KOALA BEACH
KOALA PLAN OF MANAGEMENT

Prepared for

Ray Group Pty. Ltd.

February 2004

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by

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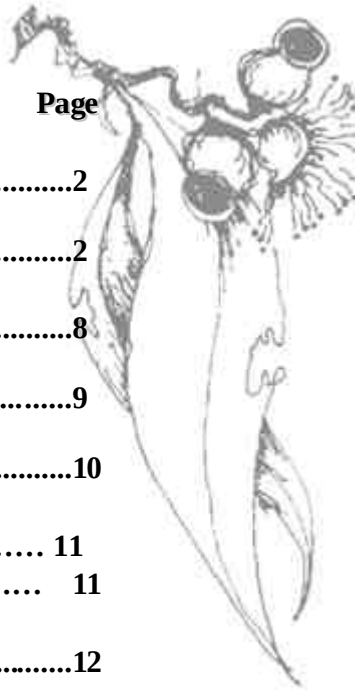


AUTHORSHIP DETAILS

The original Koala Management Plan (KMP) was prepared for the Koala Beach Estate (formerly called 'Searanch') in December 1994 by Stephen Phillips of the Australian Koala Foundation (AKF) on behalf of the Ray Group Pty. Ltd. Two approved amendments were made to the KMP (June 1996 and June 1997) by Stephen Phillips (AKF) on behalf of the Ray Group Pty. Ltd., incorporating supplementary information and revised management provisions.

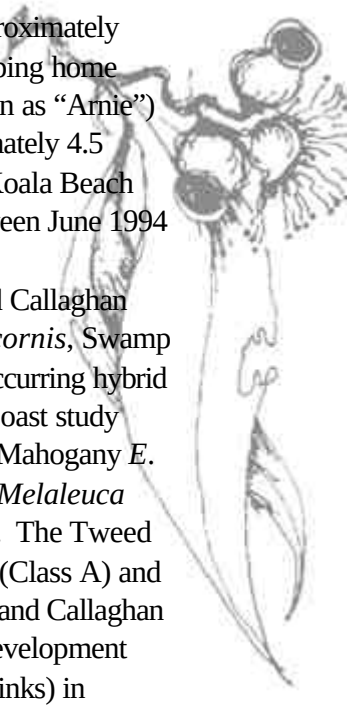
A required review of the KMP was completed in March 2002 by John Callaghan of the Australian Koala Foundation (AKF). The KMP was revised and updated in July 2002 by John Callaghan (AKF) on behalf of the Ray Group Pty. Ltd. to incorporate the recommendations and findings from the review report. The revised Koala Plan of Management (KPoM) was further amended by John Callaghan (AKF) in January 2003 on behalf of the Ray Group Pty. Ltd. in conjunction with Stages 5 and 6, and in November 2003 in conjunction with Stage 7. This revision has been prepared by John Callaghan (AKF) for the proposed Sports Fields and access road.

EXECUTIVE SUMMARY

The original Koala Beach Koala Management Plan (KMP) sought to establish a model for residential development within part of a site that had been largely cleared and degraded historically, but which retains adequate habitat on the site and surrounding lands to sustain a resident Koala population.

In the original KMP, Stephen Phillips (1994) of the Australian Koala Foundation (AKF) reported that surveys of the site suggested the resident Koala population at that time was likely to consist of no more than 30 to 40 animals, including three main breeding aggregations. The largest of these breeding groups, estimated to include no more than 10 to 12 adult Koalas, was primarily dependent upon the area of the site proposed for the development (Phillips 1994).

The home ranges of eight members of the resident Koala population that occupied remnant habitat and scattered trees over the area proposed for residential development were identified through a radio-tracking program undertaken for preparation of the original KMP. This area later became the subject of current Stages 1 and 2, as well as the recently constructed Stage 4, and proposed Stages 3, 5 and 6. The radio-tracking program together with additional monitoring clearly established that despite the level of historical disturbance to the site, the area



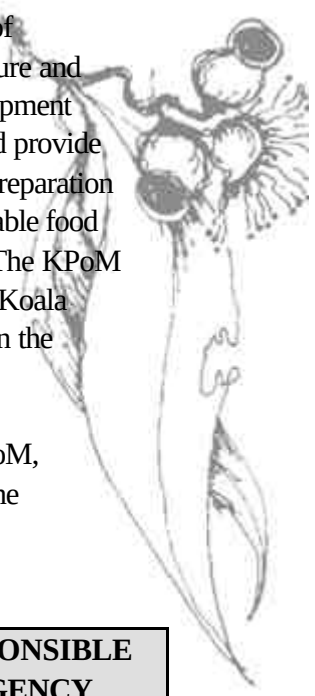
supported a stable Koala population consisting of at least four adult males and approximately seven adult females. The eight radio-tracked Koalas occupied a matrix of overlapping home ranges, varying in size from the largest (recorded for the apparent alpha male known as "Arnie") of approximately 33 hectares to the smallest area (for an adult female) of approximately 4.5 hectares (Phillips 1994). A total of seventeen Koalas were radio-tracked on the Koala Beach site, including additional animals beyond the area proposed for development, between June 1994 and June 1996.

The Australian Koala Foundation's Tweed Coast Koala Habitat Atlas (Phillips and Callaghan 1996) identified Tallowwood *Eucalyptus microcorys*, Forest Red Gum *E. tereticornis*, Swamp Mahogany *E. robusta*, Small-fruited Grey Gum *E. propinqua* and the naturally-occurring hybrid *E. robusta* x *tereticornis* as the primary Koala food tree species for the Tweed Coast study area. Secondary tree species recorded for the Tweed Coast area included White Mahogany *E. acmenoides*, Northern Grey Ironbark *E. siderophloia*, Broad-leaved Paperbark *Melaleuca quinquenervia*, Forest Oak *Allocasuarina torulosa* and Swamp Oak *A. glauca*. The Tweed Coast Koala Habitat Atlas identified areas of Primary Habitat, Secondary Habitat (Class A) and Secondary Habitat (Class B) within the study area including Koala Beach (Phillips and Callaghan 1996). A more detailed Koala Habitat Atlas prepared for the later stages of the development included areas of Secondary Habitat (Class C) and Tertiary Habitat (Buffers and Links) in additional to the above categories.

In addition to the above-mentioned primary and secondary food tree species, Phillips (1999) identified Brush Box *Lophostemon confertus* as being important for thermal refuge (shelter) as a result of further detailed analysis of the radio-tracking data obtained for the Koala Beach site. A number of Brush Box in the area proposed for development were identified for protection as multiple use (home range) trees through the original KMP.

In the original KMP, Phillips (1994) discussed the significance of the Koala population at Koala Beach with respect to the presence of socially-stable breeding aggregations, and the fact that Koala Beach is part of the largest relatively contiguous area of remaining habitat on the Tweed Coast. On this basis, he argued that the Koala population at Koala Beach was of local, regional and state significance. This claim is strongly supported by the findings reported in the Tweed Coast Koala Habitat Atlas (Phillips and Callaghan 1996), together with the outcomes of other AKF Koala research and habitat mapping projects for study areas within New South Wales including East Lismore, Richmond River LGA, Greater Taree LGA, Port Stephens LGA, Campbelltown LGA and the Pilliga region.

The recent review of the original KMP (as amended) concluded that it had effectively provided for the continued survival of the resident Koala population in association with Stage 1 of the Koala Beach development, on the basis of initial monitoring information (Callaghan 2002). The review recommended a number of amendments, updates and additions to the KMP in conjunction with proposed future stages of the development.

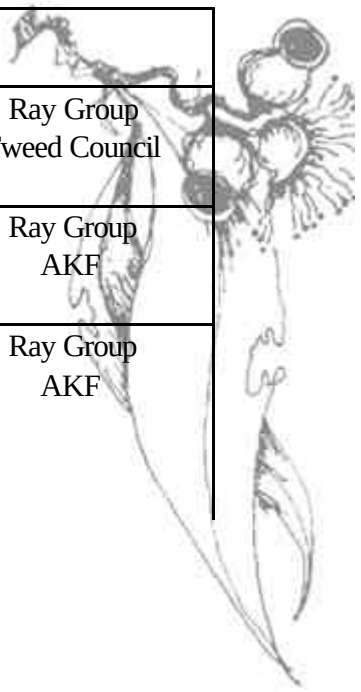


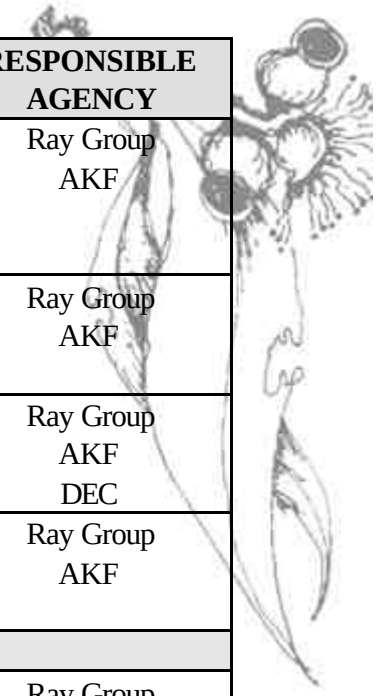
Consistent with the original Koala Beach KMP, the revised and updated Koala Plan of Management (KPoM) has the overall objective of maintaining the demographic structure and ongoing survival of the Koala population within and adjoining the Koala Beach development area. This objective is met through design standards to minimise threats to Koalas and provide for the continuation of their normal ranging behaviour. The KPoM recommends the preparation of an Estate-wide Koala Habitat Restoration Plan together with enhancement of available food resources through streetscape plantings, coupled with measures to minimise threats. The KPoM also makes provision for preparation of an overall Koala Monitoring Program for the Koala Beach Estate in order to assess the ongoing effectiveness of the provisions contained in the KPoM.

The actions and initiatives proposed in Section 5.0 (Management Actions) of this KPoM, summarised in the following table together with performance criteria, are considered the **minimum** necessary to secure the local Koala population.

MANAGEMENT ACTIONS (SUMMARY)	PERFORMANCE CRITERIA	RESPONSIBLE AGENCY
Habitat Protection Measures		
1. All primary Koala food trees to be retained and incorporated into the final design layouts for each stage. *(Note: An exemption was made to allow for the removal of eight primary Koala food trees from Stage 5; one from Stage 6; and two from the Sports Fields and access road in conjunction with compensatory habitat restoration activities).*	❖ All primary Koala food trees retained *(except for eight trees exempted from Stage 5; one from Stage 6; and two from the Sports Fields and access road).*	Ray Group AKF
2. Known 'Home Range" trees to be retained and incorporated into the final design layouts for each stage.	❖ All known Home Range trees retained.	Ray Group AKF
3. All secondary food trees and significant shelter tree species to be retained and incorporated into the final design layouts for each stage wherever possible.	❖ Secondary food trees and significant shelter tree species retained wherever possible.	Ray Group AKF
4. Maximise retention of native vegetation, with emphasis on additional trees used by Koalas during home-ranging, as well as any recorded high	❖ The majority of native vegetation is retained including additional trees used during home-ranging;	Ray Group AKF

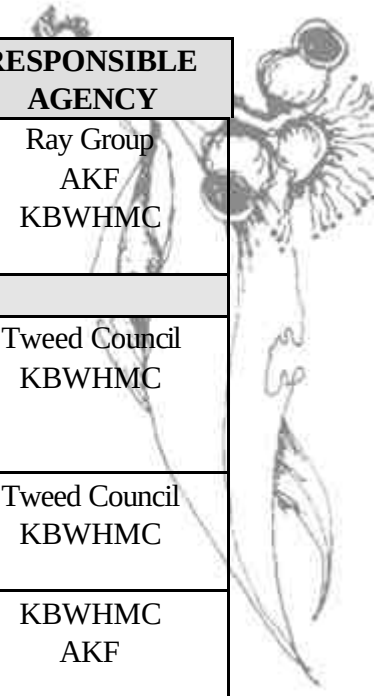
Koala activity areas.	as well as high Koala activity areas.	
5. Protection of the trees referred to in (i) and (ii) by Covenant on title and/or specific ordinance.	❖ All trees referred to in (i) and (ii) legally protected.	Ray Group Tweed Council
6. Map the location of trees referred to in (i), (ii) and (iii) and provide to Council with the DA for each stage.	❖ All trees referred to in (i), (ii) & (iii) located on map submitted with each DA.	Ray Group AKF
7. Trees mapped in (vi) must be fenced or clearly flagged prior to commencement of any construction.	❖ All trees referred to in (vi) clearly fenced or flagged prior to any construction. ❖ All mapped trees survive construction activities.	Ray Group AKF





