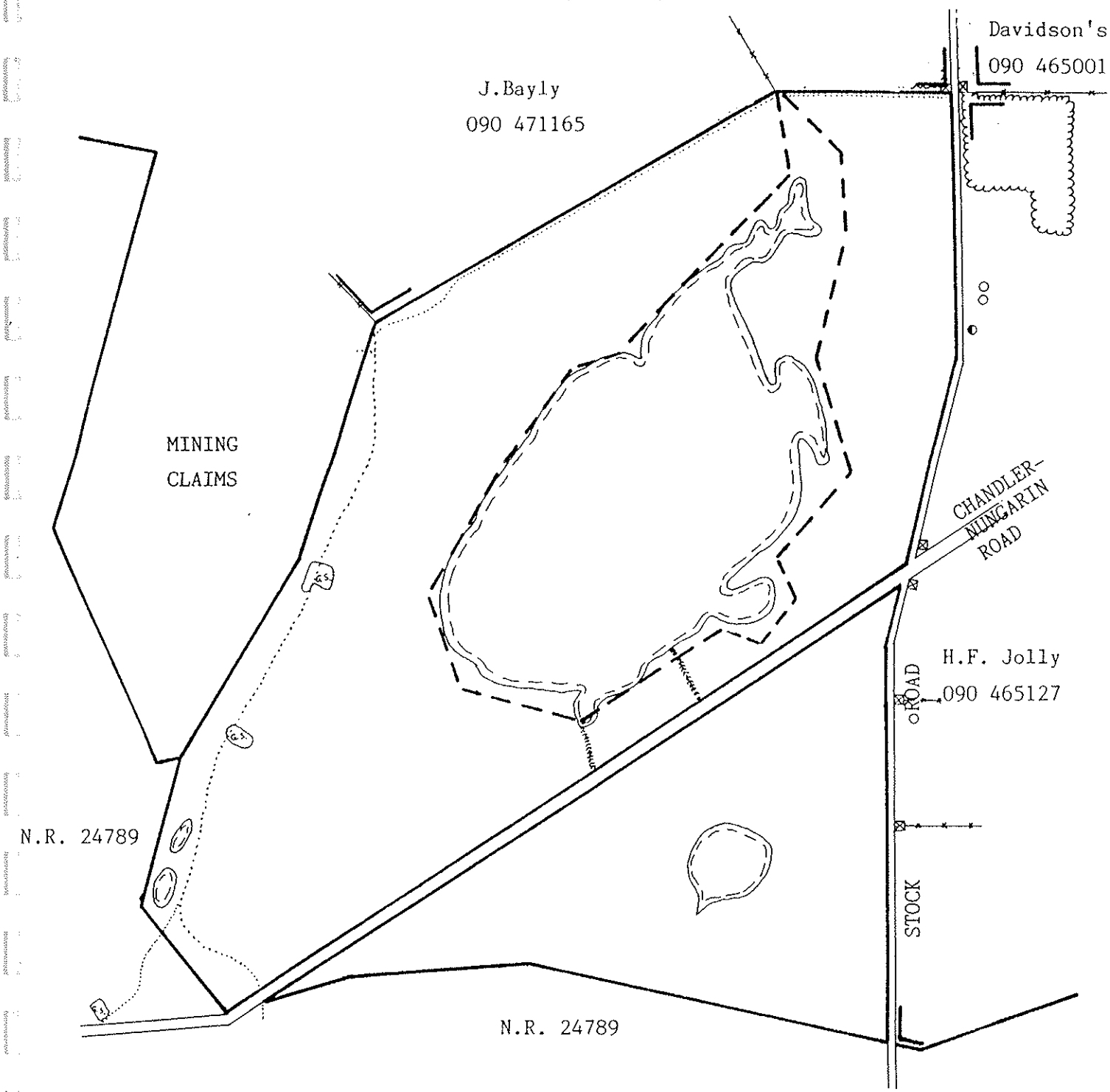
Lake Campion Nature Reserve includes Avon Locations 28386, 15985, 27888, 24197, 24817, 14006 and 14008 and is almost completely surrounded by farmland with Reserve No. 21759 adjoining part of the northern boundary. Adjacent areas of uncleared bushland also include Location 14001 and the old Chandler Townsite.

There is a small gravel pit on the reserve in the south eastern corner south of the Burracoppin-Campion road. Four areas within the reserve boundary have been excluded from the reserve as vacant Crown land and are covered by mining leases. These include three areas on Lake Brown and an area east of the Chandler Townsite. Woodland areas in the south of Avon Location 14008 have been cut for timber in the past.

b) Reserve No. 21759 (Common)

The Common (Reserve No. 21759) is situated in the Shire of Nungarin and comprises Avon Location 14334. The salt lake in the centre has been excluded from the reserve as vacant Crown land. The Common is roughly rectangular in shape (see Figures 3 and 4) and covers an area of 761.618 hectares. The terrain is fairly flat varying only slightly from 280 metres above sea level. Part of the reserve on the eastern side, north of the Chandler-Nungarin Road has been previously cleared and is now regenerating.

FIGURE 4 - Reserve No. 21759 (Common)



Reserve Boundary

Road

Track

Fence

Gate onto Reserve

Gate on Adjoining Property

Adjoining Bush

Neighbour's Boundary

Lake

Drain

Gypsum Stockpile

0 250 500 750 1000m

Scale 1:25,000

The western boundary of the reserve is adjacent to the mining claims on Lake Brown. A well maintained gravel road runs along the western boundary providing access to the gypsum workings with two areas for stockpiling gypsum present on the reserve. The dune on the eastern edge of Lake Brown also runs along the western boundary. Most of the dune is situated on vacant Crown land except for a small area to the south which lies within the boundaries of the Lake Campion Nature Reserve.

The Chandler-Nungarin Road (gravel) passes through the south eastern section of the reserve and Stock Road (gravel) runs along the eastern boundary.

1.6 Mining Leases in the Lake Campion Area

Figure 5 illustrates the position of mining leases within and adjacent to the Lake Campion Nature Reserve. The leases cover vacant Crown land or reserve land.

Gypsum occurs around the eastern shore of Lake Brown as seed gypsum in a large bank and crystalline gypsum in Lake sediments. Mining commenced in 1935 and up to 1982 a total of 471 750 tonne had been produced. Purity is fairly constant at 90% gypsum (Chin, 1986). Lease 77/41 covers an area of the lake bed. The kopi dune along the eastern shore is considered too impure for plaster manufacture (DeLaHunty and Low, 1958) but part of the area has been disturbed with some minor excavation and with the construction of tracks for access to the workings.

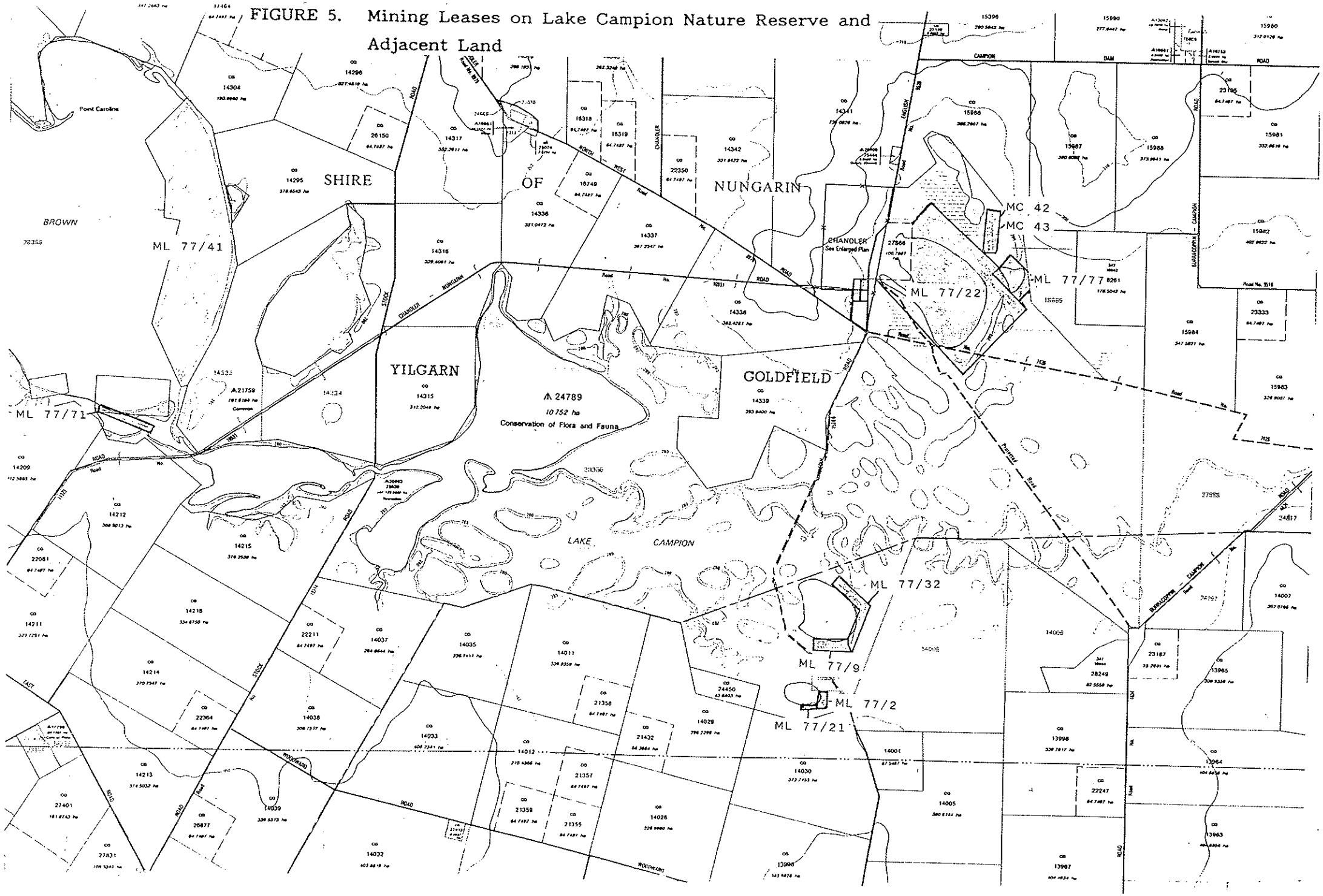
The gypsum seed bank which parallels the northern boundary of Location No. 14212 varies in thickness up to approximately 30 centimetres and is contaminated with quartz grains (DeLaHunty and Low, 1958). The mining lease in the vicinity (ML 77/71) is pending and covers an area of reserve land.

MC 42 and 43 cover vacant Crown land north of Lake Chandler. This area yielded 60 270 tonnes of gypsum for the manufacture of plaster between 1950 and 1952. Samples of high grade seed gypsum contained over 97% gypsum but in some samples the gypsum content was only 57% (Chin, 1986). ML 77/22 covers Lake Chandler where granular and seed gypsum occur in dunes and seed gypsum also on the lake flat. DeLaHunty and Low (1958) and Chin (1986) report the extent of the gypsum reserves in the area. Mining lease 77/77, east of Lake Chandler, has been granted, the lease is transitional from the old Mining Act. The lease holders are currently treating stockpiles of bentonite (kitty litter). A Notice of Intent should be requested if lakehead mining recommences.

Mining Lease 77/2 covers an area of reserve land near the southern boundary of the reserve adjacent to the Chandler-Merredin Road. Productive mining occurred in this area for a number of years without approval and in breach of most conditions of the lease. An inspection of the area in November 1986 showed that ground disturbance had been excessive and unco-ordinated and had resulted in the clearing of a large area of the lease with only removal of a portion of the resource. Terms were agreed to under which mining could continue but no further clearing is permitted until a satisfactory rehabilitation performance is achieved. The lease adjacent to this area (ML 77/21) has also been granted and mining approval obtained after a Notice of Intent was submitted. However no clearing can take place on 77/21 until the mining performance improves on ML 77/2.

Mining Lease 77/32 covers reserve land and it situated on an unnamed lake approximately 6 kilometres south of Lake Chandler. The lease has been granted but a Notice of Intent has not been submitted. An Environmental report by M I Blackwell and Associates (unpublished) covers Mining Leases 77/2, 77/21 and 77/32.

FIGURE 5. Mining Leases on Lake Campion Nature Reserve and Adjacent Land



Mining Lease 77/9 is situated on the southern shore of the unnamed lake where the dunes have a kopi cover and range up to 3.5 metres in places (DeLaHunty and Low, 1958). This lease was refused by the Hon. Minister in August 1986. The reasons given were that the gypsum dunes are an integral part of the ecological and landscape value of the reserve and as current mining operations were already present in the area further destruction of the dunes could not be justified.

2.0 METHOD

The ground survey of the vegetation and flora of the Lake Campion Nature Reserve and Reserve No. 21759 was carried out during April 1990.

General vegetation divisions were noted using aerial photography at a scale of 1:25 000. Areas of interest thus delineated were examined in the field and the vegetation and soils at selected sites described. Because of time limitations some areas were not covered in detail in the ground survey and mapping was carried out by extrapolation of known vegetation associations using the aerial photographs.

Vegetation association descriptions were based on the classification system devised by Muir (1977) which was specifically designed for describing wheatbelt vegetation (Table 1).

Voucher specimens of most plant species encountered were collected and identified using keys and by comparison with specimens at the Western Australian Herbarium. Experts involved in revising particular genera were consulted wherever possible to ensure accuracy with identification.

On 19 September 1990, ten volunteers from the Mukinbudin Wildflower Society and two officers from the Department of Conservation and Land Management Merredin District Office completed a ground survey of selected sites on Lake Campion Nature Reserve and Reserve No. 21759 to record flora and collect voucher specimens of plant species encountered. The aim was to collect flowering material and annual plants which may not have been collected or identified during the main autumn survey.

The volunteers were broken up into two groups, one to collect in the open woodlands (Sites 8, 15, 17 and 25) and the second to collect over the dune communities which border the salt lakes (Sites "A", 7, 22 and 23).

TABLE 1 - MUIR SYSTEM OF VEGETATION CLASSIFICATION

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70 - 100%	MID DENSE 30 - 70%	SPARSE 10 - 30%	VERY SPARSE 2 - 10%
T Trees > 30 metres	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
M Trees 15 - 30 metres	Dense Forest	Forest	Woodland	Open Woodland
LA Trees 5 - 15 metres	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
LB Trees < 5 metres	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
KT Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
KS Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
S Shrubs > 2 metres	Dense Thicket	Thicket	Scrub	Open Scrub
SA Shrubs 1.5 - 2.0 metres	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
SB Shrubs 1.0 - 1.5 metres	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
SC Shrubs 0.5 - 1.0 metres	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
SD Shrubs 0.0 - 0.5 metres	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
P Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
H Hummock Grass	Dense Hummock Grass	Mid Dense Hummock Grass	Hummock Grass	Open Hummock Grass
GT Bunch grass > 0.5 metres	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
GL Bunch grass < 0.5 metres	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
J Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
VT Sedges > 0.5 metres	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
VL Sedges < 0.5 metres	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
X Ferns, Mosses, Liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

3.0 VEGETATION SURVEY

3.1 Previous Surveys

a) Reserve No. 21759 (Common)

Reserve No. 21759 is situated in the Avon Botanical District within the Moorine Rock Vegetation System. The Avon District includes much of the Wheatbelt Region west and north west of the goldfields and the extensive mallee areas of the Roe Botanical District. Beard (1980) mapped the vegetation of the Kellerberrin grid square at a scale of 1:250 000. From this work it can be noted that the map units covering the area of the reserve include Salt lakes and Woodlands of salmon gum, morrell and gimlet (e^{8}_{9}Mi).

