Priority Ecological Community

MAPPING AND CONDITION ASSESSMENT:

Cable Beach Ghost Gum Community (*Corymbia paractia* Hill & Johnson)

within the Broome townsite

August 2015

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SAVING THE NATURE OF THE KIMBERLEY

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*The waypoints, shapefiles, and GIS datasets that inform this report have been provided to the Department of Parks and Wildlife (DPaW) and can be accessed by contacting the Species and Communities Branch, Department of Parks and Wildlife, Locked Bag 104, Bentley Delivery Centre WA 6983 communities.data@dpaw.wa.gov.au

** The report has been provided to the Shire of Broome, Nyamba Buru Yawuru Land and Sea Management Unit, Kimberley Ports Authority, Northwest Property Consultants and is also available for free download at: www.environskimberley.org.au through the Projects-BBS-SKIPA tabs.

Parties interested in obtaining shapefiles and datasets of this Priority 1 community and remnant trees should first contact:

Species and Communities Branch
Department of Parks and Wildlife
Locked Bag 104
Bentley Delivery Centre WA 6983

Cover Photo: *Corymbia paractia* in flower opposite University of Notre Dame, verge of Guy Street. Note cockchafer beetle visiting the flowers. Photo: 28 November 2013, Willing

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Executive Summary

The *Corymbia paractia* (Priority 1) Priority Ecological Community (PEC) at Broome has been poorly-defined and understood, partly due to taxonomic changes and confusion resulting from this.

Using local knowledge, near coastal locations within the townsite where this PEC was present were identified. Then, between November 2013 and March 2014, numerous ground traverses were undertaken and 63 populations mapped (mapped as CP1-63).

During the survey, a total of 2,095 *Corymbia paractia* trees were recorded by Tim Willing within the townsite, using a hand-held Garmin GPS, accurate to 7m. In addition, a further 7 trees were recorded outside the town boundary, including a few near Coconut Well and off Cape Leveque Road.

In November-December 2013 four 50m x 50m flora quadrats (P1-P4) were established and sampled at representative sites (located within CP2, 16, 41 and 56); identified on maps as blue squares, where the PEC was identified to be present, to gain a better understanding of its associated soils, flora, species overall condition and identified threats. Invasive weeds were identified as the major threat. Major weeds included Passionfruit Vine, Buffel Grass, Hairy Merremia, Neem Tree and Mint Bush.

Significant cultural values and fauna associations of the *C. Paractia* PEC were also documented for the first time.

Voucher specimens of bud and flower material of *Corymbia paractia* and its close relative *C. flavescens* were also collected at a number of sites within and outside the Broome townsite to gain a better understanding of the distribution of this local endemic species.

An earlier study by Woodman (2008) stating that this PEC does not occur in lands controlled by the Broome Port Authority is demonstrated to be incorrect. This may have significant implications for future expansion of laydown facilities: both in the Port and adjacent areas.

The authors recommend both a descriptive and spatial redefinition of the PEC, based on updating the taxonomy of coastal vegetation units described by Malcolm Trudgen in 1988 and the mapping and condition assessment undertaken for this survey. Specifically, the authors suggest that the *Corymbia paractia* PEC be redefined "as being an associate component of monsoon vine thicket (Threatened Ecological Community or TEC; Endangered under the Federal EPBC Act (1999), Gubinge *Terminalia ferdinandiana* woodlands, coastal pindan, Dwarf Pindan Heath (PEC1) and the *Keraudrenia exastia* community (DRF- Critically Endangered, EPBC act (1999)) on the Broome Peninsula." The ecology of these communities is closely linked due to their proximity and the number of shared species throughout.

During the compilation of this report a further 8.75ha of *Paractia PEC* was cleared near the Broome Port. 7.12ha occurred under the Permit no. CPS 3104/5 and 1.63ha was also cleared illegally outside of the permitted clearance zone. This clearing occurred in October 2014 and was within vegetation preliminarily assessed as being VERY GOOD under the Bush Forever Score.

The total area of this PEC within the Broome townsite, prior to illegal and permitted clearing in 2014 is estimated at 260.1ha, inclusive of 63 community patches (CP1-63). This figure now stands at 251.35ha. Almost fifty eight percent (57.47%) was preliminarily assessed as VERY GOOD according

the Bush Forever Score, though clearing of quality habitat since the survey has increased this to nearly sixty one percent (60.09%)

Immediate development concerns include the area of this PEC identified at the proposed Wilderness Retreat (NE side of the Broome Turf Club), previously identified by Willing (2013) as 2.64 ha. (See Map 2.7). The calculated % of total PEC area within the townsite to be impacted within this proposed development was 1.02%, or 1.71% of similarly assessed VERY GOOD *Paractia* habitat within the township. Clearing since the survey has increased these percentages to 1.05% and 1.82% respectively.

The developer of the proposed Wilderness Retreat, North West Property Consultants has made a commitment to conserve 90% of the *Corymbia paractia* trees within the development zone. The *Paractia* community forms a narrow belt running parallel to Gantheume Point Road. A few individual trees, and part of the PEC may be lost to facilitate access to the site from Gantheaume Point Road and further detailed discussions are required. It is recommended that planners work with the Department of Environment Regulation (DER) to identify development plans that first avoid, then minimise the clearance of any areas identified as *Paractia* community.

The Yawuru Conservation Park (YCP) currently only protects 126.39ha or 50.28% of the total *Corymbia paractia* PEC area, leaving almost half of the PEC exposed to development pressure as the town expands. Three patches are protected in their entirety: CP44, CP43 and CP1, each of which have been preliminarily assessed as VERY GOOD under the Bush Forever Score.

Of the remaining 60 patches, 31 remain completely unprotected. The largest patch, CP41 which spans 45.6ha is not completely protected, with slightly less than 85% in the Yawuru Conservation Park. Two patches have already been compromised by non-permitted clearing (CP 7) or clearing that has been undertaken with a permit, but where the *C. paractia* community was not recognised in environmental surveys (CP4). 73% of CP4 remains within the YCP, however, the larger patch, CP7, of which 7.1ha has already been cleared without a permit has only 27% of its total extent protected within the YCP. Of the remaining patches, 5 patches have more than 85% of their area protected within the YCP, with four of these being preliminarily assessed as VERY GOOD (CP5, CP12, CP40, CP46). Greater than 90% of CP17 is protected, however it is only preliminarily assessed as GOOD habitat under the Bush Forever score. Less than 5% of CP10 is protected, though it is 7.48ha of VERY GOOD quality habitat. Twelve patches have between 50% and 85% of their area protected within the YCP, and ten have less than 50% (and greater than 1%) of their area protected.

1.0 Introduction

This survey and condition report was commenced in response to a request from the Department of Environment Regulation (DER) to the developer (North West Property Consultants) to identify the extent and condition of the *Corymbia paractia* community throughout the Broome townsite as there is potential for up to 2.64ha to be impacted in the proposed development. Prior to this survey, the community was poorly defined and understood and its exact extent unclear. Taxonomic changes have exacerbated the situation.

This precautionary approach to the survey of the PEC prior to a permit to clear being granted has enabled a greater understanding of the ecology, condition, threats and extent of the ecosystem throughout the Broome peninsula.

The survey has been in-part commissioned by North West Property Consultants and an Interim report was produced by Tim in June 2014 for North West Property Services entitled "Interim summary of Priority Ecological Community (PEC) mapping and condition assessment: Cable Beach Ghost-gum community (*Corymbia paractia* Hill and Johnson) within Broome townsite". However the majority of the survey work has been undertaken voluntarily by Tim Willing, with some volunteer input from SKIPA, and with Louise Beames from Environs Kimberley working to produce maps and this extensive final report.

2.0 Background

The "*Corymbia paractia* dominated community on dunes" has been listed as a Priority 1 Ecological Community by the Western Australian Threatened Ecological Community Scientific Committee (TECSC). The description of the ecosystem is as follows:

> *"Corymbia paractia* behind dunes, Broome township area, Dampier Peninsula. Transition zone where coastal dunes (with vine thickets) merge with Pindan (desert) vegetation. Also, port north of Broome. Threats: clearing, trampling, weed invasion, inappropriate fire regimes."

Franklin and Preece (2014) rated *Corymbia paractia* as an extremely restricted Eucalypt species and poorly reserved (<10%). They assessed the species status as Vulnerable, meeting a number of IUCN criterion (B1ab (ii,v)), and identified that the rarity of the species and clearing were among the greatest threats.

The body of work conducted throughout 2013-14 and contained within this 2015 report has vastly improved the understanding of the ecology, extent and vulnerability of this Priority Ecological Community.

2.1 Dominant Tree - *Corymbia paractia*

For many years the Cable Beach Ghost Gum was known as *Eucalyptus confertiflora* by botanists such as Trudgen (1988). Then in 1995, distinguished eucalyptologists Ken Hill & Lawrie Johnson (both now deceased) described *Corymbia paractia* as a new species, only known from the Broome area (Appendix 3). The name they chose derives appropriately from the Greek word *paraktios* meaning

"on the seaside". They speculated that the newly-named species might be a **stable hybrid** between *C. dendromerinx* and *C. flavescens,* although neither of the presumed "parents" occurs close to the town. *C. dendromerinx* is conspicuous on Jowlaenga Sandstone around the 100 km quarry and watershed on the Great Northern Highway, almost halfway to Derby. The nearest populations of *C. flavescens* known to the author occur on the Crab Creek Road: its robust pink-capped flower buds are quite different (Pic 1.1) and easily distinguished from the slender flower buds of the region's endemic *C. paractia* (Pic 1.0). See section **5.2** regarding voucher specimens collected.

The location of the *C. paractia* **type specimen** is a little misleading, as the collections were actually made from a tree on the verge outside the former Government Nursery run by the Forests Dept [now the DPaW office], at the southern end of Herbert Street. Tim Willing (author) just happened to be present when the specimens were collected in July 1984. The type tree still survives, although its crown is frequently pruned off by Horizon Power!

Pic 1.0 *Corymbia paractia* with its markedly slender flower buds and green to cream operculums or flower-caps. Tree at Coconut Well (WP407). Photo: 6 December 2013, Willing

Pic 1.1 Flowers and robust pink-capped buds of *Corymbia flavescens* on Crab Creek Road (WP 389). Photo: 6 December 2013, Willing.

Pic 1.2 *C. paractia* with young fruits Photo: Willing.

2.2 Cultural Value

Yawuru people do not distinguish between species of Ghost Gum, referring to them all as **Gunurru**. During Larja season (Oct-Nov, build up season) people traditionally dug up emerging cicadas or **Liyirr** from the roots at the base of Ghost Gums to use as food (Pic 1.3). See section **5.1** regarding Fauna. In present times local school children sometimes capture cicadas and keep them (attached by cotton threads) as temporary "pets."

In the past Ghost Gum ash was produced by burning bark and was mixed with chewing tobacco (Kenneally *et al.* 1996)]. However this practise is now restricted to a few elders as younger people favour commercially-sourced cigarettes.

Yawuru people use the flowering of **Gunurru** to indicate that Stingray or **Birndany** (four species) and Sliteye Shark *Loxodon macrohinus* or **Jurrawayi,** are fat and ready to be speared in the shallows of Roebuck Bay (Lands and Mann 1990, p.111-2).

Pic 1.3 *C. paractia* with emergent cicada. Photo: Willing

2.3 Ghost Gums around Broome

The form and appearance of the trees varies considerably around Broome and is largely dependent on exposure or protection from sea winds. Thus, *C. paractia* growing on cliff-tops at Reddell Beach or in the Dwarf Pindan Heath (PEC1) near Gantheaume Point are sprawling, multi-stemmed, mallee-like shrubs less than 3m in stature (Pic 1.4). Erosion (See Pic 1.5) and unwitting clearance, such as that which occurred in 2014 in the Broome Port area, are among the greatest threats to these trees.

On the western side of Great Northern Highway near the former OTC facility and ABC Transmitter Mast on the northern outskirts of Broome there is an impressive savanna woodland of large, scattered *C. paractia* trees, occurring in an inland vegetation community significantly different from the coastal and near-coastal populations, which in the authors views comprise the PEC. This inland

population extends across the Cape Leveque Road into the Broome Water Reserve. Accordingly, although noted, this community has not been mapped in detail during this survey.

Scattered populations of *C. paractia* extend as far north as Coconut Well, but do not extend to Willie Creek or further north along the coast (Pic 1.6). Somewhat similar-looking ghost gums encountered in the latter area are generally *C. bella.* These can be distinguished easily by their characteristcally weeping foliage.

There is still a healthy population of mature *C. paractia* trees scattered through residential areas of Old Broome, where they have sometimes been retained as trees on verges or in gardens (Pic 1.7). However, a significant portion of these trees can be expected to be lost to urban infill and senescence. *C. paractia* can be propagated without difficulty from fresh seed (Tom Harley, horticulturist, pers. com.) and replacement and renewal of *C. paractia* within new and existing urban areas should be uncomplicated.

In the northern Cable Beach-Lullfitz Drive area, where relatively large rural properties prevail, there are likewise significant numbers of mature *C. paractia* trees remaining at the present time on private land. This is especially so where landowners such as Dave Dureau on Millington Road, have made a conscious decision to conserve areas of native bushland.

In contrast, trees growing at the base of high dune systems - as at the Golf Course - can be slender, single-trunked trees to 8m. These trees have the added advantage of receiving sewage effluent water, used for irrigating the adjacent fairways (Pic 1.8).

On the verge of Lullfitz Drive (Quadrat P4) one particular tree is close to 12m high and is presumed to be accessing groundwater from the Hidden Valley dunes, lying directly to the west (Picture: Quadrat P4b, Appendix 1). The majority of the trees located and mapped fall in between these two extremes: modest trees averaging around 5m in height, frequently multi-trunked. Pic 1.9 illustrates what might be termed a typical sized specimen.

Pic 1.4 *Corymbia paractia* as wind-pruned, multi-trunked, mallee-like shrubs at Gantheaume Point Car Park. Photo: Willing.

Pic 1.5 ***Corymbia paractia*** **on eroding pindan at Reddell Beach.** **Photo: Willing.**

Pic 1.6 ***Corymbia paractia*** **trees on E side of Waterbank Homestead Road, near junction with McGuigan Road at Coconut Well (WP 407).** **Photo: 6 December 2013, Willing.**

Pic 1.7 ***Corymbia paractia*** **retained as a verge tree – junction of Rivergum Avenue and Leichardt Place, Old Broome. Photo: Willing.**

Pic 1.8 ***Corymbia paractia*** **on the northern boundary of the Golf Course with the Sewage Farm. View looking west. Note the abundance of the climbing weed** ****Merremia aegyptia.*** **Photo: Willing**

Pic 1.9 *Corymbia paractia* in thick Spinifex *(Triodia schinzii)* with Cable Beach dunes at rear. This site is directly west of the Broome Airport Runway in the northern sector of Minyirr Park. Photo: Willing.

2.4 Previous Mapping

In 2007 Woodman Environmental Consulting was engaged by the Broome Port Authority to report on the flora and vegetation communities of both the land it manages (128 ha) and a much larger area from Demco Drive west to Gantheaume Point and Minyirr Park as far north as the Surf Club Car Park at Cable Beach. The rationale for the study was the Port's need to identify suitable laydown (storage) areas for anticipated oil and gas development in the offshore Browse Basin.

Woodman Environmental Consulting (2008) reported that the PEC *C. paractia* community **"could not be identified as a separate entity during this study and as such has not been mapped"** (in Executive Summary, p.ii and at p.34). They also allege – untruthfully in our view– that **"this community is not located within Port of Broome managed lands".** However, at Appendix D5, Woodman list *C. paractia* as a species recorded within the Port of Broome Survey Area.

How did this situation arise? There are a number of possible reasons. Firstly, at the present time, the *Corymbia paractia* PEC is poorly-defined and understood. Secondly, despite a full-length tabulation of Trudgen's vegetation units, Woodman apparently failed to grasp that the taxonomic entity called *C. paractia* - named in 1995, had been referred to by Trudgen back in 1988 as *Eucalyptus confertifolia!*

Pic 2.0 to 2.4 show areas of the Port land where *C. paractia* occur.

Pic 2.0 Thicket in swale with a *Corymbia paractia* population at centre of photograph, just west of Entrance Point and the Broome Fishing Club, Port of Broome. Photo: Willing.

Pic 2.1 *Corymbia paractia* (WP 911) in swale west of Entrance Point, near Broome Fishing Club, Port of Broome. Photo: 24 December 2013, Willing

Pic 2.2 ***Corymbia paractia*** **trees retained at entrance to OTS yard, Port Drive, Port of Broome. Pleistocene sand dune in background overlooks Roebuck Bay. Photo: Willing**

Pic 2.3 Grove of ***Corymbia paractia*** **trees at junction of Kavite Road and Port Drive. The grove abuts the southern fence of the OTS yard. View is looking east with Pleistocene dune in left background.**
Photo: Willing.

Pic 2.4 Grove of *Corymbia paractia* trees, visible at centre, viewed from the sand dune behind/east of the OTS yard, Port of Broome. Port Drive with Toll laydown yard in background. View looking south-west. Pic: Willing

Trudgen (1988) had been engaged by the State Planning Commission to identify and map coastal vegetation communities between Reddell Point and Hidden Valley, including Gantheaume Point, Cable Beach and what is now Minyirr Park.

Trudgen noted and carefully mapped the **Cable Beach Ghost Gum**'s close association with:

(a) (Monsoon) **Vine Thickets** – in one vegetation unit located along the inland dune-base and as a component of a mixed community with Helicopter Tree *(Gyrocarpus americanus)* on adjacent pindan soils*;* [currently listed as a Threatened Ecological Community (TEC)];

(b) **Gubinge Woodlands** *(Terminalia ferdinandiana)* in two vegetation units on pindan soils; [this linear community is a principal feature of what is now Minyirr Park];

(c) **Pindan** - as three mapped vegetation units and as a component of a further three units; one of t]he mapped units included:

(d) **Dwarf Pindan Heath** – [now a Priority One PEC occurring between the Racecourse and Gantheaume Point].

Trudgen's vegetation units were reproduced in Woodman Environmental Consulting 2008, as Table 3 on pages 9-10. A copy of this table is provided in Appendix 2.

Thirdly, Woodman appears to have **mis-identified** two other *Corymbias* – *C. flavescens* and *C. grandifolia* subsp*. longa.* The large juvenile leaves of *C. paractia* do have superficial similarity to *C. grandifolia*, so this error is understandable. However in reality, *C. flavescens* occurs north-east of Broome (Hill & Johnson, p. 462-3) while *C. grandifolia* is only present in the North Kimberley according to Florabase! Indeed - almost bizarrely - Woodman only acknowledges *Corymbia paractia* as being **present in one mapped community FCT4** (see his Appendix F). If the above-mentioned two *Corymbias* are accepted as being probable mis-identifications, *C. paractia* should more plausibly

have been identified as a component of Woodman's three mapped communities: FCT1, 3 & 4, if not more!

Woodman's mapping approach was radically different from Trudgen. Woodman relied heavily on statistical analysis of quadrat data using PATN, based on presence/absence of species (see Woodman's Appendix 1). However, by overlooking or ignoring subtle geomorphic features within the Pindan – notably inland dune ridges supporting *Sersalisia sericea* [a Priority One PEC since 2012] and laterite patches supporting *Acacia monticola* – the overall effect was to somewhat "homogenize" this vegetation type.