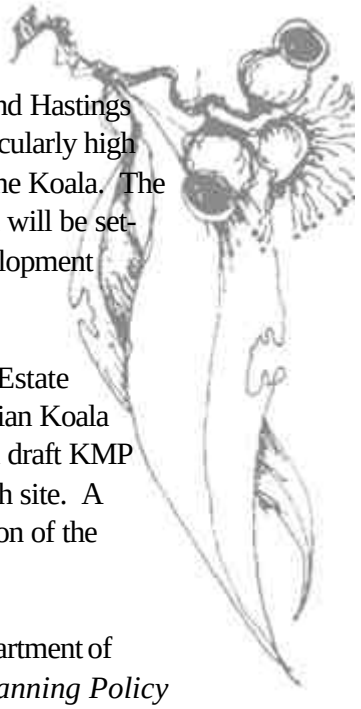
MANAGEMENT ACTIONS (SUMMARY)	PERFORMANCE CRITERIA	RESPONSIBLE AGENCY
8. The DA for each stage to be accompanied by a recent aerial photograph (1:2500 or larger) with overlay showing impacts on trees.	❖ Suitable air-photo and overlay showing impacts on trees submitted with each DA.	Ray Group AKF
9. The DA for each stage to be accompanied by an AKF assessment of impacts on Koala habitat.	❖ Assessment of impacts by AKF for each stage. ❖ Impacts minimised.	Ray Group AKF
10. Final designs for each stage should maximise habitat retention and minimise traffic threats.	❖ Habitat retention successfully maximised. ❖ Traffic threats minimised.	Ray Group AKF DEC
11. Inspection by AKF required immediately prior to any tree removal activities.	❖ Inspection by AKF prior to all tree removals.	Ray Group AKF
Threat Abatement Measures		
12. Domestic dogs or cats are not to be kept or otherwise brought onto the Koala Beach Estate (under Covenant).	❖ No domestic dogs or cats brought onto the Estate. ❖ Contractors effectively advised of the prohibition. ❖ Effective Council ranger policing of this provision.	Ray Group Tweed Council
13. Vehicle speed to be restricted to 40km/hr within Koala Beach Estate.	❖ Vehicles successfully restricted to 40km/hr.	Ray Group Tweed Council
14. Stout rope (minimum 50mm diameter) to be installed in all swimming pools (under Covenant).	❖ Stout rope (minimum 50mm diameter) installed in all swimming pools.	Ray Group Tweed Council
15. Minimum ground clearance of 300mm for any necessary fencing (except around pools).	❖ Minimum clearance of 300mm for all fencing.	Ray Group Tweed Council
Habitat Restoration Measures		
16. Streetscape and landscape plantings to include at least one preferred Koala food tree for every residential allotment (with locations for plantings nominated by the AKF for inclusion in the *Statement of Landscape Intent* for each new stage of the development). *(Alternate locations to be selected for roadsides with footpaths).*	❖ At least one preferred Koala food tree planted for every residential allotment in accordance with advice from AKF. ❖ Plantings checked yearly, with the majority surviving and replacements planted for any losses.	Ray Group AKF Tweed Council KBWHMC

MANAGEMENT ACTIONS (SUMMARY)	PERFORMANCE CRITERIA	RESPONSIBLE AGENCY
17. The Ray Group responsible for preparation of an **Estate-wide Habitat Restoration Plan** for all protected areas.	❖ An Estate-wide Habitat Restoration Plan completed and underway by May 2004. ❖ Annual monitoring of all restoration activities. ❖ Results reported annually to the KBWHMC. ❖ Restoration Plan reviewed as considered necessary.	Ray Group Tweed Council KBWHMC
18. Funds for implementation of the Habitat Restoration Plan to come from the "Special Rate".	❖ Funding effectively allocated by Council from the "Special Rate" through the KBWHMC for the restoration program.	KBWHMC Tweed Council Ray Group
19. All plantings under the Habitat Restoration Plan should be propagated from locally collected seed (*i.e.* Tweed Coast area).	❖ All restoration plantings propagated from locally collected seed.	Ray Group Tweed Council KBWHMC
20. Bushfire Asset Protection Zones that overlap with Environmental Protection Zones or habitat restoration areas should be clearly identified and permanently marked out on site, using metal posts and signs.	❖ All Bushfire Asset Protection Zones that overlap EP Zones or habitat restoration areas effectively marked. ❖ No accidental damage during fuel management activities beyond the marked area.	Ray Group Tweed Council KBWHMC
21. Ownership of protected areas to be transferred to Council for Environmental Protection zoning wherever possible.	❖ Protected areas successfully transferred to Council ownership and zoned for EP whenever possible. ❖ All protected areas incorporated into the Estate-wide Habitat Restoration Plan.	Ray Group Tweed Council



MANAGEMENT ACTIONS (SUMMARY)	PERFORMANCE CRITERIA	RESPONSIBLE AGENCY
22. Future Species Management Plans and the Estate-wide Habitat Restoration Plan to be checked to ensure consistency with the KPoM.	❖ All future species and restoration planning consistent with the KPoM.	Ray Group AKF KBWHMC
Implementation		
23. The KBWHMC established under the original KMP to remain, with participation actively sought amongst Koala Beach residents.	❖ The KBWHMC continues with participation actively sought from residents.	Tweed Council KBWHMC
24. Allocation of funds from the "Special Rate" must be consistent with the KPoM.	❖ All funding allocations from the "Special Rate" consistent with the KPoM.	Tweed Council KBWHMC
25. Information brochure to be updated annually (if necessary) to reflect outcomes from monitoring, outline recent developments, and describe any new proposals.	❖ The brochure updated annually (if necessary). ❖ The brochure provided to all prospective residents.	KBWHMC AKF
Monitoring and Review		
26. The Ray Group to fund the design of a suitable Koala Monitoring Program in conjunction with the overall development.	❖ Design of an overall Koala Monitoring Program funded by the Ray Group. ❖ Design completed by August 2004.	Ray Group AKF
27. Funds for annual implementation of the Koala Monitoring Program to come from the "Special Rate".	❖ Funding effectively allocated by Council from the "Special Rate" through the KBWHMC for the Koala Monitoring Program. ❖ Results reported annually to the KBWHMC.	Tweed Council KBWHMC
28. The AKF and KBWHMC should review this KPoM after 5 years and make amendments if necessary.	❖ Review of the KPoM undertaken after 5 years. ❖ The KPoM subsequently amended if necessary.	AKF KBWHMC

1.0 INTRODUCTION



The Koala Beach Estate is a residential development located between Pottsville and Hastings Point on the Tweed Coast in northeastern New South Wales. The region has particularly high biodiversity values and supports a number of listed threatened species, including the Koala. The Koala Beach site has a total area of approximately 380ha, of which around 300ha will be set-aside for environmental protection. The area of the site subject to residential development consists mainly of land formerly used for cattle grazing.

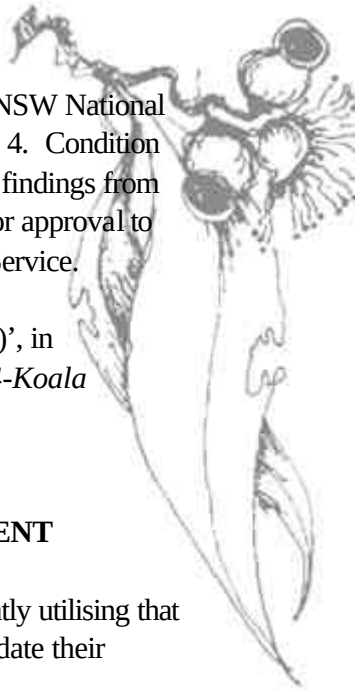
The original Koala Management Plan (KMP) was prepared for the Koala Beach Estate (formerly called 'Searanch') in December 1994 by Stephen Phillips of the Australian Koala Foundation, on behalf of the Ray Group Pty. Ltd. Public exhibition of the original draft KMP coincided with exhibition of a draft Development Control Plan for the Koala Beach site. A number of submissions were received and considered in conjunction with finalisation of the original KMP.

The original KMP was later approved by both Tweed Shire Council and the Department of Urban Affairs and Planning (DUAP) in accordance with *State Environmental Planning Policy No. 44-Koala Habitat Protection* (SEPP 44). The KMP was previously revised on four occasions (June 1996, June 1997, January 2003 and November 2003) to incorporate supplementary information and revised management provisions.

Stage 1 (11.09 ha with 101 lots) and Stage 2 (5.97 ha with 66 lots) of the Koala Beach Estate have now been developed in accordance with the provisions of the original KMP. Construction for Stage 3 (13.63 ha with 111 lots) and Stage 4 (2.56 ha with 11 lots) has been completed, whilst construction is currently underway for Stage 5 (19.74 ha with 131 lots) and Stage 6 (8.53 ha with 77 lots). Separate Development Applications have been lodged for Stage 7 (26 ha with 2 lots), and the construction of two Sports Fields with an access road from Stage 3 of the Koala Beach Estate.

A review of the effectiveness of the KMP (as amended) with respect to Stages 1 and 2 was required by Tweed Shire Council as a condition of Development Consent for Stage 4. The review was undertaken for the Ray Group Pty. Ltd. by the Australian Koala Foundation (Callaghan 2002) and was required to address (but not be limited to) the following matters:

- The results of the Koala population monitoring.
- The effectiveness of the protective measures employed, for example, has retention of Koala feed trees been successful? Have there been any Koala road-kills? Have there been any Koalas killed by dogs?
- Details of any protective measures that should be considered in addition to the Koala Management Plan for Stages 1 and 2.



- Any site-specific measures proposed for Stage 4.

The review report was required to be submitted to Tweed Shire Council and the NSW National Parks and Wildlife Service prior to release of the Subdivision Certificate for Stage 4. Condition 7 of the Development Consent for Stage 3 required that the recommendations and findings from the review be included in an amended Koala Management Plan to be submitted for approval to planningNSW, Tweed Shire Council and the NSW National Parks and Wildlife Service.

The revised plan was titled the 'Koala Beach Koala Plan of Management (KPoM)', in accordance with the provisions of *State Environmental Planning Policy No. 44-Koala Habitat Protection* (SEPP 44).

2.0 OBJECTIVES FOR THE KOALA PLAN OF MANAGEMENT

1. Maintain the existing demographic structure of the Koala population currently utilising that area of the Koala Beach Estate proposed for development and accommodate their ranging requirements.

2. Protect resident animals from undue disturbance during earth works associated with proposed development works.

3. Minimise the chances of motor vehicle collision throughout that area proposed for development, particularly in areas of high use or where the home ranges of resident animals overlap.

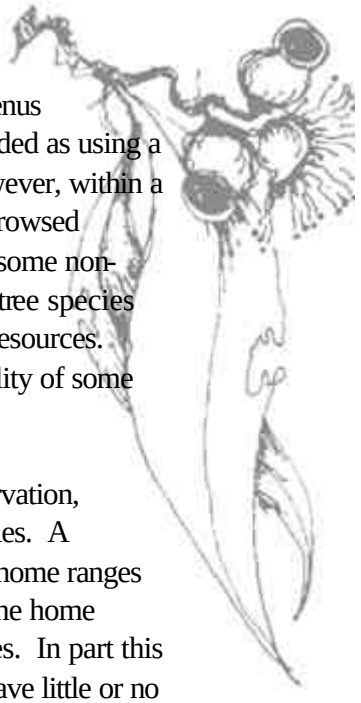
4. Embellish existing habitat where appropriate and create additional Koala habitat with a longer-term aim of increasing the overall population size.

5. Establish a degree of empathy on the part of prospective land purchasers and residents of the Koala Beach site with a view to engendering community support for maintenance of the current and future Koala population.

6. Provide long-term protection and effective management over the whole of the Koala Beach site within the context of managing a Koala population of local, regional and state significance.

7. Provide for establishment of a program to regularly monitor and review the effectiveness of the KPoM.

3.0 BACKGROUND INFORMATION

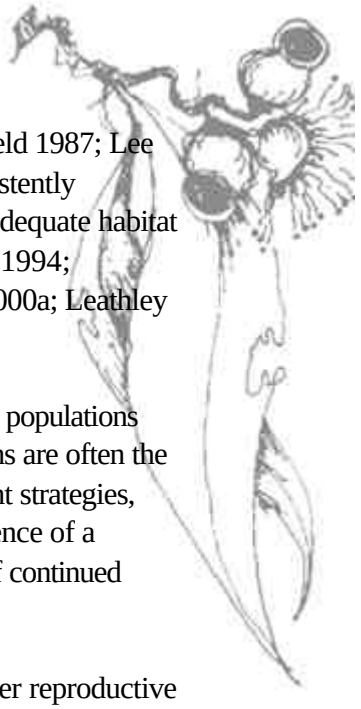


Koalas are obligate folivores that feed primarily, although not exclusively on the genus *Eucalyptus*. Throughout their range in eastern Australia, Koalas have been recorded as using a wide range of *Eucalyptus* species, as well as many species of non-eucalypt. However, within a given study area only a few species of *Eucalyptus* are likely to be preferentially browsed (primary and secondary browse trees), while a number of other species including some non-eucalypts will be incorporated into the diet as supplementary browse. Additional tree species may have particular importance to local or regional Koala populations as shelter resources. Edaphic characteristics such as soil type are also believed to influence the palatability of some browse species (Cork 1994).

The socio-biology of Koalas is a critical consideration for management and conservation, although often overlooked in environmental impact assessments and planning studies. A fundamental premise of this consideration is a contention that the establishment of home ranges and movement patterns of Koalas within areas of suitable habitat are dictated by the home ranging patterns of other Koalas, as well as by the presence of preferred food trees. In part this explains why some areas of otherwise significant Koala habitat can be shown to have little or no evidence of the animal's presence while other areas, even of lesser quality habitat, can be shown to support socially stable breeding aggregations.

In a socially stable population, individual Koalas arrange themselves in a system of overlapping home range areas. Within each animal's home range are a small number of trees that are visited repeatedly; such trees are considered to be important in maintaining the social cohesion of the population, while delineating the area of food resource necessary to sustain the animal on a year-round basis. Koalas in areas with high densities of primary browse trees tend to have smaller home ranges than do those in areas where the density of primary browse trees is lower. The sex of the animal is also important, with male Koalas generally requiring a larger home range than females. While this may be simply a function of the normally significantly larger body size of male Koalas, it is also a requirement of a polygenous social structure wherein the home ranges of dominant males overlap with those of several adult females.

In a socially stable population, notwithstanding occasional short term forays, fidelity to the home range area by the constituent Koalas is long term and can extend over many years (Lee and Martin 1988; Mitchell 1990; Phillips unpub. data). In fact, there is increasing evidence from long term records of Koala Welfare groups such as the Koala Preservation Society of New South Wales, that, notwithstanding any undue disturbances, such fidelity may extend to the term of the animal's natural life. This is in contrast to the movements of dispersing sub-adult Koalas of both sexes and other non-breeding members of Koala society (predominantly surplus males). These animals tend to maintain ephemeral home range areas and are capable of travelling large distances (in excess of 40-50kms) over extended periods in their search for socially stable breeding aggregations.



Koalas in Urban Environments

The plight of Koalas in urbanised environments has been well documented (Canfield 1987; Lee and Martin 1988; Starr *et al.* 1990). Motor vehicles and domestic dogs are consistently reported in the literature as posing major threats to Koalas in urban areas where adequate habitat remains to sustain Koalas (*e.g.* Phillips 1990; Summerville 1990; Callaghan *et al.* 1994; Ashworth 1998; de Villiers 1999; Martin and Handasyde 1999; Leathley *et al.* 2000a; Leathley *et al.* 2000b).