Reserve No. 21759 was surveyed by Department of CALM Reserves Officer R Brazell on 28 January 1987. Four vegetation formations were reported including:

1. Woodland of predominantly *Eucalyptus salmonophloia* with areas of *Eucalyptus longicornis* and *Eucalyptus yilgarnensis* over Low Scrub A *Exocarpus aphyllus, Pittosporum phylliraeoides, Bossiaea leptacantha* and *Acacia multispicata;* over Low Heath D of *Atriplex* sp. and *Maireana triptera.*

2. Thicket of *Melaleuca lateriflora/Acacia* aff. *tetragonophylla* or *Dodonaea viscosa/Acacia multispicata;* over Low Heath D of *Atriplex* sp. and Grasses of *Stipa juncifolia.*

3. Low Heath D of *Frankenia ?desertorum* and *Halosarcia* sp.

4. Open Low Scrub B over Low Heath D of *Maireana triptera* and *Atriplex* sp. and Grasses. Area regenerating.

b) Lake Campion Nature Reserve (No. 24789)

Lake Campion Nature Reserve is situated in the Avon Botanical District along the boundaries of the Moorine Rock Vegetation System and the Muntadgin System to the south. The boundary of the Muntadgin System is formed by the salt channel running out of Lake Brown first to the south west and then south. There are no playa lakes or salt flats in the Muntadgin System except for Lake Brown-Lake Campion which are shared with the Moorine Rock System. Most of the Muntadgin System is relatively high-lying with substantial areas of residual sandplains covered by dense thickets of shrubs. The valleys are occupied by red soils which carry a mallee formation. If the clay is close to the surface the mallee changes to woodland of *Eucalyptus salmonophloia* and *Eucalyptus salubris* and more rarely *Eucalyptus longicornis* (Beard 1980).

The catena in the Moorine Rock System is one of halophytes in and around the salt lakes, sclerophyll woodland in the bottom lands, with mallee patches becoming more common up-slope until mallee is dominant on stripped granite soils adjacent to rock outcrops and sand plains. Thicket occur on remnants of the old duricrust plateau surface (Beard 1980).

The vegetation of the Lake Campion Nature Reserve has been mapped by Beard (1980) at a scale of 1:250 000. Map units covering the Reserve area include:

1. Salt country. Salmon gum *(Eucalyptus salmonophloia)* and yorrell *(Eucalyptus yilgarnensis)* with saltbush and samphire.

2. Salmon gum *(Eucalyptus salmonophloia)*, morrell *(Eucalyptus longicornis)* and gimlet *(Eucalyptus salubris)* Woodland.

Muir surveyed the Reserve in 1978 and recorded samphire flats on the edge of the bare salt lakes with a shallow belt of shrublands and woodland on higher ground. On dunes between salt flats *Templetonia* or *Acacia* shrublands were found. The whole area was described as a mosaic of woodland, shrubland and salt heaths completely surrounding the bare lake. Species recorded for the woodlands included *Eucalyptus gracilis* (now *Eucalyptus yilgarnensis), Eucalyptus kondininensis, Eucalyptus loxophleba* and *Eucalyptus salmonophloia.*

Muir (1978) also surveyed Reserve No. 24507 which has now been included in the Lake Campion Nature Reserve. He described the majority of the area as extensive stands of *Eucalyptus gracilis* (now *Eucalyptus yilgarnensis)* and *Eucalyptus salubris* Woodland with a patchy understorey of *Melaleuca cymbifolia* (now *Melaleuca halmaturorum* ssp. *cymbifolia)* over *Atriplex paludosa* and *Acacia colletioides.* A small area of *Melaleuca uncinata* and *Acacia* aff. *resinomarginea* Dense Thicket was recorded in the south west corner with the northern and north east areas mostly salt watercourses with low sandy mounds supporting shrubland. The watercourses were bare with immediate margins of samphire shrubs bordered by Broombush thicket in clumps. Low sandy ridges supported *Templetonia sulcata* and *Hakea preissii* Scrub with scattered *Callitris heugellii* (now *Callitris glaucophylla).*

M I Blackwell and Associates surveyed the area covered by Mining Leases 77/2, 77/21 and 77/32. The vegetation on the leases progressively changed from samphire on the lake margins to woodland with the increase in height of the marginal dune. For leases 77/2 and 77/21 *Halosarcia lylei* and *Melaleuca cymbifolia* (now *Melaleuca halmaturorum* ssp. *cymbifolia)* were recorded for the edge of the lake with dominant shrubs of *Callitris columellaris* (now *Callitris glaucophylla), Leptospermum roei, Darwinia diosmoides* (now *Darwinia drummondii), Jacksonia hakeioides, Leucopogan insulare* and *Hakea scoparia* on the light gypsum soils of the front of the dune. *Eucalyptus salicola* was found on top of the dune and on the lee slopes.

The pattern of vegetation change was similar for Mining Lease 77/32 with *Halosarcia lylei* and *Melaleuca halmaturorum* at the lake edge and *Leptospermum roei, Darwinia drummondii* and *Leucopogon cuneifolius* occurring in the gypsum soil at the foot of the dune. The dominant species toward the top of the dune became *Callitris preissii* ssp. *verrucosa, Eucalyptus salicola, Templetonia sulcata* and *Jacksonia hakeiodes.* On the lee slope grading into the swale *Eucalyptus yilgarnensis, Eucalyptus sheathiana, Eucalyptus salicola, Santalum acuminatum, Choretrum glomeratum, Beyeria lechenaultii* and *Allocasuarina acutivalvis* were recorded.

3.2 Current Surveys

In the present survey the vegetation of the Lake Campion Nature Reserve (24789) and Reserve No. 21759 is analysed in more detail. Reserve No. 21759 and an area on the Lake Campion Nature Reserve east of the Merredin-Chandler Road (see Figure 6) were examined in some detail to provide most of the information required for the descriptions of the vegetation associations mapped. In other areas of the reserve site data was only gathered if further information was required for comparing dune areas or expanding the descriptions and species list. The intricate mosaic of plant communities is linked to topographical, pedological and/or geological features.

The vegetation was primarily divided into Tree communities (Woodlands, Low Woodlands, Low Forests), Mallee communities (Tree Mallee, Open Shrub Mallee) and Kwongan communities (Heath, Thicket and Scrub). The vegetation was then further divided into species associations within these groupings. Table 2 lists the fourteen vegetation associations described and mapped in this study. Two of these associations, the *Eucalyptus salicola* Woodland and the *Melaleuca* Thicket have been further divided because of differences within the associations related to structure or species composition. However it was not always possible to map these areas separately and in each case they have been retained as one association overall.

All fourteen of the vegetation associations are found on the Lake Campion Nature Reserve with eight covering the area of Reserve No. 21759. The vegetation map of the reserves is presented in Figure 6 and Muir descriptions for the vegetation found at sites marked on the map are listed in Appendix 2. A species list for each vegetation type is also presented in Appendix 3.

VEGETATION MAP

Vegetation boundaries were drawn from aerial photographs at a scale of 1:25 000. The boundaries of the *Melaleuca* Scrub and *Halosarcia* Heath associations are usually too narrow to map at this scale and therefore the presence of these two vegetation types are only indicated by the presence of the symbols Km_3 and S in most cases.

Where *Eucalyptus salicola* forms a very sparse upper stratum and covers only small areas or low mounds the association is mapped only as Es. Where *Melaleuca* Thicket cannot be differentiated as Type 1 or Type 2 the associations is mapped a Km indicating that a mosaic of the two types of thicket is present.

The presence of scattered trees of *Callitris glaucophylla* in *Melaleuca* Thicket and areas where *Callitris glaucophylla* becomes dominant in the *Eucalyptus salicola* Woodland - Type 2 are indicated by using the symbol (c). Areas where *Acacia acuminata* becomes prominent in the *Acacia* Scrub associations are indicated by the symbol (j).

a) Vegetation of the Lake Campion Nature Reserve (24789)

The Lake Campion Nature Reserve is covered by an intricate mosaic of bare salt lakes and channels interspersed with shrublands, woodlands, and small areas of mallee. The species composition and the structure of the vegetation changes with variation in soils, geology and topography. Small changes in the topography carry different vegetation types.

In the central area of the reserve where many small salt lakes and channels form a complex system the vegetation types may not be as well defined. Here changes in the topography occur over shorter distances and more complex soil mixing has taken place. In general the salt lakes are bare clay and silt with a salt crust in dry seasons. The saline soils at the edge of the lake support succulent samphire mainly of the genus *Halosarcia (Halosarcia* Heath). Smaller salt pans may be covered by samphire and other halophytic plants. A strand of *Melaleuca* Scrub of *Melaleuca lateriflora* or *Melaleuca halmaturorum* ssp. *cymbifolia* patchily distributed occurs on the elevated margins of the lake beds.

On slight rises or low mounds interspersed between the salt lakes and channels *Acacia* Scrub is supported on sandy loams over clay. *Acacia assimilis* is usually prominent with *Hakea preissii, Acacia colletioides, Dodonaea viscosa, Exocarpus aphyllus* and *Templetonia sulcata* also characteristic species. Areas of *Melaleuca uncinata* and *Melaleuca lateriflora* Thicket to 3 metres (Type 1) forms a mosaic with clumps of *Melaleuca uncinata* Thicket to 5 metres or more in height (Type 2). The *Melaleuca* Thicket occurs on slightly raised areas adjacent to the salt lakes and channels in poorly drained areas where the clay becomes more prominent.

The major water course running through the reserve is usually bare clay and silt and probably supports a fairly large volume of rapidly moving water in some seasons. The immediate creek margins have samphire shrubs and subshrubs bordered by *Melaleuca* Thicket and Scrub. Species recorded at Site 36 include *Halosarcia halocnemoides, Halosarcia lepidosperma, Halosarcia leptoclada, Maireana oppositifolia, Atriplex hymenotheca, Frankenia desertorum, Melaleuca halmaturorum* and *Melaleuca uncinata.*

Woodlands are found on higher ground with *Eucalyptus yilgarnensis* (yorrel) Woodland covering the lower sections adjacent to the salt lakes and dunes and interspersed with Shrubland and other Woodland communities. *Eucalyptus salubris* (gimlet) covers small areas on heavier soils where clay is closer to the surface and occasional areas of *Eucalyptus loxophleba* (York gum) Tree Mallee occur on deeper sandy loams. Mallee associations become more extensive further "up slope" from the valley bottoms and salt lake systems in the Muntadgin and Moorine Rock vegetation systems.

Eucalyptus salicola (salt gum) Woodland - Type 2 is typically found on the dunes which have developed on the eastern and southern shores of the playa lakes. These dunes contain seed or granular gypsum below the sandy surface soils which can also be capped by kopi or gypsum dust. On five of the larger lakes dune formation has been substantial and a sparse to mid dense upper stratum of *Eucalyptus salicola* trees cover the area. The understorey is rich in plant species many confined to the dune habitat. In areas adjacent to small playa lakes and channels, dunes may only form low ridges and mounds with a very sparse cover of salt gums *(Eucalyptus salicola)* and only scattered shrubs and herbs as an understorey.

A transect taken through Sites 20 to 23 illustrates the changes in vegetation with soil type and topography found cn the southern shore of one of the larger lakes, from the lake bed to the flats on the far side of the dunes. The lake of silt and clay is bare except for a narrow patchy stand of *Halosarcia lylei* at the edge with scattered shrubs of *Melaleuca halmaturorum* (Site 21) on slightly elevated areas. Adjacent to these areas are low dunes of coarse crystalline gypsum of recent origin which are still being added to at the present time from material crystallizing on the lake surface. Here *Callitris glaucophylla* Open Low Woodland is found (Site 22) forming a very patchy association with an understorey of Scrub and Dwarf Scrub. Characteristic species include *Leptospermum roei, Jacksonia* aff. *hakeoides, Darwinia drummondii, Leucopogan ?nutans, Conostephium preissii and Persoonia ?angustiflora.*

The larger dune behind the "fore dune" is made up of quartzose and gypsiferous soils and is covered by *Eucalyptus salicola* Woodland - Type 2 (Site 23) with an understorey of *Callitris glaucophylla* and occasional *Callitris preissii* ssp. *verrucosa* over Scrub and Dwarf Scrub. A number of understorey species are found only in this dune habitat including *Grevillea juncifolia, Melaleuca cordata, Prostanthera baxteri* and *Calothamnus gilesii.* On the lee slope the salt gums are joined by *Eucalyptus sheathiana* (ribbon bark mallee) and on the flats beyond by *Eucalyptus salubris* with adjacent areas of *Melaleuca lateriflora* and *Melaleuca uncinata* Thicket (Type 1) at Site 20.

On the periphery of the mosaic of salt lakes and channels, on higher ground and covering areas of alluvium (Qa geological map unit, Department of Mines) are *Eucalyptus longicornis* (red morrel) and *Eucalyptus melanoxylon* (black morrel) Woodlands on clay loam and loam soils and *Eucalyptus myriadena, Eucalyptus salubris, Eucalyptus yilgarnensis* Woodland on sandy clay loam soils. The *Eucalyptus myriadena, Eucalyptus salubris* and *Eucalyptus yilgarnensis* Woodland consists of an intricate mosaic of tree species with gimlet, yorrel and *Eucalyptus myriadena* occurring in patches or in mixed species stands. *Melaleuca lanceolata* forms a patchy understorey over Scrub of *Cassia* species, *Eremophila* species and *Acacia* species as well as the commonly occurring *Templetonia sulcata, Exocarpus aphyllus* and *Dodonaea viscosa*. Dwarf Scrub of *Atriplex paludosa, Atriplex stipitata* (saltbush) and *Olearia muelleri* forms a patchy lower stratum.

Other vegetation associations covering only small areas on the periphery of the salt lake system include *Eucalyptus capillosa* (wheatbelt wandoo) on clay loam soils underlain by granite and *Eucalyptus leptopoda* Open Shrub Mallee over Thicket on sandy soils containing laterite pebbles. The Open Mallee association is described by Beard (1980) as thicket covering remnants of the old duricrust plateau surface in the Moorine Rock and Muntadgin vegetation systems. Beard points out that in areas which have remained unburnt for some time the sandplain mallee form an upper stratum to 6 metres in height. On granitic soils near the Old Chandler Townsite covering only a small area is *Acacia* Thicket with areas of *Borya constricta* Herbs interspersed.

b) Vegetation of Reserve No. 21759

Reserve No. 21759 forms part of the intricate mosaic of bare salt lakes and channels, shrublands, woodlands and small areas of mallee which make up the Lake Brown-Lake Campion system.

A transect taken through Sites 3 to 6 illustrates the change in vegetation associations from the lake bed of the major lake (which is situated on vacant Crown land) to the higher ground to the west. The salt lake is mainly bare saline silt and clay with the margins of the lake vegetated closest to the shore with strands of samphire and other halophytic shrubs *(Halosarcia* Heath) with *Halosarcia peltata, Halosarcia halocnemoides, Sclerostegia disarticulata* and *Maireana oppositifolia* recorded at Site 6. Slightly raised above the level of the lake bed on saline silty clay is a narrow belt of *Melaleuca lateriflora* which is patchily distributed (Site 5, *Melaleuca* Scrub).

Woodlands then develop on higher ground with *Eucalyptus yilgarnensis* (yorrel) Woodland at Site 4 close to the lake and *Eucalyptus salicola* (salt gum) Woodland - Type 1 (Site 3) on loam soils covering the highest ground on the reserve. The understorey of the *Eucalyptus salicola* Woodland is in two layers of Scrub and Dwarf Scrub with common species including *Acacia colletioides, Acacia tetragonophylla, Dodonaea viscosa, Eremophila oppositifolia, Exocarpus aphyllus, Pittosporum phylliraeoides, Santalum acuminatum* and *Templetonia sulcata* over *Atriplex* and *Rhagodia* species (saltbush).