Table 1.0 Mapped Vegetation Communities by Woodman Environmental Consulting (2008)

Floristic Community Type	Description
FCT1:	Shrubland dominated by *Acacia bivenosa* and *Crotalaria cunninghamii* subsp. *cunninghamii* with occasional *Bauhinia cunninghamii* and *Santalum lanceolatum* over grassland dominated by *Spinifex longifolius* on pale brown sand on foredunes and on leeward side of foredunes. Indicator species included: *Acacia bivenosa, Boerhavia gardneri, Canavalia rosea, Crotalaria cunninghamii subsp. cunninghamii, Mallotus nesophilus, Myoporum montanum* and *Spinifex longifolius.*
FCT3:	Open Woodland of mixed species, including *Bauhinia cunninghamii* and *Terminalia petiolaris* over occasional shrubland dominated by *Acacia bivenosa* over lower shrubland of mixed species including *Tephrosia rosea* var. *rosea, Euphorbia coghlanii* and *Abrus precatorius* subsp. *precatorius* on pale orange to brown sand on lower slopes behind dunes and secondary dunes. Indicator species included: *Carissa lanceolata, Cassytha capillaris, Exocarpos latifolius, Grewia breviflora* and *Tephrosia remotiflora.*
FCT4:	Open Woodland of mixed *Corymbia* spp. [i.e. including *C. paractia*], *Hakea macrocarpa* and *Persoonia falcata* over shrubland dominated by *Acacia colei* var. *colei* and other species such as *Ehretia saligna* var. *saligna* and *Waltheria indica* over grassland dominated by *Triodia pungens* and *T. acutispicula* on orange to red pindan soils on lower to upper slope positions. Indicator species included: *Cassytha filiformis, Erythrophleum chlorostachys, Gardenia pyriformis* subsp. *keartlandii, Goodenia armitiana, Gyrostemon tepperi, Hibiscus leptocladus, Persoonia falcata, Scaevola parvifolia* subsp. *parvifolia, Scleria* sp., *Sida* sp. B (Kimberley Flora), *Triodia acutispicula, T.pungens, Waltheria indica* and *Zornia prostrata* var. *prostrata.* Weeds included: *Merremia dissecta, Passiflora foetida* var. *hispida, Setaria verticillata* and *Tridax procumbens.* Conservation Significant Species: *Keraudrenia exastia* (DRF), *Goodenia byrnesii* (P1),*Triodia acutispicula* (P3) and *Phyllanthus aridus* (P3).

In the context of this report and for clarity, it seems appropriate to update Trudgen's taxonomy to complement his excellent ecologically-based mapping as follows:

Table 1.1 Vegetation units updated and adapted from Trudgen (1988) following 2013/14 surveys.

Group	Vegetation Unit	Description
Monsoon Vine Thickets and deciduous woodlands to forests	**Cp**AbFv: *Corymbia paractia* low open woodland over *Acacia bivenosa, Flueggea virosa* open heath **[NB This unit is now part of the MONSOON VINE THICKET TEC]**	Unit occurred on the bottom of the lee side of the inland dune at the south end of Cable Beach on pindan soil; scattered *Corymbia paractia* over *Acacia bivenosa, Flueggea virosa, Grewia breviflora, Carissa lanceolata, Jasminum didymum, Tylophora cinerascens, Triodia schinzii.*
Terminalia ferdinandiana **('Gubinge')] Woodlands]**	Tf: *Terminalia ferdinandiana* open woodland over *Corymbia paractia, Sersalisia sericea* low open woodland	Unit occurred on pindan soils; open cover of *Terminalia ferdinandiana* over *Sersalisia sericea* and *Corymbia paractia* over mixed shrub layer with *Hakea arborescens, Ficus aculeata, Jasminum didymum, Ehretia saligna, Flueggea virosa, Grewia retusifolia, Carissa lanceolata and Streptoglossa macrocephala* over *Triodia schinzii..*
	Tf**Cp**CgSs: *Terminalia ferdinandiana, Corymbia paractia, Corymbia greeniana, Sersalisia sericea* low woodland	Unit occurred on pindan soils on flat to slightly sloping area behind dunes next to Cable Beach; tree layer including *Terminalia ferdinandiana, T. petiolaris, Sersalisia sericea, Corymbia greeniana, C. paractia, Exocarpos latifolius, Ehretia saligna* and *Bauhinia cunninghamii* over diverse shrub layer of various species over grass layer dominated by *Triodia schinzii* with *Aristida holathera and Eriachne* sp.
Pindan (Heath)	AtkGp: *Acacia tumida, Grevillea pyramidalis* open heath over *Triodia schinzii* hummock grassland with *Eriachne* sp. and *Eragrostis eriopoda* **[NB This is now PEC Priority One] DWARF PINDAN HEATH]**	Unit occurred on pindan with thin sand overlay with no dunal protection from winds, dominated by *Acacia tumida* var. *kulparn* and *Grevillea pyramidalis* with scattered *Corymbia paractia* and *Gyrostemon tepperi, Dodonaea hispidula, Solanum cunninghamii, Persoonia falcata, Dolichandrone heterophylla, Gardenia pyriformis* and *Terminalia ferdinandiana* over *Triodia schinzii* with other species such as *T. pungens, Eragrostis eriopoda* and *Eriachne* sp.
Pindan	**Cp**Ts: *Corymbia paractia, C. greeniana and C. zygophylla* low open woodland over *Triodia schinzii* mid-dense hummock grass	Unit occurred on flat to gently sloping Pindan; low *Corymbia* trees with *C. paractia* being most dominant over mixed shrub layer including *Ehretia saligna, Ficus aculeata, Erythrophleum chlorostachys, Gardenia pyriformis, Grewia retusifolia, Gossypium* aff.*australe, Dolichandrone heterophylla* and *Persoonia falcata* over *Triodia schinzii.*
	CpTfE: *Corymbia paractia, Terminalia ferdinandiana* shrubland over *Eriachne* sp. and *Triodia schinzii* grassland	Unit occurred on pindan slope above the beach on the north side of Gantheaume Point; dominated by *Corymbia paractia* and *Terminalia ferdinandiana* with *Persoonia falcata, Santalum lanceolatum* and *Grevillea pyramidalis* over *Eriachne* sp. and *Triodia schinzii.*
	CPAcTs: *Corymbia paractia* low open woodland over *Acacia colei* high open shrubland over *Triodia schinzii* mid-dense hummock grassland	Unit occurred upslope of CPTfE: has a taller and more open stratum of *Corymbia paractia* over *Acacia colei* and *Bauhinia cunninghamii* over shrubs including *Terminalia ferdinandiana, Santalum lanceolatum, Gardenia pyriformis, Hakea macrocarpa, Grevillea pyramidalis, Erythrophleum chlorostachys* and *Dodonaea hispidula* over *Triodia schinzii* with *Eragrostis eriopoda* and *Eriachne* sp.
	CgHaTs: *Corymbia greeniana* low woodland over *Hakea arborescens* high shrubland over *Triodia schinzii* mid-dense hummock grassland	Unit occurred on pindan red sand gently sloping to the base of dunes behind Cable Beach; *Corymbia greeniana* is the most abundant tree with *Corymbia paractia* and *C. zygophylla* also present, over a shrub layer dominated by *Hakea arborescens* with *Acacia colei* and other shrub species over *Triodia schinzii.*
	CgAeHTs: *Corymbia greeniana* low open woodland over *Acacia eriopoda, Hakea macrocarpa, H. arborescens,* open scrub over *Triodia schinzii* mid-dense hummock grassland	Unit occurred on pindan soil on a slight slope into the vine thicket area; open tree layer of *Corymbia greeniana* with occasional *C. paractia* over shrubs dominated by *Acacia eriopoda* with *Hakea macrocarpa, H. arborescens* and *Acacia colei, Ventilago viminalis, Bauhinia cunninghamii* and *Ehretia saligna* over *Triodia schinzii* and other grasses.

When Hill and Johnson described *Corymbia paractia* in 1995, they stated (p.462):

> *"This species is restricted to a narrow strip where coastal beach dunes merge into the sandy red earths of the Pindan".*

Kenneally *et al.* (1996, p.144) stated:

> *"Common between Gantheaume Point and Cable Beach. Apparently restricted to a narrow coastal zone in the Broome area where beach dunes merge into pindan soils."*

However, as this survey has demonstrated, *C. paractia* is equally common from the southern part of Old Broome (Demco Estate and Clementson Street, Light Industrial Area) down to Kavite Road and nearby "Oiltanks Beach" with a small outlying population in a swale at Entrance Point. From Reddell Point, the species is again common behind dunes, generally associated with Gubinge *(Terminalia ferdinandiana)* and along cliff-tops in association with *Acacia tumida var. kulparn,* around to Gantheaume Point.

Accordingly any suggestion that the *C. paractia* PEC should only apply to the populations between Gantheaume Point and the area behind Cable Beach makes no ecological sense and, in the view of this author, PEC recognition should apply equally to the near-coastal populations listed above.

3.0 Survey

This survey was conducted by Tim Willing with some assistance from Christine Howe-Piening from November 2013 to April 2014 for the purposes of identifying the extent and condition of the *Corymbia paractia* community (PEC) within the Broome townsite. Phil Docherty from Society for Indigenous Plants and Animals (SKIPA) also assisted with a number of surveys. Brief excursions were also made to Coconut Wells (via Cape Leveque Road) and Crab Creek to check the identity of ghost gums in those areas.

3.1 Methodology

The survey team first identified *Corymbia paractia* community occurrences throughout the Broome Peninsula using a combination of previous mapping, aerial photography and local knowledge.

Each individual *Corymbia paractia* specimen was GPS located using a hand-held GPS (Garmin GPS 60C or Garmin Oregon 550 device) with accuracies of at least 7m. In addition, written notes were made about the condition of each specimen, including weeds present, fire scars, animal tracks, birds or any other observations.

Known locations of some remnant individual trees were also GPS-located within the Broome township.

Four 50x50m flora quadrats (P1-P4) were located at selected representative sites in December 2013 where the PEC was clearly identified to be present, to gain a detailed understanding of its associated soils and flora species and assess overall condition and identified threats (See 4.1). These four representative quadrats are found across *Paractia* patches CP17, CP2, CP41, CP56 and are

identifiable on the maps as green squares. Christine Howe-Piening and Phil Docherty assisted the surveyor with four and two quadrats respectively.

In March 2014, the surveyor took a helicopter flight over the Broome Peninsula to photograph quadrat locations and cross-check the extent of populations surveyed.

The collected data was uploaded from the hand-held GPS to Google Earth Pro and cross-checked with written notes.

In order to identify the area and extent of each of the distinct *Corymbia paractia* patch communities, an arbitrary 50m buffer was plotted from the outer-most individual trees.

3.2 Limitations

The survey was severely limited by the amount of paid time available to the consultant to undertake the mapping across the Broome Peninsula. As a result, much of the work has been undertaken on a volunteer basis and has relied upon the commitment of the surveyor to undertaking a thorough and professional survey, with the unpaid assistance of volunteers from community groups SKIPA and Environs Kimberley. Despite this huge undertaking, the maps developed for the ecological community within the townsite are considered by the authors to be 85% complete and 99% accurate. With more availiable time, for example, additional trees on private land in the Cable Beach (Milington Road-Lulfitz Drive) area could have been logged.

Despite the survey work occurring in 2013/14, the compilation of the report was delayed due to the sheer volume of data points and information that needed to be compiled during a time when one of the primary authors (Louise) was having her second child (in two years).

The survey was restricted to one Mankala season (Dec-March), whereas, surveys over variable seasons and multiple years would doubtless provide additional data about the floristic and faunal composition of the ecosystem.

The local Yawuru people recognise six seasons:

Mankala	(December - March)	Wet season with north-westerly winds
Marul	(April)	Hot period with high humidity and light winds
Wirralburu	(May)	South-east winds and cool nights start
Barrgana	(June-August)	South-east winds blow with cold nights
Wirlburu	(September)	Westerly winds return with warmer nights
Larja	(October-November)	Winds strengthen to north-west, thunderstorms begin

4.0 Results

During the survey, a total of 2,095 *C.paractia* trees were recorded by the surveyor within the township, across 63 discrete community patches (CP1-CP63) with a further 55 individual trees within the townsite area. Many of these individuals were isolated roadverge trees or, as at the Golf Course, fragmented remnants of a once extensive community, now divided by fairways.

Inclusive of the 50m buffer from the outer most *C.paractia* specimens, the total area of this PEC within the Broome township is estimated 260.1ha. Following recent clearing, the total is now estimated at 251.35ha. An additional area toward Crab Creek road remains unsurveyed though it is suspected that the community is present throughout this area as a patch or patches and has been identified in maps throughout this report.

Table 1.2 provides a quick glance summary of each of the *C.paractia* patches, survey dates and details including area, land tenure, condition assessment, weeds, threats and recommendations by the authors. Of the total extent prior to clearing, of 260.1ha, fifty nine percent (59%) or 154.1ha was preliminarily assessed as VERY GOOD and 9% as GOOD according to the Bush Forever Score.

During the compilation of this report a further 8.75ha of *Paractia PEC* was cleared near the Broome Port. Of this, 7.12ha occurred under the Permit no. CPS 3104/5 and 1.63ha was cleared illegally outside of the permitted clearance zone. This clearing occurred in October 2014 and was within vegetation preliminarily assessed as being VERY GOOD under the Bush Forever Score.

Of the 251.35ha of *C paractia* remaining, nearly sixty one (60.09%) percent has been preliminarily assessed as VERY GOOD according the Bush Forever Score, while the remaining areas have been preliminarily assessed as GOOD (36.36%) and Poor (7.87%).

Due to historical clearing and degradation of vegetation as a result of development, weeds and fire, as well as climatic changes over time, fifty five *C. paractia* trees exist outside of defined patches as remnant trees scattered throughout the Cable Beach area, the golf course area and parts of Old Broome. These *C. paractia* remnant trees were recorded and described and recommendations have been made with regards to their management and protection (See Table 1.4)

A conservative estimate of the historical *C. paractia* extent has been developed using the locations of the remnant trees, extending 50m buffer lines from them and where probable, conservatively linking them with *C.paractia* patches within a close proximity. A cautious map of these remnant patches (Rp1-21) is provided in Map 1.8 and Map 1.9. As shown in Table 1.5, the conservative estimate of historical loss of *C. paractia* is approximately 65.5ha. Recent clearing of 12.52ha increases the total (conservative) loss of *C. paractia* to 78.02ha. Using these figures, the original range of the *C.paractia* PEC has already been reduced by 23.71%.

The shape files for the Yawuru Conservation Park have been overlayed on the shape files for the *C. paractia* PEC patches. The Yawuru Conservation Park (YCP) currently only protects less 126.39ha or 50.28% of the total Minyjuru PEC area leaving almost half of the PEC exposed to development pressure as the town expands. The area of each patch within the Yawuru Conservation Park is shown in Table 1.3 along with % of each patch in the Yawuru Conservation Park and relationships to preliminary quality assessments.

Three patches are protected in their entirety; CP44, CP43 and CP1, each of which have been preliminarily assessed as VERY GOOD under the Bush Forever Score.

Of the remaining 60 patches; 31 remain completely unprotected. The largest patch, CP41 which spans 45.6ha is not completely protected, with slightly less than 85% in the Yawuru Conservation Park. Two patches have already been compromised by non-permitted clearing (CP 7) or clearing that has been undertaken with a permit but where the *C. paractia* community was not recognised in environmental surveys (CP4). 73% of CP4 remains within the YCP, however, the larger patch, CP7, of which 7.1ha has already been cleared without a permit has only 27% of its total extent protected within the YCP. Of the remaining patches, 5 patches have more than 85% of their area protected within the YCP, with four of these being preliminarily assessed as VERY GOOD (CP5, CP12, CP40, CP46). Greater than 90% of CP17 is protected, however it is only preliminarily assessed as GOOD habitat under the Bush Forever score. Less than 5% of CP10 is protected, though it is 7.48ha of VERY GOOD quality habitat. Twelve patches have between 50% and 85% of their area protected within the YCP, and ten have less than 50% (and greater than 1%) of their area protected.

Immediate development concerns include the area of this PEC identified at the proposed Wilderness Retreat (NE side of the Broome Turf Club), previously identified by Willing (2013) as 2.64 ha. (See Map 2.7). The calculated % of total PEC area within the townsite to be impacted within this proposed development was 1.02%, or 1.71% of similarly assessed VERY GOOD *Paractia* habitat within the township. Clearing that has occurred in other areas since the survey has increased these percentages to 1.05% and 1.82% respectively.

The developer of the proposed Wilderness Retreat, North West Property Consultants has made a commitment to conserve 90% of the *Corymbia paractia* trees within the development zone. The *Paractia* community forms a narrow belt running parallel to Gantheume Point Road. A few individual trees, and part of the PEC may be lost to facilitate access to the site from Gantheaume Point Road and further detailed discussions are required. It is recommended that planners work with the Department of Environment Regulation (DER) to identify development plans that first avoid, then minimise the clearance of any areas identified as *Paractia* community.

The data that informs this report has been sent to the Department of Parks and Wildlife, Species and Communities Branch as the following three kmz files that open into Google Earth:

File no.1 Cparactia shape files and labels

File no.2 Cparactia waypoints ALL TREES

File no.3 Cparactia PEC Mapping - Complete dataset is found within this document inclusive of quadrats, 50m buffer lines, shapefiles, tree waypoints, clearance areas etc.

The results have been collated into the following maps:

Map 1.0 shows *C. paractia* patches Cp 1 - Cp63 and the position of the quadrats (P1-P4) throughout the community

Map 1.1 shows *C. paractia* patches in the southern Broome Peninsula Cp 1 - Cp48.

Map 1.2 shows *C. paractia* patches in the northern Broome Peninsula Cp 47 - Cp63.

Map 1.3 shows an overview of all the *C. paractia* patches across the Broome Peninsula Cp 1 - Cp63.

Map 1.4 shows the data points for each *C. paractia* specimen mapped within patches Cp1-Cp63 and as outlier remnant trees.

Map 1.5 shows the data points for each *C. paractia* specimen mapped within the southern Broome Peninsula (patches Cp1-Cp47) and as remnant trees.

Map 1.6 shows data points for each *C. paractia* specimen mapped within the northern portion of the Peninsula (patches Cp47-Cp63) and as remnant trees.

Map 1.7 shows data points for remnant trees mapped outside of Cp1-Cp63 patches.

Map 1.8 shows *C. paractia* patches in the southern peninsula , the conservative historical (now cleared) estimate Rp 1-21 and outlier remnant trees.

Map 1.9 shows the conservative historical (now cleared) estimate of *C. paractia* Rp1-21, totaling 68.5 hectares

Map 2.0 shows *C. paractia* patches, the three voucher sites (red "v" balloons) and a site known to contain *C.paractia* but remaining unmapped.

Map 2.1 shows an overview of all the *C. paractia* patches across the Broome Peninsula Cp 1 - Cp63, the Yawuru Conservation Park, and *C. paractia* areas within the conservation park. The area known to contain *C. paractia,* but not yet mapped is also shown.

Map 2.2 shows the *C. paractia* patches across the Southern Broome Peninsula Cp 1 - Cp47, the Yawuru Conservation Park and *C. paractia* areas within the conservation park.

Map 2.3 shows the *C. paractia* patches across the Southern Broome Peninsula Cp 47-63, the Yawuru Conservation Park and *C. paractia* areas within the conservation park. The unsurveyed *C. paractia* area is also shown.

Map 2.4 shows an overview of all the *C. paractia* patches across southern Broome Peninsula Cp 1 - Cp47, mapped and unmapped Dwarf Pindan Heath, Monsoon Vine Thicket (Registered, and unmapped).