Inevitably, the lack of realistic assessment and consideration of the needs of urban populations leads to a gradual decline in Koala numbers to the point where localised extinctions are often the end result (see Smith and Smith 1990). In the absence of appropriate management strategies, the eventual loss of urban Koala populations often seems obscured by the persistence of a steadily dwindling number of resident animals, possibly supplemented by a level of continued offspring recruitment from nearby populations.

Small Koala populations are more vulnerable to disturbance and have a much lower reproductive potential for recovery. Within an urban environment, increased mortalities can generally be associated with the following factors:

(i) incremental habitat loss and degradation;

(ii) increased likelihood of collisions with motor vehicles as Koalas traverse developed areas as part of their normal ranging behaviour;

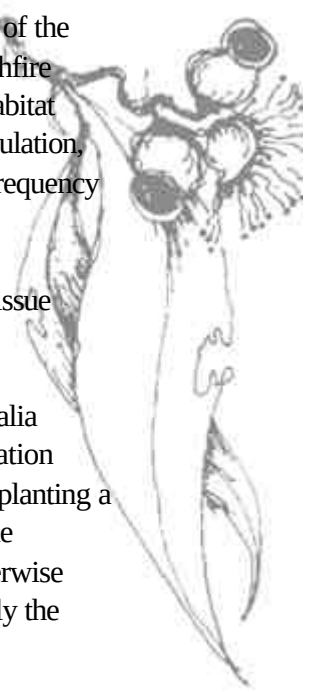
(iii) increased vulnerability to attack by domestic dogs;

(iv) higher incidence of disease within the population, particularly Chlamydiosis, commonly associated with loss of habitat including preferred browse trees and other stress factors such as mentioned in the above points; and

(v) greater likelihood of mortality by misadventure associated with common features of the urban environment such as fences and swimming pools.

Non-urban Koala Populations

Apart from the commonly recognised symptoms associated with Chlamydiosis such as urinary tract infections (Wet Bottom Syndrome) and kerato-conjunctivitis, the problems faced by non-urban Koalas have been less intensively researched. While disease clearly contributes to mortality in the wild, increasingly habitat loss and bushfire can be shown to be having a significant impact on Koala populations.



Bushfire is known to have the potential to result in mortality of a substantial proportion of the Koalas within affected areas. The recovery of Koala populations following severe bushfire depends upon factors such as the size of the remaining population, the proportion of habitat affected by the fire and how quickly it regenerates, subsequent breeding within the population, recruitment of offspring from outside the affected area, habitat fragmentation, and the frequency and intensity of further fires.

Predation by feral dogs and foxes is also increasingly being recognised as a significant issue affecting the conservation and management of Koala populations.

The continuing decline of many Koala populations along the eastern seaboard of Australia suggests that current protection measures are often inadequate and that Koala conservation requires much more than simply ensuring the retention of a few selected food trees (or planting a few to compensate for the removal of others). Aside from broad-scale clearing and the wholesale destruction of Koala habitat, the *ad hoc* removal of trees, which would otherwise allow Koala populations to maintain social stability and nutritional well being, is arguably the single most important contributing factor to the species decline in many areas.

The challenge for planners and developers is to identify and implement suitable measures to genuinely accommodate the needs of Koalas and other wildlife.

4.0 USE OF THE KOALA BEACH SITE BY KOALAS

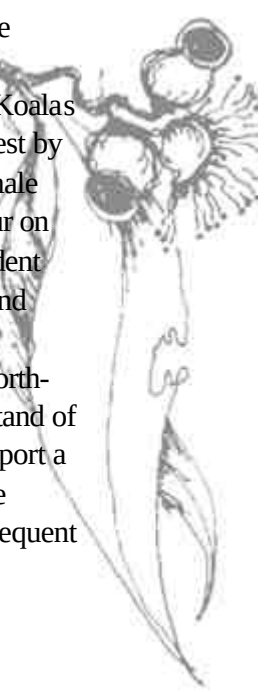
Detailed investigations were considered necessary in order to identify and better understand a number of important features of the Koala Beach local Koala population such as the structure, status and number of Koalas involved, habitat preferences, and the location of established home ranges.

Assessment of the Koala Beach Koala population in conjunction with preparation of the original Koala Management Plan (KMP) involved:

(i) Opportunistic observations of Koalas recorded during traverses of the study area for the KMP and during fieldwork associated with the Australian Koala Foundation's Tweed Coast Koala Habitat Atlas;

(ii) Replicated spotlighting surveys associated with assessment of terrestrial and arboreal fauna occurring on the Koala Beach site; and

(iii) Radio-tracking studies of Koala movements within and immediately adjacent to the area proposed for residential development.



As a result of the above techniques it was determined that, while evidence of Koalas on the Koala Beach site was widespread, it was not indicative of a large population. In fact, the collective evidence provided by the above techniques suggest that no more than 30 to 40 Koalas were likely to be resident on the area of the Koala Beach site bounded to the north and west by the Christies Creek drainage canal. Based on repeated observations of the location of female Koalas with dependent young, only three main breeding aggregations were thought to occur on the site, the largest of which (probably no more than 10 to 12 adults) was primarily dependent upon the area proposed for development. The remaining two aggregations were smaller and considered unlikely to contain more than 6 to 8 Koalas each. There was also evidence to suggest that the total population size had declined in recent times, most notably in the far north-eastern corner (freehold land adjacent to the Koala Beach site). In this area a significant stand of Forest Red Gum *Eucalyptus tereticornis* dominated woodland, previously known to support a small breeding aggregation of Koalas, no longer appeared to contain resident animals. The reasons for this apparent decline were not known, but were thought to possibly relate to frequent burning of the site in conjunction with grazing activities.

Significance of the Koala Beach Koala Population

Despite the relatively small size of the Koala population inhabiting the area proposed for residential development, the significance of socially stable breeding aggregations on the Koala Beach site should not be understated. Elsewhere in the Tweed, in common with other areas along the eastern seaboard of New South Wales, localised extinctions are widespread and many of the remaining Koala populations are dissolute, isolated and in reproductive decline with extremely poor long term prospects for survival (Phillips and Callaghan 1996). The Koala Beach site is also located on the southern edge of a much larger, although fragmented, habitat area that includes the Cudgen Lake-Round Mountain Nature Reserve and surrounding areas.

The results of stratified plot surveys undertaken for the Australian Koala Foundation's Tweed Coast Koala Habitat Atlas in conjunction with the results of radio-tracking work suggest a likely population density of between 0.07 and 0.14 Koalas per hectare for habitat in the Tweed Coast area. On this basis, the total Koala population size for the Tweed Coast area is considered likely to be significantly smaller than previously expected (possibly as few as 150 to 200 Koalas), emphasising the importance of the Koala Beach population. With the broader area including the Koala Beach site forming the largest remnant of relatively contiguous Koala habitat on the Tweed Coast, its resident Koala population is arguably of regional and state significance. This claim is supported by findings reported in the Tweed Coast Koala Habitat Atlas (Phillips and Callaghan 1996), as well as other AKF Koala research projects for study areas within New South Wales including East Lismore, Richmond River LGA, Greater Taree LGA, Port Stephens LGA, Campbelltown LGA, and the Pilliga region.

Koala Movements in the Area Proposed for Development

For the purposes of the original KMP, the movement patterns of Koalas utilising the area of the Koala Beach site proposed for development were determined from analysis of independent fixes obtained from radio-collared animals. Captured Koalas were ear-tagged and fitted with collars to which Microlite 1B radio transmitters (Titley Electronics, Ballina) were attached. A Regal 2000 Radio receiver and AW Model Directional Antenna were used to locate the animals at regular intervals (daily to every second day) and locational fixes were established by measuring distances along known compass bearings from numbered survey pegs in the study area and plotted on a 40 X 40 grid at a scale of 1:4000. Examination of the data was undertaken using the software package "Ranges IV" (Institute of Terrestrial Ecology, Wareham, United Kingdom). Convex Polygons were used to delineate the extent of home range size while Harmonic Mean Analysis (Dixon and Chapman 1980; Spencer and Barrett 1984) was used to examine and delineate activity levels within each of the home range areas studied.

On the basis of those investigations the demographic and reproductive status of the resident Koala population from the area proposed for residential development at the time the original KMP was prepared were as follows:

1. **M701A**: Adult male (6.6kgs) initially captured on 16th June 1994; died 4th July 1994 (autopsy report available); home range area later occupied by M480.

2. **M501**: Adult male “Levi” (8.0kgs) initially captured on 23rd June 1994; continued to maintain home range area and died in 2000 of suspected natural causes.

3. **F680**: Sub-adult female (1.9kgs) initially captured on 30th June 1994; a limited number of independent fixes were obtained before this animal discarded the radio collar. This animal was thought to have been recently weaned and occupying a small proportion of an adult female's home range area. Observed in close proximity to an adult female assumed to be the mother.

4. **M701B**: Large adult male “Arnie” (reached 11.0kgs) initially captured on 6th July 1994; considered likely to be the dominant (alpha) male; continued to maintain home range area; now almost certainly deceased.

5. **F402**: Adult female (5.8kgs) with back young; initially captured on 24th July 1994; dispersed from the study area in June 1995. This home range was subsequently utilised by another female Koala observed with back young.

6. **F484**: Adult female "Marie" (5.6kgs) initially captured on 30th August 1994; continued to maintain home range area. The presence of an elongated teat and distended pouch entrance suggested that this animal had recently weaned a juvenile. A small sub-adult was subsequently observed within her home range.

7. **M522**: Sub-adult male (3.8kgs) initially captured on 28th September 1994; dispersed from the study area in June 1995.

8. **M423**: Adult male (7.5kgs) initially captured on 14th October 1994; (died on 23rd October 1995: autopsy report available).

Additional Koalas that were recorded in association with the above included:

9. **M761**: Young male (6.1kgs) initially captured 29th May 1995; home range area located north west of M423 (died in November 1995).

10. **F480**: Adult female (7.2kgs) with back young initially captured on 24th August 1995; maintained home range area in vicinity of the temporary reservoir.

11. **F778**: Adult female (6.4kgs) with small pouched young initially captured 13th September 1995; home range area located north and west of M778A.

12. **F518**: Adult female (5.8kgs) with back young initially captured 18th September 1995. Collar discarded 3rd October 1995; home range as for M778A.

13. **F518**: Adult female (6.2kgs) initially captured on 13th December 1995; home range area south of M501 (killed by a roaming dog or fox on 31st March 1996).

14. **M357**: Adult male (8.0kgs) initially captured on 25th January 1996; maintained home range area to the south of M501.

15. **M778A**: Adult male (8.0kgs) initially captured on 25th January 1996; maintained home range area in the north-eastern corner of the study area adjacent to Stage 2 of the proposed development (died on 14th February 1996: autopsy report available).

16. **M336**: Young-adult male (5.8kgs) initially captured 25th January 1996; home range area located to the south of M501.

17. **M480**: Adult male initially captured on 14th February 1996; maintained home range area to the north of M501.

18. A mature, possibly senescent female without young was observed on at least three occasions during 1994; dark brown pelage on dorsal surface, low stress threshold.

At least two other mature females and a further two adult males were observed in association with the animals detailed above. A total of seventeen Koalas were radio-tracked on the Koala

Beach site, including additional animals beyond the area proposed for development, between June 1994 and June 1996.

Of the eight Koalas radio-tracked in the area proposed for residential development in conjunction with the original KMP, considerable variation was recorded in the home range size and movement patterns (see Figure 1). Amongst the males, M701B occupied the largest home range area (approximately 33ha) and was considered the most active and the likely dominant (alpha) male in the population, with ranging patterns overlapping those of at least three adult females. By comparison, M501 (7.5ha), M423 (17.6ha) and the sub-adult M522 (14ha) occupied significantly smaller home range areas. Based on a limited

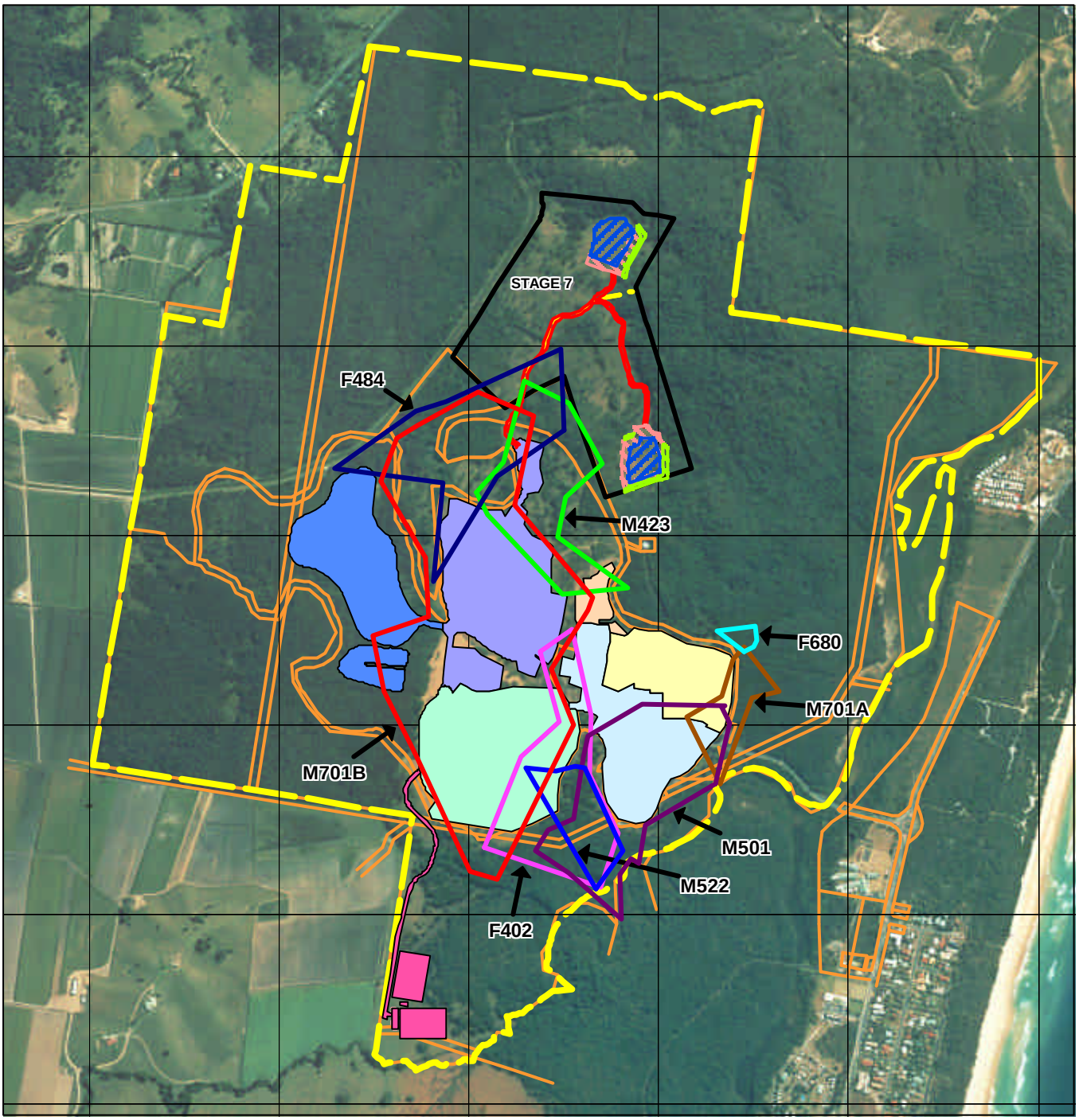


Figure 1: Home ranges of the eight Koalas radio-tracked for the original Koala Management Plan (1994)
Koala Beach Estate, Pottsville

