



023492

DEC LIBRARY ARCHIVE  
NOT FOR LOAN

023492

LIBRARY  
DEPARTMENT OF ENVIRONMENT  
& CONSERVATION  
WESTERN AUSTRALIA

**Muchea Limestones of the Kemerton Silica Sands Project Area  
Report 2: Extent of Muchea Limestone Community Mosaic in the  
Kemerton Silica Sands Area and the Gwalia Nature Reserve**

**BJ Keighery<sup>1</sup>, GJ Keighery<sup>2</sup>, BM Hyder-Griffiths<sup>1</sup>, Jill Pryde<sup>2</sup> and Melissa Hoskins<sup>2</sup>**

**February 2005 (draft prepared in February 2004)**

**1 Department of Environment**

**2 Department of Conservation and Land Management**

ARCHIVAL

581.

9

(9412)

MUC

## Background

The area of Muchea Limestones communities in the Kemerton Silica Sands area was initially located on a brief field survey by DEP staff in October 1997 (Bronwen Keighery and Michelle Mifka, as reported in Keighery 1998). Subsequent work in the area by Muir (1999) and Mattiske Consulting (2003) did not result in further information or delineation of these areas.

As part of continuing studies of the Muchea Limestones from north of Gingin to Kemerton (most southern location known of Muchea Limestones) BJ Keighery (DOE) and GJ Keighery (CALM) visited Kemerton Silica Sands area on 2 September 2003 to begin a detailed documentation of this area of Muchea Limestones (see Attachment 1). This work focused on:

- estimating the area in which limestone was most apparent in the soils; and
- location of a transect of plots to be established in late spring/early summer

From this work preliminary mapping of the Muchea Limestone area was determined, being based on the extent of the Muchea Limestone *Eucalyptus decipiens* and *Eucalyptus calophylla* dominated native vegetation in the Kemerton Silica Sands area. The area was roughly delineated using three GIS points and the eastern and southern boundary of the area. However it was noted that

".....the full extent of Muchea Limestone vegetation in the adjacent western area is yet to be documented and described. Work on this documentation is continuing and is being done as part of a broader study being conducted on the Muchea Limestone communities over their known range."

As a consequence further work has been done in the Kemerton Muchea Limestone area. This work has resulted in a more comprehensive delineation of the Muchea Limestone as outlined below.

## Survey Work

Four further survey sessions have been undertaken in the Gwalia Nature Reserve and the adjacent Kemerton Silica Sands area. These are outlined below.

### October 2003

Survey work: further general survey and established and sampled seven 10 by 10m plots (see Map 1)

Participants: two days by BJ Keighery, BM Hyder-Griffiths and Jill Pryde.

### November 2003

Survey work: further general survey and re-sampled plots

Participants: two days by BJ Keighery, BM Hyder-Griffiths; one day John Dell (DOE), Jill Pryde, Melissa Hoskins and Bec Ryan (DPI).

### February 2004

Survey work: further general survey

Participants: two hours by BJ Keighery, BM Hyder-Griffiths, John Dell and Gary Whisson

### **Location and extent of the Muchea Limestones in the Kemerton Silica Sands area**

On the basis of survey to date the extent of the restricted floristic community type mosaic - "Shrublands and woodlands on Muchea Limestones" is shown on Map 1.

Within the area of the "Shrublands and woodlands on Muchea Limestones" four broad vegetation units can be distinguished.

- *Eucalyptus decipiens* unit: This woodland to open forest is dominated by combinations of *Eucalyptus decipiens*, *E. calophylla*, *Banksia littoralis* and *Agonis flexuosa* on the eastern rise and *Eucalyptus decipiens* and *Agonis flexuosa* on the central southern rise. The area previously delineated between 33° 08.161" and 115° 47.871", 33° 08.353" and 115° 47.868" and 33° 08.188" and 115° 48.013" is part of the eastern rise.
- *Melaleuca raphiophylla* and *Eucalyptus decipiens* Low Forest: This unit fringes the rises.
- *Melaleuca* species Shrublands/Sedgeland/Herbland wetland mosaic: This unit is dominated by a complex suite of *Melaleuca* species associated with a series of sedges, rushes and herbs. At times the sedges, rushes and herbs occur without the *Melaleuca* layer.
- *Melaleuca raphiophylla* Low Forest: This unit is associated with the deeper wetland areas, some of which contain areas of EPP lakes and areas of *Baumea articulata*.

Survey to the north of the current mine site in the area of the Gwalia Nature Reserve identified a series of clay based wetlands but did not locate a similar suite of communities or any areas of *Eucalyptus decipiens*.