Map 2.5 shows an overview of all the *C. paractia* patches across northern Broome Peninsula Cp 47 - Cp63 including the unmapped area, Monsoon Vine Thicket (Registered, mapped and unmapped).

Map 2.6 shows a close up of the areas of *C. paractia* that were cleared in 2014 (outlined in red). The areas within CP7 and CP4 that were cleared under Permit no. CPS 3104/5 are shown as well as the area in CP7 that was subject to overclearing outside of the permitted area.

Map 2.7 shows a close up of the areas of C. paractia patches (Cp1 - Cp63), Minyjuru patches (M1-17), and the unsurveyed *C.paractia* patch (outlined in pink).

Map 2.8 shows a close up of the areas of *C. paractia* patches (Cp1 - Cp63) in pink and Minyjuru patches (M1-17) in blue and the unsurveyed Paractia patch (outlined in pink) and the location of the *Corymbia flavescens* and *Corymbia paractia* vouchers (shown as red "v" balloons).

Map 2.9 is an extract of the map of *C. paractia* (and other) trees within the proposed Wilderness Retreat as provided by Willing in his short report to Northwest Property Consultants (2014).

Table 1.2 provides a quick glance summary of each of the Minyjuru patches, survey dates and details including area, land tenure, condition assessment, weeds, threats and recommendations by the authors.

Corymbia paractia site no.	Hectares	Quality Assessment	Threats	Weeds	Notes	Recommendations
CP1	2.8ha	Would qualify as VERY GOOD in Bush Forever Score	Runoff from existing industrial development (Toll Shed) and any new neighbouring developments. Weeds from drains and edge effect (traffic/weeds/cats/rubbish /invasive ants) associated with industrial activity. Numerous wild cats in this area - likely to be impacting bird life.	*Passiflora foetida, Cenchrus ciliaris* and *Aerva javanica* (close by) *Leucaena leucocephala (*in drain to east)	Crowns 3-6m height Southern-most *Paractia* patch contiguous with dune/monsoon vine thicket ecosystem near Entrance Point. Close proximity to industrial development. Invasive Black Crazy Ants (*Paratrechina longicornis*) present. No known recent fire.	Manage impacts from neighbouring industrial development-existing and new. Ensure that runoff does not affect this site by changing local hydrology and facilitating additional weed spread.
C P2	5.33ha	Would qualify as VERY GOOD in Bush Forever Score	Camping tracks through here creating disturbance and facilitating weed invasion. Salt water discharge from Aquaculture Centre impacting on patch. New industrial development threatens clearance of the patch and modification of local hydrology.	*Passiflora foetida*	Contiguous with dune/monsoon vine thicket ecosystem. Bounded by industrial development and Kavite Road. Once contiguous with CP4 and CP5. Contains the P2 Quadrat Only known CP community located on a seaward facing dune slope. *Keraudrenia exastia* (EPBC- listed) patch abuts this patch (in the north) *Paractica* patch overlaps with unmapped Monsoon Vine Thicket No known recent fire.	MVT is mapped and registered. Ensure that discharge from Aquaculture Centre avoids this patch and is appropriately managed. New industrial developments between the Pearl Aquaculture Centre and Manbana undertake flora assessment, avoiding first and then minimising any clearance of the *Paractia* ecosystem. Any losses should be offest appropriately, including; conserving other at risk patches and contributing to management. *Keraudrenia exastia* occurs behind the Pearling Aquaculture shed here. This is the southern limit for this species in the Broome Peninsula.

CP3	0.91ha	Would qualify as VERY GOOD in Bush Forever Score	New industrial development threatens clearance of the patch and modification of local hydrology. Edge effects (weeds etc.) from OTS development abutting this patch, it is expected that this activity will facilitate threats including; traffic/weeds/cats/rubbish /invasive ants. New industrial yard developed by KPA to south in May 2015	*Passiflora foetida*	Abuts recent industrial development OTS (Oilfield Transport Services). Likely that clearing of parts of this patch has occurred in 2013. Once connected to CP4 and Minyjuru 1 but now intersected by Port Drive. Supposed to be a wildlife corridor under the old Rubibi plan - to ensure the crossing of macropods and possums from the west to east side of the Broome Peninsula. Dune system with Monsoon Vine Thicket elements contiguous with this patch. No known recent fire.	Should be retained as a corridor linking the east and west ecosystems. Manage threats from existing industrial activity.
CP4	5.67ha	Would qualify as VERY GOOD in Bush Forever Score	Part of this patch was already cleared (0.25ha) under Permit Number CPS 3104/5 in October 2014 69% included within YCP A number of tracks intersect. Some rubbish dumping occurs including garden waste which facilitates the introduction of invasive weeds. Any future widening of Port Drive or Kavite Road threatens the roadside edge of this patch.	*Passiflora foetida*	Overlap with Minyjuru 1. Overlaps with *Keraudrenia exastia* patch (EPBC- listed) Once connected to CP3 but now intersected by Kavite Road. Patch is intersected by vehicle tracks. Could be considered connected to CP5 as narrow distance in between. No recent fires except for one targeting the *Keraudrenia exastia* some years back.	Industrial development to the north of this patch needs to be managed to reduce any vehicle traffic, weeds and changed hydrology/drainage that may occur. Slight changes to the YCP boundaries would enable the remainder of this patch to be conserved. Accuratley survey and manage to protect large old *C. paractia* trees on the roadside before conducting any widening of Port Drive or Kavite Road.

CP5	2.62ha	Would qualify as VERY GOOD in Bush Forever Score	Majority within the Yawuru Conservation Park however realignment and/or widening of Kavite Road threatens the roadside edge.	*Passiflora foetida*	Crowns 4-6m in height. Some mallee form. Once connected to CP6 but now intersected by Kavite Road. Overlaps with *Keraudrenia exastia* patch (EPBC- listed) Has been burnt in the previous 5 years.	The alignment of Kavite Road in this area is not gazetted. Recommend closure. This would also benefit *Keraudrenia exastia* populations, some of which are very close to the road. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP6	0.82ha	Would qualify as VERY GOOD in Bush Forever Score	Majority within the Yawuru Conservation Park however realignment and/or widening of Kavite Road threatens the roadside edge.	*Passiflora foetida*	Trees line the road - once connected to CP5 but now intersected by Kavite Road. Some monsoon vine thicket elements close to the dune and contiguous with this patch. Due to the alignment of the road (not gazetted) there are significant drainage problems in this area which frequently floods. The altered hydrology affects both this ecosystem and the dune vegetation. It also needs to be closed regularly. No known recent fire.	The alignment of Kavite Road in this area is not gazetted. Recommend closure. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP 7	15.6ha -1.63ha - 6.87ha Total (Apr2015) =7.1ha	Would qualify as VERY GOOD in Bush Forever Score	Most of this area has now been cleared under Permit no.CPS 3104/5 in October 2014. 1.63ha was overcleared outside of the permitted area, while 6.87ha was within the permit area. Widening of existing vehicle track (has already been widened considerably) Widening of Kavite Road threatens the roadside edge.	*Stylosanthes hamata* on the track. One patch of *Hyptis suaveolens* expanding.	Once connected to CP8 but intersected by Kavite Road. Likely overlaps with Minyjuru 2 once it has been ground-truthed. Patch intersected by vehicle tracks. Largest southern area of mallee-form *Paractia* occurs here. Has been burnt in the last five years.	Conserve this area - Avoid and minimise any further habitat loss. Offset current losses appropriately, including: conserving other at risk patches and contributing to management. New industrial developments should undertake a flora and habitat assessment focussing on this PEC and the Minyjuru PEC occurrence. Developments should first avoid, then minimise any clearance of the *Paractia* or *Minyjuru* ecosystems. The alignment of Kavite Road in this area is not gazetted. Recommend closure Register trees from within this patch that are close to the road verge to prevent loss through future road widening.

CP8	3.84ha	Would qualify as VERY GOOD in Bush Forever Score	Drainage problem on southern bend of Kavite Road due to poor road alignment. Frequently floods. Majority within the Yawuru Conservation Park however realignment and/or widening of Kavite Road threatens the roadside edge.	*Passiflora foetida* *Stylosanthes hamata* (at car park)	Once connected to CP7 and Minyjuru 2 but intersected by Kavite Road. Bounded on the western edge by Reddell Beach cliffs and dunes. The northern edge likely connected to CP11 and CP10 prior to erection of the Catholic Bishop's house and associated native vegetation displacement. One formalised carpark occurs for coastal access to Riddell Beach which is aiding weed spread. Lots of Gubinge trees occur throughout this area. No known recent fire.	Conserve this area as part of the Coastal Park - manage roads, tracks and carparking to minimise impact including reducing the spread of weeds. The alignment of Kavite Road in this area is not gazetted. Recommend closure and/or onsider partial road closure/realignment. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP 9	3.66ha	Would qualify as GOOD in Bush Forever Score	Old abandoned vehicles throughout. Large numbers of weeds Garden rubbish dumping occurring here facilitating weed introduction and spread.	*Hyptis suaveolens* *Passiflora foetida* *Stylosanthes hamata* *Leuceana leucocephala* *Merremia dissecta* *Anarcardium occidentale* (Cashew)	Overlaps Minyjuru 1 and 2 and intersected by vehicle tracks. North-eastern corner is bounded by industrial development, which has modified the hydrology and created drainage impacts on the patch. Some recent fire.	Remove rubbish. Prevent garden and refuse dumping. Requires urgent weed management Industrial development abutting this patch needs to be managed to reduce any vehicle traffic, weeds and changed hydrology/drainage that may occur.
CP 10	7.48ha	Would qualify as VERY GOOD in Bush Forever Score	Kavite Road subdivision A patch of the weed *Anarcardium occidentale* (Cashew) occurs on the track that extends from the east of the Catholic Bishop's place from the industrial area. Widening of Kavite Road threatens the roadside edge. Less than 5% in YCP	*Anarcardium occidentale* (Cashew)	Once connected to CP11 and CP 12 but intersected by Kavite Road. Patch intersected by vehicle tracks. Close proximity to Minyjuru 3 Mostly malle-form *Paractia* to 5m. No known recent fire.	Shire de-gazettes ecologically inappropriate (c.1970) subdivision and YCP is brought to the edge of Kavite Road. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.

CP 11	9.17ha	Would qualify as VERY GOOD in Bush Forever Score	Numerous unmanaged tracks and illegal camping facilitating weed spread, rubbish. Cliff erosion behind Reddell Beach is leading to slumping and loss of *C.paractia* trees. Widening of Kavite Road threatens the roadside edge. Any private dwelling construction or development within the Catholic Bishop and Nuns residence may impose up the connectivity of CP11.	*Passiflora foetida*	Mostly malle-form with 5m crowns. Adjoins Reddell Beach. Once connected to CP10 but intersected by Kavite Road. Area has been reduced by location of the Catholic Bishop's and Nuns Residence (Sister's place) further north. Overlaps with Minyjuru 4 Likely contained remnant tree 430, however this specimen has been cut off by Kavite Road and now treated as an outlier. Intersected by a number of tracks. Known place for regular illegal camping. No known recent fire.	Expand Yawuru Conservation Park to encompass the entirety of this population including Minyjuru 4B. Manage access tracks and illegal camping activities. Advise residents of the significance of this community within their blocks. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP12	0.93ha	Would qualify as VERY GOOD in Bush Forever Score	Long-delayed Kavite Road subdivision Majority within the YCP	*Hyptis suaveolens* *Passiflora foetida*	Intersected by narrow track. In close proximity to CP13 and Minyjuru 3 and Minyjuru 4 No known recent fire.	Shire de-gazettes ecologically inappropriate (c.1970) subdivision and YCP is brought to the edge of Kavite Road to optimally include CP12 and surrounding CP and Minyjuru patches. Cluster of *Corymbia paractia* trees are protected. Further ground-truthing establishes whether this cluster of trees is connected to the CP13 patch. Improved track management throughout this area will reduce the impact on this and other *C. paractia* and Minyjuru patches. Remove satellite *Hyptis suaveolens* incursion (near tree no. 499) before the weed spreads and becomes a problem infestation.
CP13	1.80ha	Would qualify as VERY GOOD in Bush Forever Score	Long-delayed Kavite Road subdivision	*Passiflora foetida*	Intersected by narrow track. In close proximity to CP12 and CP10. Overlaps with Minyjuru 4 No known recent fire.	Shire de-gazettes ecologically inappropriate (c.1970) subdivision and YCP is brought to the edge of Kavite Road to optimally include CP12 and surrounding CP and Minyjuru patches.

CP 14	1.75ha	Would qualify as VERY GOOD in Bush Forever Score	Likely to be threatened by coastal cliff erosion in the near future. Numerous unmanaged tracks and illegal camping facilitating weed spread, rubbish.	*Passiflora foetida*	All these *C.paractia* are mallee-form. Intersected by many vehicle tracks. Close proximity to CP 11, CP 15 and Minyjuru 4 and 5B. Western edge abounded by Reddell Beach cliffs. Overlaps with unmapped Dwarf Pindan Heath PEC No fires in previous 30 years.	Expand Yawuru Conservation Park to encompass the entirety of this patch. 70% remains unprotected. Improved track management throughout this area will reduce the impact on this and other nearby *C. paractia* and Minyjuru patches.
CP15	1.85ha	Would qualify as VERY GOOD in Bush Forever Score	Likely to be threatened by coastal cliff erosion in the near future. Widening of Kavite Road threatens the roadside edge.	*Passiflora foetida*	Intersected by vehicle track. Once connected to CP38 however intersected by Kavite Road. Western edge abounded by Reddell Beach cliffs. Slight overlap with Minyjuru 5B. Abuts unmapped Dwarf Pindan Heath PEC No fires in previous 30 years.	Expand Yawuru Conservation Park to encompass the entirety of this patch. More than 75% remains unprotected. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP16	0.39ha	Would qualify as GOOD in Bush Forever Score	Weeds in the nearby old Shire Sandpit pose a significant threat to this patch and the surrounding Yawuru Conservation Park if left unmanaged. High risk weeds include *Jatropha gossypifolia* and *Merremia dissecta* and *M. aegyptia* Widening of Port Drive threatens the roadside edge.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida* *Hyptis suaveolens* *Gomphrena celsioides* *Stylosanthes hamata* *Cenchrus ciliaris* (all weeds on the Port Drive road verge)	Small patch, bordered by main track into old Shire Sandpit. Close proximity to CP17. Once inclusive of remnant tree 511 which is now cut off by development and vegetation displacement associated with the Stockyards No fires in previous 30 years.	Expand Yawuru Conservation Park to encompass the entirety of this patch. Currently a portion of the patch is included, but not the area specifically containing the overstorey tree: *C. paractia.* Register trees from within this patch that are close to the road verge to prevent loss through future road widening.

CP17	2.41ha	Would qualify as GOOD in Bush Forever Score	Weeds in the nearby old Shire sandpit pose a significant threat to this patch and the surrounding Yawuru Conservation Park if left unmanaged. High risk weeds include *Jatropha gossypifolia* and *Merremia dissecta* and *M. aegyptia.* Dumping of garden waste on Father Emo track has facilitated the spread of existing weeds. Widening of Port Drive threatens the roadside edge.	*Azadirachta indica* *Antigonon leptopus* *Leuceana leucocephala* *Passiflora foetida* *Hyptis suaveolens* weeds on the Port Drive road verge: *Macroptilium atropurpureum* *Cenchrus ciliaris* *Stylosanthes hamata*	Once contiguous with CP18 which is now a highly modified patch within the rifle range. Intersected by vehicle track. Father Emo's old camp in the adjacent sand dune. High heritage value. No known recent fire. Contains the P1 quadrat Majority within the YCP	Seek some heritage recognition/listing for Father Emo's camp in the dunes here (potentially through the Broome Historical Society - David Dureau knows the oral history of this area well. Manage weeds, particularly those that have the high potential to spread and cause ecological problems throughout this patch and the Yawuru Conservation Park (*Azadirachta indica, Antigonon leptopus, Leuceana leucocephala)* Discourage dumping of garden waste to reduce incursion of new weeds and spread of weeds.
CP18	0.78ha	Would qualify as POOR in Bush Forever Score	Compounded threats include; tracks, slashing, seasonal camping, weed spread by vehicles Widening of Port Drive threatens the roadside edge.	Weeds on the Port Drive road verge: *Cenchrus ciliaris* *Merremia dissecta,* *Hyptis suaveolens*	Poor management by the Pistol Club. Area functions as a seasonal overflow caravan park. Intersected by many tracks, highly modified understorey as a result of tracks and regular slashing. *Corymbia paractia* are retained as shade trees and are present at the front of the Pistol Club. Once contiguous with CP 17 and CP18 but substantial management differences has resulted in this being defined as a separate patch. No known recent fire.	Register trees from within this patch to prevent clearing of significant mature trees.

CP19	4.15ha	Would qualify as VERY GOOD in Bush Forever Score	Garden weeds and unmanaged escapees from Pistol Club and Habitat Resort. Potential Industrial/other development Widening of Port Drive threatens the roadside edge.	Weeds on the Port Drive road verge: *Cenchrus ciliaris* *Hyptis suaveolens* *Macroptilium atropurpureum* *Merremia dissecta,* *Azadirachta indica* *Stylosanthes scabra*	Dense, no tracks throughout Was once contiguous with CP18 and CP20 and inclusive of remnant tree 670. Cut off by deleterious management within Pistol Club and vegetation displacement within Habitat Resort. No known recent fire.	Expand Yawuru Conservation Park to encompass the entirety of this quality patch. Register trees from within this patch to prevent clearing of significant mature trees.
CP20	3.79ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water, herbicide spraying and irrigation for turf management, existing and new weed incursions.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Contains the golfing practice area within it which is watered with the treated sewage water - consequently has nutrient overload which is encouraging weed growth. Nutrient overload is potentially contributing to the *Lyngbya* blooms in Roebuck Bay due to leaching into the shallow aquifers beneath. Was once contiguous with CP19, but intersected by Habitat Resort development. Was once contiguous with CP21 but intersected by Golf Course access road. Contains a golfers access path between the Golf Course and Habitat Resort. Dense cluster of mature *C. paractia* trees occurs away from the practice area/intense management area. Area is managed by golf course staff and includes some herbicide spraying for turf management which has been deleterious toward the native understorey. No known recent fire. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The existing practice area is not expanded and avoids impacting upon the dense cluster of trees to the south and south east of the practice area. The intense turf management, inclusive of the irrigation with sewage water and herbicide use is restricted to the practice area. The use of treated sewage water is seasonally restricted (not during the wet season) to avoid flushing the aquifers through into the bay. Manage high threat weeds and encourage native plant restoration.

CP21	0.89	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for turf management, mowing, existing and new weed incursion, including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Acts as a buffer zone between the access road and the golf course. Intersected by tracks and informal carpark, highly degraded from Golf Course activities including the use of treated sewage water, as irrigation and as spray drift, increasing nutrients and contributing to weed growth. Mowing has removed the understorey. Trees are mature specimens. No known recent fire. Would have been contiguous with CP22, CP 20 Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Golf Club commits to only planting native species along the fairways.
CP22	1.37ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed including new weeds from exotic plantings along the fairways and increased fire risk due to weed load. Widening of Port Drive threatens the roadside edge.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Has been recently burnt (June 2014) Intersected by many wide tracks and bounded by roadside clearing on Port Drive as well as Golf Course fairway. Would have been contiguous with CP21, CP20, CP 33 and included remnant trees 859, 860 and 809 Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Golf Club commits to only planting native species along the fairways.