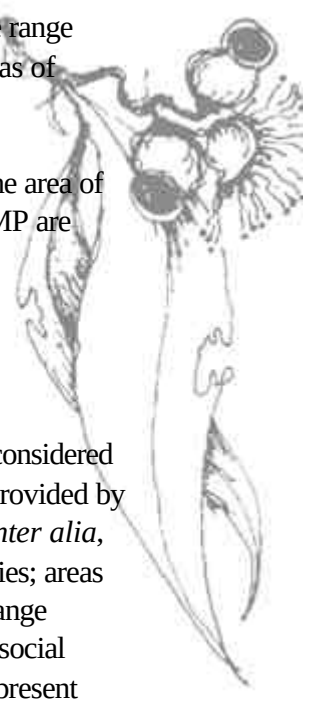
Scale: 1: 15,000

Radio Tracked Koalas
- Koala M501B
- Koala F402
- Koala M522
- Koala M701A
- Koala F680
- Koala M501
- Koala M423
- Koala F484

Development Stages
- Stage 1
- Stage 2
- Stage 3
- Stage 4
- Stage 5
- Stage 6
- Stage 7
- Proposed Sports Fields
- Cadastral Boundary
- 500m Grid
- Site Boundary

number of independent fixes, Male 701A similarly appeared to occupy a smaller home range area (approximately 12ha). Of the females, F484 and F402 occupied home range areas of 16.6ha and 4.5ha respectively.

The location and approximate boundaries of the home ranges of individual Koalas in the area of Koala Beach proposed for residential development in conjunction with the original KMP are illustrated in Appendix 1.



Areas of Major Koala Activity

Harmonic Mean Analysis of fixes obtained from radio-tracking provided a quantitative assessment for the original KMP of the movements and ranging behaviour of animals considered most likely to be disturbed by the proposed development. In contrast to information provided by delineation of convex polygons for home ranges, Harmonic Mean Analysis identifies, *inter alia*, areas where significant activity centres are located. The functionality of such areas varies; areas of major use (or activity) for an adult male Koala are likely to occur where the home range overlaps with that of a resident female, and are consequently considered important for social interaction including breeding behaviour. For adult females, areas of major use can represent parts of the home range that are used more exclusively during lactation and raising of young, in addition to areas important for social contact. There is some evidence, primarily from a temporal analysis of ranging behaviour, to suggest that areas of major use may shift slightly on a seasonal basis; such considerations do not detract from the importance of these areas.

Home range analyses established that the proposed Environmental Protection (Habitat) Zone lands would not fully accommodate the needs of the resident Koala population. Harmonic Mean Analysis confirmed that a number of major activity areas for several Koalas occurred within the area proposed for residential development, while additional areas of major activity were located within adjoining Environmental Protection zoned lands. Furthermore, it was clear that in addition to the resident Koalas, others would continue to traverse the site over time. Consequently, it was confirmed that in order for the population to be treated with care and responsibility, a range of additional ameliorative measures would need to be applied to the proposed development.

The 65% isopleth generated from the Harmonic Mean Analysis for each Koala highlighted areas where the majority of fixes were recorded and by inference, areas where Koalas spent a corresponding higher proportion of time. For example, in the case of M701B four areas of major activity were identified (Figure 2); areas A and D corresponded to areas of overlap with F402, while areas B and C corresponded to overlap with F484 and at least one other female.

In contrast, the home range area of F402 (Figure 3) indicated two areas of major activity. Area A clearly represented the area of her home range shared with M701B, while area B corresponded to areas of overlap with M501. The focus of activity indicated by area B was

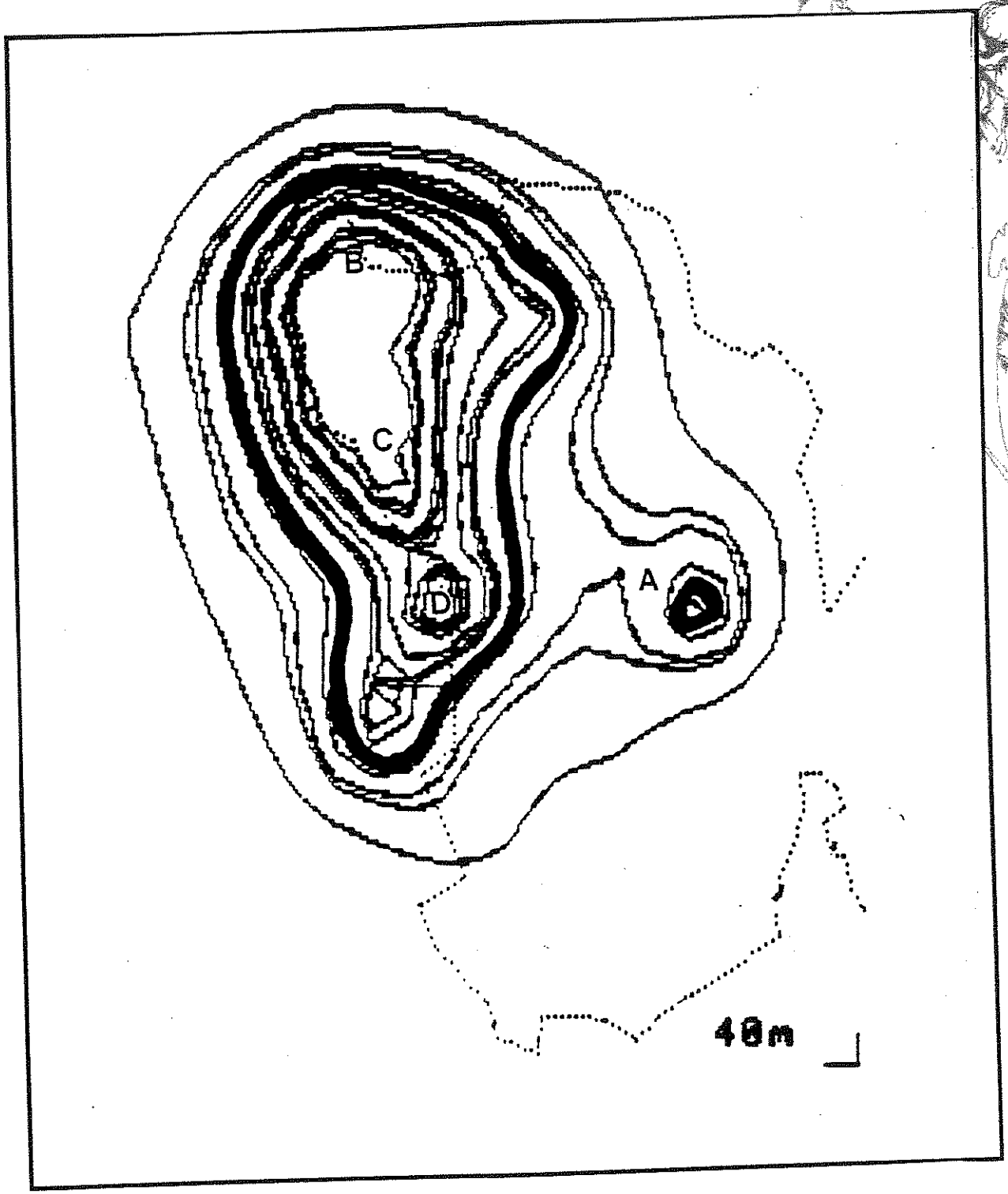


Figure 2: Harmonic Mean analyses for home range movements for M701B over the period 6th July to 30th November 1994. The 65% isopleth is highlighted and delineates areas of major activity (the dotted line indicates the approximate development boundary).

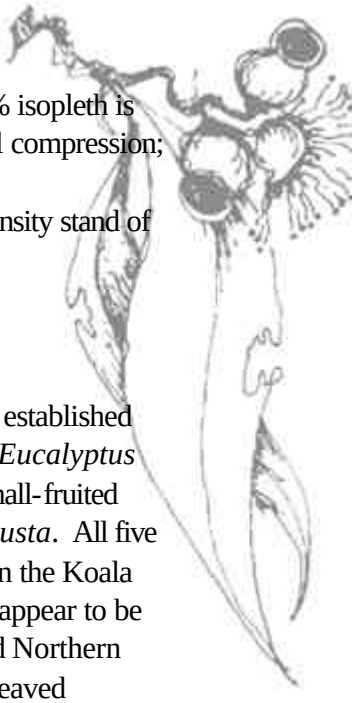


Figure 3: Harmonic Mean analyses for home range movements for F402; the 65% isopleth is highlighted and delineates areas of major activity (this image is distorted by vertical compression; the dotted line indicates the approximate development boundary).
also likely to reflect intensive utilisation of high quality habitat in this area (a high density stand of Small-fruited Grey Gum *E. propinqua*), possibly during lactation.

Habitat Utilisation by the Koala Beach Koalas

Fieldwork associated with the Australian Koala Foundation's Koala Habitat Atlas established that primary browse trees for Koalas in the Tweed lowlands include Tallowwood *Eucalyptus microcorys*, Forest Red Gum *E. tereticornis*, Swamp Mahogany *E. robusta*, Small-fruited Grey Gum *E. propinqua* and a naturally-occurring hybrid *E. tereticornis* x *E.robusta*. All five primary browse species occur within the overall area proposed for development on the Koala Beach site. Secondary browse species utilised by Koalas in the Tweed lowlands appear to be confined to only two other eucalypt species (White Mahogany *E. acmenoides* and Northern Grey Ironbark *E. siderophloia*) and a number of non-eucalypts including Broad-leaved Paperbark *Melaleuca quinquenervia*, Forest Oak *Allocasuarina torulosa* and Swamp Oak *Casuarina glauca*. The use and importance of these latter species is considered likely to be particularly influenced by the presence of primary browse species.

The Tweed Coast Koala Habitat Atlas identified areas of Primary Habitat, Secondary Habitat (Class A) and Secondary Habitat (Class B) throughout the study area, including the Koala Beach site (Phillips and Callaghan 1996). A more detailed Koala Habitat Atlas was prepared in conjunction with impact assessment for the later stages of the Koala Beach development (Figure 4). This mapping identified areas of Secondary Habitat (Class C) and Tertiary Habitat (Buffers and Links) in additional to the above categories.

Use of 19 species of trees was recorded during the Koala Beach radio-tracking program including 7 species of *Eucalyptus* and at least 12 species of non-eucalypt (Table 1). Small-fruited Grey Gum, Tallowwood and Swamp Mahogany recorded the highest level of use amongst the eucalypts, supporting their status as preferred food tree species for the resident Koala population. Northern Grey Ironbark also appeared to be utilised disproportionately to its occurrence on the site, consistent with use as a secondary species.

Of the non-eucalypts, Swamp Oak featured most significantly, with Brush Box *Lophostemon confertus* and Broad-leaved Paperbark to lesser degrees. It was concluded that these three species most likely comprised secondary browse for their respective users; the exotic *Pinus spp.* appeared to be favoured by M501, most likely as a shelter resource. The considerable use of Swamp Oak by several of the Koalas was possibly related primarily to its abundance within sections of the respective home range areas.

In addition to the above findings, Phillips (1999) identified Brush Box as providing an important thermal refuge (shelter resource) through further detailed analysis of the radio-tracking data obtained for the Koala Beach site. A number of Brush Box in the area proposed for development were identified for protection as multiple use (home range) trees in the original KMP.