### **Significant species**

The first of the reports in this series (see Attachment 1) listed a series of significant taxa. It is worth noting the following additional species/information.

- *Alogyne huegelii* var *huegelii*: It appears that this taxon may be a newly delineated *Alyogyne*, *A. angustiloba* Conran ms. The only determined specimens of this taxon in the WA Herbarium are from adjacent to Yalgorup National Park.
- *Calandrinia* sp Kenwick (GJ Keighery 10905): The specimens of this taxon in the WA Herbarium currently appear to encompass two taxa. Both of these taxa appear to be present in the *Melaleuca* species Shrublands/Sedgeland/Herbland wetland mosaic area. However, true *Calandrinia* sp Kenwick (GJ Keighery 10905) is more restricted than the other, currently known from the Brixton Street Wetlands and the study area.

Further work on both of these taxa is required to determine both their taxonomic and conservation status. The limited nature of their distributions indicates both may well be proposed for listing as Declared Rare Flora.

### **References**

Muchea Limestones of the Kemerton Silica Sands Project Area - Report 2: Extent of Muchea Limestone Community Mosaic in the Kemerton Silica Sands Area and the Gwalia Nature Reserve  
Keighery *et al.* February 2005

4

Keighery BJ 1998 Vegetation and Flora Conservation Values of the Kemerton Silica Sands Project Area. An unpublished report for the Department of Environmental Protection.

Keighery BJ and Keighery GJ 2003 Muchea Limestones of the Kemerton Silica Sands Project Area. An unpublished report for the Department of Environmental Protection and Department of Conservation and Land Management.

Mattiske Consulting Pty Ltd 2003 Kemerton Silica Sands review of Flora, vegetation and Conservation values on the Kemerton Project Area. Prepared for Kemerton Silica Sands.

Muir Environmental 1999 report of Biological Survey – Phase 1: Kemerton Industrial Estate. Volume 1 – Report and Volume 2 – Appendices. Unpublished report for Landcorp.

**ATTACHMENT 1**

**Muchea Limestones of the Kemerton Silica Sands Project Area  
BJ Keighery and GJ Keighery  
September 2003**

## Background

### *Introduction*

Since release of EPA Bulletin 741 (EPA 1994) documentation and analysis of data on plant and plant community distribution has led to a more detailed knowledge and a better understanding of the vegetation and flora of the Swan Coastal Plain<sup>1</sup>. In respect to the area of the Kemerton Silica Sands area these data indicate that there are important flora and vegetation conservation issues that were not addressed in the 1994 assessment. These issues relate to the identification of threatened ecological communities, possible occurrences of Declared Rare Flora, occurrences of additional Priority Flora and the diversity of major landform units in and adjacent to the Kemerton Silica Sands area (Keighery 1998).

### *Muchea Limestones*

Of particular interest in Keighery (1998) is the initial documentation of an area of soils and vegetation associated with Muchea Limestones in the Kemerton Silica Sands area.

The presence of Muchea Limestones on the Plain was:

- discussed by McArthur and Bettenay (1960) in their treatment of the soils of the Swan Coastal Plain; and
- mapped along the eastern side of the Plain (associated with the Pinjarra Plain) on environmental geology maps from south of the Moore River National Park to Harvey.

However, previous to a report by Keighery and Keighery (1995), the only known reference to the vegetation of these soils is in an obscure letter by the first botanical collector in the state, James Drummond, in 1847 about the plants growing on these eastern soils with outcropping limestone.

Survey work for the System 6 and Part System 1 Update in 1994 gave some hints as to what would be expected on the Muchea Limestones when a series of coastal species, generally associated with limestone, were found on a few small remnants between Muchea and Moore River National Park. These included Limestone Marlock (*Eucalyptus decipiens*), Chenile Honey Myrtle (*Melaleuca huegelii*) and Dune Sheoak (*Allocasuarina lehmanniana*). There are also several recent unpublished reports that describe Chenile Honey Myrtle in bushland adjacent to the Ellenbrook bushland area and Limestone Marlock in the Gosnells area.