CP 23	0.62ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways, increased fire risk due to weed load. High traffic through the area further contributes to weed spread and vegetation degradation.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	An unsealed carpark has been created in the middle of this patch. Also contains some gardeners sheds here. Would be contiguous with CP 21 and CP24 and inclusive of remnant trees (850 and 849, 820, 818 and 821) but tracks, vegetation degradation and the development of a golf course fairway have isolated the patches/remnant trees. No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from within this patch to prevent clearing of significant mature trees. Inform golf club of locations to prevent clearing through widening/extension of the carparking facilities. Golf Club commits to only planting native species along the fairways.
CP24	1.34ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Surrounded by golf course fairways on the N, W and E, the patch connects to the dune/vine thicket system along Simpson's Beach on the southern side, but would have been contiguous with patches CP23 and CP25, inclusive of trees in-between now recorded as remnant trees (821, 820, 819, 757) No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from along the fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Golf Club commits to only planting native species along the fairways.

CP25	2.46ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	The long north-western side of the patch is edged by Golf Course fairway, while the south eastern edge meets with the Simpson's Beach dune/vine thicket. But for the fairway and the sewage ponds, this patch would have been contiguous with CP26, CP24, CP27, inclusive of remnant trees 757 and 748. Part of this patch is within the Yawuru Conservation Park No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	Look to extending the Yawuru Conservation Park boundaries to take in more of this patch, particularly the dune base and the cluster of mature *C. paractia* specimens. The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from along the fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Golf Club commits to only planting native species along the fairways.
CP 26	0.55ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Fragmented by fairway construction. Would have been contiguous with CP25, CP28, inclusive of remnant trees 757 and 748. No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from along the fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Golf Club commits to only planting native species along the fairways.

CP27	0.42ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Fairways have fragmented this patch which would have been contiguous with CP28, CP25. No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from along the fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Golf Club commits to only planting native species along the fairways.
CP28	5.39ha	Would qualify as POOR in Bush Forever Score	Compounded threats include: High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management, mowing, existing and new weed incursions including new weeds from exotic plantings along the fairways.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Large patch intersected by holding ponds for the waste water treatment plant, industrial development on Clementson St and the construction of Golf Course fairways which have fragmented once contiguous patches; CP27, CP26, CP25, CP29 and CP32, inclusive of remnant trees 841, 748,757, 589 and 590. No known recent fire. Trees are mature specimens. Current management and weed dominance inhibits active recruitment of *C. paractia* trees and associated understorey. Weeds are in extremely high densities close to the treatment plant.	The intense turf management, inclusive of the irrigation with sewage water and herbicide is restricted to the fairways. The use of treated sewage water in adjacent fairways is seasonally restricted (not during the wet season) to avoid flushing through the aquifers and into the bay. Manage high threat weeds and encourage native plant restoration. Register trees from along the fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Golf Club commits to only planting native species along the fairways.

CP 29	2.46ha	Would qualify as POOR in Bush Forever Score	Lack of management of weeds from the shire drains and surrounding the sewage treatment area.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica, Leuceana leucocephala,* *Hyptis suaveolens*	Northern extent bounded by industrial development lining Clementson Street, and east west drain, isolating the two remnant trees 589 and 590 which would have once been contiguous. Southern and S-Western extent is bounded by the holding ponds at the Waste Water Treatment Plant. Would have once been contiguous with CP28. Could be considered contiguous with CP30, however due to low density of trees, vegetation degradation and fragmentation the patches have been labelled as separate. Eastern section has burnt recently (2013). Western section has not burnt for many years. Trees are mature specimens.	Manage high threat weeds and weed incursions from the shire drainage reserve and the sewage treatment area. Encourage native plant restoration.
CP 30	1.22ha	Would qualify as POOR in Bush Forever Score	Lack of management of weeds surrounding the sewage treatment area. Dumping of garden waste and rubbish. Facilitation of weed spread. Unmanaged fire	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica*	Western extent bounded by the Waste Water Treatment holding ponds. Could be considered contiguous with CP29 and CP31, however due to low density of trees, vegetation degradation and fragmentation the patches have been labelled as separate. Intersected by informal tracks. Burnt in 2013 - hot fire which damaged mature trees. Regular fire has occurred throughout this area.	Manage high threat weeds and weed incursions from the sewage treatment area. Encourage native plant restoration. Implement an early season cool burning regime to prevent further hot fires.

CP31	4.47ha	Would qualify as POOR in Bush Forever Score	Lack of management of weeds. Dumping of garden waste and rubbish. Facilitation of weed spread. Unmanaged fire Illegal camping and associated rubbish.	*Merremia dissecta, Merremia aegyptia,* *Passiflora foetida,* *Macroptilium atropurpureum,* *Azadirachta indica,* *Leuceana leucocephala*	Bounded by the Demco residential development and sealed entry into Demco beach reserve, inclusive of carpark. Contiguous with the Simpson/Demco Beach dune/vine thicket system and could be considered contiguous with CP30 but due to low density of trees and vegetation degradation, the patches have been labelled as separate. Trees are mature specimens. Intersected by informal tracks. Burnt in 2013 - hot fire which damaged mature trees. Regular fire has occurred throughout this area.	Extend Yawuru Conservation Park to include as much of this patch as possible. Manage high threat weeds and weed incursion. Encourage native plant restoration. Badly requires rubbish removal Implement an early season cool burning regime to prevent further hot fires. Rationalise and manage tracks.
CP32	1.61ha	Would qualify as GOOD in Bush Forever Score	High nutrient loads due to use of treated sewage water as irrigation for adjacent turf management. Any future road-widening of Port Drive.	*Passiflora foetida*	Bounded on the N-western edge by Port Drive. Fairway development has fragmented historical patch and would have once been contiguous with CP28, CP26, CP 27 and CP25, and across the road with CP35 and CP34, and likely inclusive of remnant trees 848, 847, 757 and 748 and 841 Trees are mature specimens. Burnt in 2012 - hot fire which damaged some mature trees. Suspect that regular fire has occurred throughout this area. No access track through here. Some minor nutrient-loaded water drift issues from the fairway edge.	Register trees along the roadside and fairways to prevent clearing of significant mature trees. Inform Golf Club of locations. Implement an early season cool burning regime to prevent further hot fires.

CP33	2.10ha	Would qualify as POOR in Bush Forever Score	Proposed Industrial Development (Land is currently being advertised as such) Dumping of garden waste Widening of the road High risk weeds established here and spreading. Any future road-widening of Port Drive.	*Merremia dissecta,* *Leuceana leucocephala,* *Clitoria ternatea,* *Cenchrus ciliaris,* *Jatropha gossypifolia,* (in road drain sump), *Passiflora foetida*	Close to Gubinge Road verge. Fire break parallel with the road is now overgrown. Some dumping of garden waste occurring here. Would have been contiguous with CP22, CP21, CP20 and inclusive of remnant trees 859, 860 and 809. Low point in the landscape, functions as a drainage sump. Trees are mature specimens. No recent burn.	Avoid clearing this patch/or at least any significant mature trees in any proposed industrial development. Manage weeds, particularly high risk established weeds (*Jatropha gossypifolia*) that will spread quickly throughout the conservation estate. Register trees along the roadside to prevent clearing of significant mature trees. Manage dumping of garden waste
CP34	0.48ha	Would qualify as POOR in Bush Forever Score	Dumping of garden waste High risk weeds established here and spreading.	*Merremia dissecta,* *Leuceana leucocephala,* *Clitoria ternatea,* *Cenchrus ciliaris,* *Passiflora foetida*	Bounded by the Vacation Village development and associated perimeter fire break and drainage sump for Gubinge Rd. Would have been contiguous with CP32. Dumping of garden waste actively occurring here. No recent burn. Trees are mature specimens.	Manage weeds, particularly high risk that have established and/or new weeds spreading from dumped garden waste or adjacent Vacation Village gardens. Liaise with Vacation Village to prevent further dumping of garden waste.
CP35	0.76ha	Would qualify as GOOD in Bush Forever Score	Frequent fire Past dumping of garden waste facilitating the spread and establishment of weeds.	*Passiflora foetida*	Bounded on the S-western edge by Vacation Village and on the N-eastern edge by Port Drive. Would have been contiguous with CP32. One track runs through this patch. Regular fire occurs here (2013). Within Yawuru Conservation Park.	Liaise with Vacation Village to prevent further dumping of garden waste.
CP 36	9ha	Would qualify as VERY GOOD in Bush Forever Score	Regular fire Unmanaged access to tracks Less than 25% included in YCP	*Passiflora foetida*	Bounded on the western edge by Gubinge Road. Once contiguous with CP37 and Minyjuru 9. Intersected by tracks. Has had some recent fire (2013) and is regularly burnt. Within Yawuru Conservation Park.	Implement cool burn program within this area as part of conservation management activities. Extend Yawuru Conservation Park to include as much of this patch as possible.

CP37	2.30ha	Would qualify as VERY GOOD in Bush Forever Score	Some rubbish and garden waste dumping along the fire break. Widening of Gubinge Road threatens the roadside edge.	*Passiflora foetida*	Bounded on the Eastern edge by Gubinge Road. Once contiguous with CP36. Overlaps with Minyjuru 9. Close proximity to sandstone outcrop Indigenous heritage sites. No known recent fire - dense throughout. Firebreak parallel to the road runs through this patch.	Manage access and dumping of garden and other waste. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP38	1.35ha	Would qualify as VERY GOOD in Bush Forever Score	Loss of roadside trees through road widening. Old dump adjacent (North-west) is likely to provide a source of invasive weeds.	*Passiflora foetida*	Once contiguous with CP15 and Minyjuru 5B but intersected by Kavite Road. Close proximity to Minyjuru 5. Road alignment and racecourse have likely resulted in clearing of CP38/CP15 which would have once included remnant tree 500. No known recent fires. Most of these trees are mallee- form.	Expand Yawuru Conservation Park to encompass the entirety of this patch. Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Investigate any weed infestations within the adjacent old dump that may impact on this patch and Yawuru Conservation Park.
CP39	0.24	Would qualify as POOR in Bush Forever Score	Loss of trees as a result of expansion of holding yard or other Turf Club infrastructure.	*Passiflora foetida*	Bounded by Turf Club holding yard and other infrastructure, as well as Gantheume Point Road. Once contiguous with CP40 and remnant trees toward the lighthouse; 501, 507, 502, 503, 504, 505, 506 which now are surrounded by carpark and highly modified vegetation. Understorey highly modified. Trees occur along the edge of the carpark. Most of these trees are mallee- form with 3m crowns. No known recent fires.	Register trees from within this patch to prevent loss through any future expansion of the holding yard or other infrastructure. Inform Turf Club of significance.

CP40	4.78ha	Would qualify as VERY GOOD in Bush Forever Score	Cliff erosion Buffel grass dominating the vegetation and increasing the risk of wildfire. Widening of Gantheaume Point Road threatens the roadside edge.	*Passiflora foetida* *Cenchrus ciliaris*	Bounded by Gantheume Point Road and Ganthueme Point cliffs. Once connected to CP 41 and CP42, but now intersected by the high traffic entrance to Ganthueme Point beach. Once contiguous with CP39 and remnant trees toward the lighthouse; 501, 507, 502, 503, 504, 505, 506 which are now surrounded by carpark and highly modified vegetation. An unusually high density patch of mallee-form *Corymbia paractia* occurs here. Significant patch of Buffel grass (nthn sector) One mature specimen of *Cordia dodecandra* (exotic) occurs here, probably on a past campsite. No recent fire.	Remove exotic *Cordia dodecandra* specimen. Manage Buffel Grass patch. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.
CP41	45.6ha	Would qualify as VERY GOOD in Bush Forever Score	Future road widening Unmanaged fire (arson) Weeds Drainage from Gantheaume Point Road which facilitates weed spread and establishment and changes the natural hydrological regime.	*Passiflora foetida* *Cenchrus ciliaris* *Azadirachta indica* *Leuceana leucocephala* *Stylosanthes hamata* *Merremia dissecta* *Hyptis suaveolens* (no large infestations of the above weeds- small incursions only)	This is the second largest and most significant patch of *C. paractia* with secure tenure. Bounded by Gantheume Point Road and the cliffs of Ganthueme Point and once connected to CP 40, CP39, CP42, CP43, CP44, but now intersected by the high traffic entrance to Ganthueme Point beach and Kavite Road. Contiguous with Minyirr Park dunes and Monsoon Vine Thicket ecosystem. Overlaps important Gubinge orchards and Monsoon Vine Thickets, both of high cultural significance. Intersected by vehicle and walking tracks and some degradation and understorey modification in the N-Western area within and surrounding the Minyirr Park base camp. Formalised walking tracks throughout, used by walkers. Important for environmental and cultural education. The Minyirr park base camp is an important community asset. Some patches have been regularly burnt (arson), especially in the north (~ 2008).	Manage all established and emerging weeds as a high priority. Implement strategic cool burning program to protect sensitive ecosystems (ie: vine thickets and gubinge orchards) and prevent regular wildfire. Monitor drains for weed establishment and focus weed control in these areas. Use any new road works etc. to modify drainage designs. Continue to maintain tracks, addressing minor erosion issues and protect and add to educational assets within the park. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.

CP42	17.2 ha	Would qualify as VERY GOOD in Bush Forever Score	Proposed Wilderness Retreat may involve minor clearance/modification of some of this patch (Western edge) Frequent unmanaged fire (arson) Future road widening Clearing of Telstra services track Drainage from Gantheaume Point Road which facilitates weed spread and establishment and changes the natural hydrological regime. Weeds Garden and waste dumping	*Passiflora foetida* *Cenchrus ciliaris*	Bounded by Gantheume Point Road and once connected to CP40, CP41, CP43, CP44, but now intersected by GP road. Intersected lightly by vehicle tracks and some degradation and understorey modification in the S-Western area adjacent to the Turf Club and inclusive of the roadside drainage area. A Telstra services track runs parallel to Gantheume Point Road. Irregular clearing of this track has damaged and destroyed some *C. paractia* specimens. Frequent fire is a serious problem throughout this patch. Burnt again in 2013. Some refuse dumping occurring along informal tracks. Some sections within the Turf Club lease and the remaining within the Yawuru Conservation Park	Expand Yawuru Conservation Park to encompass as much of this patch as possible. Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Implement strategic cool burning program. Liaise with Telstra to modify service line clearance practices to avoid further destruction of *C. paractia.* Use any new road works etc. to modify drainage designs. Manage weeds and work to prevent garden and waste dumping.
CP43	1.41ha	Would qualify as VERY GOOD in Bush Forever Score	Frequent unmanaged fire (arson) Future road widening Clearing of Telstra services track	*Passiflora foetida*	Once connected to CP41 but intersected by Gantheume Point Road Could be considered contiguous with CP42, however low density of trees between, more likely connected to the north-eastern edge of CP41 so mapped as a distinct patch. A Telstra services track runs parallel to Gantheume Point Road. Irregular clearing of this track has damaged and destroyed some *C. paractia* specimens. Many of the trees in this patch are close to the road. Hot burn in 2012	Liaise with Telstra to modify service line clearance practices to avoid further destruction of *C. paractia.* Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Implement strategic cool burning program.

CP44	0.68ha	Would qualify as VERY GOOD in Bush Forever Score	Frequent unmanaged fire (arson) Future road widening Clearing of Telstra services track	*Passiflora foetida*	Once connected to CP41 but intersected by Gantheume Point Road. Could be considered contiguous with CP43, however low density of trees between, more likely connected to the north-eastern edge of CP41 so mapped as a distinct patch. A Telstra services track runs parallel to Gantheume Point Road. Irregular clearing of this track has damaged and destroyed some *C. paractia* specimens. Hot burn in 2012	Liaise with Telstra to modify service line clearance practices to avoid further destruction of *C. paractia.* Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Implement strategic cool burning program.
CP45	1ha	Would qualify as VERY GOOD in Bush Forever Score	Frequent unmanaged fire (arson) Future road widening	*Passiflora foetida*	Bounded on the eastern edge by Gubinge Road. Probably once connected to CP36. Fire has probably reduced the extent of this patch, which was once inclusive of remnant tree 870. Vegetation recovery through fire management and encouraging natural recruitment could re-extend the boundaries of this patch. There is a track running parallel with Gubinge Road through this patch. Hot burn in 2012	Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Implement strategic cool burning program.
CP46	2.45ha	Would qualify as VERY GOOD in Bush Forever Score	Frequent unmanaged fire (arson) Future road widening	*Passiflora foetida*	Bounded on the eastern edge by Gubinge Road. Could be considered contiguous with CP41 and CP47 but due to low density of trees between, it has been mapped as a separate patch. Has burnt recently (2010?) Opposite Januburu Estate. Formalised walking tracks throughout, used by walkers and dog walkers and is important for environmental and cultural education. Minyirr Park is an important community asset.	Implement strategic cool burning program to protect sensitive ecosystems (ie: vine thickets and Gubinge orchards) and prevent regular wildfire. Continue to maintain tracks, addressing minor erosion issues and protect and add to educational assets within the park. Register trees from within this patch that are close to the road verge to prevent loss through future road widening.

CP47	54.4 ha	Central section (in the vicinity of the Demarchi Road Drain system and Harman Road drain system) would qualify as GOOD Bush Forever Score (Approx 15% ~ 8.16ha) Northern and Southern section would qualify as VERY GOOD in Bush Forever Score (Approx 85% ~ 46.24ha)	Weeds, established and emerging Frequent unmanaged fire events (Arson) Flooding - resulting in tree death and transformation of the ecosystem leading to increased weed abundance. Increased runoff and weed spread throughout drainage system. Unregulated expansion of the informal carpark opposite Murray Road. Rubbish dumping is occurring in here and other places due to illegal overnight camping, particularly under shade trees.	Worst weeds occur in the central section in the vicinity of the Demarchi Road Drain system and Harman Road drain system: *Passiflora foetida, Cenchrus ciliaris, Azadirachta indica, Leuceana leucocephala, Stylosanthes hamata, Merremia dissecta, Merremia aegyptia, Hyptis suaveolens, Jatropha gossypifolia, Stachytarpheta cayennensis, Khaya senegalensis, Antigonon leptopus, Delonix regia, Macroptilium atropurpureum, Clitoria ternatea* North of the residential house including the Surf Club drain, the following weeds occur in low density: *Hyptis suaveolens* *Azadirachta indica* *Merremia dissecta* *Senna occidentalis* *Ziziphus mauritiana* *Passiflora foetida*	Largest patch running much of the length behind the Cable Beach dunes and contiguous with monsoon vine thicket/dune systems. Bounded on the eastern edge by Gubinge Road and the Januburu residential development. Likely to include several varying quality zones due to intersection by tracks, drainage reserves, car parks and proximity to dense residential/commercial and/or length of time since development. This is the largest and most significant patch of *C. paractia* within a secure tenure. Some patches have been regularly burnt. Arson is a problem here. Some patches have not been burnt for a long period. Increase in the sealed surfaces in this area has increased runoff and flooding events. For example the flooding in 1997 left large areas of this patch and surrounding houses (Smirnoff Road) submerged for weeks. As a result, much of the spinifex and *Gyrocarpus* trees were killed and replaced by large stands of the Buffel grass weed. This area overlaps important Gubinge orchards and monsoon vine thickets, both of high cultural significance. Formalised walking tracks throughout, used by walkers and dog walkers and is important for environmental and cultural education. The Minyirr park base camp is an important community Residential (QC) house contained within, however gardens and surrounds have continued to be native vegetation - no significant modification is taking place by voluntary agreement. Northern end is abutted by carpark. Some of the trees within the carpark have been retained as shade trees but are not included within the patch - listed as remnant trees. Weeds are also a problem surrounding the Cable Beach Surf Club drain at the northern end of the patch. Fire has impacted the southern section opposite Januburu (approx 2012).	Survey and identify quality zones throughout and identify appropriate management actions as part of the Conservation Park Management Plan Manage all established and emerging weeds as a high priority, particularly high threat weeds. Implement strategic cool burning program to protect sensitive ecosystems (ie: vine thickets and gubinge orchards) and prevent regular wildfire. Monitor drains for weed establishment and focus weed control in these areas. Use any new road works/car park works etc. to modify drainage designs. Continue to maintain tracks, addressing minor erosion issues and protect and add to educational assets within the park. Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Formalise or close informal carpark opposite Murray Road. Discourage illegal overnight camping. Look to provide bins in problem areas.