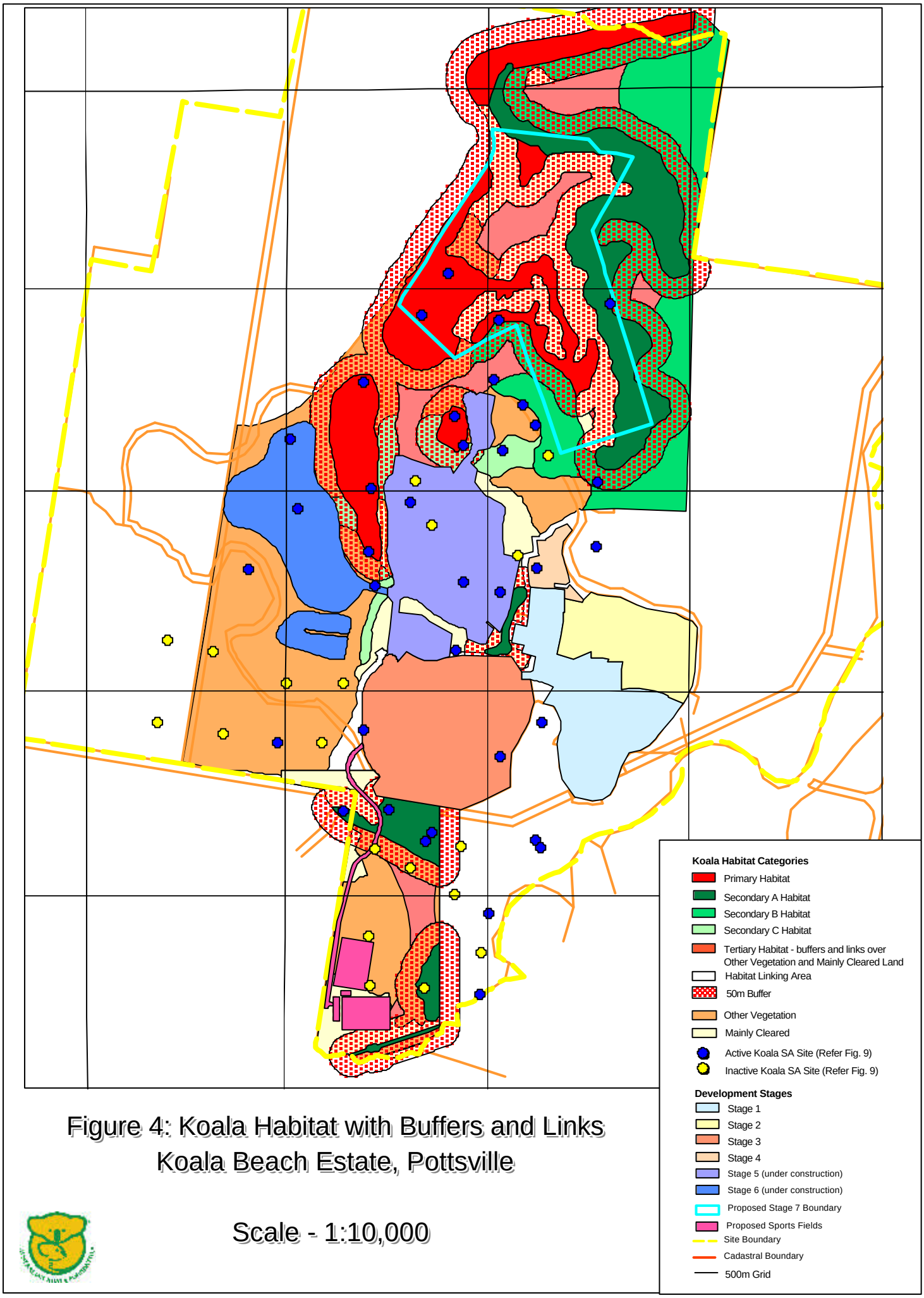


Figure 4: Koala Habitat with Buffers and Links
Koala Beach Estate, Pottsville

Scale - 1:10,000

KOALA	701A	701B	501	402	680	484	423	522	TOTAL
EUCALYPTS									
E. propinqua		12	4	22		3	1	4	**46**
E. microcorys	3	15	3	6	8	2	8		**45**
E. robusta	9		9		14	1		5	**38**
E. siderophloia		8	2	7		4	3		**24**
E. pilularis		7		2		2			**11**
E. spp (hybrid)	1			1		1			**3**
E. acmenoides						1	1		**2**
NON-EUCALYPTS									
C. glauca		35	56	13		26	3	10	**143**
L. confertus		5	10	18			6	2	**41**
M. quinquenervia		7	11	6	2	6		3	**35**
Pinus spp.			14	2					**16**
C. gummifera		7	1	6		1			**15**
C. salignus			2	2				4	**8**
L. suaveolens		6				2			**8**
A. cunninghamii			3	3					**6**
A. torulosa							2		**2**
C. camphora		2							**2**
B. integrifolia								2	**2**
A. melanoxylon								1	**1**
Unidentified Species		2				4	2		**8**
Total Observations	**13**	**106**	**115**	**88**	**24**	**54**	**24**	**33**	**457**

Table 1. Tree species utilisation by eight Koalas radio-tracked in conjunction with preparation of the original KMP for the Koala Beach development area.

5.0 MONITORING OUTCOMES TO JULY 2002

A total of 60 Koala captures (involving 38 different Koalas) were undertaken by a research team lead by the AKF (Scientific Research Licences A1412 and A2240; ACEC Research Authority AW 95/090) on the overall Koala Beach Estate between September 1995 and November 1997. These captures included animals from the radio-tracking program. Data recorded included variables such as location of capture, age estimation, sex, condition and breeding status. The majority of these Koalas were blood sampled, swabbed and clinically assessed under anesthesia in the field by a veterinary team. This additional work has yielded considerable

background information on genetics, *Chlamydial* infection, fecundity, demographics, disease and overall health status within the local Koala population.

Koala capture record sheets were systematically completed and are maintained by the AKF on a Microsoft Access computer-database. This information will provide useful baseline data for an overall Koala monitoring program for the Koala Beach Estate.

Faecal Pellet Surveys

Monitoring of Koala activity levels within Stage 1 of the Koala Beach Estate has been undertaken by Dr. Stephen Phillips on behalf of the Koala Beach Wildlife and Habitat Management Committee (KBWHMC). Dr. Phillips' monitoring report for October 2001 is included in Appendix 2. The report focused upon street plantings within three specific areas of Stage 1 including Muskheart Court/Bunya Crescent, Flintwood Street, and Bottlebrush Drive, where faecal pellet Spot Assessment surveys were undertaken in 2000 and 2001 in accordance with the technique described in Phillips and Callaghan (1995).

According to Dr. Phillips' report, the results for the three monitoring sites confirmed that Koalas continue to range through Stage 1 of the Koala Beach Estate, with an encouraging trend towards increasing activity levels. High activity levels were recorded at two of the three monitoring sites. These are indicative of utilisation as part of the home range of one or more resident Koalas (Phillips and Callaghan 1995).

With respect to areas of the Koala Beach Estate beyond Stage 1, a total of eleven Spot Assessments were undertaken by the Australian Koala Foundation (AKF) in November 2000 in conjunction with Eight Part Tests of Significance for proposed development of Stage 3 and Stage 4 (AKF 2001). Eight of these assessments were associated with Stage 3 and three with Stage 4. A further 24 Spot Assessments were undertaken by the AKF in April 2002 in conjunction with Eight Part Tests of Significance for proposed development of Stage 5 and Stage 6 (AKF 2003). An additional 20 Spot Assessments were undertaken by the AKF in December 2003 in conjunction with Eight Part Tests of Significance for proposed development of the Sports Fields and access road (AKF 2004). Spot Assessment Sites that recorded low, low-moderate, moderate and high Koala activity levels according to Phillips and Callaghan (1995) are indicated in Figure 5. The results of these recent surveys confirm the continued widespread use of the Koala Beach site (beyond Stage 1) by members of the resident Koala population.

Survey of Residents

The AKF undertook a survey of 16 residents of Stage 1 in January 2002. A standard form was completed in conjunction with each survey (see Appendix 3). The survey results are maintained by the AKF on a computer database and will be made available for the purposes of ongoing monitoring. Similar surveys are recommended as a component of an overall monitoring program.

Future surveys should ideally seek to achieve a representative sample of residents from across the Estate.

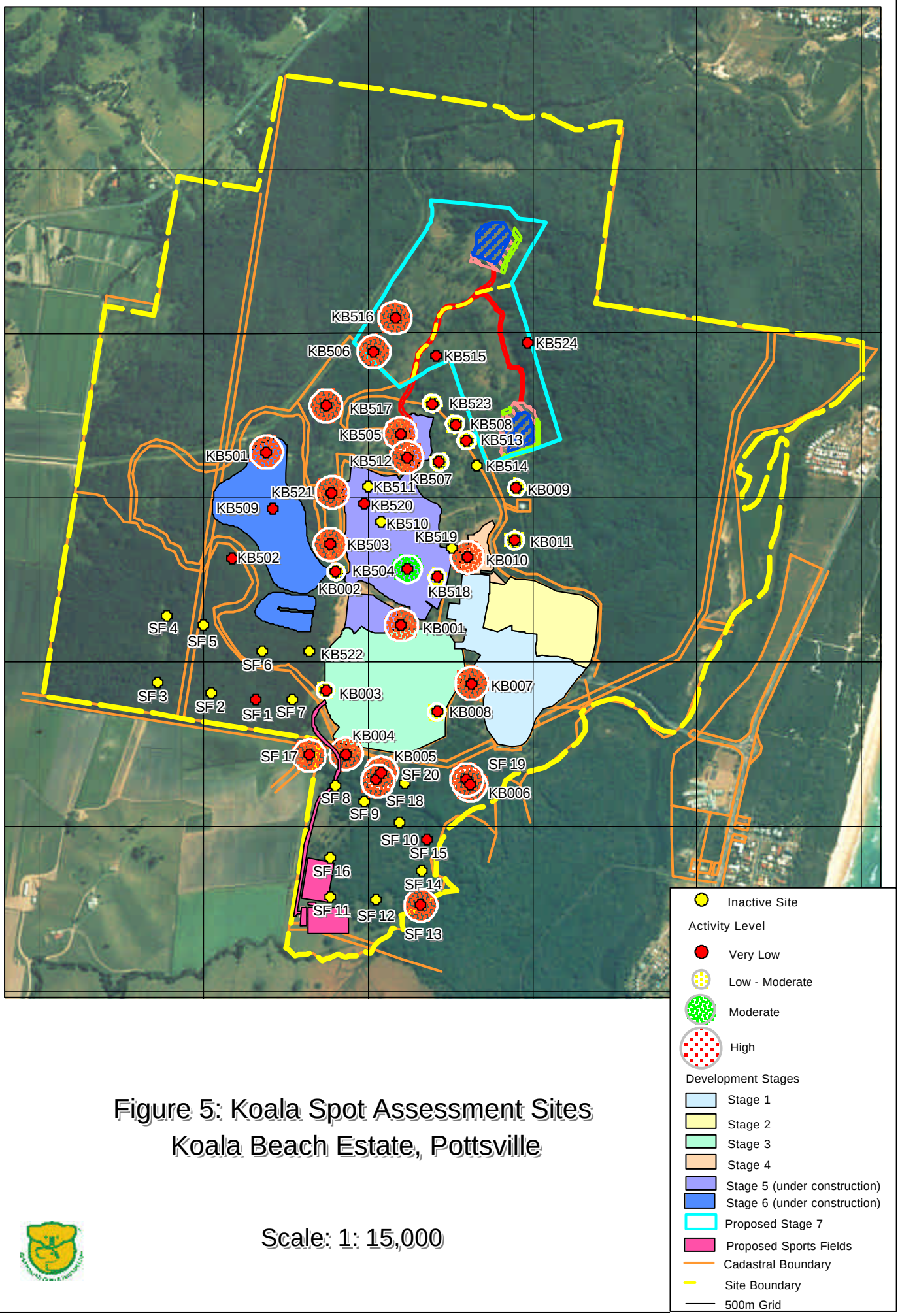
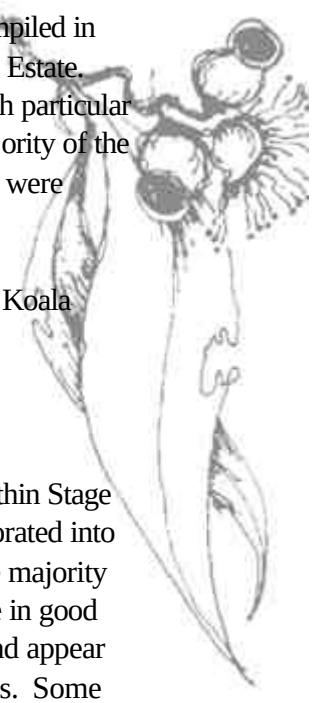


Figure 5: Koala Spot Assessment Sites
Koala Beach Estate, Pottsville

Scale: 1: 15,000



A total of 43 Koala records (including three sightings of mothers with young) were compiled in response to the survey, with all but one of the residents having observed Koalas in the Estate. Eleven of the residents reported seeing Koalas in the Stage 1 streetscape plantings with particular emphasis on Bunya Crescent, Muskheart Street and Bottlebrush Drive, where the majority of the more recent sightings (2001-2002) were concentrated. Locations for Koala sightings were depicted in Callaghan (2002).

The survey of residents confirmed a continuation of Koala sightings for Stage 1 of the Koala Beach Estate from initial development through to the present.

Koala Feed Trees

Detailed monitoring of health and survival of retained and planted Koala food trees within Stage 1 and Stage 2 has yet to be undertaken, though it is recommended that this be incorporated into an Estate-wide Habitat Restoration Plan. However, as best as can be ascertained, the majority of the trees retained within Stage 1 and Stage 2 still survive and generally appear to be in good health. Similarly, most of the landscape plantings of Koala food trees have survived and appear to be healthy. This includes some supplementary plantings away from the built-up areas. Some instances of lerp infestation of streetscape plantings were reported during the survey of residents, however subsequent inspections indicated that the trees recovered reasonably well.

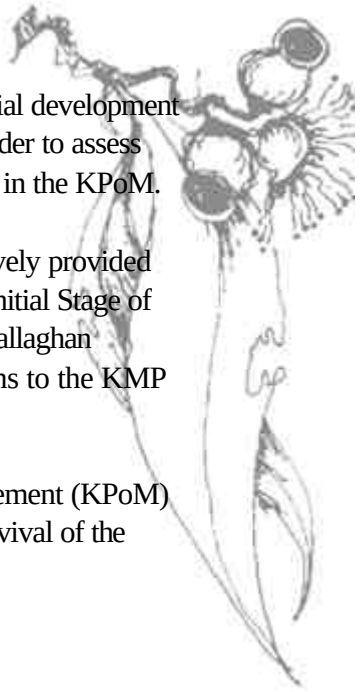
A number of Koala food trees died as a result of construction works for: 1) a retention wall at the eastern end of Upper Grey Gum Gully during Stage 1 development; and 2) incorporation of several Swamp Mahogany trees into a drainage retention basin in Stage 2.