As a consequence in 1995 the System 6 survey team and CALM staff spent some time systematically observing areas of remnant vegetation from roads between Ellenbrook bushland and the Moore River National Park in the vicinity of areas of mapped limestone. This work identified a suite of communities associated with these soils and a suite of characteristic species. Some examples of these species are the three mentioned above and Fremantle Mallee (*Eucalyptus foecunda*), Lilac Hibiscus (*Alyogyne huegelii* var *huegelii*), *Diplopeltis huegelii*, Coast Hop Bush (*Dodonaea aptera*), *Hibbertia spicata* ssp. *leptotheca*, Coastal Honey Myrtle (*Melaleuca acerosa*) and Coast Spear Grass (*Austrostipa flavescens*). Two highly restricted taxa not found on the western limestones

---

<sup>1</sup> Such studies include Atkins 2003, Gibson *et al* 1994, Keighery and Keighery 1995, DEP 1996, English and Blyth 1997 and Government of WA 2000

*Grevillea curviloba* ssp. *curviloba* and *Grevillea evanescens* and probably *Darwinia* sp.. Muchea were found in these northern Muchea Limestones. *Haloragis aculeolata*, which was previously only known from one limestone hill and calcareous clay area in the Yalgorup National Park was also found.

Interestingly a series of soils were found to be associated with the areas of limestone ranging from clays on the wet flats to ridges of yellow sand over orange sand. The limestone occurrences ranged from nodules within the clays to outcropping ridges on some rises. A series of plant communities were associated with the different soils.

With this more detailed knowledge of the floristics of the Muchea Limestones the areas to the south could be integrated into a synopsis of the plant communities of these soils prepared for the Australian Nature Conservation Authority National Reserves Network (Keighery and Keighery 1995). The Muchea Limestones were described in this report from Gosnells to south of the Moore River National Park. Unfortunately most of the areas (especially south of Muchea), including the System 6 areas where these communities were identified, are severely impacted by mining, clearing and/or grazing.

With areas of Muchea Limestones defined and located the CALM Threatened Communities Unit nominated these areas to the Threatened Communities Scientific Advisory Committee who determined that these communities should be listed as critically endangered. This decision was endorsed by the Western Australian Minister for the Environment and the Commonwealth and subsequently listed under the EPBC act. The CALM Threatened Communities and Species Unit began investigating the possibility of purchasing the best currently known remnant of the Muchea Limestones.

CALM and ANCA (now Environment Australia) jointly arranged the purchase of some of the northern remnants for nature reserves. The core of the Gosnells area is recognised for protection in Bush Forever Site 465 (Government of WA 2003).

## **Muchea Limestones of the Kemerton Silica Sands Project Area**

### ***Survey Work***

The area of Muchea Limestones communities in the Kemerton Silica Sands area was located on a brief field survey by DEP staff in 1997 (Bronwen Keighery and Michelle Mifka, October 1997 as reported in Keighery 1998). Subsequent work in the area by Muir (1999) and Mattiske Consulting (2003) did not result in further information or delineation of these areas.

As part of continuing studies of the Muchea Limestones from Gingin north to Kemerton (most southern location known of Muchea Limestones) BJ Keighery (DEP) and GJ Keighery (CALM) visited Kemerton Silica Sands area on 2<sup>nd</sup> September 2003 to begin a detailed documentation of this area of Muchea Limestones. Approximately three hours was spent traversing the area. This work focused on:

- estimating the area in which limestone was most apparent in the soils; and
- location of a transect of plots to be established in late spring/early summer.

***Location and extent of the Muchea Limestones in the Kemerton Silica Sands area***

The known area of *Eucalyptus decipiens* and *Eucalyptus calophylla* (also known as *Corymbia calophylla*) dominated vegetation associated with the Muchea Limestones soils with surface or near surface limestone in the Kemerton Silica Sands area is located between 33° 08.161" and 115° 47.871" and of 33° 08.353" and 115° 47.868". The eastern vegetated extent of this vegetation unit was a fenceline at 33° 08.188" and 115° 48.013". Recent work on the fenceline has exposed extensive sub-surface deposits of limestone and limestone nodules were found throughout soils in the area bounded by these points.

***Species and vegetation of the Muchea Limestones in the Kemerton Silica Sands area***

The most apparent area of Muchea Limestone vegetation in the Kemerton Silica Sands area is an area of *Eucalyptus decipiens* Closed Tree Mallee (previously identified in the area of Site 12 on Map 2 in Keighery 1998). However the area extends further to the north and is associated with *Eucalyptus calophylla*, *Banksia littoralis* and *Agonis flexuosa*. While on a slight rise, adjacent to an extensive mosaic of clay flat wetland vegetation to the west, the area is damp and is part of an extensive wetland area (as clearly indicated by the presence of *Banksia littoralis* and other wetland species).