CP48	3.55ha	Would qualify as GOOD in Bush Forever Score	Weeds, established and emerging. Dumping of garden waste and hard rubbish. Future road-widening. Weeds focus around the drainage area.	North of the Harman Road Drain, the following weeds occur in low densities: *Cenchrus ciliaris* (high density) *Macroptilium atropurpureum,* *Merremia dissecta* *Merremia aegyptia* *Leuceana leucocephala* *Hyptis suaveolens* *Clitoria ternatea* *Passiflora foetida* South of the Harman Road Drain, the following weeds occur: *Cenchrus ciliaris* (high density) *Chloris sp.* *Azadirachta indica,* *Macroptilium atropurpureum,* *Leuceana leucocephala,* *Hyptis suaveolens,* *Jatropha gossypifolia,* (minor) *Passiflora foetida*	Narrow patch, bounded on the eastern edge by the Cable Beach residential development. Once contiguous with CP47 but now intersected by Gubinge Road. Intersected by a track and a drain. Some planted Boab and Pandanus in the southern area. Has not burnt since Gubinge Road was widened.	Register trees from within this patch that are close to the road verge to prevent loss through future road widening. Manage all established and emerging weeds as a high priority, particularly high threat weeds. Work with local residents to reduce garden and other rubbish dumping and understand the importance of maintaining this patch.

CP49	1.89ha	Would qualify as VERY GOOD in Bush Forever Score	Widening of the road and ensuing movement of the bike track. Clearing for future developments Weeds Fire	*Passiflora foetida* *Cenchrus ciliaris*	Once contiguous with CP47 but now intersected by Gubinge Road. Intersected by bike path running right through the patch. Old walking track is now overgrown. *C. paractia* is mostly close to the road and the bike track. Has not burnt for many years.	Register trees from within this patch that are close to the road verge to prevent loss through future road widening and works to the bike track. New developments undertake flora assessment, avoiding first and then minimising any clearance of the *Paractia* ecosystem. Any losses should be offest appropriately, including: conserving other at risk patches and contributing to management.
CP50	1.72ha	Would qualify as VERY GOOD in Bush Forever Score	Widening of the road and ensuing movement of the bike track. Clearing for future developments Weeds Fire	*Passiflora foetida* *Cenchrus ciliaris*	Once contiguous with CP47 but now intersected by Cable Beach Road. Bounded by the Cable Beach Caravan Park development which has likely removed much of the patch which once extended to remnant trees 335 and 334, 337, 336, 338, and created a narrow strip running between the road reserve and the caravan park at the northern end of the patch. There are some additional mature remnant *C. paractia* trees in the North-east section of the caravan park that have been retained as shade trees. These have not been mapped. Recent fire (approx 2012)	Register trees from within this patch that are close to the road verge to prevent loss through future road widening and works to the bike track. Register remnant trees within the Caravan Park to avoid unwitting removal of these mature specimens, include trees in the north east section of the Caravan Park, which have yet to be mapped. New developments undertake flora assessment, avoiding first and then minimising any clearance of the *Paractia* ecosystem. Any losses should be offest appropriately, including; conserving other at risk patches and contributing to management.

CP51	1.42ha	Would qualify as POOR in Bush Forever Score	Widening of the road and ensuing movement of the bike track. Clearing for future developments Weeds	*Cenchrus ciliaris* *Passiflora foetida*	Perimeter of the former Crocodile Farm. Once contiguous with CP47 and CP52 but now intersected by Cable Beach Road and Sanctuary Road. Likely once extended to CP50, however commercial and residential development has cleared much of the patch which would have included now remnant trees; 1855, 339, 334, 335, 333, 337, 338, 336 All the surviving trees mapped are on the verge of the old Crocodile Farm. Patch has been highly modified due to past use. The entire area is mowed and slashed and maintained as road verge. Little remaining understorey. No known recent fire.	Register trees from within this patch to prevent loss through future road widening and development.
CP52	1.16ha	Would qualify as POOR in Bush Forever Score	Clearing for future developments including current works for installation of water pipes.	*Hyptis suaveolens* (abundant) *Cenchrus ciliaris* *Passiflora foetida*	Once contiguous with CP47, CP52 and inclusive of remnant tree 374 and 339 but now intersected by Sanctuary Road, Millington Road and Cable Beach Road. Surrounded by residential and commercial development. Old tracks run through this patch off Sanctuary Road due to historical use. No known recent fire.	Register trees from within this patch to prevent loss through future road widening and development.
CP53	0.25ha	Would qualify as POOR in Bush Forever Score	Clearing for future developments	*Cenchrus ciliaris* *Passiflora foetida*	Small remnant patch now enclosed within the Cable Beach Camp School. Highly modified. Could be considered connected to CP54, intersected by concrete driveway. Occurs mostly around the carpark. No known recent fire.	Register trees from within this patch to prevent loss through future road widening and development.

CP54	0.34ha	Would qualify as POOR in Bush Forever Score	Clearing for future developments	*Cenchrus ciliaris* *Passiflora foetida*	Small remnant patch now enclosed within the Cable Beach Camp School. Highly modified, in slightly better condition to CP53. Could be considered connected to CP53, intersected by concrete driveway. No known recent fire.	Register trees from within this patch to prevent loss through future road widening and development.
CP55	1.0 ha	Would qualify as POOR in Bush Forever Score	Clearing for future developments/road widening	*Cenchrus ciliaris* *Passiflora foetida*	Remnant patch, once connected to CP53, CP54 and inclusive of remnant tree 345 but Millington Road has intersected the patches, which are now surrounded by residential and commercial development. Survives as a group of scattered verge trees only. Highly modified. No known recent fire.	Register trees from within this patch to prevent loss through future road widening and development.
CP56	2.49ha	Would qualify as POOR in Bush Forever Score	New North-South road (Fairway Drive extension) proposed within the Shire plan (LPS6) threatens the patch and particularly a large remnant tree (387) one of the largest *C.paractia* in the township. Weeds - of particular concern is the rubber bush (*Calotropis procera)* in the drainage basin opposite the Billy. When it seeds it will spread into the Hidden Valley Coastal Sand dune system (high threat weed) Rubbish and garden waste.	Many weeds present including: *Aerva javanica* *Cenchrus ciliaris* (high density), *Azadirachta indica, Macroptilium atropurpureum, Hyptis suaveolens, Passiflora foetida, Clitoria ternatea, Merremia dissecta, Calotropis procera*	Once connected to CP57 but intersected by Fairway Drive. Patch intersected by many tracks. Close proximity to unmapped and unregistered Monsoon Vine Thicket patch - approximate area shown on map. Inclusive of quadrat P4. Formally used by the Higgins family as a cattle feedlot (D. Dureau - pers com) hence there are many weeds and the vegetation is highly modified. No known recent fire.	Eradicate small *Calotropis procera* patch from drainage basin as soon as possible to prevent weed noxious spread into adjacent dune system. Register trees from within this patch to prevent loss through future road widening and development. Modify proposed road design to accommodate the retention of the large *C. paractia* (approx 15m high). - Tree no 387 Survey, map and register the Monsoon Vine Thicket patch to the north east.

CP57	1.1ha	Would qualify as GOOD in Bush Forever Score	Neem invasion is a major threat (*Azadirachta indica)* Widening and/or realignment of Lulfitz Drive/Coucal Street	*Azadirachta indica,* *Cenchrus ciliaris,* *Passiflora foetida*	Once connected to CP56 but intersected by Fairway Drive. Abuts commercial development on the Southern edge. Contiguous with Cable Beach dune/monsoon vine thicket ecosystem, including unregistered MVT as shown on map. Within Coastal Park - secure tenure. No known recent fire.	Register trees from within this patch to prevent loss through future road widening/drainage modification and development. Manage established and emerging weed threats with particular focus on rampant Neem invasion.
CP58	0.34	Would qualify as POOR in Bush Forever Score	Any future road-widening. Weeds	*Jatropha gossypifolia,* *Hyptis suaveolens,* *Cenchrus ciliaris,* *Passiflora foetida*	Small remnant patch surrounded on all sides by roads, tracks and clearing, including Lullfitz and Fairway Drive and close proximity to residential development as well as unmapped and unregistered Monsoon Vine Thicket. Present within the road verge, intersected by old road alignment, in front of residential development. Once inclusive of remnant tree 387. No recent burns	Register trees from within this patch to prevent loss through future road widening. Manage weeds
CP59	0.22	Would qualify as POOR in Bush Forever Score	Future road-widening/Residential development/activities Weeds	*Hyptis suaveolens,* *Cenchrus ciliaris,* *Passiflora foetida*	Small remnant patch once connected to CP60 and CP61, but intersected by Lullfitz Drive and Sands Street. Present within the road verge, in front of residential development (rural living blocks). No known recent fire.	Register trees from within this patch to prevent loss through future road widening/residential development/activities.

CP60	0.71ha	Would qualify as GOOD in Bush Forever Score	Future re-zoning or land sale and subdivision could potentially fragment the area more.	*Cenchrus ciliaris,* *Passiflora foetida*	Small remnant patch once connected to CP59 and CP61, but intersected by Lullfitz Drive and Sands Street. Close proximity to houses (rural living blocks) but still contiguous with Cable Beach dune system and Monsoon Vine Thicket. More trees within this block which have not been mapped eg: those within Curran family block which is registered under Land for Wildlife. Current residents are very supportive and active in bushland management. A portion of the area is part of the Yawuru Coastal Park. No known recent fire.	Register trees from within this patch to prevent loss through future road widening/residential development/activities.
CP61	0.37ha	Would qualify as POOR in Bush Forever Score	Future road-widening/Residential development/activities Weeds	*Hyptis suaveolens,* *Cenchrus ciliaris,* *Passiflora foetida*	Small remnant patch once connected to CP59, CP60 and CP62 but intersected by Lullfitz Drive and Sands Street. Present within the road verge in front of residential development. (rural living blocks) No known recent fire.	Register trees from within this patch to prevent loss through future road widening/residential development/activities.
CP62	0.57ha	Would qualify as POOR in Bush Forever Score	Future road-widening/Residential development/activities Weeds	*Hyptis suaveolens,* *Cenchrus ciliaris,* *Passiflora foetida*	Small remnant patch once connected to CP60, CP61 and CP63 but intersected by Lullfitz Drive and Sands Street. Present within the road verge in front of residential development. (rural living blocks) No known recent fire.	Register trees from within this patch to prevent loss through future road widening/residential development/activities.

CP63	0.67ha	Would qualify as GOOD in Bush Forever Score	Future road-widening/Residential development/activities/subdivision and fragmentation. Periodic clearing undertaken by Horizon Power does not take into account the location and status of the PEC. Weeds	*Hyptis suaveolens* *Cenchrus ciliaris* *Passiflora foetida*	Small remnant patch once connected to CP60, CP61 and CP62 but intersected by Sands Street and residential development with native vegetation displacement. Present within the road verge in front of residential development (rural living blocks) Horizon Power periodically clear the verge here under the powerlines and recently (2013) knocked down some mature *C. paractia.* Current resident (Sharon Griffiths) is very supportive and active in bushland management and has registered her block under the Land for Wildlife. No known recent fire.	Register trees from within this patch to prevent loss through future road widening/residential development/activities. Liaise with Horizon Power to change policies with regards to clearing under the powerlines and avoid further destruction of the *C.paractia* habitat and mature specimens.

Table 1.3 Area of each patch within the Yawuru Conservation Park, % calculations and relationships to preliminary quality assessment.

Paractia Patch	Total Area (ha)	Area within YCP	% in Yawuru Conservation Park	Rating	Cleared area	2015 area	%in YCP after clearing
CP1	2.8	2.8	100.00%	VG			
CP2	5.33	0.93	17.45%	VG			
CP3	0.91	0.52	57.14%	VG			
CP4	5.67	3.93	69.31%	VG	**0.25**	**5.42**	73%
CP5	2.62	2.34	89.31%	VG			
CP6	0.82	0.53	64.63%	VG			
CP7	15.6	1.94	12.44%	VG	**8.5**	**7.1**	27%
CP8	3.84	3.11	80.99%	VG			
CP9	3.66	0	0.00%	G			
CP10	7.48	0.36	4.81%	VG			
CP11	9.17	7.1	77.43%	VG			
CP12	0.93	0.86	92.47%	VG			
CP13	1.8	0.26	14.44%	VG			
CP14	1.75	0.54	30.86%	VG			
CP15	1.85	0.41	22.16%	VG			
CP16	0.39	0.05	12.82%	G			
CP17	2.41	2.19	90.87%	G			
CP18	0.78	0	0.00%	P			
CP19	4.15	0	0.00%	VG			
CP20	3.79	0	0.00%	P			
CP21	0.89	0	0.00%	P			
CP22	1.37	0	0.00%	P			
CP23	0.62	0	0.00%	P			
CP24	1.34	0	0.00%	P			
CP25	2.46	0.43	17.48%	P			
CP26	0.55	0	0.00%	P			
CP27	0.42	0	0.00%	P			
CP28	5.39	0	0.00%	P			
CP29	2.46	0	0.00%	P			
CP30	1.22	0	0.00%	P			
CP31	4.47	1.36	30.43%	P			
CP32	1.61	0	0.00%	G			
CP33	2.1	0	0.00%	P			
CP34	0.48	0	0.00%	P			
CP35	0.76	0	0.00%	G			
CP36	9	2.14	23.78%	VG			
CP37	2.3	1.42	61.74%	VG			
CP38	1.35	0	0.00%	VG			
CP39	0.24	0	0.00%	P			
CP40	4.78	4.1	85.77%	VG			
CP41	45.6	38.6	84.65%	VG			
CP42	17.2	10.7	62.21%	VG			
CP43	1.41	1.41	100.00%	VG			

CP44	0.68	0.68	100.00%	VG
CP45	1	0.59	59.00%	VG
Paractia Patch	**Total Area (ha)**	**Area within YCP**	**% in Yawuru Conservation Park**	**Rating**
CP46	2.45	2.15	87.76%	VG
CP47	54.4	32.6	59.93%	15% G /VG 85%
CP48	3.55	0	0.00%	G
CP49	1.89	0	0.00%	VG
CP50	1.72	0	0.00%	VG
CP51	1.42	0	0.00%	P
CP52	1.16	0	0.00%	P
CP53	0.25	0	0.00%	P
CP54	0.34	0	0.00%	P
CP55	1	0	0.00%	P
CP56	2.49	1.1	44.18%	P
CP57	1.1	0.9	81.82%	G
CP58	0.34	0	0.00%	P
CP59	0.22	0	0.00%	P
CP60	0.71	0.34	47.89%	G
CP61	0.37	0	0.00%	P
CP62	0.57	0	0.00%	P
CP63	0.67	0	0.00%	G
Within town totals	**260.1**	**126.39**	**48.59%**	
Within town totals inc cleared area	**251.35**	**126.39**	**50.28%**	

Prior to clearing	**Area (ha)**	**Area within YCP**	**Amt condition class reserved**	**Condition of PEC overall**	**YCP comprises Condition Class**
VG	200.34	115.13	74.71%	77%	91%
G	23.02	8.37	36.36%	9%	7%
P	36.74	2.89	7.87%	14%	2%

Following Clearing	**Area (ha)**	**Area within YCP**	**Amt condition class reserved**	**Condition of PEC overall**	**YCP comprises Condition Class**
VG	191.59	115.13	79.21%	**76%**	91%
G	23.02	8.37	36.36%	**9%**	7%
P	36.74	2.89	7.87%	15%	2%

Table 1.4 Fifty five (55) remnant *Corymbia paractia* trees were recorded and described and recommendations have been made with regards to their management and protection.

Remnant Tree No.	Latitude	Longitude	Closest Patches	Notes	Recommendations
127	-17.956289°	122.234609°	NA	Residential area between Rivergum Ave and Herbert Street	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
162	-17.971051°	122.200232°	CP42	Alongside informal vehicle track between Turf Club and Gubinge Rd. Approximately 220m from CP42.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
333	-17.936976°	122.217920°	CP50	Along Murray Road near the Gubinge Road corner and bikepath. Approx 460m from and probably once connected to CP50.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
334	-17.935623°	122.216545°	CP50	Along Murray Road. Approx 355m from and probably once connected to CP50	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
335	-17.937177°	122.215568°	CP50	Behind the Cable Beach Caravan Park close to fenceline. Probably once connected to CP50 (approx 210m from patch)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
336	-17.935456°	122.213601°	CP50, CP47	Along Murray Road at the front of the Cable Beach Caravan Park/shop in a cluster of three with 338 and 337. Once contiguous with CP50 cut off by carpark and development.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
337	-17.935543°	122.213628°	CP50, CP47	Along Murray Road at the front of the Cable Beach Caravan Park/shop in a cluster of four with 336 and 338. Once contiguous with CP47 and CP50 cut off by carpark, road and development.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
338	-17.935524°	122.213706°	CP50, CP47	Along Murray Road at the front of the Cable Beach Caravan Park/shop in a cluster of three with 336 and 337. Once contiguous with CP47 and CP50 cut off by carpark, road and development.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
339	-17.933292°	122.214626°	CP47, CP51	Along Koolama Drive in front of residential area. Once contiguous with CP51 but cut off from patch by residential development and old Crocodile Park.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
345	-17.924637°	122.214743°	CP55	Along Millington Road - separated from CP55 by road. On the Dureau block which has not been sufficiently surveyed.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Resident is aware of significance. In cooperation with resident, survey the remaining area within the Dureau block and identify *C.paractia* patches or remnant trees.

346	-17.923506°	122.215984°	CP55	May have been connected to CP55 or part of another distinct patch however residential and tourist development have fragmented. More *C. paractia* may be present within the Dureau block (not mapped- excepting 345 and 346, 347 and 348 on the fenceline.)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Resident is aware of significance. In cooperation with resident, survey the remaining area within the Dureau block and identify *C.paractia* patches or remnant trees.
347	-17.923412°	122.215959°	CP55	May have been connected to CP55 or part of another distinct patch however residential and tourist development have fragmented. More *C. paractia* may be present within the Dureau block (not mapped- excepting 345 and 346, 347 and 348 on the fenceline.)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Resident is aware of significance. In cooperation with resident, survey the remaining area within the Dureau block and identify *C.paractia* patches or remnant trees.
348	-17.923233°	122.215874°		May have been connected to CP55 or part of another distinct patch however residential and tourist development have fragmented. More *C. paractia* may be present within the Dureau block (not mapped- excepting 345 and 346, 347 and 348 on the fenceline.)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Resident is aware of significance. In cooperation with resident, survey the remaining area within the Dureau block and identify *C.paractia* patches or remnant trees.
349	-17.922183°	122.216806°		Utilised as a shade tree in small park behind residence, along Frangipani Drive.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree.
352	-17.924462°	122.218556°		Along Lullfitz Drive on front verge of Tarangau Caravan park in a cluster of 4 (352, 353, 354, 355)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
353	-17.924423°	122.218556°		Along Lullfitz Drive on front verge of Tarangau Caravan park in a cluster of 4 (352, 353, 354, 355)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
354	-17.924375°	122.218550°		Along Lullfitz Drive on front verge of Tarangau Caravan park in a cluster of 4 (352, 353, 354, 355)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
355	-17.924351°	122.218548°		Along Lullfitz Drive on front verge of Tarangau Caravan park in a cluster of 4 (352, 353, 354, 355)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
387	-17.913656°	122.222567°		Along track to residence off Lulfitz Drive. Disconnected from CP58 by Lullfitz Drive.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree. Inform resident/tenant.
430	-17.983862°	122.192879°	CP11, CP 13	Within Minyjuru 4. On Kavite Road verge. Once a part of CP11 but fragmented due to Kavite Road construction.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening.