Traffic and Domestic Dogs

There have been no reported instances of Koalas being hit by cars or attacked by dogs within the Koala Beach Estate since the development and occupation of Stage 1. Hence, the measures contained in the KMP to protect Koalas from potential injury or mortality from traffic and domestic dogs appear to have been successful to date.

The need for improved signage near the Estate entrance to inform visitors of the complete prohibition on domestic dogs (and cats) is supported by continued reports of building contractors and visitors occasionally bringing dogs onto the Estate. Installation of a more visible sign on the main entrance road to the Estate is proposed in conjunction with Stage 7. Additional signs will be installed near the proposed Sports Fields and on the access road from Stage 3.

6.0 CONCLUSIONS



The Koala population at Koala Beach would be highly unlikely to survive residential development in the absence of an effective KPoM. Ongoing monitoring will be necessary in order to assess the longer-term effectiveness of the management actions and provisions contained in the KPoM.

The recent review of the original KMP (as amended) concluded that it had effectively provided for the continued survival of the resident Koala population in association with the initial Stage of the Koala Beach development, on the basis of the initial monitoring information (Callaghan 2002). The review recommended a number of amendments, updates and additions to the KMP in conjunction with proposed future stages.

Consistent with the original KMP, the revised and updated Koala Plan of Management (KPoM) has the overall objective of maintaining the demographic structure and ongoing survival of the local Koala population through management actions and design standards.

7.0 MANAGEMENT ACTIONS

For the purposes of the Koala Beach residential development, the Koala Plan of Management (KPoM) proposes to meet the specified objectives through the provisions detailed below. These actions and initiatives are considered the **minimum** necessary to protect the Koala population; the plan will fail if these specific provisions cannot be guaranteed, particularly those that relate to recommended controls on vehicle speed and dog ownership, habitat protection and restoration.

Habitat Protection Measures

1. All specimens of primary Koala food trees (as identified in this KPoM) that occur within the area proposed for development should be retained and incorporated into the final design layouts for each stage in such a way that they will not be threatened, either now or in the future, by the construction or maintenance of dwellings (and associated infrastructure) on the site.

   Exemption for Stage 5 and Stage 6:

   Due to the degree of earthworks necessary for the development of Stages 5 and 6 it was necessary to remove nine preferred Koala food trees. These nine trees included one Forest Red Gum (155mm dbh) from Stage 6; plus two Tallowwoods (195mm and 190mm dbh) and six Small-fruited Grey Gums (440mm; 345mm; 185mm; 574mm; 111mm; and 238mm dbh) from Stage 5. The likely impact from the loss of these trees was addressed in the Eight Part Test Report for Stages 5 and 6 (AKF 2003). It was determined that it would be possible to adequately compensate for the loss of these nine preferred Koala food trees by landscape plantings and by implementing compensatory habitat restoration

activities for a number of identified sites outside the areas proposed for development. These sites were specified in the Eight Part Test Report including a total of approximately 8.05 ha (from six sites) for compensatory plantings and 11.4 ha (from four sites) for woody weed management and other restoration activities.

Exemption for the Sports Fields and access road:

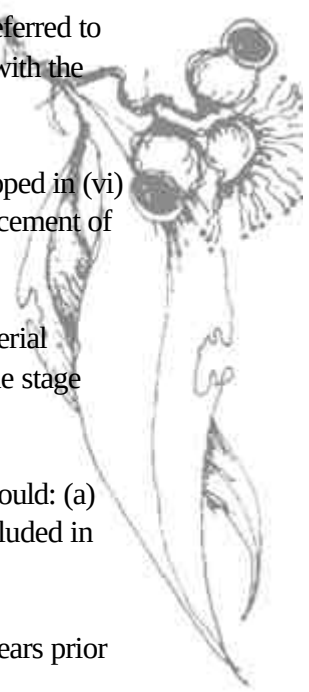
Due to the extent of fill required for the development of the Sports Fields and access road it is likely to be necessary to remove two preferred Koala food trees. These trees include one Tallowwood (700mm dbh) for the access road from Stage 3 and one Swamp Mahogany (415mm dbh) for the northern-most Sports Field. The likely impact from the loss of these trees was addressed in the Eight Part Test Report for the Sports Fields and access road (AKF 2004). It was determined that it would be possible to adequately compensate for the loss of these two preferred Koala food trees by implementing compensatory habitat plantings for a number of identified sites outside the areas proposed for development. These sites were specified in the Eight Part Test Report including a total of 1.78 ha for Koala habitat restoration.

2. Each "home range" tree (*i.e.* trees which are known to be shared by two or more Koalas in the population or which are known to have been visited on more than one occasion by an individual Koala), regardless of the species, should be retained and incorporated into the final design layouts for each stage in such a way that they will not be threatened, either now or in the future, by the construction or maintenance of dwellings (and associated infrastructure) on the site. Koala faecal pellet surveys may be used as an alternative to radio-tracking, for the purposes of identifying "home range" trees.

3. All secondary food trees and significant shelter tree species identified in this KPoM that occur within the area proposed for development should be retained and incorporated into the final design layouts for each stage wherever possible.

4. In addition to the specific trees and provisions detailed above, retention of native vegetation within the area proposed for development is to be maximised with emphasis on any further trees known to be used by Koalas as part of their home ranging, together with any areas of recorded high Koala activity. An investigation to identify any high activity areas is to be undertaken in accordance with the Spot Assessment Technique (Phillips and Callaghan 1995).

5. Each of the trees referred to in (i) and (ii) above must be permanently protected by a Covenant under Section 88B of the *Conveyancing Act 1919* and/or by specific ordinance (Tree Preservation Order) under the *Local Government Act 1993*, whichever has the greater statutory power.



6. A map detailing the precise location, status and taxonomic identity of the trees referred to in items (i), (ii) and (iii) is to be provided to Tweed Shire Council in conjunction with the Development Application for each stage.

7. To avoid confusion or mishaps, trees referred to in items (i), (ii) and (iii) and mapped in (vi) must be fenced (if appropriate) or otherwise clearly flagged prior to the commencement of any approved construction works at the site.

8. The Development Application for each stage is to be accompanied by a recent aerial photograph of the site of not less than 1:2500 scale. The aerial photograph of the stage should be accurately matched with an overlay at the same scale.

   The overlay should clearly identify individual trees and areas of tree cover that would: (a) be retained and protected; (b) be destroyed or adversely affected; and (c) be included in proposed housing allotments, driveways or streetscapes.

   The recent aerial photograph of the stage should be taken: (a) not more than 3 years prior to lodgement of the Development Application for the stage; (b) not prior to the commencement of any other development works within 200m from the edge of the stage; and (c) not prior to any bushfire (either prescription or wildfire) within the stage.

9. The Development Application for each stage must be accompanied by an assessment from the Australian Koala Foundation (AKF) of the magnitude and likely significance of impacts on Koalas and Koala habitat.

10. The Development Application and final design layouts for each stage should demonstrate to the satisfaction of the Department of Environment and Conservation (DEC) that habitat retention has been maximised including any high Koala activity sites, and that threats from traffic have been effectively minimised. Ideally, roads should not be positioned near areas of high Koala activity or where the home-ranges of two or more Koalas are known to overlap. Vehicle calming devices such as that depicted in Appendix 4 should be required at appropriate locations where roads are unavoidable in such situations. Vehicle calming devices should be clearly sign-posted and well illuminated at night.

11. Earthworks or other activities involving tree removal must not proceed until the area has been inspected by an officer from the Australian Koala Foundation (AKF), or their nominated representative. Tree clearing operations will be temporarily suspended within a range of 50m from any tree that is occupied by a Koala and will not resume until the Koala has moved out of the area of its own volition.

Threat Abatement Measures

12. By means of a Covenant under Section 88B of the *Conveyancing Act 1919*, domestic dogs and cats are not to be kept or otherwise brought onto the Koala Beach Estate. All access roads to the Koala Beach Estate must be clearly sign-posted to that effect. Construction and building contractors are to be specifically advised of this provision in conjunction with their contract of engagement. Council rangers will be asked to police the dog and cat prohibition and to respond to any reports of dogs or cats being brought onto the Estate.

13. Road design standards and appropriate speed calming devices must be incorporated into the designs for each stage to restrict motor vehicles to a maximum speed of 40km/hour within all areas of the Koala Beach Estate.

14. By means of a Covenant under Section 88B of the *Conveyancing Act 1919*, all swimming pools installed by future residents of the Koala Beach Estate must include a stout rope (minimum of 50mm diameter), one end of which is to be secured to a stable poolside fixture, the other end of which must trail in the pool at all times.

15. Notwithstanding the intent of Clause 4.3(iii) of the Deed of Agreement between Tweed Shire Council and the Ray Group Pty. Ltd. (see below), fencing within the development area should not be encouraged. However, where fencing is considered necessary for privacy or security reasons a minimum ground clearance of 300mm must be provided and maintained at all times, except for swimming pool fences.

    Pursuant to Clause 4.3(iii) of the Deed of Agreement, fencing must be provided which effectively excludes stock from the land zoned 7(l) which has been acquired by Council. Barbed wire fencing is not acceptable adjacent to urban areas and local parks. The fencing must be of a design that does not cause loss of or damage to trees on the subject land.

Habitat Restoration Measures

16. Streetscape and landscape plantings for each stage of the development should include at least one preferred Koala food tree for every residential allotment. These plantings are to be included only on roadsides where Tweed Shire Council do not require footpaths, with alternate locations selected to accommodate the remaining plantings. The trees are to be centrally located in the verge away from the kerb. A root barrier is to be installed along the adjacent kerb edge wherever streetscape plantings are undertaken. A *Statement of Landscape Intent* will be submitted with Development Applications for each stage, indicating the locations and species for Koala tree plantings as per advice from the AKF. Plantings should be checked yearly, with replacement plantings for any loses.

Recommended streetscape and landscape Koala food trees include: (well-drained sites) Tallowwood *Eucalyptus microcorys*; Small-fruited Grey Gum *E. propinqua*; Forest Red Gum *E. tereticornis*; Narrow-leaved Peppermint *E. nicholli*; (poorly-drained sites) Swamp Mahogany *E. robusta*; Tallowwood and Forest Red Gum. Streetscape plantings should ideally be propagated from locally collected seed.

17. The Ray Group should be responsible for preparation of an **Estate-wide Habitat Restoration Plan** for all protected areas of the residential environment, as well as surrounding areas including adjacent lands zoned for Environmental Protection. The Restoration Plan should include an overall site assessment, a map depicting target areas (including the areas recommended in the original KMP), the current extent of weed invasions, proposed work zones, prioritisation of works, weed control methods, timing, proposed plantings, and responsibilities for implementation. Provision for annual monitoring of the health and survival of retained and planted trees (including naturally recruited juveniles) and other vegetation, as well as the success of restoration activities, should be incorporated into the Restoration Plan. The Restoration Plan should be reviewed when considered necessary by the KBWHMC in response to results from the monitoring program. The Restoration Plan should ensure consistency with existing species management plans, management plans for adjacent Environmental Protection Zone lands, Landscape Plans, and Bushfire Management Plans that have been prepared and approved for the Estate. Annual monitoring/progress reports should be submitted to the KBWHMC.

18. Funds for ongoing implementation of the Habitat Restoration Plan are to come from the "Special Rate" administered by Tweed Shire Council and allocated as required through the KBWHMC.

19. All plantings in conjunction with the Habitat Restoration Plan should be propagated from seed collected locally (*i.e.* from the Tweed Coast area).

20. Fencing of restoration areas is considered unlikely to be necessary in most instances. However, it is recommended that any Bushfire Asset Protection Zones that overlap with Environmental Protection Zones or habitat restoration areas should be clearly identified and permanently marked out on site (using metal posts and signs) to avoid accidental damage during fuel management activities.

21. Ownership of areas set aside and protected from development in conjunction with each successive stage should be transferred to Tweed Shire Council and zoned for Environmental Protection whenever possible, and be incorporated into the Estate-wide Habitat Restoration Plan.

22. Future Management Plans for other species and the Estate-wide Habitat Restoration Plan should be checked to ensure consistency with the KPoM.

Implementation

23. The original KMP provided for the establishment of the Koala Beach Wildlife and Habitat Management Committee (KBWHMC), which generally meets every two months and is comprised of representatives from the following organisations:

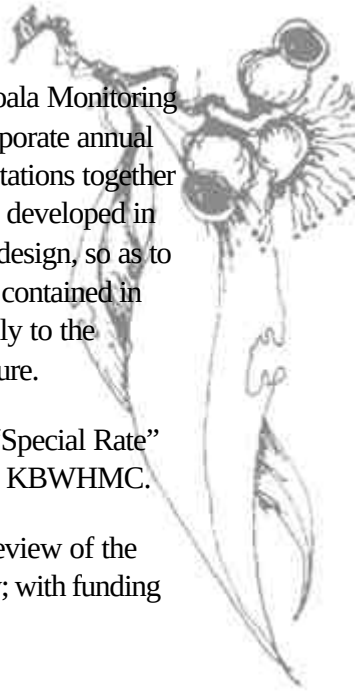
- Ray Group Pty. Ltd.
- Tweed Shire Council.
- Community representatives (including the correspondence secretary).
- Australian Koala Foundation.
- Tweed Valley Wildlife Carers - Koala Rescue Unit.
- Department of Environment and Conservation (attendance upon special request).

Membership and participation in the activities of the KBWHMC should continue to be actively sought amongst residents of the Koala Beach community.

24. The KBWHMC is responsible for overseeing implementation of the provisions in the KPoM. Funding for this purpose is derived predominantly from the "Special Rate", which is levied and administered by Tweed Shire Council and allocated through the KBWHMC as required. Under the *Local Government Act 1993*, the levy can only be expended in accordance with the provisions set out in the KPoM, the purpose for which it was raised. From time to time, the KBWHMC may decide to allocate funds towards other matters relevant to the Koala Beach Estate that are not specifically identified in the KPoM. However, such allocations **must be consistent with the KPoM**. An example of such a situation might involve a decision by the KBWHMC to allocate funding towards management of access for passive recreational use of protected environmental areas within the Estate, in order to minimise impacts. Whilst this might entail a decision to investigate and formalise a suitable access trail and/or install regulatory or interpretative signage, under the KPoM it would not extend to the provision of other structural features.