On the eastern shore of the major salt lake dune development has not been substantial and the sandy ridges are covered with *Melaleuca* Thicket (Type 1) with scattered *Callitris glaucophylla*. Adjacent areas to the east are degraded with some areas regenerating after past clearing operations. The kopi dune adjacent to the western boundary of the reserve is covered by *Eucalyptus salicola* Woodland - Type 2 with an understorey of *Callitris glaucophylla* in places. The area has been disturbed and the woodland is very sparse.

South of the major lake the typical mosaic of vegetation associations is found with small salt pans covered with samphire and the larger lakes supporting only a peripheral band of samphire then *Melaleuca* Scrub. On saline loams on low rises adjacent to the lake areas, *Acacia* Scrub occurs usually with *Acacia assimilis* prominent but *Acacia acuminata* (jam) becomes prominent in some areas. The Woodland associations occupy the higher ground with *Eucalyptus yilgarnensis* on the topographically lower areas and *Eucalyptus salicola* on the top of very gently sloping rises or ridges. Small areas of *Eucalyptus salubris* (gimlet) occur on clay soils and *Eucalyptus loxophleba* Tree Mallee covers small areas with deeper loamy soils.

In the following pages vegetation descriptions of the structure and species composition of each vegetation association mapped in the present survey is detailed.

TABLE 2 - VEGETATION ASSOCIATIONS OF THE LAKE CAMPION NATURE RESERVE (NO. 24789) AND RESERVE NO. 21759

Woodlands, Low Woodlands, Low Forests

		Map Unit
1a.	*Eucalyptus salicola* (salt gum) Woodland - Type 1	Ws1
1b.	*Eucalyptus salicola* (salt gum) Woodland - Type 2	Ws2
2.	*Eucalyptus yilgarnensis* (yorrell) Woodland	Wy
3.	*Eucalyptus salubris* (gimlet) Woodland	Wg
4.	*Eucalyptus longicornis* (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland	Wl
5.	*Eucalyptus myriadena, Eucalyptus salubris* (gimlet), *Eucalyptus yilgarnensis* (yorell) Woodland	Wm
6.	*Eucalyptus capillosa* (wheatbelt wandoo) Woodland	Ww
7.	*Callitris glaucophylla* (native Cypress pine) Open Low Woodland	Wc

Mallee

8.	*Eucalyptus loxophleba* (York gum) Tree Mallee	My
9.	*Eucalyptus leptopoda* Open Shrub Mallee over Thicket	Ml

Kwongan (Shrublands)

10.	*Acacia* Scrub	Ka
11.	Thicket/*Borya constricta* Herbs	Kh
12a.	*Melaleuca* Thicket - Type 1	Km1
12b.	*Melaleuca* Thicket - Type 2	Km2
13.	*Melaleuca* Scrub	Km3

Samphire

14.	*Halosarcia* Heath	S

WOODLANDS, LOW WOODLANDS, LOW FORESTS

Ws1 *Eucalyptus salicola* (salt gum) Woodland - Type 1

Diagnosis — Woodland (Open Woodland, Woodland, Low Woodland A) over Scrub over Low Heath D/Dwarf Scrub D.

Sites — 1, 3, 12.

Description

Stratum 1 — Woodland to Low Woodland A of *Eucalyptus salicola* becoming Open Woodland in some areas. *Eucalyptus salubris, Eucalyptus yilgarnensis* and *Eucalyptus loxophleba* occur as scattered individuals but may become dominant over short distances within the association.

Stratum 2 — Open Scrub to Scrub (rarely Thicket) of mixed shrubs from 1.5 to 4 metres, forming a discontinuous and patchy stratum. Charateristic species include *Acacia colletoides, Acacia tetragonophylla, Dodonaea viscosa, Eremophila oppositifolia, Exocarpus aphyllus, Melaleuca lanceolata* ssp. *thaeroides, Pittosporum phylliraeoides, Santalum acuminatum, Santalum spicatum, Scaevola spinescens* and *Templetonia sulcata*.

Stratum 3 — Low Heath D to Dwarf Scrub D of mixed shrub species including *Acacia erinacea, Atriplex paludosa, Atriplex stipitata, Enchylaena tomentosa, Maireana triptera, Olearia muelleri, Olearia pimeleoides, Olearia revoluta, Rhagodia drummondii, Rhagodia preissii* and *Zygophyllum fruticulosum*. Low Grass of *Stipa* species occurs near farmland at Site 1.

Comments

Eucalyptus salicola Woodland - Type 1 occurs on loamy soils over clay on the gently sloping rises covering the highest ground on Reserve No. 21759. *Eucalyptus salmonophloia* has also been recorded for the area but was not found during the present survey. The smooth bark and crown of *Eucalyptus salicola* resembles that of the salmon gum and some confusion between the two may exist.

Photograph 1: *Eucalyptus salicola* (salt gum) Woodland - Type 1 near Site 1 on Reserve No. 21759

Ws *Eucalyptus salicola* (salt gum) Woodland - Type 2

Diagnosis

Open Low Woodland A to Low Forest A over *Callitris galucophylla* Open Low Woodland B/Low Woodland B over Scrub (Open Low Scrub A to Scrub) over variable lower statum.

Sites

7, 10, 23, 27, 35, 38, 39, 41, 42, 43, 49.

Description

Stratum 1

Low Woodland A of *Eucalyptus salicola* becoming Open Low Woodland A or occasionally Forest A at different localities. In some areas *Eucalyptus salicola* may be present only as scattered individuals. Occasional *Eucalyptus salubris, Eucalyptus yilgarnensis, Eucalyptus melanoxylon* or *Eucalyptus sheathiana* may occur on the lee slope of the dunes or on the adjacent flats.

Stratum 2

Open Low Woodland B to Low Woodland B of *Callitris glaucophylla* and occasionally *Callitris preissii* ssp. *verrucosa*. *Callitris* species may only be present as scattered individuals in some areas.

Stratum 3

Open Low Scrub A to Scrub (rarely thicket) of mixed shrubs and species form a discontinous and patchy stratum. Characteristic species include *Acacia colletioides, Acacia prainii, Acacia acuminata, Allocasuarina acutivalvis, Alyxia buxifolia, Bossiaea walkeri, Baeckea* aff. *behrii, Beyeria lechenaultii, Daviesia benthamii, Dodonaea viscosa, Exocarpus aphyllus, Eremophila scoparia, Grevillea juncifolia, Leoptospermum roei, Melaleuca lanceolata, Melaleuca uncinata, Santalum acuminatum, Santalum spicatum* and *Templetonia sulcata*.

Stratum 4

The lower stratum varies from Dwarf Scrub D to Low Heath C with Low Scrub B and Open Low Grass also recorded. Characteristic species include *Acacia merrallii, Astroloma serratifolium, Atriplex paludosa, Grevillea huegelii, Lepidosperma drummondii, Melaleuca cordata, Melaleuca conothamnoides, Phebalium canaliculatum, Phebalium filifolium, Phebalium tuberculosum, Westringia cephalantha, Westringia dampieri* and *Zygophyllum fruticulosum*.

Comments

Eucalyptus salicola Woodland - Type 2 is typically found on the dunes which have developed on the eastern and south eastern shores of some of the large salt lakes. these dunes consist of quartzose and gypsiferous soils. The understorey is rich in plant species, many confined to this habitat, for example, *Prostanthera baxteri, Calothamnus gilesii, Melaleuca cordata, Melaleuca conothamnoides, Leucopogan cuneifolius* and *Exocarpus sparteus*. In areas adjacent to small lakes and channels where dunes form only low mounds on ridges, *Eucalyptus salicola* may only form a very sparse stratum or be present only as scattered individuals. These areas are mapped as Es or Es(c) where *Callitris glaucophylla* is dominant.

Photograph 2: *Eucalyptus salicola* Woodland - Type 2 on dunes on the eastern shore of Lake Chandler

Ey *Eucalyptus yilgarnensis* (yorrell) Woodland

Diagnosis — Low Forest A/Low Woodland A over variable understorey.

Sites — 4, 8, 33.

Description

Stratum 1 — Low Woodland A to Low Forest A of *Eucalyptus yilgarnensis* with occasional *Eucalyptus salicola* and *Eucalyptus salubris* in some areas.

Stratum 2 — Open Scrub to Scrub of mixed shrub species including *Acacia colletioides, Alyxia buxifolia, Dodonaea lobulata, Exocarpus aphyllus, Eremophila oppositfolia, Hakea preissii, Hakea recurva, Pittosporum phylliraeoides, Santalum acuminatum, Scaevola spinescens* and *Templetonia sulcata*. These species may be present as scattered individuals only or completely absent in some localities where only small areas of yorrell woodland occur.

Stratum 3 — Dwarf Scrub D to Low Heath D with *Atriplex* paludosa, *Atriplex stipitata* and *Olearia muelleri* prominent in some areas. Other commonly occurring species include *Enchylaena tomentosa, Eremophila drummondii, Olearia pimeleoides, Ptilotus eriostrichus, Rhagodia drummondii, Rhagodia preissii, Stipa* sp. and *Zygophyllum fruticulosum*.

Comments

Eucalyptus yilgarnensis is found on sandy loam soils. Of the woodland communities this association tends to occupy the lower areas adjacent to salt lakes or interspersed between dunes. The smaller patches of *Eucalyptus yilgarnensis* Woodland have fewer understorey species.

Photograph 3: *Eucalyptus yilgarnensis* (yorrell) on Lake Campion Nature Reserve

Eg *Eucalyptus salubrus* (gimlet) Woodland

Diagnosis — Low Woodland A over variable understorey.

Sites — 2, 9, 25, 28.

Description

Stratum 1 — Low Woodland A of *Eucalyptus salubris* occasionally forming Low Forest A. This stratum is discontinuous and patchy with occasional *Eucalyptus salicola, Eucalyptus yilgarnensis, Eucalyptus loxophleba* or *Eucalyptus sheathiana*.

Stratum 2 — Open Scrub to Open Low Scrub A of mixed shrub species including *Acacia colletioides, Daviesia benthamii, Dodonaea viscosa, Eremophila oppositifolia, Exocarpus aphyllus, Melaleuca lanceolata, Santalum acuminatum,* and *Scaevola spinescens. Melaleuca uncinata* and *Melaleuca lateriflora* Low Scrub A forms an understorey at Site 25. Stratum 2 is variable and may be absent in some areas.

Stratum 3 — Dwarf Scrub D to Low Heath C of mixed shrub species with Low Grass of *Stipa* sp. at Site 2. Commonly occurring species include: *Acacia erinacea, Acacia merrallii, Atriplex paludosa, Atriplex stipitata, Enchylaena tomentosa, Eremophila drummondii, Grevillea huegelii, Grevillea acuaria, Olearia muelleri, Olearia pimeleiodes, Olearia revoluta, Podolepis capillaris, Maireana diffusa, Maireana triptera, Rhagodia preissii, Stipa elegantissima* and *Westringia cephalantha*.

Comments

Eucalyptus salubris Woodland occurs on heavier soils where the clay is closer to the surface. In some areas, usually adjacent to farmland, the trees show signs of stress probably due to an increase in surface salt.

Photograph 4: *Eucalyptus salubris* (gimlet) at Site 5. The trees show signs of stress probably due to salt encroachment.

W1 *Eycalyptus longicornis* (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland

Diagnosis — Woodland over variable understorey.

Sites — 19, 45, 55.

Description

Stratum 1 — Woodland of *Eucalyptus longicornis* with *Eucalyptus melanoxylon* present in most areas. Occasional *Eucalyptus yilgarnensis*, *Eucalyptus salubris* and *Eucalyptus* sp. (2269) may also be present.

Stratum 2 — Open Low Woodland B of *Melaleuca lanceolata* ssp. *thaeroides* occurring in patches with areas of Open Low Scrub A occasionally to Low Scrub A forming a discontinuous stratum. Commonly occurring species include: *Alyxia buxifolia*, *Acacia colletioides*, *Bossiaea walkeri*, *Eremophila scoparia*, *Exocarpus aphyllus*, *Lycium australe*, *Pittosporum phylliraeoides* and *Santalum acuminatum*.

Stratum 3 — Low Heath D to Low Heath C of mixed shrub species with Open Dwarf Scrub D in some areas. At Site 55 *Atriplex paludosa* is prominent. Other commonly occurring species include *Acacia merrallii*, *Atriplex stipitata*, *Lomandra collina*, *Olearia muelleri*, *Podolepis capillaris*, *Stipa elegantissima* and *Westringia dampieri*.

Comments

Eucalyptus longicornis, Eucalyptus melanoxylon Woodland occurs on the periphery of the mosaic of salt lakes and channels on loam and clay loam soils. These woodlands occupy part of the area covered by the Geological Map Unit Qa - alluvium (Department of Mines, 1986).

Photograph 5: *Eucalyptus longicornis* (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland at Site 55

Wm *Eucalyptus myriadena*, *Eucalyptus salubris* (gimlet), *Eucalyptus yilgarnensis* (yorrell) Woodland

Diagnosis — Open Low Woodland A/Low Woodland A over *Melaleuca lanceolata* Open Low Woodland B or Open Low Scrub A/Low Scrub A over Dwarf Scrub C/Dwarf Scrub D.

Sites — 17, 31, 54.

Description

Stratum 1 — Open Low Woodland A to Low Woodland A of *Eucalyptus myriadena*, *Eucalyptus salubris* and *Eucalyptus yilgarnensis*. This stratum is discontinuous and patchy and areas of Low Forest A occur in some places. Each species may either become dominant over short distances or occur in mixed stands forming a complex mosaic.

Stratum 2 — This stratum is very variable with Open Low Woodland B of *Melaleuca lanceolata*, which is patchily distributed, occurring in some areas.

Stratum 3 — Open Low Scrub A to Low Scrub A of mixed shrub species occurring at most sites. Common Stratum 3 species include: *Acacia colletioides*, *Acacia acuminata*, *Acacia nyssophylla*, *Acacia hemiteles*, *Alyxia buxifolia*, *Cassia nemophila*, *Cassia chatelainiana*, *Dodonaea viscosa*, *Eremophila drummondii*, *Eremophila oppositifolia*, *Eremophila scoparia*, *Exocarpus aphyllus*, *Lycium australe*, *Melaleuca uncinata*, *Pittosporum phylliraeoides*, *Santalum acuminata*, *Scaevola spinescens* and *Templetonia sulcata*.

Stratum 4

Dwarf Scrub D with Dwarf Scrub C occasionally found in some areas. Commonly occurring species include *Atriplex stipitata, Atriplex paludosa* and *Olearia muelleri. Acacia erinacea, Acacia merrallii, Amphipogon ?strictus, Borya constricta, Enchylaena tomentosa, Grevillea acuaria, Podolepis capillaris, Ptilotus exaltatus, Rhagodia preissii, Sclerolaena fusiformis, Stipa elegantissima, Westringia dampieri* and *Zygophyllum fruticulosum* were also recorded.

Comments

This woodland association forms a complex mosaic of *Eucalyptus myriadena, Eucalyptus salubris* and *Eucalyptus yilgarnensis* with a patchy, discontinuous understorey on sandy clay loam soils. The woodland is mainly on the periphery of the salt lake system occurring on the Geological Map Unit Qa - alluvium. Extensive timber cutting has taken place at Site 17.