500	-17.979823°	122.184764°	CP15, CP38	Kavite Road verge, coastal side, next to parallel vehicle track.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or track re-alignment.
501	-17.976931°	122.179804°	CP39, CP38	Kavite Road verge, eastern side. Closer to the Turf Club stables than defined patch.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or track re-alignment. Inform Turf Club of significance.
502	-17.975338°	122.179080°	CP39	Present within verge between Kavite Road and Ganthueme Point Lighthouse carpark.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or carpark realignment.
503	-17.975287°	122.179146°	CP39	Present within verge between Kavite Road and Ganthueme Point Lighthouse carpark.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or carpark realignment.
504	-17.975223°	122.178891°	CP39	Present within verge between Kavite Road and Ganthueme Point Lighthouse carpark.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or carpark realignment.
505	-17.975183°	122.178835°	CP39	Present within verge between Kavite Road and Ganthueme Point Lighthouse carpark.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening or carpark realignment.
506	-17.974761°	122.178737°	CP39	Present within verge between Kavite Road and Ganthueme Point Lighthouse carpark and the Ganthueme point cliffs.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future track realignment.
507	-17.975094°	122.179998°	CP39, CP38	Kavite Road verge, southern side. Closer to the Turf Club stables and other remnant trees near lighthouse carpark than defined patch.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform Turf Club of significance.
511	-17.991162°	122.205835°	CP16	Front driveway of stockyards	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform Stock Yards of significance.
583	-17.971311°	122.232326°	CP31	In front of DPaW building in Herbert St. This specimen has three trunks and is the type specimen for *Corymbia paractia.*	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform DPaW of significance.
584	-17.971453°	122.232281°	CP31	In front of DPaW building (near gate) in Herbert St.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road

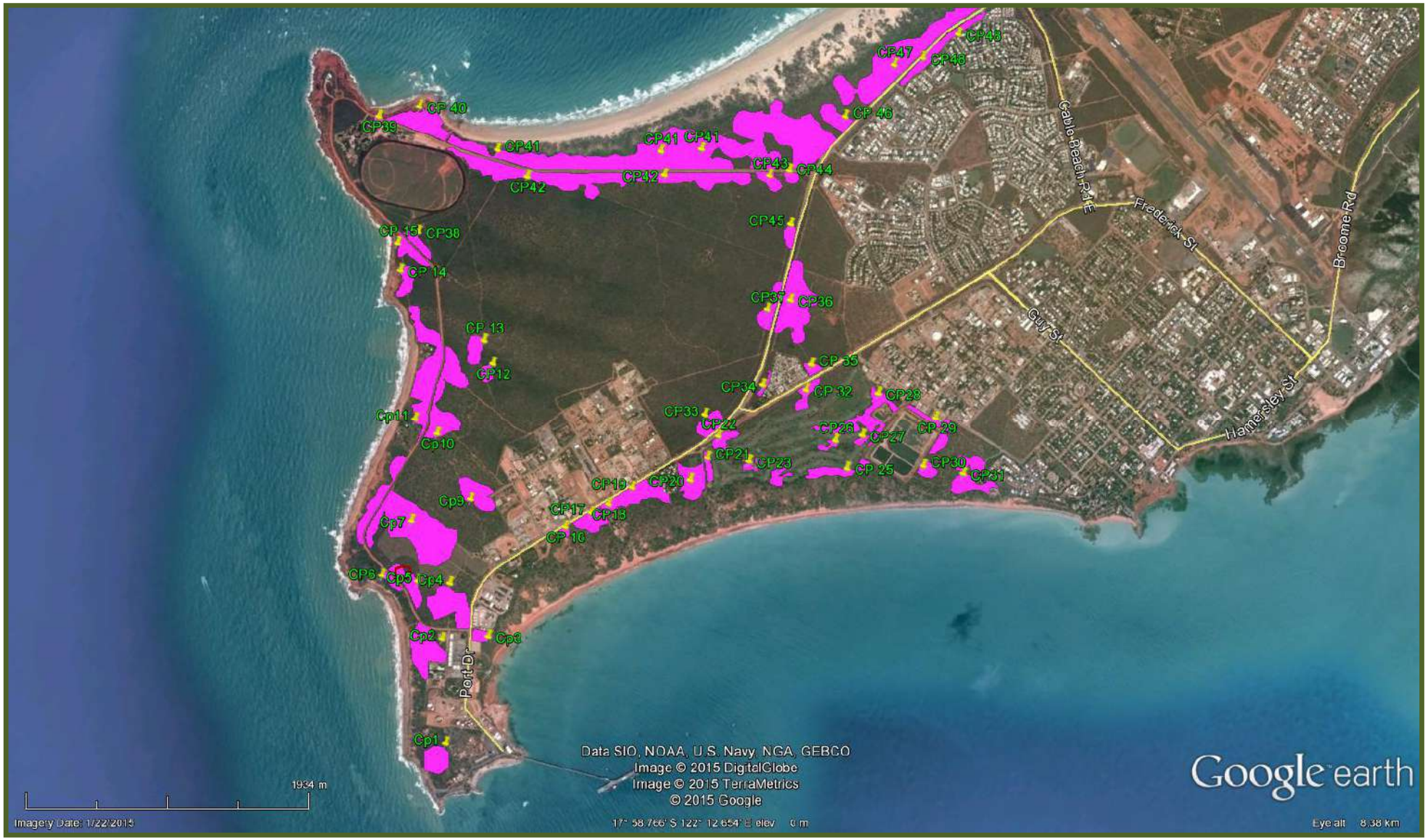
					widening. Inform DPaW of significance.
585	-17.970695°	122.232165°	CP31	In front of caravan overflow area in Herbert St/Robert St corner.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform PCYC of significance.
586	-17.970576°	122.232217°	CP31	In front of caravan overflow area in Herbert St/Robert St corner.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform PCYC of significance.
587	-17.970767°	122.232330°	CP31	In front of DPaW building in Herbert St.	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any future road widening. Inform DPaW of significance.
589	-17.971593°	122.222278°	CP29	Next to industrial building (near Kim Furnishings on Clementson St, on drainway)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any drain works.
590	-17.971746°	122.222302°	CP29	Next to industrial building (behind Kim Furnishings on Clementson st, on drainway)	Add to Shire Significant Tree Register to avoid un-witting clearance of this significant tree during any drain works.
757	-17.978659°	122.217434°	CP24, CP25, CP26	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
748	-17.978148°	122.218179°	CP24, CP25, CP26	Stand-alone remnant tree within the golfcourse fairway.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
809	-17.981793°	122.213333°	CP21, CP22, CP23	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
819	-17.980041°	122.215173°	CP23, CP24	Within a modified vegetation island surrounded by golf course fairways. Next 820	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen

					to avoid the long term impacts from over-nutrification.
820	-17.980062°	122.215213°	CP23, CP24	Within a modified vegetation island surrounded by golf course fairways. Next 819	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
821	-17.980467°	122.215298°	CP23, CP24	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
847	-17.978181°	122.214646°	CP22, CP23, CP24	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
847	-17.974002°	122.218056°	CP28, CP32	Golf course fairway separates this tree from CP28	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
848	-17.978757°	122.214501°	CP22, CP23, CP24	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
849	-17.980121°	122.213470°	CP23, CP22	Within a modified vegetation island surrounded by golf course fairways and vehicle tracks. Next to 850	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
850	-17.980175°	122.213430°	CP23, CP22	Within a modified vegetation island surrounded by golf course fairways and vehicle tracks. Next to 849	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
859	-17.981230°	122.212188°	CP21,	Within a modified vegetation island surrounded by golf course	Add to Shire Significant Tree Register to avoid un-witting

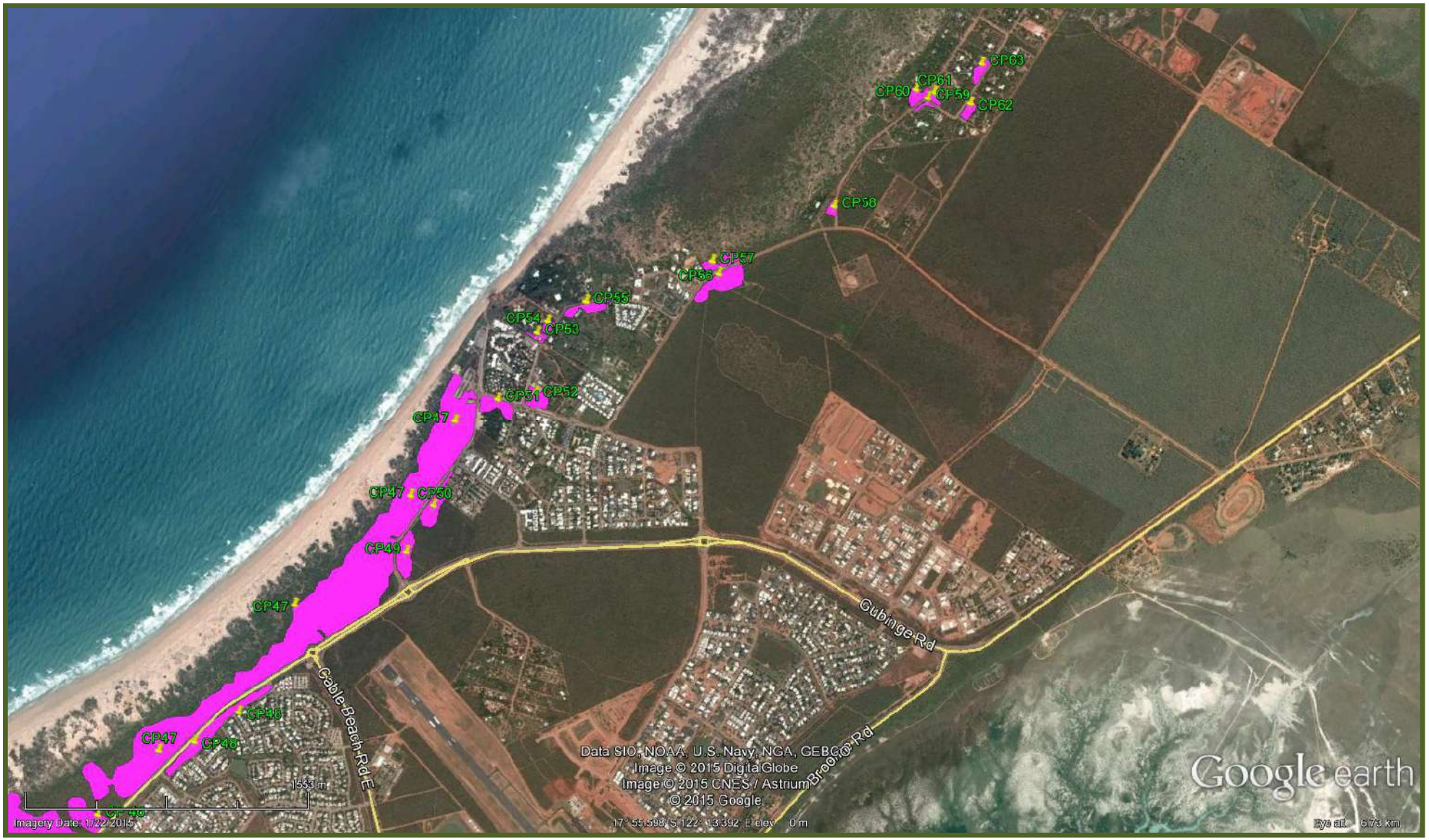
			CP22, CP23	fairways.	clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
860	-17.981283°	122.212299°	CP21, CP22, CP23	Within a modified vegetation island surrounded by golf course fairways.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree. Golf course managers should be advised to keep the irrigation of treated sewage water away from this specimen to avoid the long term impacts from over-nutrification.
870	-17.965707°	122.207650°	CP42, CP43, CP 44, CP45	Approximately 140m from CP44	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree.
884	-17.968588°	122.204745°	CP42, CP43, CP 44, CP45	Alongside track. Approximately 240m from CP42	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree through the realignment of informal track.
889	-17.975746°	122.182719°	CP39	Within turf club grounds	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree
1828	-17.931544°	122.211174°	CP47, CP51	Cut off from CP47. Is present within the surf club carpark	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree during modification or maintenance of the carpark.
1829	-17.931539°	122.211369°	CP47, CP51	Cut off from CP47. Is present within the surf club carpark	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree during modification or maintenance of the carpark.
1866	-17.933480°	122.213084°	CP47, CP51	Along Cable Beach Road West close to the old Crocodile park carpark. Once contiguous with CP 47 and CP51 but cut off from patch by road and development of crocodile park.	Add to Shire Significant Tree Register to avoid un-witting clearance or damage to this significant tree during re-development of the old Crocodile Park. Inform landowner.
Total no of Remnant Trees:		**55**			

Map 1.0 shows *C. paractia* patches Cp 1 - Cp63 (in pink) and the position of the quadrats (P1-P4) as green squares positioned at the corners of each quadrat.

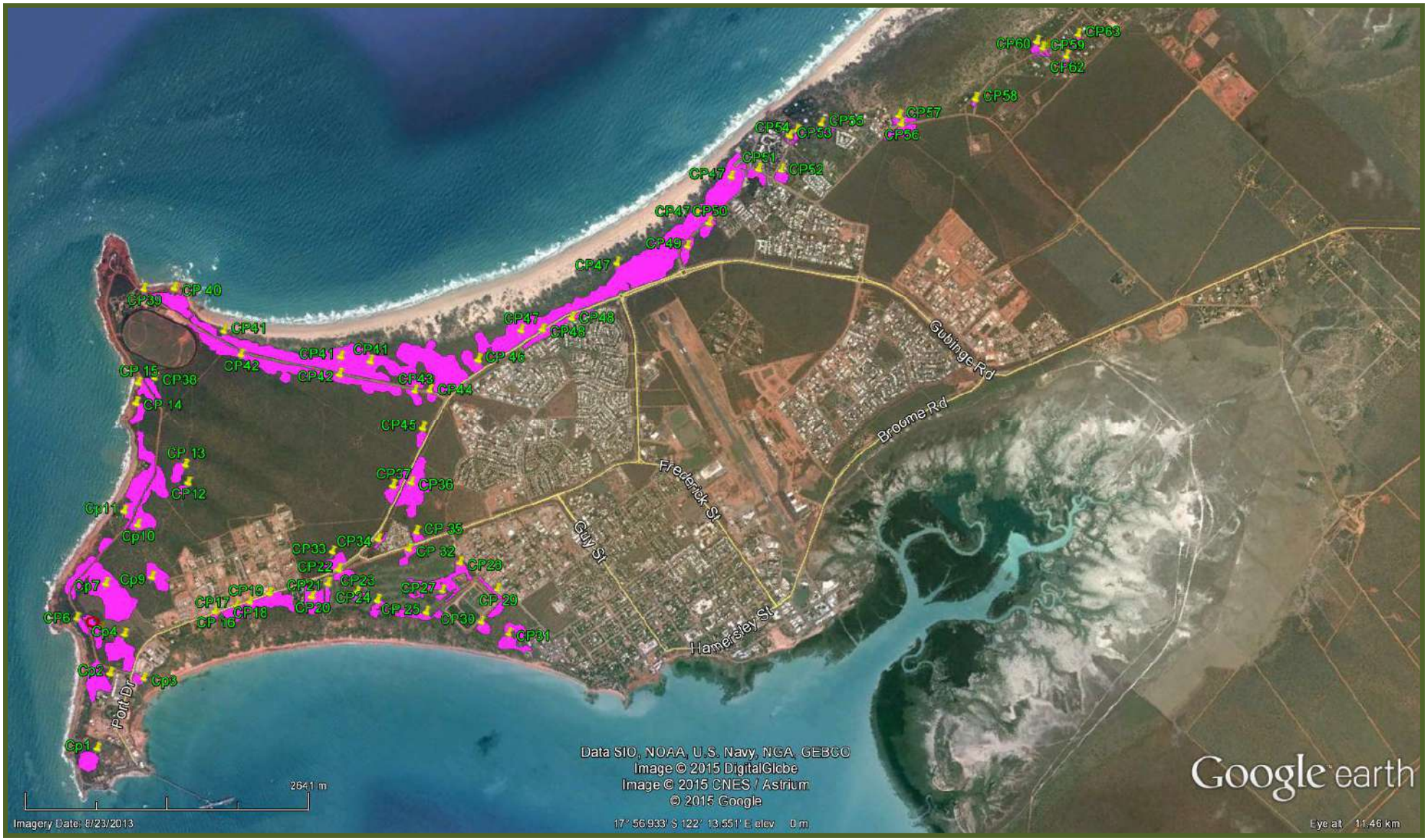
Map 1.1 shows *C. paractia* patches in the southern Broome Peninsula Cp 1 - Cp48 (in pink).