25. The importance of the Koala Beach site for Koala conservation should continue to be communicated to intending land purchasers and residents by way of the information brochure. Future updates of the brochure should emphasise opportunities for potential active involvement of residents. The brochure should be updated annually (if necessary) to reflect outcomes from the monitoring program, to summarise recent developments, and describe any new proposals. The brochure should be provided consistently to *all* prospective residents.

Monitoring and Review



26. The Ray Group should be responsible for funding the design of a suitable Koala Monitoring Program for the overall development. The monitoring program should incorporate annual Spot Assessments (Phillips and Callaghan 1995) at established monitoring stations together with Koala surveys and record keeping. The monitoring program should be developed in consultation with the KBWHMC and should be scientifically rigorous in its design, so as to provide the best opportunity to determine the effectiveness of the provisions contained in the KPoM. Results from the monitoring program should be reported annually to the KBWHMC and submitted periodically for publication in the scientific literature.

27. Funds for implementation of the Monitoring Program are to come from the "Special Rate" administered by Tweed Shire Council and allocated as required through the KBWHMC.

28. The Australian Koala Foundation and the KBWHMC should undertake a review of the performance of this KPoM after 5 years and make amendments if necessary; with funding from the "Special Rate"

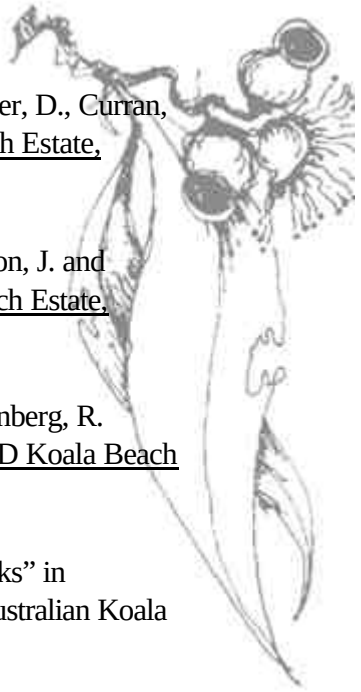
ACKNOWLEDGEMENTS

Fieldwork associated with the original Koala Management Plan (KMP) was undertaken under Scientific Authority No. A 1412 issued by the NSW National Parks and Wildlife Service. Numerous individuals assisted with fieldwork including Mark Fitzgerald, Graeme Lloyd, Rhonda James, Greg and Brad James, and Julia McLean. Radio-tracking was undertaken by Graeme Lloyd and Rhonda James, computer analysis by Dionne Coburn.

Assessments for subsequent stages of the development were undertaken under Scientific Authority No. A 2240 with assistance from Jane Thompson (AKF), Graeme Lloyd and Timothy Curran (AKF). For the purpose of reviewing and revising the original KMP, Jane Thompson undertook the survey of residents and summarised the results. Additional Koala records were kindly provided by Adele Casson and Rhonda James. Critical comments on the KMP review report were provided by Timothy Curran (AKF), Mark Fitzgerald, and Graeme Lloyd. Constructive comments on a draft of the KPoM were provided by Adrian Day, Darryl Anderson and Steve Macrae. GIS maps were prepared by Jane Thompson and Dave Mitchell (AKF), with assistance from Renee Sternberg (AKF).

The Ray Group Pty. Ltd. funded the original KMP, as well as the review report and the subsequent preparation of this KPoM.

REFERENCES



Australian Koala Foundation: Callaghan, J., Fitzgerald, M., Markus, N., Rohweder, D., Curran, T. and Benwell, A. (2001) Eight Part Tests of Significance STAGE 4 Koala Beach Estate, Pottsville. Report prepared for the Ray Group Pty. Ltd.

Australian Koala Foundation: Callaghan, J., Fitzgerald, M., Markus, N., Thompson, J. and Benwell, A. (2003) Eight Part Tests of Significance STAGES 5 and 6 Koala Beach Estate, Pottsville. Report prepared for the Ray Group Pty. Ltd.

Australian Koala Foundation: Callaghan, J., Fitzgerald, M., Benwell, A., and Sternberg, R. (2004) Eight Part Tests of Significance SPORTS FIELDS AND ACCESS ROAD Koala Beach Estate, Pottsville. Report prepared for the Ray Group Pty. Ltd.

Ashworth, G. (1998) "How Pine Rivers Shire is protecting Koalas from dog attacks" in Proceedings of a conference on the Status of the Koala held at Coffs Harbour. Australian Koala Foundation, Brisbane.

Callaghan, J. (2002) Review of the Koala Beach Koala Management Plan. Report prepared for the Ray Group Pty. Ltd. by the Australian Koala Foundation.

Callaghan, J., Leathley, S. and Lunney, D. (1994) Port Stephens Koala Management Plan: draft for public discussion. NSW National Parks and Wildlife Service, Sydney.

Cameron McNamara. (1982) Hastings Village Environmental Study. Report prepared for Direct Acceptance Corporation Limited.

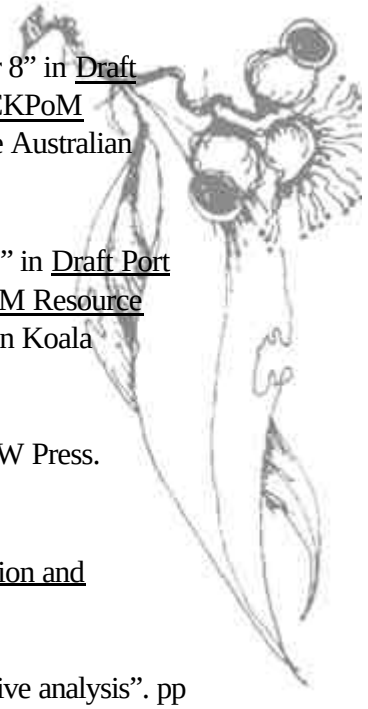
Canfield, P.J. (1987) A Mortality Survey of Free Range Koalas from the north coast of New South Wales. *Aust. Vet. J.* **64**, 325-8.

Cork, S. (1994) Investigation of Relationships Between Koala Abundance and the Nutritional Composition of Foliage in Northern New South Wales. Report to the Australian Koala Foundation.

de Villiers, D. (1999) "Koala Management in South East Queensland – How do we know if it works?" in Proceedings of a Conference on the Status of the Koala held on Phillip Island. Australian Koala Foundation, Brisbane.

Dixon, K.R. and Chapman, J.A. (1980) Harmonic Mean Measure of Animal Activity Areas. *Ecology* **61**:1041-1047.

Harden, G. (1991) The Flora of New South Wales. Vol 2. New South Wales University Press, Kensington.



Leathley, S., Callaghan, J. and Curran, T. (2000a) "Traffic Management: Chapter 8" in Draft Port Stephens Council Comprehensive Koala Plan of Management (CKPoM): CKPoM Resource Document – November 2000. Prepared by Port Stephens Council, the Australian Koala Foundation and NSW National Parks and Wildlife Service.

Leathley, S., Callaghan, J. and Curran, T. (2000b) "Dog Management: Chapter 9" in Draft Port Stephens Council Comprehensive Koala Plan of Management (CKPoM): CKPoM Resource Document – November 2000. Prepared by Port Stephens Council, the Australian Koala Foundation and NSW National Parks and Wildlife Service.

Lee, A. and Martin, R. (1988) The Koala - A Natural History. University of NSW Press. Sydney, NSW.

Martin, R. and Handasyde, K. (1999) THE KOALA: Natural History, conservation and management. UNSW Press, Sydney.

Mitchell, P. (1990) "The Home Ranges and Social Activity of Koalas - a quatitative analysis". pp 171 - 187 in Biology of the Koala. Ed. by A. K. Lee, K. A. Handasyde and G. D. Sanson. Surrey Beatty and Sons, Sydney.

Phillips, B. (1990) Koalas - The Little Australians We'd All Hate To Lose. Australian National Parks and Wildlife Service. Australian Government Publishing Service, Canberra.

Phillips, S. (1994) Koala Management Plan for Proposed Searanch Residential Development. Prepared for RDC Pty. Ltd. by the Australian Koala Foundation, Brisbane.

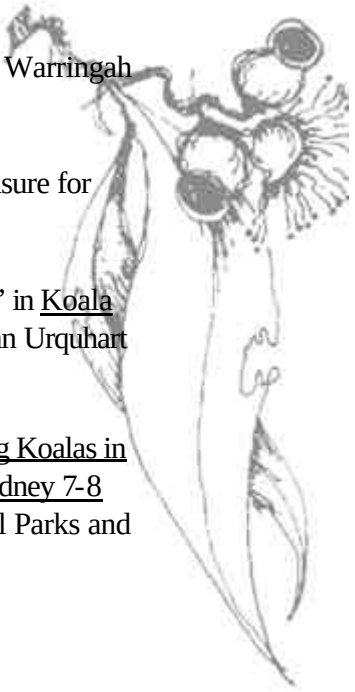
Phillips, S. and Callaghan, J. (1995) "The Spot Assessment Technique for determining the significance of habitat use by Koalas" in Proceedings of a conference on the status of the Koala in 1995. Australian Koala Foundation, Brisbane.

Phillips, S. and Callaghan, J. (1996) The Koala Habitat Atlas-Project No.4: The Tweed Coast. Australian Koala Foundation, Brisbane.

Phillips, S. (1999) Habitat utilisation by the Koala *Phascolarctos cinereus*-towards a new approach for effective conservation and management. Unpub. Ph.D. Thesis. Southern Cross University, Lismore.

Planning Workshop. (1993) Koala Beach Environmental Study. Report prepared for Tweed Shire Council.

Sinclair Knight and Partners. (1990) Golf Course Development - Statement of Environmental Effects. Report prepared for Tweed Shire Council.



Smith, P. and Smith, J. (1990) Warringah Shire Koala Study. Report prepared for Warringah Shire Council.

Spencer, W.D. and Barrett, R.H. (1984) An evaluation of the harmonic mean measure for defining carnivore activity areas. *Acta Zoologica Fennica* **171**:255-259

Starr, J., Moran, E. and Whitehouse, D. (1990) "The Port Macquarie Experience" in Koala Summit - Managing Koalas in New South Wales. Ed. by Daniel Lunney, Chris Ann Urquhart and Philip Reed. NSW National Parks and Wildlife Service, Sydney.

Summerville, K. (1990) "Koalas in the Tweed Shire" in Koala Summit – Managing Koalas in New South Wales – Proceedings of the Koala summit held at the University of Sydney 7-8 November 1988. Ed. by Lunney, D., Urquhart, C.A. and Reed, P. NSW National Parks and Wildlife Service, Sydney.

Appendix I

Location and approximate boundaries for Home Ranges of the eight radio-tracked Koalas resident in the area proposed for residential development in conjunction with preparation of the original Koala Management Plan, 1994.

1

Development Boundary

Por 69

Staked Tree Line

F402

Por 70

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

2

Development Boundary

Por 69

Staked Tree Line

F680

Por 70

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

3

Por 69

Por 70

Development Boundary

Staked Tree Line

M701A

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

F484

4

Development Boundary

Por 69

Staked Tree Line

Por 70

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

5

Development Boundary

Por 69

Staked Tree Line

Por 70

M501

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road locaton.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

6

Development Boundary

Por 69

Staked Tree Line

Por 70

M522

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

.This note is an integral part of this plan.

M701B

Por 69

Por 70

Development Boundary

Staked Tree Line

Cudgera Creek

IMPORTANT NOTE

This plan was prepared for R.D.E PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

Trees shown on this plan are those located by the Australian Koala Foundation.

This note is an integral part of this plan.

8

M423

Development Boundary

Por 69

Staked Tree Line

Por 70

Cudgera Creek

IMPORTANT NOTE

.This plan was prepared for R.D.C PTY LTD for the purpose of identifying the location of trees significant to Koalas and trees required for specific road location.

.Trees shown on this plan are those located by the Australian Koala Foundation.

This note is an integral part of this plan.

Appendix 2

Koala Beach Stage 1 initial Koala monitoring program results. Prepared by Steve Phillips for Koala Beach Community Koala Management Committee.

KOALA BEACH KOALA MONITORING PROGRAM

Background

Monitoring of koala activity within Stage 1 of the Koala Beach residential estate has now been completed for both 2000 and 2001. Monitoring has thus far been focussed on street plantings in three areas (detailed below) of Stage 1.

The presence/absence of koala faecal pellets is determined on the basis of pellets being observed within a 1m radius from the base of each tree being assessed. This approach is consistent with that developed for the AKF's Koala Habitat Atlas project and has been described in detail by Phillips *et al.* (2000) and Phillips and Callaghan (submitted).

Scientific names for each of the tree species detailed below are as follows:

Swamp Mahogany - *Eucalyptus robusta*
Tallowwood - *E. microcorys*
Grey gum - *E. propinqua*
Forest Red Gum - *E. tereticornis*
Northern Grey Ironbark - *E. siderophloia*
Moreton Bay Ash - *Corymbia tessellaris*
Lemon Scented Gum - *C. citriodora*

The results of site assessments from each of the three selected areas within the urban environment of Stage 1 are provided below. The numbers in brackets following the common name for each tree species simply indicate the number of trees with pellets / the total number of that species sampled.

Site No. 1
Date: June 2000
Area: Muskheart Ct./Bunya Cr.
No. trees: 30. No. trees with pellets: 10. Activity level: 30%
Description: Swamp Mahogany (5/12), Tallowwood (1/5), Grey Gum (4/10), Moreton Bay Ash (0/2), Unknown (0/1).
Note: Female koala with joey sighted in Swamp Mahogany at top of Muskheart Ct. on the 8th June.