Photograph 6: *Eucalyptus salubris* (gimlet) and *Eucalyptus yilgarnensis* with an understorey of *Melaleuca lanceolata* at Site 17

Photograph 7: *Eucalyptus myriadena* prominent in Woodland at Site 31

Ww *Eucalyptus capillosa* (wheatbelt wandoo) Woodland

Diagnosis — Low Woodland A over Open Dwarf Scrub C.

Sites — 24.

Description

Stratum 1 — Low Woodland A of *Eucalyptus capillosa* with scattered *Eucalyptus salubris*, *Eucalyptus salicola* and *Eucalyptus sheathiana* at the edge of the association.

Stratum 2 — Open Dwarf Scrub C of mixed shrub species with scattered shrubs to 2 metres. Species recorded include *Daviesia benthamii*, *Eremophila drummondii*, *Grevillea acuaria*, *Lomandra collina*, *Melaleuca lateriflora*, *Melaleuca uncinata*, *Podolepis* sp. and *Templetonia sulcata*.

Comments — *Eucalyptus capillosa* Woodland was found on only three small areas of the reserve on clay loam soils probably underlain by granite. Brooker and Kleinig (1990) indicate that *Eucalyptus capillosa* often occurs on low rises of decomposed granite. In the Muntadgin and Moorine Rock vegetation systems *Eucalyptus capillosa* (referred to as *Eucalyptus wandoo)* is typically found in the vicinity of granite outcrops, bordering Kwongan where there may have been some surface wash from the sandplain, immediately below distinct break-aways or where quartz dykes are situated (Beard, 1980).

Wc *Callitris glaucophylla* (native Cypress pine) Open Low Woodland

Diagnosis — Open Low Woodland B over Scrub over Dwarf Scrub C.

Sites — 22, 26, 37, 48.

Description

Stratum 1 — Open Low Woodland B to Scrub in some places of *Callitris glaucophylla*. This stratum is patchy and discontinuous with *Callitris glaucophylla* present only as scattered individuals in some areas. Occasional *Callitris preissii* ssp. *verrucosa*, *Allocasuarina acutivalvis* and *Eucalyptus salicola* may be present.

Stratum 2 — Very patchy stratum of Scrub to Low Scrub A present in some areas. Characteristic species include *Acacia rigens*, *Acacia prainii*, *Alyxia buxifolia*, *Grevillea juncifolia*, *Leptospermum roei*, *Persoonia ?angustiflora*, *Melaleuca halmaturorum* ssp. *cymbifolia*, *Melaleuca uncinata* and *Santalum acuminatum*.

Stratum 3 — A very patchy and discontinuous stratum of Dwarf Scrub C with only scattered shrubs present in some areas. Characteristic species include *Astroloma serratifolium*, *Darwinia drummondii*, *Conostephium preissii*, *Jacksonia* aff. *hakeoides*, *Grevillea apiciloba*, *Leucopogon cuneifolius*, and *Leucopogon ?nutans*.

Comments — *Callitris glaucophylla* Open Low Woodland is found on low gypsum dunes adjacent to the edge of the larger lakes and preceeding the larger lunette dunes which carry *Eucalyptus salicola* Woodland - Type 2. These "foredunes" consist of crystalline gypsum. They are of recent origin and are being added to at the present time from material crystallizing on the lake surface.

Photograph 8: *Eucalyptus capillosa* Woodland at Site 24

Photograph 9: *Callitris glaucophylla* and *Callitris preissii* on gypsum dunes at Site 48 on the shore of Lake Chandler

MALLEE

Wy *Eucalyptus loxophleba* (York gum) Tree Mallee

Diagnosis — Tree Mallee/Shrub Mallee over variable understorey.

Sites — 13, 18, 44, 52.

Description

Stratum 1 — Tree Mallee to Shrub Mallee of *Eucalyptus loxophleba.*

Stratum 2 — Open Scrub to Open Low Scrub A forms a lower stratum in some areas. Commonly occurring species include *Acacia acuminata, Acacia colletioides, Alyxia buxifolia, Dodonaea viscosa, Exocarpus aphyllus, Eremophila oppositifolia, Lycium australe, Pittosporum phylliraeoides* and *Templetonia sulcata.*

Stratum 3 — Dwarf Scrub D to Low Heath D of mixed shrub species with Dwarf Scrub C in some areas. Stratum 3 species include *Acacia prainii, Atriplex stipitata, Dianella revoluta, Eremophila drummondii, Eremophila decipiens, Olearia exiguifolia, Olearia muelleri, Olearia pimeleoides, Prostanthera grylloana, Rhagodia drummondii, Rinzia carnosa, Westringia cephalantha, Waitzia acuminata and Zygophyllum fruticulosum.* Open Low grass of *Amphigogon ?strictus* forms a third stratum at Site 18.

Comments — *Eucalyptus loxophleba* Tree Mallee occurs on areas of sandy loam where the top soil increased in depth over the clay substrate. This association occurs infrequently and covers only small sections of the reserves. The Mallee associations in the Muntadgin and Moorine Rock vegetation systems become more extensive further up slope from the valley bottoms and salt lake systems.

M1 *Eucalyptus leptopoda* Open Shrub Mallee over Thicket

Diagnosis — Very Open Shrub Mallee over Thicket over Low Grass.

Sites — 56.

Description

Stratum 1 — Very Open Shrub Mallee of *Eucalyptus leptopoda*. This stratus is discontinuous with *Eucalyptus leptopoda* present only as scattered individuals emergent to 5 metres in some areas. An area of *Eucalyptus leptopoda* Shrub Mallee was also recorded near the gravel pit.

Stratum 2 — Thicket to 3 metres in some areas. Prominent species include *Acacia coolgardiensis, Melaleuca uncinata, Baeckea* aff. *behrii* and *Hakea minyma*.

Stratum 3 — Low Grass of *Amphipogon ?strictus*. Other Stratum 3 species recorded include *Glischrocaryon aureum, Prostanthera grylloana and Westringia dampieri*.

Comments — *Eucalyptus leptopoda* Open Shrub Mallee over Thicket occurs on loamy sandy soils containing laterite pebbles covering a small area in the south east corner of the reserve. This association is adjacent to the area covered by the Geological Map Unit Czs - reworked sandplain, sand containing locally abundant limonite pebbles.

Photograph 10: *Eucalyptus loxophleba* (York gum) Tree Mallee at Site 44

Photograph 11: *Eucalyptus leptopoda* Open Shrub Mallee over Thicket at Site 56

KWONGAN

Ka *Acacia* Scrub

Diagnosis — Scrub to Thicket over variable understorey.

Sites — 11, 14, 15, 29, 32.

Description

Stratum 1 — Scrub to Thicket reaching a height of 3 metres in places. This stratum is patchy with *Acacia assimilis* prominent in most areas. Other frequently occurring species which may be prominent at some localities include *Acacia colletioides, Acacia tetragonophylla, Dodonaea viscosa, Exocarpus aphyllus, Hakea preissii,* and *Templetonia sulcata. Alyxia buxifolia, Eremophila oppositifolia, Lycium australe, Santalum acuminatum and Scaevola spinescens* were also recorded. *Acacia acuminata* very occasionally becomes dominant over small areas.

Stratum 2 — Open Dwarf Scrub D to Dwarf Scrub C of mixed shrub species forms a variable understorey in some areas. Commonly occurring species include *Atriplex hymenotheca, Atriplex stipitata, Disphyma crassifolium, Erymophyllum tenellum, Enchylaena tomentosa, Frankenia desertorum, Eremophila decipiens, Grevillea acuaria, Maireana oppositifolia, Maireana diffusa, Maireana triptera, Pimelea microcephala, Podolepis capillaris, Rhagodia preissii* and *Zygophyllum fruticulosum.*

Comments

Acacia Scrub occurs on saline sands and loams over clay often on low rises between the salt flats. This association occupies areas on the landscape between the low lying margins of the salt lakes and the Woodlands which occupy the higher ground. *Acacia acuminata* becomes prominent infrequently and only over small areas. These areas are indicated on the vegetation map using the letter (j).

Photograph 12: *Acacia* Scrub on the Lake Campion Nature Reserve

Kh Thicket/*Borya constricta* Herbs

Diagnosis — Thicket with areas of *Borya constricta* Herbs interspersed.

Sites — 50.

Description — Thicket of *Acacia coolgardiensis* reaching a height of 3 metres in places. Other species recorded include *Acacia acuminata, Acacia colletioides, Amphipogon ?strictus, Atriplex stipitata, Dianella revoluta, Melaleuca eleuterostachya, Olearia pimeleoides, Rhagodia preissii, and Stipa elegantissima.* A small clump of Shrub Mallee of *Eucalyptus hypochlamydea* was also recorded.

Open Areas — In open areas adjacent to the Thicket, Herbs to Open Herbs of *Borya constricta* are found.

Comments — Thicket/Borya *Constricta* Herbs are supported by red brown loam soils over granite and cover only a small area of the reserve adjacent to the Merredin-Chandler Road, south of Lake Chandler. The area is mapped as Ang - "heterogeneous, foliated and banded gneiss extensively intruded by leucocratic granite and adamellite" by the Department of Mines W.A.

Photograph 13: Thicket with areas of *Borya constricta* Herbs interspersed at Site 50

Km *Melaleuca* Thicket

Kml *Melaleuca* Thicket - Type 1

Diagnosis Dense Heath A to Thicket.

Sites 16, 20, 30, 34, 51.

Description

Stratum 1 Dense Heath A to Thicket of *Melaleuca* shrubs to 3 metres with *Melaleuca uncinata* and/or *Melaleuca lateriflora* prominent. Other *Melaleuca* species recorded included *Melaleuca acuminata* ssp. *acuminata* and *Melaleuca eleuterostachya*. Scattered trees of *Callitris glaucophylla* occur in some areas adjacent to lakes or the watercourse. Scattered *Eucalyptus loxophleba* and *Eucalyptus myriadena* emergent to 8 metres were recorded at Site 16.

Stratum 2 Open Low Grass of Amphipogon ?strictus occur at Site 16. In most areas shrubs, grasses and herbaceous species are present only as scattered individuals. These include *Grevillea acuaria*, *Disphyma crassifolium*, *Frankenia desertorum*, *Myriocephalus gracilis*, *Olearia exiguifolia* and *Olearia pimeleoides*.

Km2 *Melaleuca* Thicket - Type 2

Diagnosis Thicket.

Sites 30.

Description

Stratum 1 Thicket of Melaleuca uncinata usually 4-5 metres but occasionally to 7 metres in height. Species occurring as scattered individuals include *Acacia assimilis, Gunniopsis intermedia, Dodonaea viscosa, Enchylaena tomentosa, Frankenia desertorum, Grevillea acuaria, Rhagodia preissii, Melaleuca halmaturorum* and *Melaleuca lateriflora.*

Comments *Melaleuca* Thicket Type 1 and 2 form a patchy mosaic at the edge of the water course and over areas covering a low topographic position on the landscape. This includes the margins of some salt lakes and channels, and on rises interspersed. The *Melaleuca* Thickets are interspersed amongst the *Acacia* Scrub but tend to occur where the clay soils are more prominent and were recorded on sand over clay, sandy clay or sandy clay loam in poorly drained areas. Most areas have been mapped as Km indicating that a mosaic of both formations is present. The presence of scattered trees of *Callitris glaucophylla* which may occur in some areas adjacent to the playa lakes or watercourses are indicated by the use of the symbol (c).

Photograph 14: *Melaleuca uncinata* to 2.5 metres (*Melaleuca* Thicket - type 1) with scattered *Callitris glaucophylla* on the Lake Campion Nature Reserve

Photograph 15: *Melaleuca uncinata* to 5 metres (*Melaleuca* Thicket - Type 2) adjacent to the watercourse on the Lake Campion Nature Reserve

Km3 *Melaleuca* Scrub

Diagnosis — Open Scrub to Scrub.

Sites — 5, 36.

Description

Stratum 1 — Open Scrub to Scrub of Melaleuca lateriflora or *Melaleuca halmaturorum* ssp. *cymbifolia* in a discontinuous and patchy strand at the edge of the salt lakes. In some areas only scattered shrubs are present.

Stratum 2 — *Halosarcia* Heath occurs in areas adjacent to the Melaleuca Scrub occasionally forming a very sparse understorey. Other species recorded include *Atriplex paludosa, Atriplex hymenotheca, Calocephalus multiflorus, Frankenia desertorum* and *Maireana oppositifolia*.

Comments — *Melaleuca* Scrub borders the salt lakes and channels in a narrow, patchy strand occurring on saline silty clay on the slightly elevated margins. The boundary of this formation is usually too narrow to map and its presences is therefore indicated by the map unit "Km3" only.

SAMPHIRE

S *Halosarcia* Heath

Diagnosis — Open Dwarf Scrub D to Low Heath D.

Sites — 6, 21a, 47.

Description — Open Dwarf Scrub D to Low Heath D of samphire, mainly of *Halosarcia* species, usually forming a strand at the edge of the salt lakes and channels. In some areas these succulent halophytes occur only as scattered individuals. *Halosarcia* species recorded include *Halosarcia peltata, Halosarcia halocnemoides, Halosarcia lylei, Halosarcia lepidosperma and Halosarcia leptoclada.* Other species commonly occurring include *Sclerostegia disarticulata, Maireana oppositifolia, Atriplex hymenotheca* and *Frankenia desertorum.*

Comments — A band of *Halosarcia* Heath usually occurs around the margins of the salt lakes and watercourse, smaller clay pans may be covered. The boundaries of this vegetation association are usually too narrow to map at a scale of 1:25 000 and the presence of samphire is usually indicated by the map unit (S) only.

Photograph 16: *Melaleuca halmaturorum* ssp. *cymbifolia* and *Halosarcia* Heath adjacent to a salt lake on the Lake Campion Nature Reserve

4.0 FLORA SURVEY

A total of 229 plant species are listed in Appendix 1. Of these species 72 were not recorded during the present survey. Twenty of these plants were collected by M Blackwell and Associates, B Muir (1978), and Department of Conservation and Land Management personnel during survey work on Common Reserve No. 21759 and Lake Campion Nature Reserve (No. 24789). Some of the species recorded during these surveys have not been included in Appendix 1 as changes in the taxonomy of many plant groups have taken place since the completion of the reports. Fifty two species not previously recorded for the reserves were collected by volunteers from the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel during the spring following the initial survey.

Due to the time and seasonal constraints of the surveys, Appendix 1 only represents part of the flora of the area, possibly less than fifty per cent. Further survey work, especially in the wildflower season would provide a more comprehensive record of the flora of the reserves particularly annual and other herbaceous species. A comparison of the floristic diversity of this salt lake system with other areas of natural vegetation in the wheatbelt should not be made until further data on the flora of the area is available.

Identifications with the generic name followed by "sp." or "?" are uncertain due to the lack of fruiting or flowering material or to confusion in the current taxonomy of the group concerned. The nomenclature follows that of Green (1985) and Supplement 7 (unpublished) unless otherwise stated. *Darwinia drummondii* has not been listed in Green, however this species name has been previously published and will be included in the revision of the genus *Darwinia* by Marchant and Keighery (Marchant pers comm.). *Darwinia drummondii* has been referred to as *Darwinia diosmoides* in previous reports on the flora and vegetation of the Lake Campion area. *Hyalosperma glutinosum* ssp. *glutinosum* has been previously known as *Helipterum hyalospermum*. This change is part of a revision by Mr P Wilson and is yet to be listed in a supplement to Green (1985).