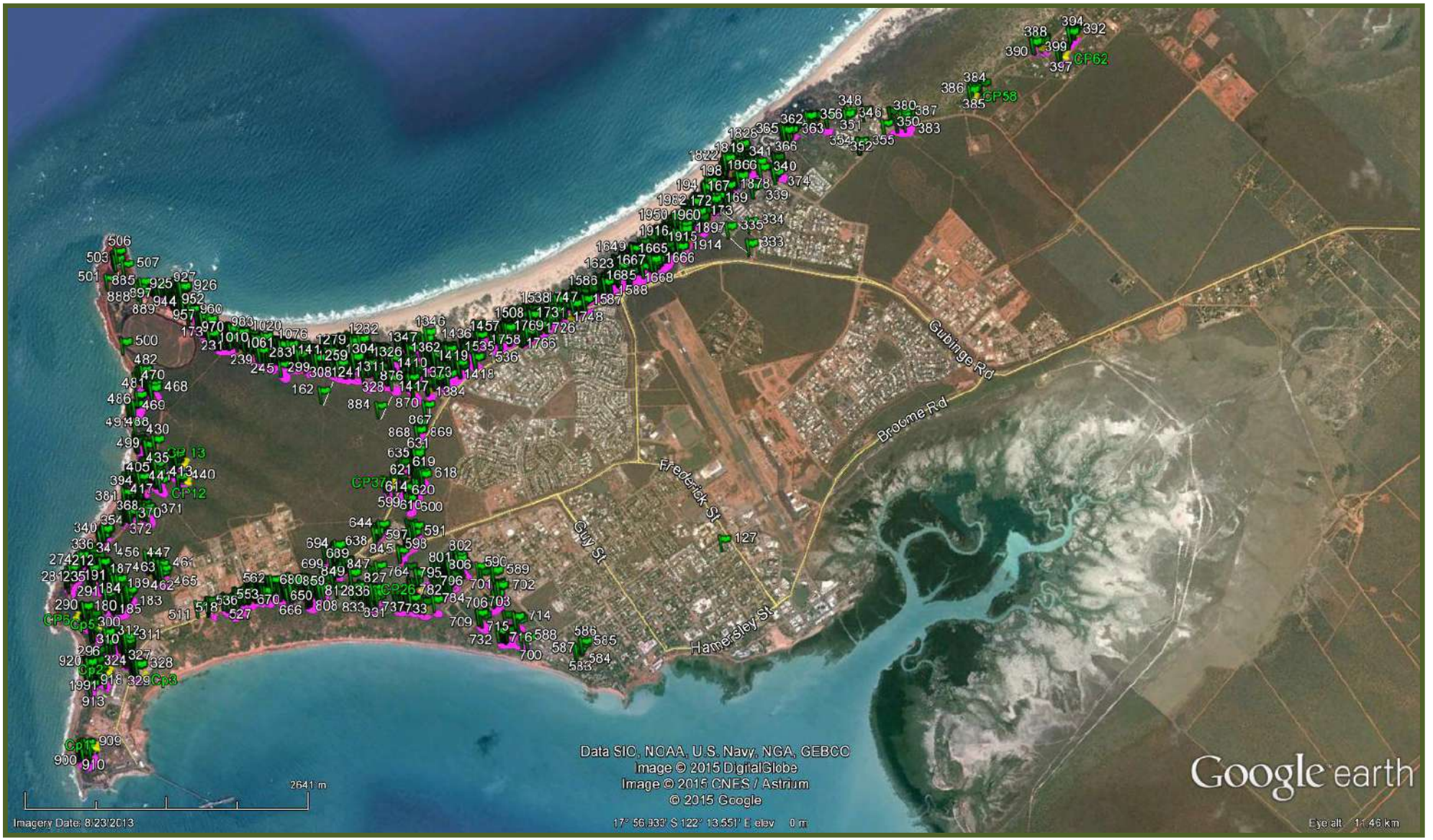
Map 1.2 shows *C. paractia* patches in the northern Broome Peninsula Cp 47 - Cp63 (in pink).



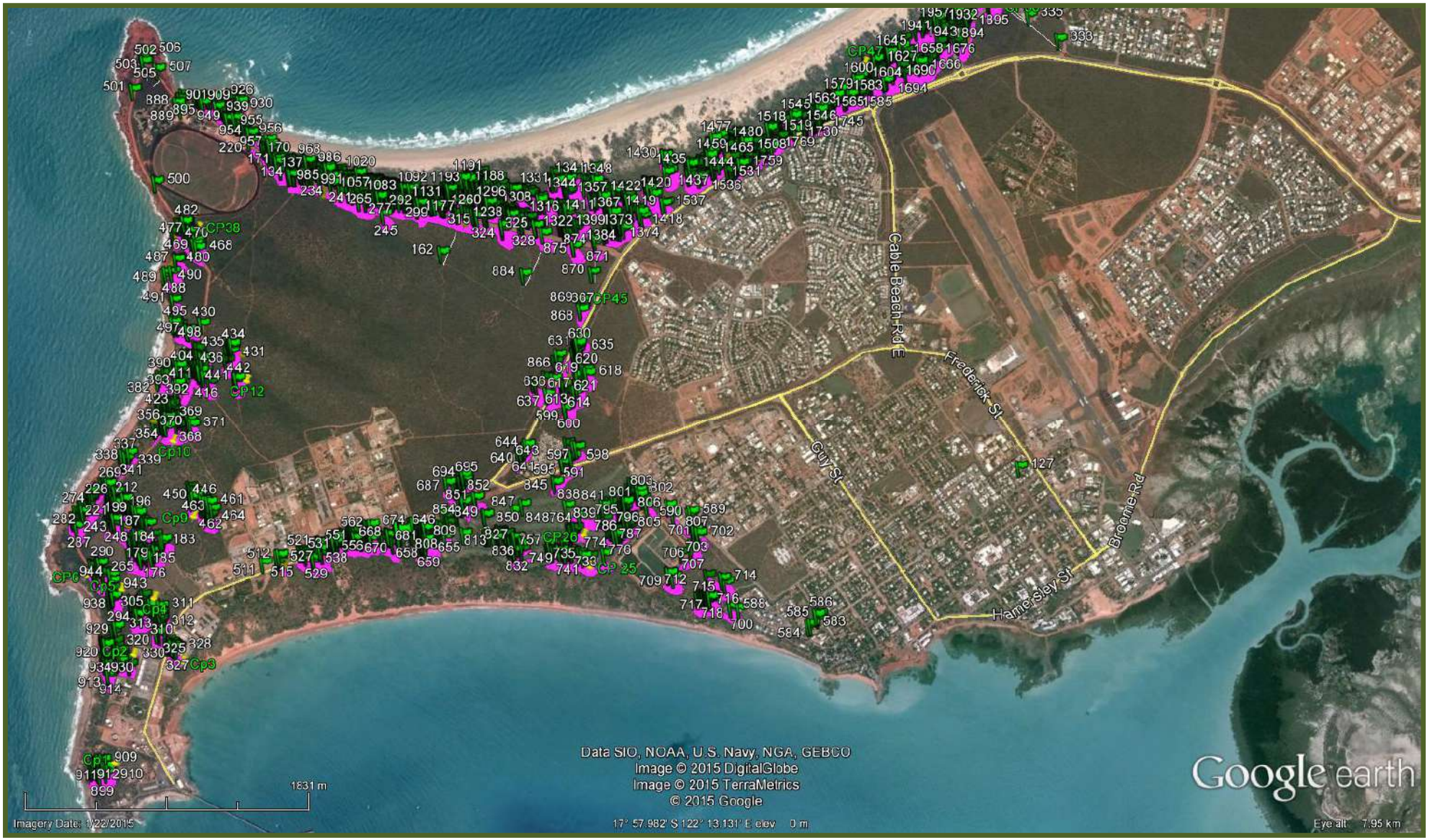
Map 1.3 shows an overview of all the *C. paractia* patches across the Broome Peninsula Cp 1 - Cp63 (in pink)



Map 1.4 shows the data points for each *C. paractia* specimen (numbered green flags) mapped within patches Cp1-Cp63 and as outlier remnant trees.

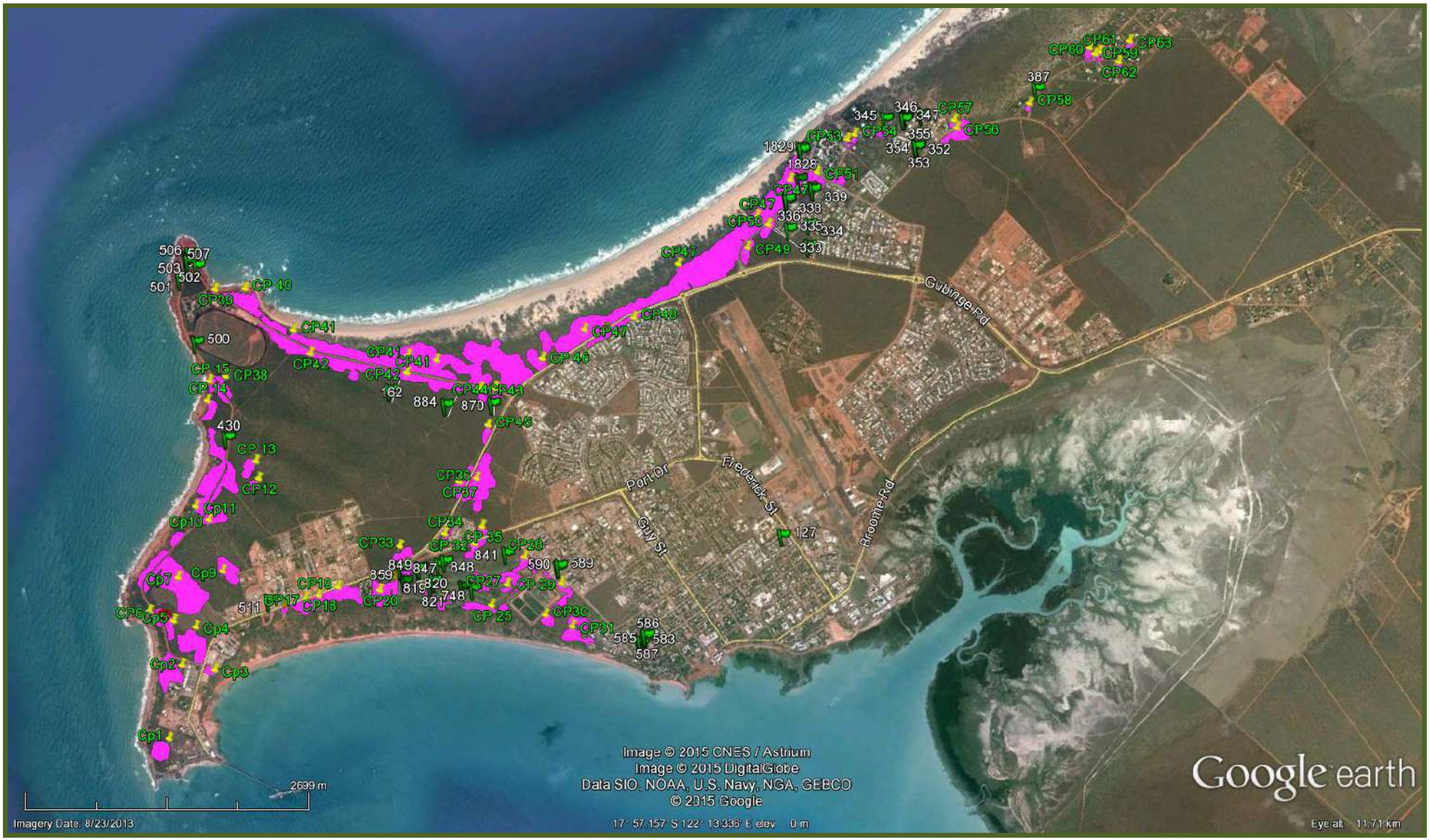


Map 1.5 shows the data points for each *C. paractia* specimen (numbered green flags) mapped within the southern Broome Peninsula (patches Cp1-Cp47) and as remnant trees.

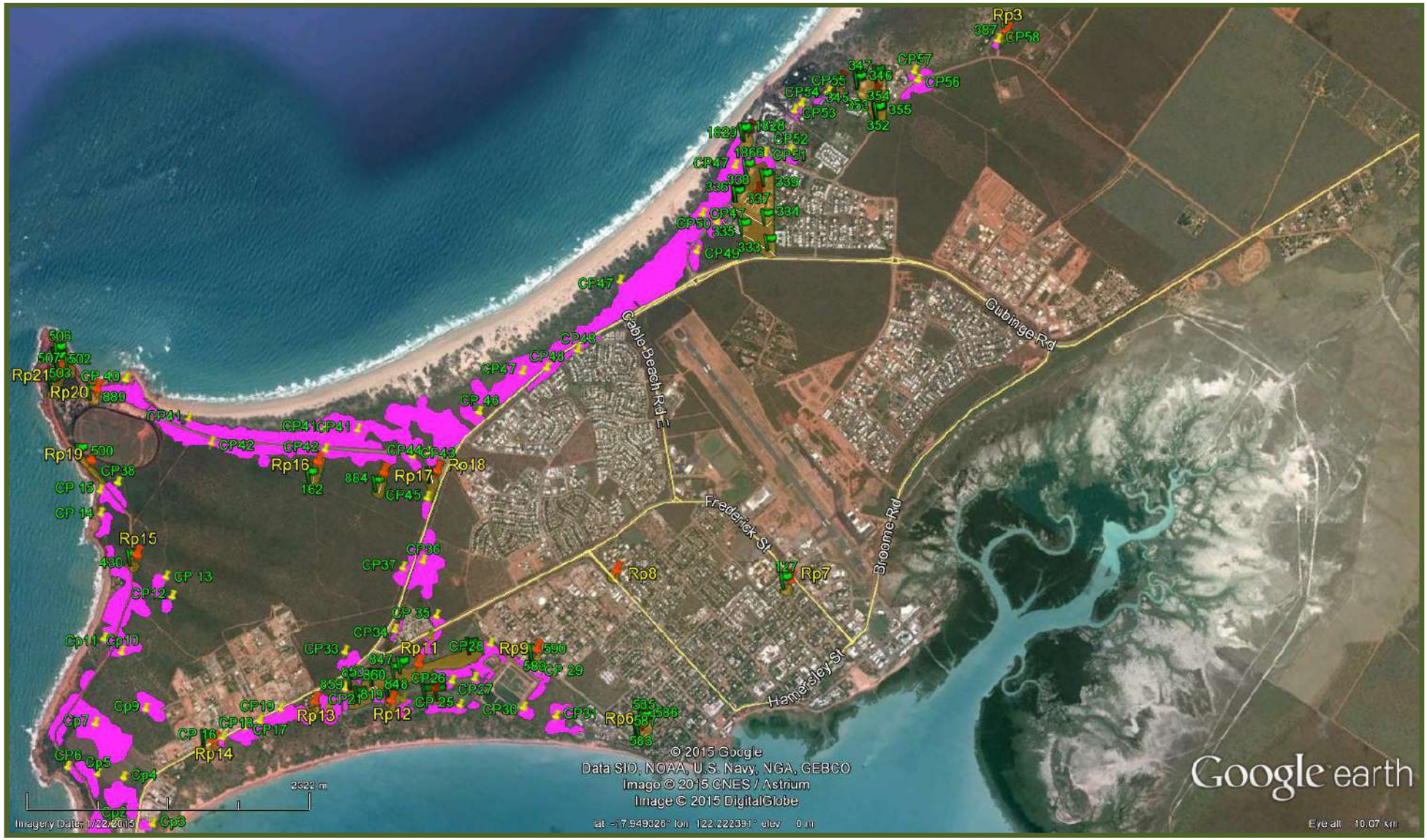


Map 1.6 shows data points for each *C. paractia* specimen (numbered green flags) mapped within the northern portion of the Peninsula (patches Cp47-Cp63) and as remnant trees.

Map 1.7 shows data points for remnant trees (as white numbered green flags) mapped outside of Cp1-Cp63 patches (green labels, pink patches).



Map 1.8 shows *C paractia* patches in the southern peninsula (in pink), the conservative historical (now cleared) estimate Rp 1-21 (in faded orange) and outlier remnant trees (numbered green flags).



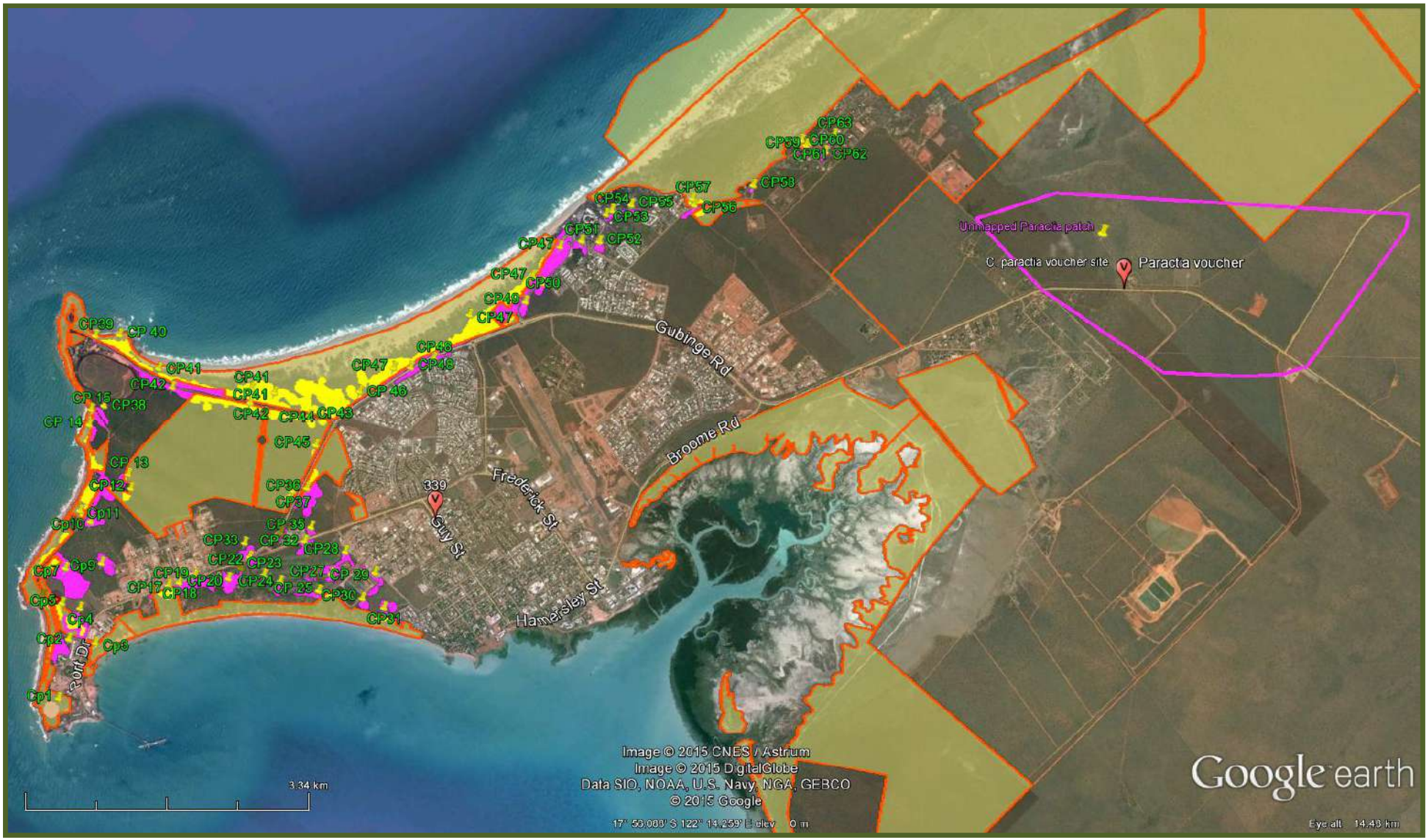
Map 1.9 shows the conservative historical (now cleared) estimate of *C. paractia* Rp1-21 (in faded orange) totaling 68.5 hectares

Table 1.5 shows the estimated area of the historical *C. paractia* patches as conservatively estimated by the authors using the proximity of remnant outlier trees.