Date: 18th July 2001
No. trees: 27. No. trees with pellets: 11. Activity level: 41%
Description: Swamp Mahogany (3/9), Tallowwood (2/5), Grey Gum (5/10), Moreton Bay Ash (1/2), Unknown (0/1).

Comment:
This result confirms the continued presence of significant koala activity in this area. The recorded increase in koala activity between 2000 and 2001 is not statistically significant ($G_{adj} = 0.217$, $P = 0.65$).

Site No. 2
Date: June 2000
Area: Flintwood St.
No. trees: 45. No. trees with pellets: 6. Activity level: 13.3%
Description: Swamp Mahogany (1/4), Grey gum/Forest Red Gum (3/22), Tallowwood (1/3), Moreton Bay Ash (0/11), Lemon Scented Gum (1/1), Northern Grey Ironbark (0/1), Unknown (0/3).

Date: 18th July 2001
No. trees: 47. No. trees with pellets: 12. Activity level: 26%
Description: Swamp Mahogany (1/4), Grey gum/Forest Red Gum (7/20), Tallowwood (2/3), Moreton Bay Ash (1/11), Lemon Scented Gum (1/6), Northern Grey Ironbark (0/3).

Comment:
This result suggests a trend towards increased koala activity in this area. Note that while the recorded increase in koala activity between 2000 and 2001 is not statistically significant (G_{adj} = 1.901, P = 0.17), the activity level recorded during the latter census is currently at the threshold level which indicates significant koala useage of the area.

Site No. 3
Date: June 2000
Area: Bottlebrush Drive
No. trees: 33 No. trees with pellets: 4 Activity level: 12.1%
Description: Swamp Mahogany (0/8), Grey gum/Forest Red Gum (4/11), Tallowwood (0/8), Moreton Bay Ash (0/5), Unknown (0/1).

Date: 18th July 2001
No. trees: 39 No. trees with pellets: 6 Activity level: 15%
Description: Swamp Mahogany (2/8), Grey Gum/Forest Red Gum (2/11), Tallowwood (1/12), Moreton Bay Ash (0/7), Unknown (1/1).

Comment:
This result indicates no change in koala activity in this area.

*Mapped Koala Trees (Y = pellets present; N = pellets absent):
2000
Tallowwood N° 20: N; Tallowwood N° 21: N; Swamp Mahogany N° 22: N; Grey Gum N° 23: N; Grey Gum N° 52: Y; Grey Gum N° 56: Y.

2001
Tallowwood N° 20: Y; Tallowwood N° 21: N; Swamp Mahogany N° 22: N; Grey Gum N° 23: Y; Grey Gum N° 52: Y; Grey Gum N° 56: N.

* refers to a map titled "Plan of Koala Tree Location, boundaries and Zone boundaries" prepared by Michel Survey Group for RDC Pty. Ltd.

Comment
The activity levels demonstrate that koalas are continuing to range throughout Stage 1 of the estate and the trend towards increasing activity levels is encouraging. Figure 1 illustrates the overall result for Stage 1 of the estate.

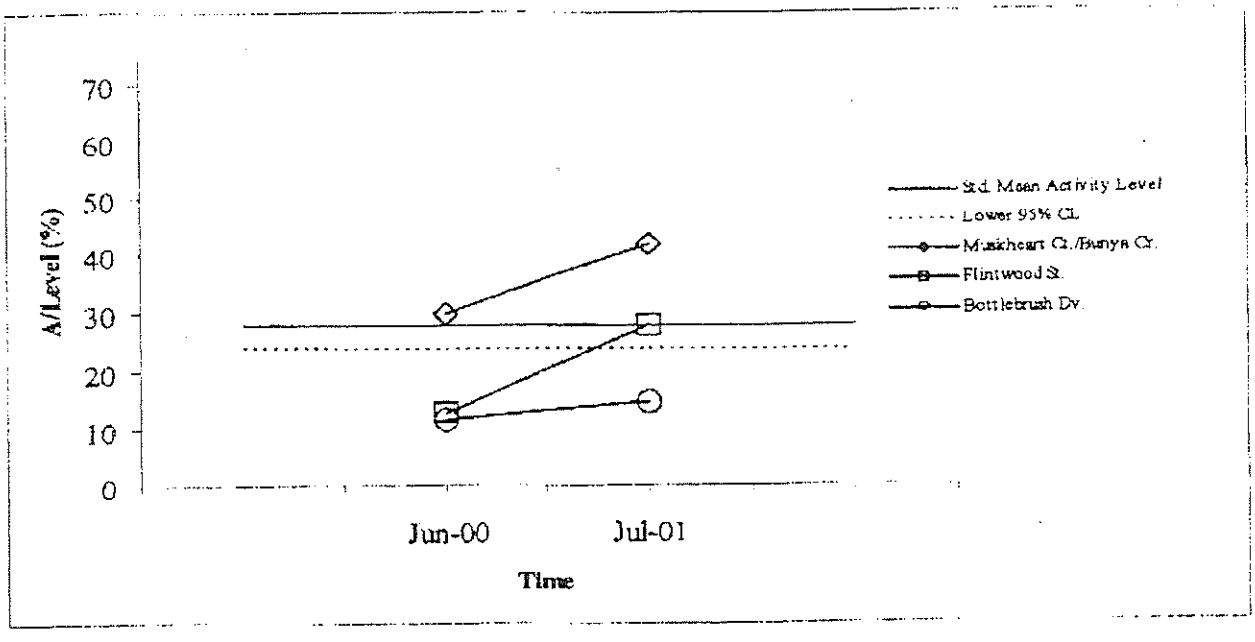


Fig. 1. Trends in koala activity within Stage 1 of the Koala Beach estate over the twelve month period June, 2000 – July 2001. Std. Mean Activity Level and associated Lower 95% CL are threshold values which indicate significant koala activity as proposed by Phillips and Callaghan (submitted).

Blossom Bat Monitoring
Mist netting for Blossom Bats was undertaken on the evenings of the 5th June 2001 (1730 – 1930hrs) and 8th August 2001 (1840 – 2300hrs). Total census effort was 101.28 metre/hours. Four Blossom Bats (1 s/adult male, 1 adult male and 2 females) were captured, ear-marked and released during the August sampling session. Mist netting was undertaken at three locations within that area previously identified by the FIS as critical habitat for Blossom Bats.

The monitoring result for the above period is thus 3.9 Blossom bats/100 metre hours. This result compares favourably to the 2.18 Blossom bats/100 metre hours recorded from this site in August 1994 (refer p18 Phillips *et al.* 1995).

Comment
The results confirm that Blossom bats are continuing to utilise the critical habitat area at levels commensurate with those obtained prior to commencement of development works on the Koala Beach estate in 1995.

Recommendations:
There are no specific recommendations arising from the koala monitoring program at this point in time.

With regard to Blossom Bats, I would suggest that the KBKMC obtain a copy of the most recent Blossom Bat and Glossy Black Cockatoo Management Plans prepared for the critical habitat site. Subject to a review of the content and any recommendations arising from these plans, I propose that the KBKMC consider the need to fence the boundary of both the Blossom bat and Glossy black cockatoo habitat areas (given that the two are contiguous) and provide signage which indicates the ecological importance of these areas. Fencing standard/design should be that used along the entrance road to the estate, with access through the four access tracks traversing the site restricted by way of a padlocked chain barrier; it may also be appropriate to consider the need for preparation of a vegetation management/rehabilitation plan for the site.

For the information of Committee Members I have attached a copy of a research note which will be published in the next edition of *Australian Mammology*.

STEVE PHILLIPS
October 22, 2001

References

Phillips, S., Parnaby, H., and Fitzgerald, M. 1995. *Fauna survey of lands associated with the proposed Searanch residential development in Tweed Shire, New South Wales.* Prepared for RDC Pty Ltd.

Phillips, S., Callaghan, J., and Thompson, V. 2000. The tree species preferences of koalas (*Phascolarctos cinereus*) inhabiting forest and woodland communities on Quaternary deposits in the Port Stephens area, New South Wales. *Wildlife Research* **27**, 1 - 10.

Phillips, S. and Callaghan, J. (submitted). The Spot Assessment Technique for determining the significance of habitat utilisation by koalas (*Phascolarctos cinereus*). *Ecological Restoration and Management.*

Appendix 3

Survey of Koala Beach Residents undertaken for the Review of the Koala Beach Management Plan (2002).

RECORDS OF KOALAS AND OTHER WILDLIFE AT "KOALA BEACH"

KOALA MANAGEMENT PLAN STEERING COMMITTEE

Street.....

Wildlife records from this survey will contribute to the ongoing monitoring of the Koala Beach development by the Australian Koala Foundation (AKF) and the Koala Management Plan Steering Committee. Please report sightings of any of the following animals: Koalas, Swamp Wallabies, Glossy Black-Cockatoos, Bush Thick-knees (Curlew), Echidnas, Brush Turkeys, Roaming Dogs, Foxes or Cats, other animals.

How long have you lived at Koala Beach.....years

REF.NO	SPECIES	DATE SIGHTED	TIME OF DAY	COMMENTS
KB1				
KB2				
KB3				
KB4				
KB5				
KB6				
KB7				
KB8				

Please mark the location for each sighting along with the reference number on the map over page

FOR EACH OF THE ABOVE KOALA SIGHTING	KB__	KB__	KB__	KB__
1. Did the koala appear to be an adult? (yes/no)				
2. If determinable, was the koala a male or female? (M/F)				
3. Did the koala appear to have an ear tag? (yes/no)				
If yes, was the tag in the Left Ear or Right Ear? (L/R)				
2. Did the koala appear to be sick? (yes/no) If yes, please detail signs of sickness you noticed in the comments section above corresponding with that record.				
3. Was the koala a mother with young? (yes/no)				
4. Have you seen koalas in this part of Koala Beach before? (yes/no)				
5. Was the koala feeding or resting in one of the landscape plantings? (yes/no)				
6. Please indicate if you think any of these records are the same koala? (eg. same as KB2)				

Comments: .....

.....

.....

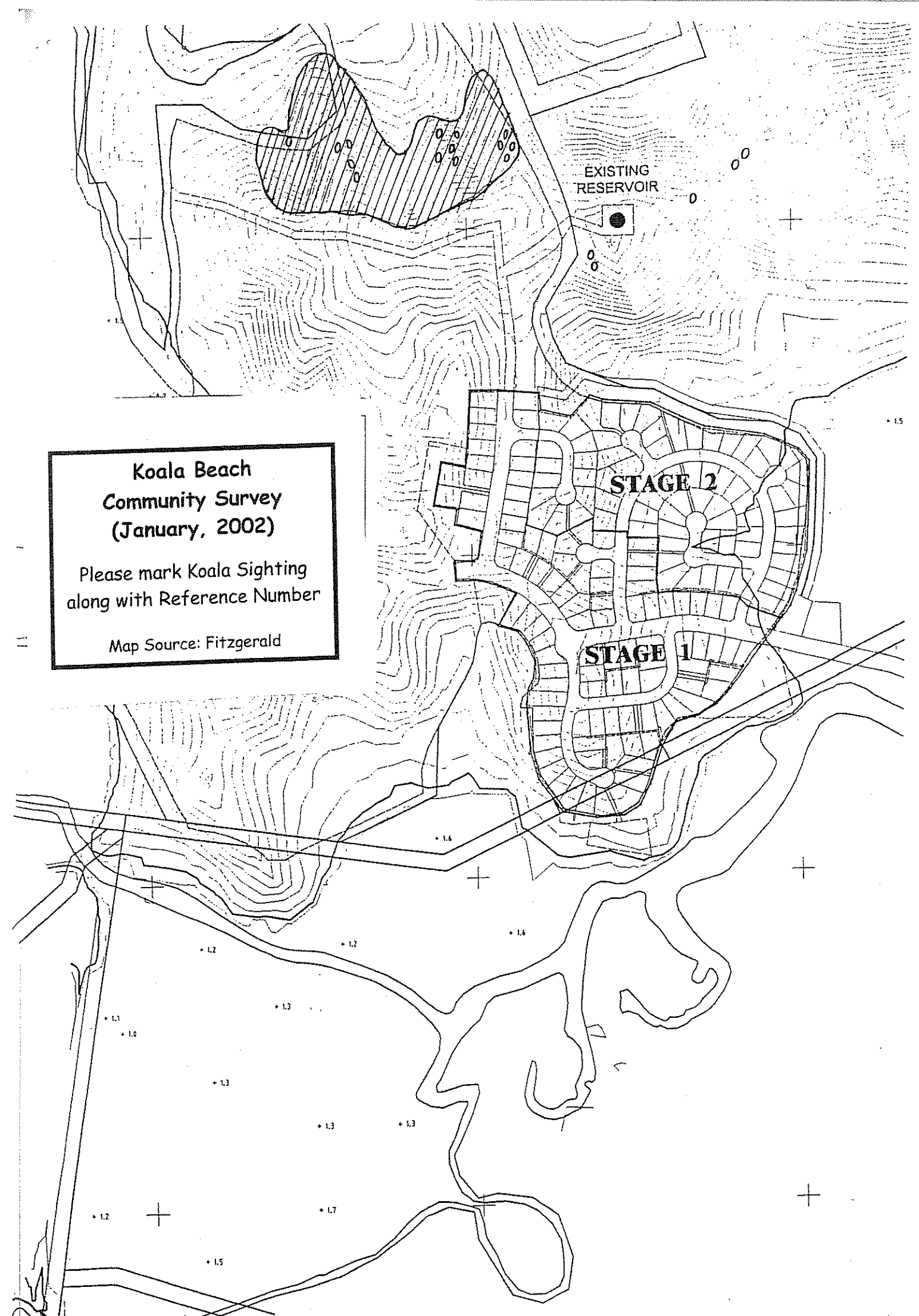
Name: .....

Address: .....

.....

Contact No: .....

Thank you for your help. If you have any further information or questions regarding wildlife at Koala Beach please contact John Callaghan or Jane Thompson at the Australian Koala Foundation on (07) 3229 7233.



Koala Beach
Community Survey
(January, 2002)

Please mark Koala Sighting along with Reference Number

Map Source: Fitzgerald