4.1 Flora of the Lake Campion Nature Reserve (No. 24789)

A total of 198 species including 2 gymnosperms and 196 angiosperms are listed in Appendix 1 as occurring in the Lake Campion Nature Reserve. Ten of the species are exotic or introduced and 17 have been previously recorded for the reserve by M Blackwell and Associates and B Muir (1978) but were not recorded during the present survey. A further 31 species were added to the list after collections were made by volunteers from the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel during September 1990.

The families with the largest representatives of genera and species are listed below.

Family	No. of Species	No. of Genera	No. of Exotics
Myrtaceae	28	8	0
Asteraceae	26	20	3
Chenopodiaceae	23	8	0
Mimosaceae	14	1	0
Proteaceae	13	3	0
Poaceae	6	6	4

The family Myrtaceae is the richest in species with *Eucalyptus* and *Melaleuca* species dominant in 10 of the 14 vegetation associations mapped for the reserve. Plant species belonging to the family Chenopodiaceae were also numerous. Many members of this family are typically found in salt lake areas.

Of the monocotyledons members of the family Poaceae are most common. The monocotyledons are poorly represented in the species list mainly due to the seasonal constraints of the survey. The number of herbaceous and ephemeral species recorded for the area is expected to increase substantially with further survey work. Major families concerned include Anthericaceae, Orchidaceae, Poaceae, Iridaceae and Haemodoraceae.

Eucalyptus salicola Woodland - Type 2 is the richest in plant species of the vegetation associations found on the Lake Campion Nature Reserve with 124 species recorded (Appendix 4). This association occurs on gypsum dunes on the eastern and southern shores of some of the larger lakes. The number of species recorded for the association may in part be due to the more intensive survey work carried out in these areas. However many of the plant species recorded were unique to the dune habitat e.g. *Callitris preissii* ssp. *verrucosa*, *Grevillea juncifolia*, *Melaleuca cordata* and *Prostanthera baxteri*.

The following vegetation associations also have a high number of species present (Appendix 3)

	No. of Species Recorded
Acacia Scrub	53 (17)
Eucalyptus myriadena, Eucalyptus salubris, Eucalyptus yilgarnensis Woodland	46 (9)
Eucalyptus salicola Woodland - Type 1	45
Eucalyptus yilgarnensis Woodland	44 (16)
Eucalyptus salubris Woodland	42 (11)
Melaleuca Thicket	38

( ) Number of additional species collected by Department of Conservation and Land Management personnel and members of the Mukinbudin Wildflower society in the following Spring. Not all vegetation types were visited during the Spring survey.

4.2 Flora of the Common Reserve (No. 21759)

A total of 153 plant species are listed in Appendix 1 as occurring on Reserve No. 21759. Eleven of these species are exotic or introduced and 3 were collected by R Brazell and identified by K Atkins but were not found during the present survey. A further 48 species were added to the list after collections were made by members of the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel during the Spring following the initial survey.

The families with the largest representations of genera and species are listed below.

Family	No. of Species	No. of Genera	No. of Exotics
Asteraceae	33	25	3
Chenopodiaceae	25	9	0
Myrtaceae	13	4	0
Mimosaceae	11	1	0
Proteaceae	3	2	0
Poaceae	9	7	4

The families Asteraceae, Chenopodiaceae and Myrtaceae were the most strongly represented in the flora of Reserve No. 21759. As with the Lake Campion Nature Reserve a large increase in the number of monocotyledons recorded for the area is expected with further field work.

4.3 Species of Interest

?Leucopogan nutans has been recorded by Briggs and Leigh (1988) in "Rare or Threatened Australian Plants" and classified as 3kc$^-$.

"3" species with a range over 100 kilometres but occurring only in small populations which are mainly restricted to highly specific and localised habitats.

"k" poorly known - species that are suspected but not definitely known to belong to any of the Conservation Status categories. At present field distribution information is inadequate.

"c$^-$" species known to be represented within a national park or other proclaimed reserve but population size within the reserve is unknown.

Rye (1982) also includes *Leucopogon nutans* as geographically restricted with a distribution of less than 100 kilometres.

M Blackwell and Associates recorded *Leucopogon nutans* on gypsum dunes in the Lake Campion Nature Reserve. The identification of this species is doubtful and flowering plant material needs to be examined before the identity of this species can be confirmed. Plant material collected during the present survey was not sufficient for this purpose. *Leucopogon nutans* has only been previously recorded from the New Norcia area and a revision of the genus *"Leucopogon"* is needed to clarify taxonomic anomalies within the group.

Hakea 'rigida' (manuscript name) is a Department of Conservation and Land Management Priority 2 species and has not been collected for 60 years. Priority 2 - Poorly known Taxa are taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey. The specimen collected during the present survey No. 2236 is possibly *Hakea 'rigida'* but further checking is needed when flowering material becomes available. The original specimen of *Hakea 'rigida'* is from the Lake Campion-Lake Brown area and was collected in a Mallee habitat. Specimen 2236 was found in the dune habitat and the leaves on this specimen are not as broad as those of the original collection.

5.0 MANAGEMENT CONSIDERATIONS

5.1 Gypsum Mining on the Lake Campion Nature Reserve and Adjacent Areas

Site data for the vegetation associations covering the dunes on the Lake Campion Nature Reserve and adjacent areas are presented in Appendix 2 (Muir Vegetation Descriptions) and Appendix 4 (Plant Species List for the dune areas). Due to time limitations and seasonal constraints the species list only represents a portion of the flora of the area. More collecting work is required on the dunes to clarify the data presented.

During field work extensive areas of the Lake Campion Nature Reserve east of Lake Brown were visited. The survey included dunes on the salt lakes covered by mining leases with the exception of Lake Reward, east of Lake Chandler, covered by Mining Lease 77/77. Only six of the salt lakes surveyed, including Lake Brown, have substantial dune formation on the southern and/or eastern shores. The dunes consist of a "foredune" of crystalline gypsum of recent origin preceding the large "lunette" dune containing seed and granular gypsum. Mining operations have already taken place on three of these lakes.

The dunes on the south eastern shore of the salt lake north of Lake Chandler are situated on vacant Crown land and are covered by mining claims MC 42 and 43. This area has been extensively mined and site data was not collected. Gypsum mining on Lease 77/2 has also taken place but has not commenced on Lease 77/21 situated on the southern dunes of the same lake.

An area on the southern shore of Lake Chandler is now regenerating (Mining Lease 77/22).

Most of the dune on the eastern shore of Lake Brown is situated on vacant Crown land (Site 7) with only a small section in the Lake Campion Reserve (Site 10). These dune areas have been disturbed with the construction of access tracks to the gypsum workings on the lake bed and the number of species recorded for Site 7 was only 30. Of the remaining two lakes, the dunes of one is covered by Mining Leases (77/32 and 77/9).

The foredunes on the six lakes support *Callitris glaucophylla* (native Cypress pine) Open Low Woodland with a total of 30 species recorded for this vegetation type. The lunette dunes are covered by a sparse to mid dense woodland of *Eucalyptus salicola* (salt gum) with 124 species recorded in these areas. This includes 7 species recorded by Blackwell and Associates but not found during the present survey and a further 8 species collected by the Mukinbudin Wildflower Society.. These preliminary figures indicate that the *Eucalyptus salicola* woodland found on the dunes is the richest in plant species of the vegetation associations described in the present survey. The number of species recorded at sites with substantial dune formation range from 32 to 68 (see Table 3).

Most of the Lake Campion Nature Reserve is covered by a complex mosaic of small salt lakes, channels and creekline where adjacent dune areas are small and form low mounds and ridges. In these areas *Eucalyptus salicola* forms a sparse to very sparse cover and fewer species are present in the understorey. At Sites 39 and 42, 18 and 14 species were recorded respectively (Table 3). The dune on the southern shore of one of the largest lakes (here called Lake Campion) also has a very sparse cover of *Eucalyptus salicola* with only 20 species recorded (Site 20). A mid dense woodland of *Eucalyptus salicola* occurs on a substantial dune located 0.5 kilometres south of the creekline and north of a chain of salt lakes but here many understorey species differ from those supported by the gypsum dunes, probably reflecting differences in soil type.

Forty five of the plant species recorded during the survey of the Lake Campion Nature Reserve and Reserve No. 21759 were found only in dune areas (Appendix 4). This is 20% of all native plant species listed for the Reserve and adjacent areas. Some of these species include *Allocasuarina helmsii, Astroloma epacridis, Callitris preissii* ssp. *verrucosa, Calothamnus gilesii, Conostephium preissii, Grevillea apiciloba, Grevillea juncifolia, Melaleuca conothamnoides, Melaleuca cordata, Jacksonia* aff. *hakeoides, Leucopogan cuneifolius, Leucopogan ?nutans, Persoonia diadena* and *Prostanthera baxteri.*

Only *Leucopogon ?nutans* has been recorded by Briggs *et al* (1988) in the listings of rare or threatened Australian plants. This species has been classified as "k" poorly known and the identification of the plant found during this survey is in doubt until flowering material is collected.

Hakea sp. (2236) is possibly the Department of Conservation and Land Management Priority 2 species *Hakea rigida* (manuscript name) and is recorded for the dune areas. The identification of this plant is also in doubt until further material is collected.

The dune areas on the Lake Campion Nature Reserve and adjoining land form an integral part of the Salt Lake System. Dunes that provide substantial areas of gypsum deposits for mining also provide a unique habitat for plant species. Many of the species recorded during the present survey were only found in these areas. Mining operations have already taken place on the reserve and further destruction may lead to the elimination of this habitat type.

TABLE 3 - NUMBER OF PLANT SPECIES RECORDED ON DUNE AREAS IN THE LAKE CAMPION NATURE RESERVE AND ADJOINING AREAS

SITE	HABITAT	MINING LEASE	NO. OF PLANT SPECIED RECORDED
7	Dune on the eastern shore of Lake Brown		30
10	Dune on the eastern shore of Lake Brown		27
22 & 23	Dunes on the southern shore of salt lake	77/9	68
Blackwell & Associates Nr. Sites 22 & 23	Dunes on the north eastern shore of salt lake	77/32	55
26 & 27	Dunes on the southern shore of salt lake		32
37 & 38	Dunes on the eastern shore of salt lake	77/2	34

SITE	HABITAT	MINING LEASE	NO. OF PLANT SPECIED RECORDED
Blackwell & Associates Nr. Sites 37 & 38	Dunes on the eastern and southern shores of salt lake	77/2 & 77/21	30
39	Small "dune" adjacent to creek-line		18
41	Dune 0.5 metres south of the creekline and north of a chain of salt lakes		18
42	Small dune on the eastern shore of salt lake		14
43	Dune on the southern shore of Lake Campion		20
48 & 49	Dunes on the eastern shore of Lake Chandler	77/22	42

5.2 Reserve No. 21759 (Common)

The addition of Reserve No. 21759 to the Lake Campion Nature Reserve is highly recommended. Although parts of the reserve have been disturbed and some salt affected areas also occur, especially on the northern boundary, the majority of the Common is in good condition. Extensive areas of *Eucalyptus salicola* Woodland - Type 1 and *Eucalyptus yilgarnensis* Woodland cover most of the area. *Eucalyptus salicola* only occurs on the Lake Campion Nature Reserve as Type 2 Woodland or as a sparse to very sparse Woodland covering only small areas. *Eucalyptus yilgarnensis* is commonly found on the Lake Campion Nature Reserve but covers only small areas interspersed between numerous salt lakes and channels.

5.3 Degraded and Disturbed Areas Needing Consideration

1. The gravel pit in the south eastern corner of the Lake Campion Nature Reserve should be rehabilitated.

2. Access to trail bikes and off-road vehicles should be restricted possibly by blocking some of the tracks and by the selective use of signs. There will be difficulty in blocking tracks in open woodland situations.

3. The north eastern boundary of the Lake Campion Nature Reserve was not examined during the present survey due to time limitations. An inspection of this area is needed to ensure that fencing is adequate and that regeneration of previously disturbed areas is taking place. The extent of salt affected areas should also be determined.

4. The effect of raising the water table of Lake Campion on the shoreline vegetation should be monitored.

6.0 ACKNOWLEDGEMENTS

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Mr B Maslin and Dr R Cowan for the identification of *Acacia* species, Mr M Trudgen for *Baeckea* species and Mr P Wilson for species belonging to the family Chenopodiaceae.

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APPENDIX 1 - PLANT SPECIES LIST.

2345 Voucher Number
* Introduced Species
K.A. Reported by K J Atkins & R Brazell
M.B. Reported by M Blackwell
B.M. Reported by B Muir (1978)
P.B. Collected by Paul Brown and the Mukinbudin Wildflower Society
J.C. Collected by John Carter and the Mukinbudin Wildflower Society

	Common Reserve No. 21759	Lake Campion Nature Reserve No. 24789
GYMNOSPERMAE		
CUPRESSACEAE		
Callitris glaucophylla 2262	X	X
Callitris preissii ssp. verrucosa 2260		X
MONOCOTYLEDONAE		
POACEAE		
* Aira caryophyllea	X	X
Amphipogon ?strictus 2194		X
Aristida sp. K.A.	X	
* Avena sativa	X	X
* Bromus rubens J.C. 218	X	X
Eragrostis dielsii J.C. 210	X	
Stipa elegantissima 2097	X	X
Stipa ?juncifolia K.A.	X	
Stipa trichophylla J.C. 212	X	
* Vulpia bromoides J.C. 276	X	X
CYPERACEAE		
Lepidosperma drummondii 2254		X
Lepidosperma ?tuberculatum J.C. 262		X

RESTIONACEAE		
Lepidobolus preissianus 2219		X
Restio sphacelatus M.B.		X
DASYPOGONACEAE		
Chamaexeros fimbriata J.C. 260		X
Lomandra collina 2173	X	
Lomandra effusa 2125	X	X
PHORMIACEAE		
Dianella revoluta	X	X
ANTHERICACEAE		
Borya constricta 2202		X
Thysanotus patersonii	X	X
Thysanotus sp. P.B. 15	X	
ASPHODELACEAE		
Bulbine semibarbata P.B. 31	X	X
DICOTYLEDONAE		
CASUARINACEAE		
Allocasuarina acutivalvis	X	X
Allocasuarina helmsii 2247		X
Allocasuarina campestris M.B.		X
Allocasuarina corniculata M.B.		X
PROTEACEAE		
Grevillea acerosa M.B.		X
Grevillea acuaria 2176	X	X
Grevillea apiciloba 2238		X
Grevillea huegelii 2230		X
Grevillea juncifolia 2213		X
Grevillea paradoxa 2273		X
Hakea invaginata 2258		X
Hakea minyma 2193		X
Hakea preissii 2148, 2135	X	X

Hakea recurva 2141	X	X
Hakea sp. (rigida manuscript name) 2236		X
Persoonia ?angustiflora 2237		X
Persoonia diadena 2274		X
SANTALACEAE		
Choretrum glomeratum M.B.		X
Exocarpus aphyllus 2092	X	X
Exocarpus sparteus 2257		X
Santalum acuminatum 2175	X	X
Santalum murrayanum M.B.		X
Santalum spicatum 2103	X	X
LORANTHACEAE		
Amyema preissii 2181	X	
Amyema miquelii M.B.		X
Lysiana casuarinae 2204		X
CHENOPODIACEAE		
Atriplex hymenotheca 2145	X	X
Atriplex paludosa ssp. baundinii 2107	X	X
Atriplex spongiosa J.C. 224	X	
Atriplex stipitata 2098	X	X
Didymanthus roei J.C. 230	X	
Enchylaena tomentosa 2096	X	X
Halosarcia halocnemoides 2115, 2117	X	X
Halosarcia lepidosperma 2288		X
Halosarcia leptoclada 2289		X
Halosarcia lylei 2239		X
Halosarcia peltata 2114	X	
Maireana amoena 2158	X	X
Maireana brevifolia 2154	X	X
Maireana carnosa P.B. 126	X	X
Maireana diffusa 2155	X	X
Maireana erioclada 2152, J.C. 205	X	X
Maireana eriosphaera J.C. 228	X	
Maireana georgei P.B. 124	X	X