Associated with the area are a series of species considered typical of communities associated with Muchea Limestones (Keighery and Keighery 1995). These are *Eucalyptus decipiens*, *Alyogyne huegelii* var *huegelii*, *Pimelea rosea*, *Austrostipa flavescens*, *Gahnia trifida* and *Logania vaginalis*. All but one of these species was identified on both visits to the area. A series of uncommon and restricted taxa on the Plain are also found in this community. These are:

- an unusual form of *Melaleuca acerosa* growing to over two metres (possibly unnamed species of *Melaleuca* in Mattiske 1993b)
- a robust, tall form of *Melaleuca bracteosa* (referred to as *M. brachyphylla* in Keighery 1998) an uncommon species on the Plain (possibly unnamed species of *Melaleuca* in Mattiske 1993b)
- *Hakea trifurcata* small flowered form previously only known from the Peel-Harvey region
- *Hibbertia perfoliata* an uncommon poorly collected species on the Plain.

Mattiske (1993b) appears to list all of these species.

Further plot based floristic survey work is required in the area of the entire wetland to adequately describe the Muchea Limestone community mosaic in this area. The floristic and community data indicates that this occurrence is most closely allied to that in Gosnells.

***Significance and extent of the Muchea Limestones Communities in the Kemerton Silica Sands area***

The Muchea Limestone vegetation in the Kemerton Silica Sands area is of out-standing conservation significance as:

- the Muchea Limestones community mosaic is a critically endangered threatened ecological community (CALM 2003);



- the community contains a series of plant species of conservation significance (significant species) being undescribed taxa, poorly known taxa and taxa not normally found in the area (outlying populations);
- it is the most southern known (closest is in Gosnells); and
- it is the only occurrence on the Swan Coastal Plain in a contiguous vegetated transect with vegetation of the Bassendean and Spearwood Dune system to the west.

The current known extent of the Muchea Limestone *Eucalyptus decipiens* and *Eucalyptus calophylla* dominated vegetation in the Kemerton Silica Sands area is indicated by the three points quoted above. However the full extent of Muchea Limestone vegetation in the adjacent western area is yet to be documented and described. Work on this documentation is continuing and is being done as part of a broader study being conducted on the Muchea Limestone communities over their known range.

Further survey work is required on the eastern side of the broader Kemerton area to locate and further occurrences. *Eucalyptus decipiens* over pasture was observed in the paddock to the south of the Kemerton Silica Sands area. Survey work by Muir and Mattiske has not identified any other occurrences of *Eucalyptus decipiens* on the eastern side of the broader Kemerton area. Muchea Limestones are only associated with the eastern side of the Swan Coastal Plain.

## Reference

Atkins K 2003 *Declared Rare and Priority Flora List for Western Australia*. Department of Conservation and Land Management, Como, Western Australia.

DEP (Department of Environmental Protection) 1995 System 6 Update. Site and area records.

Environmental Protection Authority - refer to EPA

EPA 1994 Kemerton silica sand mining proposal. Gwalia Consolidated Ltd. Report and recommendations of the Environmental Protection Authority, Perth Western Australia.

Gibson, N., Keighery, B.J., Keighery, G.J., Burbidge, A. and Lyons, M. (1994) A Floristic survey of the southern Swan Coastal Plain. Unpublished Report to the Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia (Inc.).

Government of WA 2000 *Bush Forever Volume 2: Directory of Bush Forever Sites*. Department of Environmental Protection, Perth, Western Australia.

Keighery B.J 1998 Vegetation and Flora Conservation Values of the

Kemerton Silica Sands Project Area. An unpublished report for the Department of Environmental Protection.

Keighery GJ and Keighery BJ 1995 *Muchea Limestones — Floristics*. Unpublished report to the Australian Nature Conservation Agency National Reserves Network and the Department of Conservation and Land Management, Como, Western Australia.

Mattiske, E.M. and Associates 1993a Gwalia Consolidated Limited - Kemerton Sand Project: Flora and Vegetation Studies. Unpublished report prepared for John Consulting Services.

Mattiske, E.M and Associates 1993b Gwalia Consolidated Limited - Kemerton Sand Project Updated Flora and Vegetation Report. Unpublished report prepared for John Consulting Services.

Mattiske Consulting Pty Ltd 2003 Kemerton Silica Sands review of Flora, vegetation and Conservation values on the Kemerton Project Area. Prepared for Kemerton Silica Sands.

McArthur, W.M. and Bettanay, E. (1960) "The development and distribution of soils on the Swan Coastal Plain, Western Australia". CSIRO Soil Publication No 16, Melbourne.

Muir Environmental 1999 report of Biological Survey – Phase 1: Kemerton Industrial Estate. Volume 1 – Report and Volume 2 – Appendices. Unpublished report for Landcorp.