Maireana oppositifolia 2112	X	X
Maireana trichoptera P.B. 123	X	X
Maireana triptera 2101	X	X
Rhagodia drummondii 2170	X	X
Rhagodia preissii ssp. preissii 2108	X	X
Salsola kali 2102	X	X
Sclerolaena diacantha P.B. 134	X	X
Sclerolaena fusiformis 2121	X	X
Sclerostegia disarticulata 2113	X	X
Sclerostegia moniliformis J.C. 202a	X	
AMARANTHACEAE		
Ptilotus eriotrichus 2138	X	X
Ptilotus exaltatus 2123	X	X
Ptilotus holosericeus P.B. 2	X	
AIZOACEAE		
Disphyma crassifolium 2189	X	X
Gunniopsis intermedia 2171	X	X
* Mesembryanthemum nodiflorum 2179	X	X
Sarcozona praecox J.C. 240	X	
PORTULACACEAE		
Calandrinia ?granulifera P.B. 21	X	X
LAURACEAE		
Cassytha sp. 2188	X	
BRASSICACEAE		
* Brassica tournefortii J.C.	X	X
* Raphanus raphanistrum	X	X
Stenopetalum filifolium P.B. 18	X	X
CRASSULACEAE		
Crassula colorata J.C. 209	X	X

PITTOSPORACEAE		
Billardiera lehmanniana M.B.		X
Pittosporum phylliraeoides 2089	X	X
MIMOSACEAE		
Acacia acuminata	X	X
Acacia assimilis 2157	X	X
Acacia chrysella 2087	X	
Acacia colletioides 2265	X	X
Acacia coolgardiensis 2290, 2291		X
Acacia erinacea 2106	X	X
Acacia fragilis 2220		X
Acacia hemiteles 2183	X	X
Acacia lasiocalyx 2161	X	X
Acacia merrallii 2184	X	X
Acacia multispicata K.A. & B.M.	X	X
Acacia nyssophylla 2207	X	X
Acacia prainii 2231		X
Acacia rigens 2232		X
Acacia tetragonophylla 2093	X	X
CAESALPINIACEAE		
Cassia charlesiana 2128	X	X
Cassia chatelainiana 2129	X	X
Cassia nemophila 2199	X	X
PAPILIONACEAE		
Bossiaea walkeri 2256	X	X
Daviesia benthamii 2211	X	X
Jacksonia sp. (aff. hakeoides) 2169	X	X
Templetonia sulcata 2255	X	X
GERANIACEAE		
* Erodium cicutarium J.C. 220	X	

ZYGOPHYLLACEAE		
Zygophyllum fruticulosum 2153	X	X
Zygophyllum glaucum 2126	X	X
Zygophyllum ovatum J.C. 203	X	
RUTACEAE		
Microcybe multiflora M.B., J.C. 280		X
Phebalium canaliculatum 2163	X	X
Phebalium filifolium 2225		X
Phebalium tuberculosum 2224		X
POLYGALACEAE		
Comesperma integerrimum J.C. 264		X
EUPHORBIACEAE		
Bertya dimerostigma 2215		X
Beyeria lechenaultii 2276	X	X
Ricinocarpos muricatus M.B.		X
SAPINDACEAE		
Dodonaea bursariifolia 2251		X
Dodonaea lobulata 2143	X	X
Dodonaea viscosa ssp. angustissima 2091	X	X
RHAMNACEAE		
Cryptandra grandiflora M.B.		X
Cryptandra parvifolia 2229		X
MALVACEAE		
Lawrencia squamata K.A.	X	
DILLENIACEAE		
Hibbertia glomerosa 2166		X
FRANKENIACEAE		
Frankenia desertorum 2147	X	X
Frankenia sp. J.C. 221	X	

THYMELAEACEAE		
Pimelea microcephala 2174	X	X
MYRTACEAE		
Baeckea sp. (aff. behrii) 2221		X
Callistemon phoeniceus 2246		X
Calothamnus gilesii 2212		X
Calytrix leschenaultii 2165	X	X
Darwinia drummondii 2168	X	X
Eucalyptus capillosa ssp. capillosa 2249		X
Eucalyptus eremophila M.B.		X
Eucalyptus hypochlamydea 2227		X
Eucalyptus leptopoda 2286		X
Eucalyptus longicornis 2209	X	X
Eucalyptus loxophleba 2120	X	X
Eucalyptus melanoxylon 2278		X
Eucalyptus myriadena 2197		X
Eucalyptus salicola 2136	X	X
Eucalyptus salubris 2119	X	X
Eucalyptus sheathiana 2248		X
Eucalyptus yilgarnensis 2137, 2201	X	X
Eucalyptus sp. 2269		X
Leptospermum roei 2227	X	X
Melaleuca acuminata ssp. acuminata 2270		X
Melaleuca conothamnoides 2277		X
Melaleuca cordata 2252		X
Melaleuca eleuterostachya 2191	X	X
Melaleuca halmaturorum ssp. cymbifolia 2240	X	X
Melaleuca lanceolata ssp. thaeroides 2130	X	X
Melaleuca lateriflora 2110	X	X
Melaleuca uncinata	X	X
Rinzia carnosa 2205		X

HALORAGACEAE		
Glischrocaryon aureum		X
APIACEAE		
Daucus glochidiatus P.B. 13	X	X
Hydrocotyle ?pilifera P.B. 11	X	X
Trachymene cyanopetala P.B. 3	X	X
Trachymene ornata J.C. 305	X	X
EPACRIDACEAE		
Astroloma epacridis 2245		X
Astroloma serratifolium 2228		X
Conostephium preissii 2234		X
Leucopogon cuneifolius 2235		X
Leucopogon ?nutans 2241		X
Leucopogon ?insularis M.B.		X
Leucopogon ?strictus M.B.		X
APOCYNACEAE		
Alyxia buxifolia 2124	X	X
LAMIACEAE		
Prostanthera baxteri 2222		X
Prostanthera grylloana 2196		X
Westringia cephalantha 2261	X	X
Westringia dampieri 2218		X
SOLANACEAE		
Lycium australe 2124	X	X
Solanum hoplopetalum 2127	X	
Solanum orbiculatum 2175	X	X
MYOPORACEAE		
Eremophila clarkei B.M.		X
Eremophila decipiens 2159	X	X
Eremophila drummondii 2085	X	X
Eremophila oppositifolia 2095	X	X
Eremophila scoparia 2177	X	X

GOODENIACEAE			
Dampiera ?lavandulacea 2164			X
Goodenia pinifolia 2253			X
Scaevola spinescens 2122		X	X
STYLIDIACEAE			
Levenhookia leptantha P.B. 9		X	
ASTERACEAE			
Actinobole uliginosum P.B. 20		X	
Angianthus tomentosus P.B. 23		X	
* Arctotheca calendula J.C.		X	X
Argyroglottis turbinata B.M.		X	X
Asteridea athrixioides P.B. 28		X	X
Brachycome ?pusilla J.C. 2196		X	X
Brachycome ciliaris J.C. 219a		X	
Calocephalus multiflorus 2185		X	X
Cephalipterum drummondii P.B. 8		X	X
Erymophyllum tenellum 2180		X	X
Gnephosis brevifolia P.B. 27		X	X
Gnephosis tridens 2186		X	X
Helichrysum leucopsideum J.C. 268			X
Helichrysum lindleyi P.B. 29		X	X
Helipterum laeve P.B. 33		X	X
Helipterum pygmaeum J.C. 206		X	
Helipterum rubellum P.B. 7		X	
Hyalosperma glutinosum ssp. glutinosum P.B. 5		X	X
Isoetopsis graminifolia J.C. 213		X	
Kippistia suaedifolia J.C. 245		X	
Myriocephalus gracilis 2190		X	X
Olearia exiguifolia 2266			X
Olearia muelleri 2094		X	X
Olearia pimeleoides 2100		X	X
Olearia revoluta 2131		X	X
* Osteospermum clandestinum P.B. 19		X	X
Podolepis canescens P.B. 30		X	X

	Podolepis capillaris 2088	X	X
	Podotheca gnaphalioides P.B. 17	X	X
	Pogonolepis ?stricta 2118	X	
	Pogonolepis muelleriana P.B. 24	X	
	Senecio ?minimus J.C. 243	X	X
*	Ursinia anthemoides	X	X
	Vittadinia eremaea 2178	X	X
	Waitzia acuminata P.B 1	X	X

APPENDIX 2 - MUIR VEGETATION DESCRIPTIONS

Eucalyptus salicola (salt gum) Woodland - Type 1 [Ws1]

Site 1	Low Woodland A/Woodland over Scrub/Open Scrub over Low Heath D/Low Grass
Site 3	Woodland/Open Woodland over Scrub/Thicket (patchy) over Dwarf Scrub D
Site 12	Woodland over Scrub (patchy) over Dwarf Scrub D

Eucalyptus salicola (salt gum) Woodland - Type 2 [Ws]

Site 7a & 7b	Open Low Woodland A over *Callitris glaucophylla* Low Woodland B in places or *Melaleuca lanceolata* ssp. *thaeroides* Low Woodland B in places over *Leptospermum roei* Low Scrub A (small area) over Dwarf Scrub C/Dwarf Scrub D (patchy)
Site 10	Low Woodland A over *Callitris glaucophylla* Open Low Woodland B over Low Scrub A over Low Heath D (in places)
Site 23	Low Woodland A/Low Forest A over Scrub over Dwarf Scrub C/Low Heath C
Site 27	Low Woodland A over Scrub over Dwarf Scrub C (patchy)
Site 35	Low Woodland A over *Allocasuarina acutivalvis, Melaleuca halmaturorum, Callitris glaucophylla* Open Low Woodland B/Open Scrub over Dwarf Scrub C
Site 38	Low Woodland A/Woodland over *Callitris glaucophylla* Low Woodland B (patchy) over Open Low Scrub A over Low Scrub B

Site 39 — Open Low Woodland A over *Callitris glaucophylla* Low Woodland B over Scrub over Open Low Grass

Site 41 — Low Woodland A/Low Forest A over *Callitris glaucophylla* Open Low Woodland B (Low Woodland B in places) over Thicket (patchy) over Open Dwarf Scrub C

Site 42 — Open Low Woodland A *(Eucalyptus salicola* scattered in places) over *Callitris glaucophylla* Open Low Woodland B over Low Scrub A (patchy) over Dwarf Scrub D

Site 43 — Open Low Woodland A *(Eucalyptus salicola* scattered in places) over *Callitris glaucophylla* Low Woodland B over Scrub over Dwarf Scrub D

Site 49 — Low Woodland A/Woodland over *Melaleuca lanceolata, Callitris glaucophylla, Allocasuarina acutivalvis* Low Woodland B/Scrub over Dwarf Scrub C

Eucalyptus yilgarnensis (yorrell) Woodland [Wy]

Site 4 — Low Forest A over Scrub over Dwarf Scrub D

Site 8 — Low Woodland A (Low Forest A in places) over Low Heath D/Dwarf Scrub D

Site 33 — Low Woodland A/Low Forest A over Open Scrub over Low Heath D

Eucalyptus salubris (gimlet) Woodland [Wg]

Site 5 — Low Woodland A over Open Scrub in places over Low Grass

Site 9 — Low Woodland A over Open Low Scrub A over Dwarf Scrub D/Low Heath D

Site 25 — Low Woodland A over *Melaleuca* Low Scrub A over Low Heath C

Site 28 — Low Woodland A (Low Forest A in places - patchy) over Open Low Scrub A in places over Open Dwarf Scrub C to Low Heath C

Eucalyptus longicornis (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland [Wl]

Site 19 — Woodland over *Melaleuca lanceolata* Open Low Woodland B (patchy) or Open Low Scrub A over Low Heath D

Site 45 — Woodland over *Melaleuca lanceolata* Open Low Woodland B (clumps) or Low Scrub A over Open Dwarf Scrub D

Site 55 — Woodland over Low Heath C (occasional patches of *Melaleuca lanceolata)*

Eucalyptus myriadena, Eucalyptus salubris, Eucalyptus yilgarnensis Woodland [Wm]

Site 17 — Open Low Woodland A/Low Woodland A (patchy) over *Melaleuca lanceolata* Open Low Woodland B (patchy) over Open Low Scrub A over Dwarf Scrub C/Dwarf Scrub D

Site 31 — *Eucalyptus myriadena* and *Eucalyptus salubris* Low Woodland A (patchy) over Low Scrub A over Dwarf Scrub D

Site 54 — Low Woodland A (patchy - Low Forest A in places) over *Melaleuca lanceolata* Open Low Woodland B (patchy) or over Low Scrub A/Open Low Scrub A in places over Dwarf Scrub D

Eucalyptus capillosa (Wheatbelt wandoo) Woodland [Ww]

Site 24 — Low Woodland A over Open Dwarf Scrub C

Callitris glaucophylla Open Low Woodland [Wc]

Site 22 — Open Low Woodland B over Scrub in places over Dwarf Scrub C (patchy)

Site 26 — Open Low Woodland B (scattered trees in places) over Scrub in places over Dwarf Scrub C (patchy)

Site 37 — Open Low Woodland B over Low Scrub A

Site 48 — Open Low Woodland B/Open Scrub (scattered trees in places) over Scrub (patchy) over Dwarf Scrub C (patchy)

Eucalyptus loxophleba (York gum) Tree Mallee [My]

Site 13 — Tree Mallee over Open Scrub over Dwarf Scrub D

Site 18 — Tree Mallee/Shrub Mallee over *Acacia* sp. (2109) Heath A over Open Low Grass

Site 44 — Tree Mallee/Shrub Mallee over Open Low Scrub A in places over Low Heath D/Dwarf Scrub D

Site 52 — Tree Mallee over Open Low Scrub A over Dwarf Scrub C

Eucalyptus leptopoda Open Shrub Mallee over Thicket [Ml]

Site 56 — Very Open Shrub Mallee over Thicket over Low Grass (area of Shrub Mallee near the gravel pit)

Acacia Scrub [Ka]

Site 11	Scrub over Dwarf Scrub D *(Acacia* sp. (2109) prominent)
Site 14	Thicket *(Acacia acuminata* prominent)
Site 15	Scrub over Open Dwarf Scrub C/Dwarf Scrub C *(Acacia* sp. (2109) prominent)
Site 31	Thicket *(Acacia* sp. (2109) prominent)
Site 32	Heath A over Open Dwarf Scrub D *(Acacia* sp. (2109) prominent)

Melaleuca Thicket [Km]

Melaleuca Thicket - Type 1 [Km1]

Site 16	*Melaleuca uncinata* Thicket over Open Low Grass
Site 20	*Melaleuca lateriflora, Melaleuca uncinata* Heath A/Thicket
Site 30	*Melaleuca uncinata* Thicket to Dense Heath A
Site 34	*Melaleuca uncinata* thicket (Scattered trees of *Callitris glaucophylla)*
Site 51	*Melaleuca uncinata, Melaleuca lateriflora* Thicket

Melaleuca Thicket - Type 2 [Km2]

Site 30	*Melaleuca uncinata* Thicket (to 7 metres in places)

Melaleuca Scrub [Km3]

Site 5	*Melaleuca lateriflora* Scrub
Site 36	*Melaleuca halmaturorum* Scrub/Open Scrub

Thicket/*Borya constricta* Herbs [Kh]

Site 50	Thicket with areas of *Borya constricta* Herbs (Shrub Mallee over small area)

Halosarcia Heath [S]

Site 6	*Halosarcia* Dwarf Scrub D (Low Heath D in some areas)
Site 21a	*Halosarcia* Open Dwarf Scrub D (scattered shrubs in some areas)
Site 47	*Halosarcia* Low Heath D/Dwarf Scrub D

APPENDIX 3 - SPECIES LIST FOR VEGETATION ASSOCIATIONS FOUND ON LAKE CAMPION NATURE RESERVE (NO. 24789) AND RESERVE (NO. 21759)

Eucalyptus salicola (salt gum) Woodland - Type 1

Acacia acuminata
Acacia chrysella
Acacia colletioides
Acacia erinacea
Acacia tetragonophylla
*Aira caryophyllea
Alyxia buxifolia
Atriplex hymenotheca
Atriplex paludosa
Atriplex stipitata
Calytrix ?leschenaultii
Cassia chatelainiana
Cassia nemophila
Dodonaea viscosa ssp. angustissima
Enchylaena tomentosa
Eremophila drummondii
Eremophila oppositifolia
Eucalyptus loxophleba
Eucalyptus salicola
Eucalyptus salubris
Eucalyptus yilgarnensis
Exocarpus aphyllus
Hakea preissii
Maireana triptera
Melaleuca lanceolata ssp. thaeroides
Olearia muelleri
Olearia pimeleoides
Olearia revoluta
Pittosporum phylliraeoides
Podolepis capillaris
*Raphanus raphanistrum
Rhagodia drummondii
Rhagodia preissii
Salsola kali
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
Sclerolaena fusiformis
Solanum hoplopetalum
Stipa elegantissima
Templetonia sulcata
Waitzia acuminata
Westringia cephalantha
Zygophyllum fruticulosum
Zygophyllum glaucum

* Introduced species

Eucalyptus salicola (salt gum) - Type 2 - see Appendix 4

Eucalyptus yilgarnensis (yorrell) Woodland

Acacia acuminata
Acacia assimilis
Acacia colletioides
Acacia tetragonophylla
#Actinobole uliginosum
Alyxia buxifolia
#Angianthus tomentosus
Atriplex paludosa
Atriplex stipitata
Bossiaea walkeri
#Brachycome ?pusilla
#Calandrinia ?granulifera
Callitris glaucophylla
Cassia nemophila
#Cephalipterum drummondii
Dianella revoluta
Dodonaea lobulata
Dodonaea viscosa
Enchylaena tomentosa
Eremophila drummondii
Eremophila oppositifolia
Eucalyptus salicola
Eucalyptus salubris
Eucalyptus yilgarnensis
Exocarpus aphyllus
#Frankenia desertorum
Hakea preissii
Hakea recurva
#Hyalosperma glutinosum
#Levenhookia leptantha
Lomandra effusa
Lycium australe
#Maireana carnosa
Maireana diffusa
#Maireana georgei
#Maireana trichoptera
Maireana triptera
Melaleuca uncinata
Olearia muelleri
Olearia pimeleoides
Pittosporum phylliraeoides
Podolepis capillaris
#Podotheca gnaphalioides
#Pogonolepis muelleriana
Ptilotus eriotrichus
Ptilotus exaltatus
Rhagodia drummondii
Rhagodia preissii
Santalum spicatum
Scaevola spinescens
#Sclerolaena diacantha
#Senecio ?minimus
Solanum orbiculatum
#Stenopetalum filifolium
Stipa elegantissima
Stipa sp.
Templetonia sulcata
Waitzia acuminata
Zygophyllum fruticulosum
Zygophyllum glaucum

* Introduced species

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

Eucalyptus salubris (gimlet) Woodland

Acacia assimilis
Acacia colletioides
Acacia erinacea
Acacia hemiteles
Acacia merrallii
Acacia tetragonophylla
Atriplex stipitata
*Avena sativa
#Brachycome ?pusilla
Daviesia benthamii
Dodonaea viscosa
Enchylaena tomentosa
Eremophila decipiens
Eremophila drummondii
Eremophila oppositifolia
Eremophila scoparia
Eucalyptus loxophleba
Eucalyptus salicola
Eucalyptus salubris
Exocarpus aphyllus
#Frankenia desertorum
Grevillea acuaria
Grevillea huegelii
Gunniopsis intermedia
#Hyalosperma glutinosum
ssp. glutinosum
Lomandra collina
Lycium australe
#Maireana carnosa
Maireana diffusa
#Maireana georgei
Maireana triptera
Melaleuca lateriflora
Melaleuca uncinata
Olearia exiguifolia
Olearia muelleri
Olearia pimeleoides
Olearia revoluta
Pittosporum phylliraeoides
Podolepis capillaris
Ptilotus exaltatus
#Rhagodia drummondii
Rhagodia preissii
#Rinzia carnosa
Santalum acuminatum
Scaevola spinescens
#Sclerolaena diacantha
Sclerolaena fusiformis
#Senecio ?minimus
Stipa elegantissima
#Trachymene cyanopetala
Westringia cephalantha
Zygophyllum glaucum

* Introduced species

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

Eucalyptus longicornis (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland

Acacia colletioides
Acacia hemiteles
Acacia merrallii
Alyxia buxifolia
Amphipogon ?strictus
Atriplex paludosa
Atriplex stipitata
Beyeria lechenaultii
Bossiaea walkeri
Callitris glaucophylla
Dianella revoluta
Enchylaena tomentosa
Eremophila drummondii
Eremophila scoparia
Eucalyptus longicornis
Eucalyptus melanoxylon
Eucalyptus salicola
Eucalyptus salubris
Eucalyptus yilgarnensis
Eucalyptus sp. (2269)
Hakea minyma
Lomandra collina
Lycium australe
Melaleuca lanceolata
Olearia muelleri
Pittosporum phylliraeoides
Podolepis capillaris
Santalum acuminatum
Stipa elegantissima
Westringia cephalantha
Westringia dampieri

* Introduced species

Eucalyptus myriadena, Eucalyptus salubris (gimlet), *Eucalyptus yilgarnensis* (yorrel) Woodland

Acacia assimilis
Acacia acuminata
Acacia colletioides
Acacia erinacea
Acacia hemiteles
Acacia merrallii
Acacia nyssophylla
*Aira caryophyllea
Alyxia buxifolia
Amphipogon ?strictus
Atriplex paludosa
Atriplex stipitata
Borya constricta
#Brachycome ?pusilla
Cassia ?chatelainiana
Cassia nemophila
#Cephalipterum drummondii
Dodonaea viscosa
Enchylaena tomentosa
Eremophila drummondii
Eremophila oppositifolia
Eremophila scoparia
Eucalyptus loxophleba
Eucalyptus myriadena
Eucalyptus salubris
Eucalyptus yilgarnensis
Exocarpus aphyllus
Frankenia desertorum
Grevillea acuaria
Grevillea huegelii
#Hyalosperma glutinosum
#Hydrocotyle ?pilifera
Lycium australe
#Maireana trichoptera
Melaleuca lanceolata
Melaleuca uncinata
Olearia muelleri
Olearia pimeleoides
Pittosporum phylliraeoides
Podolepis capillaris
#Podotheca gnaphalioides
Ptilotus exaltatus
Rhagodia preissii
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
#Sclerolaena diacantha
#Senecio ?minimus
#Stenopetalum filifolium
Sclerolaena fusiformis
Stipa elegantissima
Templetonia sulcata
Westringia dampieri
Zygophyllum fruticulosum
Zygophyllum glaucum

* Introduced species

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

Eucalyptus capillosa (wheatbelt wandoo) Woodland

Daviesia benthamii
Eremophila drummondii
Eucalyptus capillosa
Eucalyptus salicola (edge)
Eucalyptus salubris (edge)
Eucalyptus sheathiana (edge)
Grevillea acuaria
Lomandra collina
Melaleuca lateriflora
Melaleuca uncinata
Podolepis capillaris
Podolepis sp.
Templetonia sulcata

Callitris galucophylla (native Cypress pine) Open Low Woodland

see Appendix 4

Eucalyptus loxophleba (York gum) Tree Mallee

Acacia acuminata
Acacia assimilis
Acacia colletioides
Alyxia buxifolia
Amphipogon ?strictus
Atriplex stipitata
Cassia nemophila
Dianella revoluta
Dodonaea viscosa
Eremophila decipiens
Eremophila drummondii
Eremophila oppositifolia
Eucalyptus loxophleba
Eucalyptus salicola
Exocarpus aphyllus
Hakea minyma
Lomandra collina
Lycium australe
Lysiana casuarinae
Olearia exiguifolia
Olearia muelleri
Olearia pimeleoides
Pittosporum phylliraeoides
Prostanthera grylloana
Rhagodia drummondii
Rinzia carnosa
Santalum acuminatum
Santalum spicatum
Templetonia sulcata
Waitzia acuminata
Westringia cephalantha
Zygophyllum glaucum

* Introduced species

Eucalyptus leptopoda Open Shrub Mallee over Thicket

Acacia coolgardiensis
Amphipogon ?strictus
Baeckea sp. (aff. behrii)
Eucalyptus hypochlamydea
Eucalyptus leptopoda
Eucalyptus loxophleba
Glischrocaryon aureum
Hakea minyma
Melaleuca uncinata
Prostanthera grylloana
Westringia dampieri

Acacia Scrub

Acacia acuminata
Acacia assimilis
Acacia colletioides
#Acacia erinacea
#Acacia prainii
Acacia tetragonophylla
Acacia sp. (2109)
*Aira caryophyllea
Alyxia buxifolia
Amyema preissii
?Argyroglottis turbinata
Atriplex hymenotheca
Atriplex stipitata
Callitris glaucophylla
Cassia nemophila
#Cephalipterum drummondii
Disphyma crassifolium
Dodonaea lobulata
Dodonaea viscosa
Enchylaena tomentosa
Eremophila decipiens
Eremophila drummondii
Eremophila oppositifolia
Eremophila scoparia
Erymophyllum tenellum
Exocarpus aphyllus
Frankenia desertorum
Grevillea acuaria
Hakea preissii
Hakea recurva
#Helipterum rubellum
#Hyalosperma glutinosum
#Hydrocotyle ?pilifera
#Levenhookia leptantha
Lycium australe
#Lysiana casuarinae
Maireana amoena
#Maireana carnosa
Maireana diffusa
#Maireana georgei
Maireana oppositifolia
#Maireana trichoptera
Maireana triptera
Melaleuca lateriflora
Melaleuca uncinata
*Mesembryanthemum nodiflorum
Olearia exiguifolia
Olearia muelleri
Olearia pimeleoides
Olearia revoluta
Pimelea microcephala
Pittosporum phylliraeoides
Podolepis capillaris
#Podotheca gnaphalioides
#Ptilotus eriotrichus
#Ptilotus exaltatus
#Ptilotus holosericeus
Rhagodia preissii
Santalum acuminatum
Santalum spicatum
Scaevola spinescens
#Senecio ?minimus
Solanum orbiculatum
Stipa elegantissima
Templetonia sulcata
#Trachymene cyanopetala
*Ursinia anthemoides
Vittadinia eremaea
Waitzia acuminata
Zygophyllum fruticulosum
Zygophyllum glaucum

* Introduced species

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

Thicket/*Borya constricta* Herbs

Acacia acuminata
Acacia colletioides
Acacia coolgardiensis
Amphipogon ?strictus
Atriplex paludosa
Atriplex stipitata
Borya constricta
Dianella revoluta
Disphyma crassifolium
Dodonaea viscosa
Eucalyptus hypochlamydea
Melaleuca eleuterostachya
Melaleuca uncinata
Olearia pimeleoides
Rhagodia preissii
Stipa elegantissima
Stipa sp.
Waitzia acuminata
Westringia dampieri
Zygophyllum glaucum

Melaleuca Thicket

Acacia assimilis
Acacia colletioides
Acacia hemiteles
Acacia prainii
Alyxia buxifolia
Amphipogon ?strictus
Callitris glaucophylla
Callistemon phoeniceus
Darwinia drummondii
Daviesia benthamii
Dianella revoluta
Disphyma crassifolium
Dodonaea viscosa
Enchylaena tomentosa
Eremophila oppositifolia
Eucalyptus loxophleba
Eucalyptus myriadena
Eucalyptus salicola
Frankenia desertorum
Grevillea acuaria
Grevillea huegelii
Gunniopsis intermedia
Lomandra collina
Lycium australe
Melaleuca acuminata ssp. acuminata
Melaleuca eleuterostachya
Melaleuca halmaturorum
Melaleuca lateriflora
Melaleuca uncinata
Myriocephalus gracilis
Olearia exiguifolia
Olearia pimeleoides
Prostanthera grylloana
Ptilotus exaltatus
Rhagodia preissii
Sclerolaena fusiformis
Templetonia sulcata
Westringia cephalantha

* Introduced species

Melaleuca Scrub

Atriplex hymenotheca
Atriplex paludosa
Calocephalus multiflorus
Enchylaena tomentosa
Frankenia desertorum
Hakea preissii
Halosarcia halocnemoides
Halosarcia lylei
Maireana oppositifolia
Melaleuca halmaturorum
Melaleuca lateriflora
Rhagodia preissii
Templetonia sulcata

Halosarcia Heath

Atriplex hymenotheca
Disphyma crassifolium
Frankenia desertorum
Halosarcia halocnemoides
Halosarcia lepidosperma
Halosarcia leptoclada
Halosarcia lylei
Halosarcia peltata
Maireana amoena
Maireana diffusa
Maireana oppositifolia
Pogonolepis ?stricta
Rhagodia preissii
Sclerostegia disarticulata

APPENDIX 4 - SPECIES LIST FOR DUNE AREAS ON THE LAKE CAMPION NATURE RESERVE AND ADJACENT AREAS

Callitris glaucophylla (native Cypress Pine) Open Low Woodland

SITES	22	26	37	48
Acacia prainii	X			
+Acacia rigens	X			
Allocasuarina acutivalvis				X
Alyxia buxifolia	X		X	X
+Astroloma serratifolium			X	
Bossiaea walkeri				X
Callitris glaucophylla	X	X	X	X
+Callitris preissii ssp. verrucosa				X
#Chamaexeros fimbriata	X			
+Conostephium preissii	X	X	X	X
+Darwinia drummondii	X	X		X
Daviesia benthamii			X	
Eucalyptus salicola	X			
+Grevillea apiciloba	X		X	X
+Grevillea juncifolia		X		
Grevillea huegelii			X	
Hakea rigida (manuscript name)	X	X		
#Helichrysum leucopsideum	X			
+Jacksonia hakeoides	X	X	X	
+Leptospermum roei	X	X	X	X
+Leucopogon cuneifolius	X	X		X
+Leucopogon ?nutans	X	X	X	X
Melaleuca halmaturorum	X	X		
Melaleuca uncinata	X	X	X	
+Persoonia ?angustiflora	X	X	X	X
Santalum acuminatum	X	X		
Santalum spicatum				X
Templetonia sulcata				X
Westringia cephalantha	X			X
Westringia dampieri	X			

\+ Species recorded on dune areas only

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

Eucalyptus salicola (salt gum) Woodland - Type 2

MB1 - Species Recorded by M Blackwell and Associates on Mining Leases 77/2 and 77/21

MB2 - Species recorded by M Blackwell and Associates on Mining Lease 77/32

SITES	7	10	23	27	35	38	39	41	42	43	49	MB1	MB2
Acacia acuminata		X	X	X	X	X	X	X		X			
+Acacia assimilis			X	X									
Acacia colletioides		X	X			X	X	X	X	X	X		X
Acacia erinacea			X		X	X		X		X	X		X
Acacia fragilis	X												
Acacia hemiteles			X			X							X
Acacia lasiocalyx		X											
Acacia merrallii			X			X						X	X
Acacia prainii			X			X					X	X	X
Acacia tetragonophylla										X			
Allocasuarina acutivalvis			X	X	X	X					X		X
+Allocasuarina campestris												X	
+Allocasuarina corniculata												X	
+Allocasuarina helmsii				X									
Alyxia buxifolia	X		X	X		X	X	X	X			X	X
Amphipogon ?strictus				X	X	X	X						
+Amyema miquelii													X
?Argyroglottis turbinata	X												
+Astroloma epacridis				X									
+Astroloma serratifolium			X								X		X
Atriplex paludosa	X												
#Atriplex spongiosa	X												
Atriplex stipitata	X	X								X			
Baeckea aff. behrii			X	X									
+Bertya dimerostigma			X	X		X						X	X
Beyeria lechenaultii			X		X	X	X	X			X		X
+Billardiera lehmanniana													X
Bossiaea walkeri			X			X	X			X	X		X
Callitris glaucophylla	X	X	X	X	X	X	X	X	X		X	X	X
+Callitris preissii			X								X		X

\+ Species recorded on dune areas only

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

SITES	7	10	23	27	35	38	39	41	42	43	49	MB1	MB2
+Calothamnus gilesii			X								X		
Calytrix leschenaultii		X											
Cassia nemophila	X							X					
+Choretrum glomeratum													X
+Cryptandra grandiflora													X
+Cryptandra parvifolia			X										
+Dampiera ?lavandulaceae		X											
+Darwinia drummondii		X				X			X			X	X
Daviesia benthamii			X			X						X	X
Dianella revoluta			X			X							
Disphyma crassifolium						X							
Dodonaea bursariifolia						X							
Dodonaea viscosa	X	X	X				X	X		X			
Enchylaena tomentosa			X							X			X
Eremophila decipiens									X				
Eremophila ?drummondii						X							
Eremophila oppositifolia								X		X	X		
Eremophila scoparia			X										
Eucalyptus eremophila												X	
Eucalyptus loxophleba								X					
Eucalyptus melanoxylon											X		X
Eucalyptus salicola	X	X	X	X	X	X	X	X	X	X	X	X	X
Eucalyptus sheathiana			X			X					X		X
Eucalyptus yilgarnensis							X						X
Exocarpus aphyllus	X		X	X		X		X		X			X
+Exocarpus sparteus			X			X	X						X
+Goodenia pinifolia			X										
+Grevillea ?acerosa												X	X
Grevillea acuaria			X		X	X	X	X			X		
Grevillea huegelii			X	X	X	X			X				X
+Grevillea juncifolia			X			X					X		X
+Grevillea paradoxa											X		
Gunniopsis intermedia		X											
+Hakea invaginata			X	X		X							
Hakea minyma			X	X									
Hakea preissii			X			X							
+Hibbertia glomerosa		X											

\+ Species recorded on dune areas only

\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

SITES	7	10	23	27	35	38	39	41	42	43	49	MB1	MB2
+Jacksonia aff. hakeoides		X							X			X	X
#Kippistia suaedifolia	X												
+Lepidobolus preissianus			X	X									
+Lepidosperma drummondii			X	X		X		X					X
+Leptospermum roei	X	X	X	X					X			X	X
+Leucopogon cuneifolius			X										X
+Leucopogon ?insularis												X	
+Leucopogon ?nutans													X
+Leucopogon ?strictus													X
Lomandra collina		X				X					X		
Lomandra effusa			X									X	X
Lycium australe	X	X								X			
Maireana brevifolia	X												
Maireana diffusa	X									X			
#Maireana erioclada	X												
Maireana oppositifolia	X												
Maireana pentatropis	X												
+Melaleuca conothamnoides											X		X
+Melaleuca cordata			X	X									
Melaleuca halmaturorum					X							X	X
Melaleuca lanceolata	X		X			X						X	
Melaleuca lateriflora		X											X
Melaleuca uncinata			X	X	X	X	X		X		X	X	X
#Mesembryanthemum nodiflorum	X												
+Microcybe multiflora			X									X	
Olearia exiguifolia			X			X		X					
Olearia muelleri			X			X				X	X		X
Olearia pimeleoides						X	X	X		X			
Olearia revoluta	X	X	X										
+Persoonia ?angustiflora							X						
+Persoonia diadena											X	X	X
+Phebalium canaliculatum		X									X		
+Phebalium filifolium			X		X	X					X	X	X
+Phebalium tuberculosum			X		X						X		
Pimelea microcephala										X			

\+ Species recorded on dune areas only

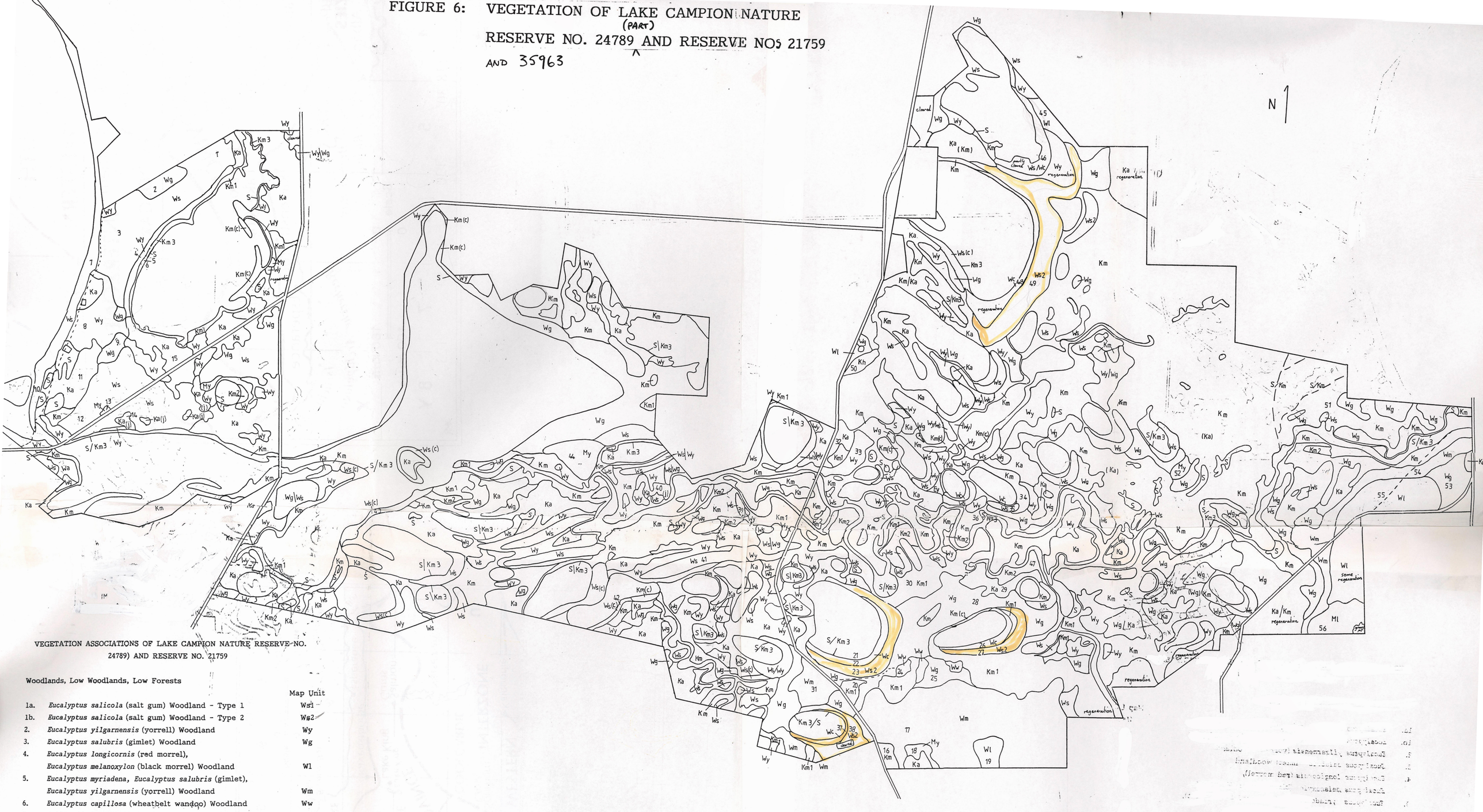
\# Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

SITES	7	10	23	27	35	38	39	41	42	43	49	MB1	MB2
Pittosporum phylliraeoides	X												
Podolepis capillaris			X										
+Prostanthera baxteri			X		X						X		X
Ptilotus eriotrichus								X					
Rhagodia drummondii		X											
Rhagodia preissii	X		X			X		X					
+Restio sphacelatus													X
+Ricinocarpus muricatus												X	
Rinzia carnosa			X										
Santalum acuminatum		X	X	X	X	X			X		X	X	X
Santalum murrayanum												X	
Santalum spicatum		X				X	X	X		X			
Scaevola spinescens		X	X			X		X	X				
Solanum hoplopetalum	X												
Solanum orbiculatum								X					
Stipa elegantissima	X	X						X		X			
#Stipa trichophylla	X												
Templetonia sulcata	X	X	X	X	X	X	X	X	X	X	X		X
Thysanotus patersonii		X											X
Waitzia sp.			X			X		X		X	X		
Westringia cephalantha			X	X		X	X	X	X		X		
Westringia dampieri			X		X	X		X			X	X	X
Zygophyllum fruticulosum	X	X								X	X		X
#Zygophyllum ovatum	X												

+ Species recorded on dune areas only

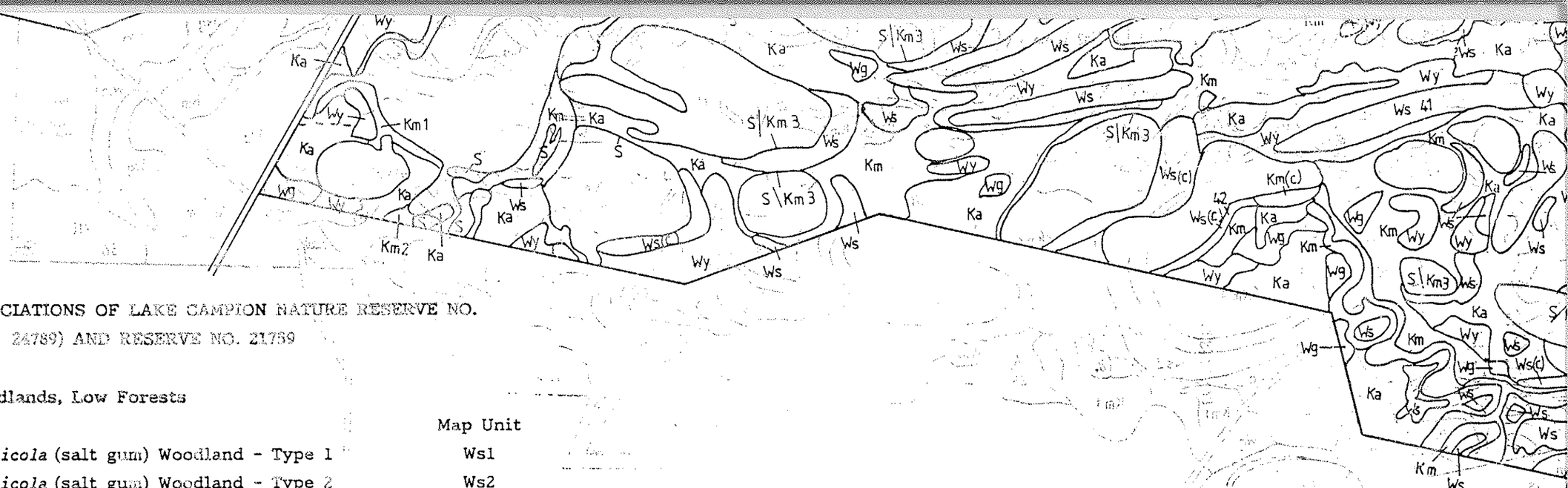
Collections made by the Mukinbudin Wildflower Society and Department of Conservation and Land Management personnel in September 1990

FIGURE 6: VEGETATION OF LAKE CAMPION NATURE (PART) RESERVE NO. 24789 AND RESERVE NOS 21759 AND 35963



VEGETATION ASSOCIATIONS OF LAKE CAMPION NATURE RESERVE NO. 24789) AND RESERVE NO. 21759

		Map Unit
Woodlands, Low Woodlands, Low Forests		
1a.	*Eucalyptus salicola* (salt gum) Woodland - Type 1	Ws1
1b.	*Eucalyptus salicola* (salt gum) Woodland - Type 2	Ws2
2.	*Eucalyptus yilgarnensis* (yorrell) Woodland	Wy
3.	*Eucalyptus salubris* (gimlet) Woodland	Wg
4.	*Eucalyptus longicornis* (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland	Wl
5.	*Eucalyptus myriadena*, *Eucalyptus salubris* (gimlet), *Eucalyptus yilgarnensis* (yorrell) Woodland	Wm
6.	*Eucalyptus capillosa* (wheatbelt wandoo) Woodland	Ww
7.	*Callitris glaucophylla* (native Cypress pine) Open Low Woodland	Wc
Mallee		
8.	*Eucalyptus loxophleba* (York gum) Tree Mallee	My
9.	*Eucalyptus leptopoda* Open Shrub Mallee over Thicket	Ml
Kwongan (Shrublands)		
10.	*Acacia* Scrub	Ka
11.	Thicket/*Borya constricta* Herbs	Kh
12a.	*Melaleuca* Thicket - Type 1	Km1
12b.	*Melaleuca* Thicket - Type 2	Km2
13.	*Melaleuca* Scrub	Km3
Samphire		
14.	*Halosarcia* Heath	S



VEGETATION ASSOCIATIONS OF LAKE CAMPION NATURE RESERVE NO. 24789) AND RESERVE NO. 21789

		Map Unit
Woodlands, Low Woodlands, Low Forests		
1a.	*Eucalyptus salicola* (salt gum) Woodland - Type 1	Ws1
1b.	*Eucalyptus salicola* (salt gum) Woodland - Type 2	Ws2
2.	*Eucalyptus yilgarnensis* (yorrell) Woodland	Wy
3.	*Eucalyptus salubris* (gimlet) Woodland	Wg
4.	*Eucalyptus longicornis* (red morrel), *Eucalyptus melanoxylon* (black morrel) Woodland	Wl
5.	*Eucalyptus myriadena*, *Eucalyptus salubris* (gimlet), *Eucalyptus yilgarnensis* (yorrell) Woodland	Wm
6.	*Eucalyptus capillosa* (wheatbelt wandoo) Woodland	Ww
7.	*Callitris glaucophylla* (native Cypress pine) Open Low Woodland	Wc
Mallee		
8.	*Eucalyptus loxophleba* (York gum) Tree Mallee	My
9.	*Eucalyptus leptopoda* Open Shrub Mallee over Thicket	Ml
Kwongan (Shrublands)		
10.	*Acacia* Scrub	Ka
11.	Thicket/*Borya constricta* Herbs	Kh
12a.	*Melaleuca* Thicket - Type 1	Km1
12b.	*Melaleuca* Thicket - Type 2	Km2
13.	*Melaleuca* Scrub	Km3
Samphire		
14.	*Halosarcia* Heath	S