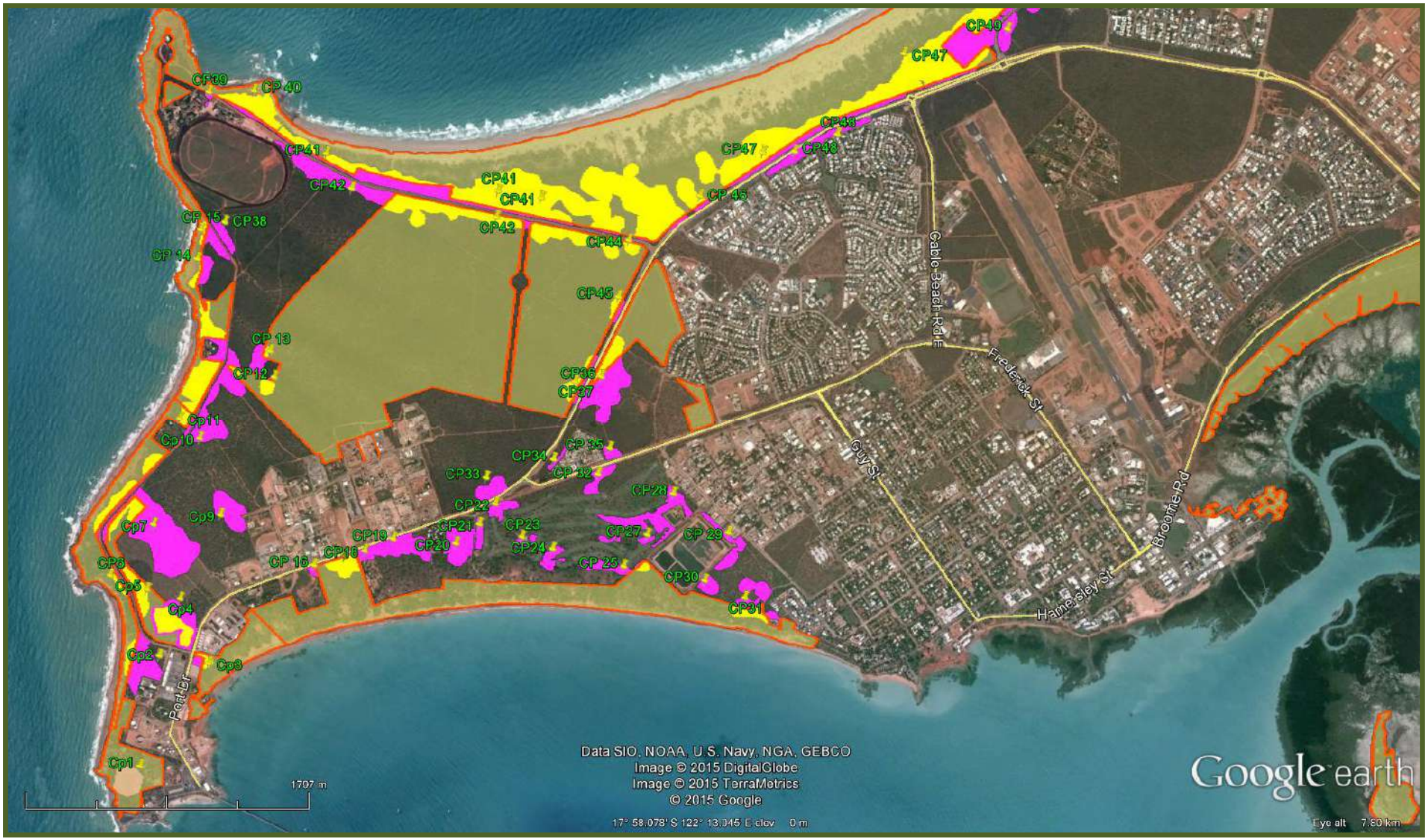
Remnant patch number	Hectares
Rp1	19.4
Rp2	6.93
Rp3	0.97
Rp4	0.63
Rp5	1.28
Rp6	1.81
Rp7	0.76
Rp8	0.8
Rp9	1.1
Rp10	1.44
Rp11	14.5
Rp12	1.49
Rp13	1.1
Rp14	1.27
Rp15	0.79
Rp16	2.51
Rp17	2.29
Rp18	2.86
Rp19	1.26
Rp20	0.85
Rp21	4.46
TOTAL Estimate	68.5 ha

Map 2.0 shows *C. paractia* patches (filled in pink), the three voucher sites (red "v" balloons) and a site known to contain *C.paractia* but remaining unmapped (outlined in pink).

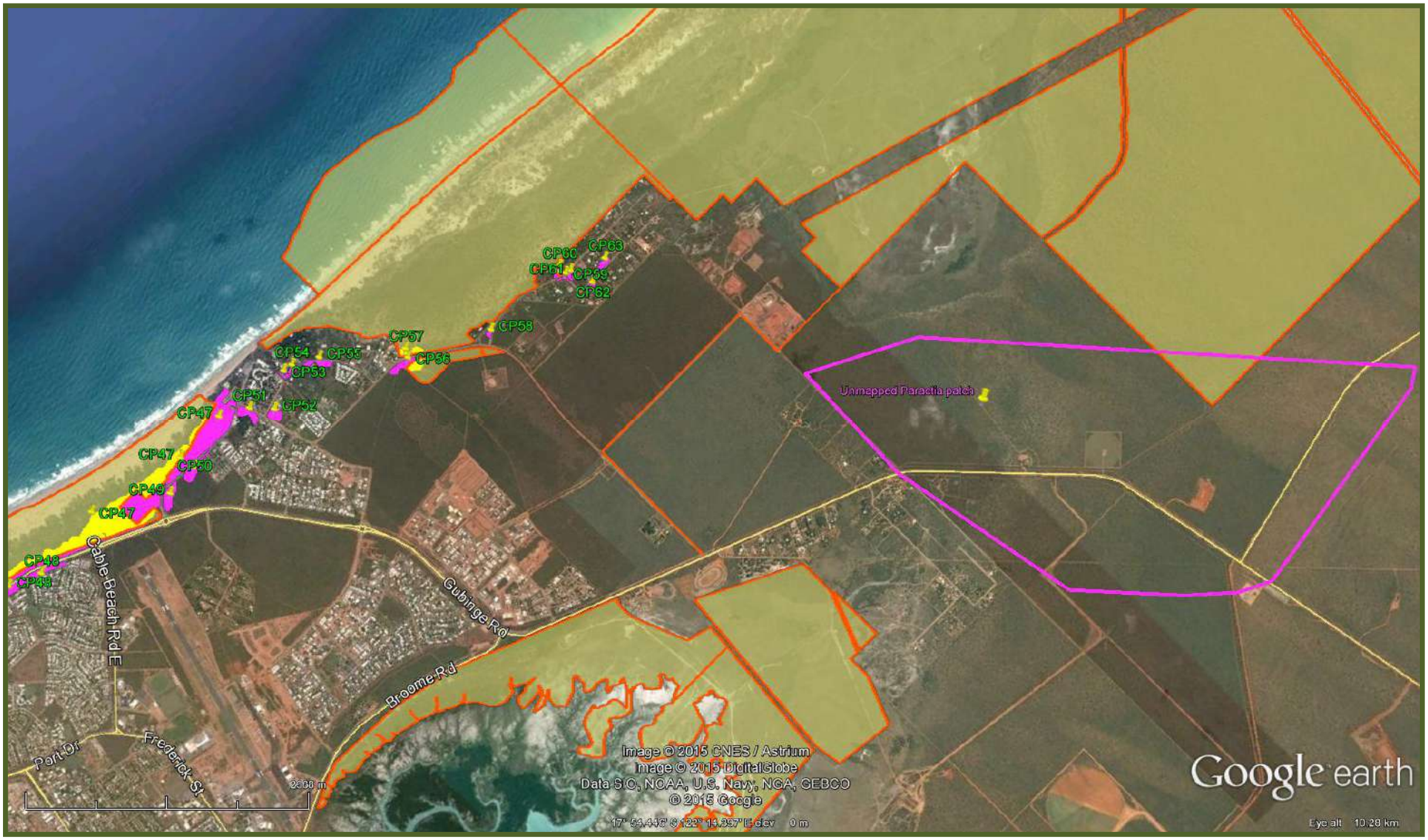
Map 2.1 shows an overview of all the *C. paractia* patches across the Broome Peninsula Cp 1 - Cp63 (in pink) the Yawuru Conservation Park (opaque yellow) and areas within the conservation park (filled yellow). The area known to contain *C. paractia,* but not yet mapped is outlined in pink.



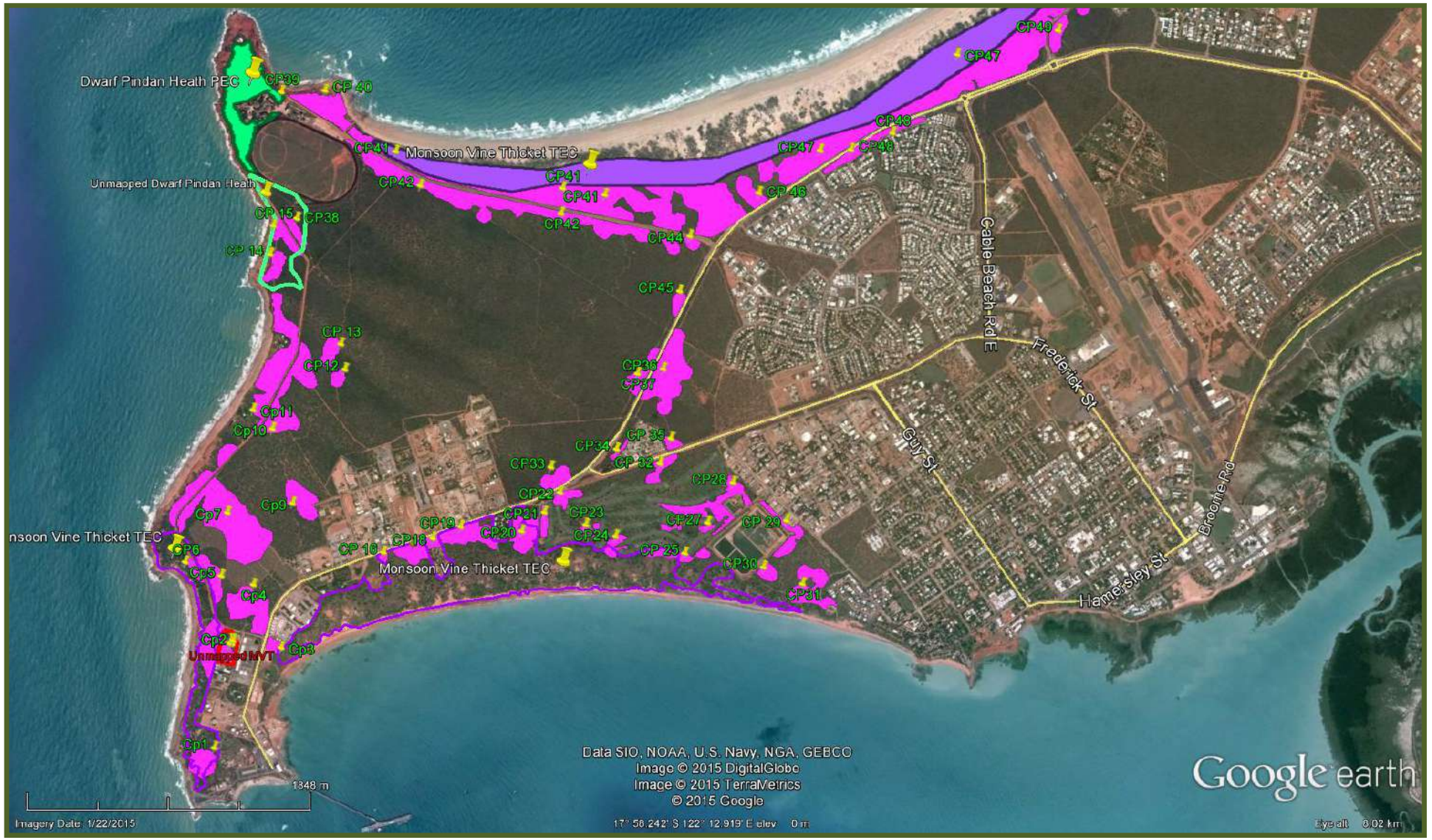
Map 2.2 shows the *C paractia* patches across the Southern Broome Peninsula Cp 1 - Cp47 (in pink) the Yawuru Conservation Park (opaque yellow) and areas within the conservation park (filled yellow).



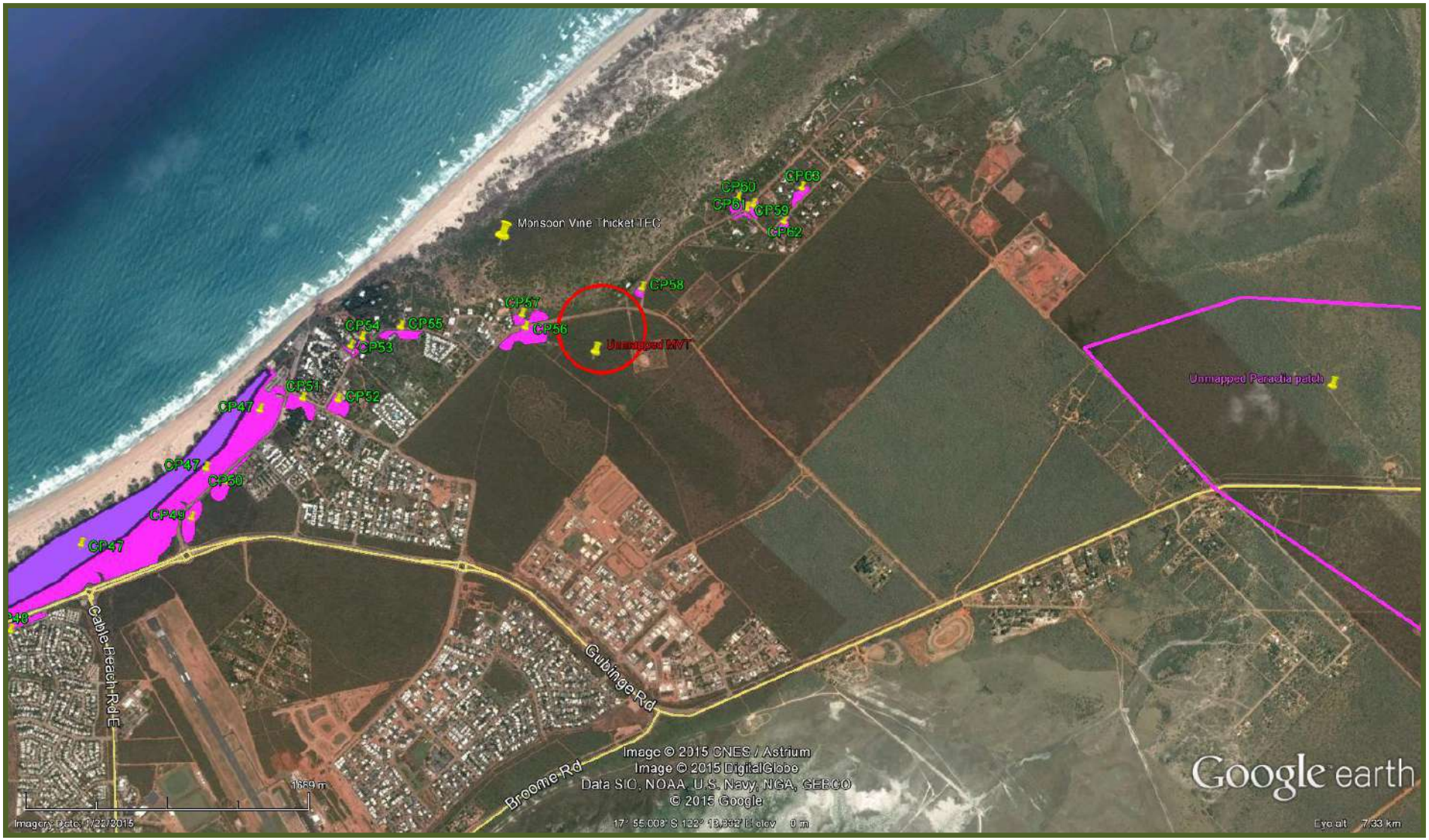
Map 2.3 shows the *C paractia* patches across the Southern Broome Peninsula Cp 47-63 (in pink) the Yawuru Conservation Park (opaque yellow) and areas within the conservation park (filled yellow). The unsurveyed *C. paractia* area is outlined in pink.



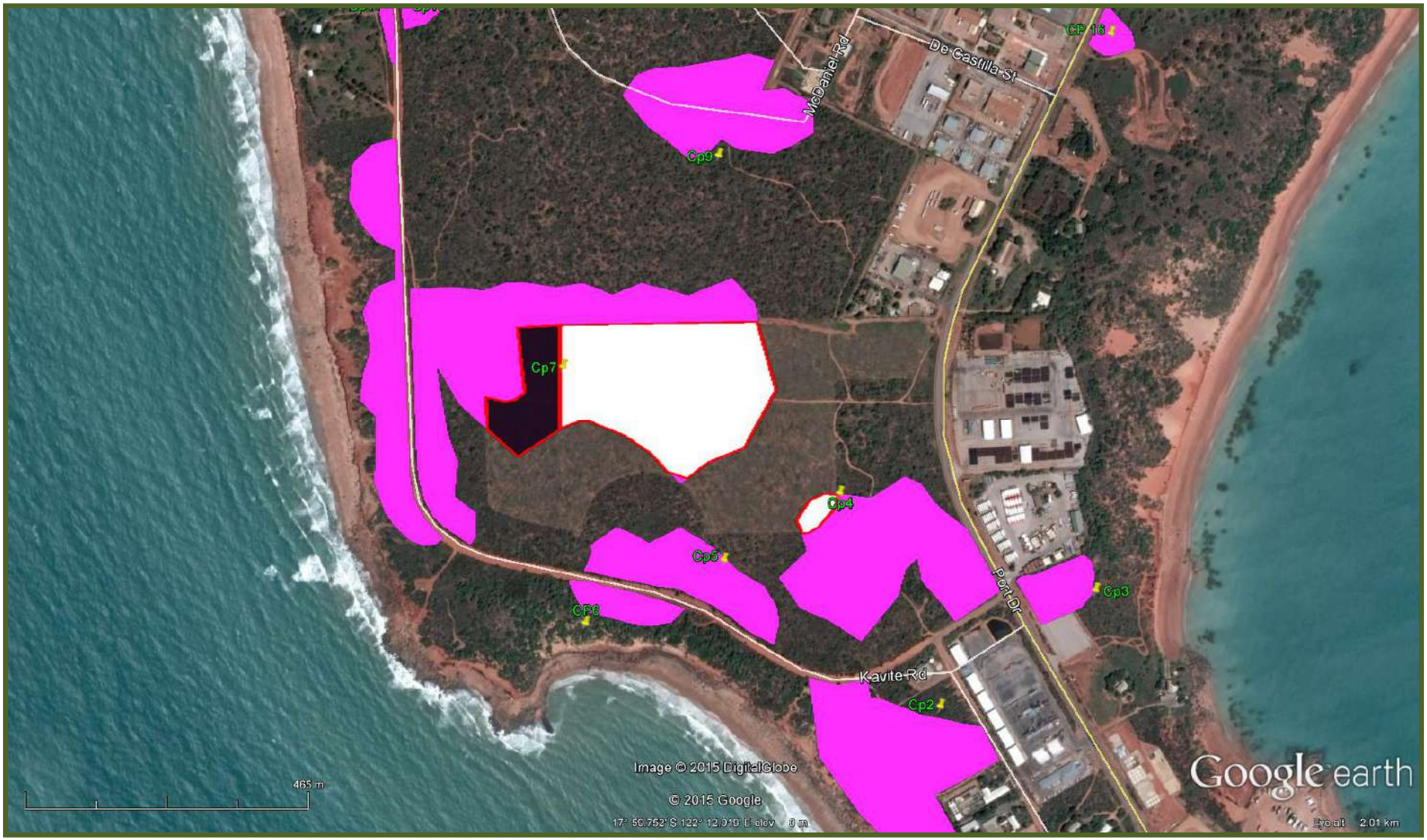
Map 2.4 shows an overview of all the *C paractia* patches across southern Broome Peninsula Cp 1 - Cp47 (in pink) Dwarf Pindan Heath (mapped - filled green; unmapped - outlined green), Monsoon Vine Thicket (Registered- filled purple, mapped 2014 - outlined purple, unmapped - red).



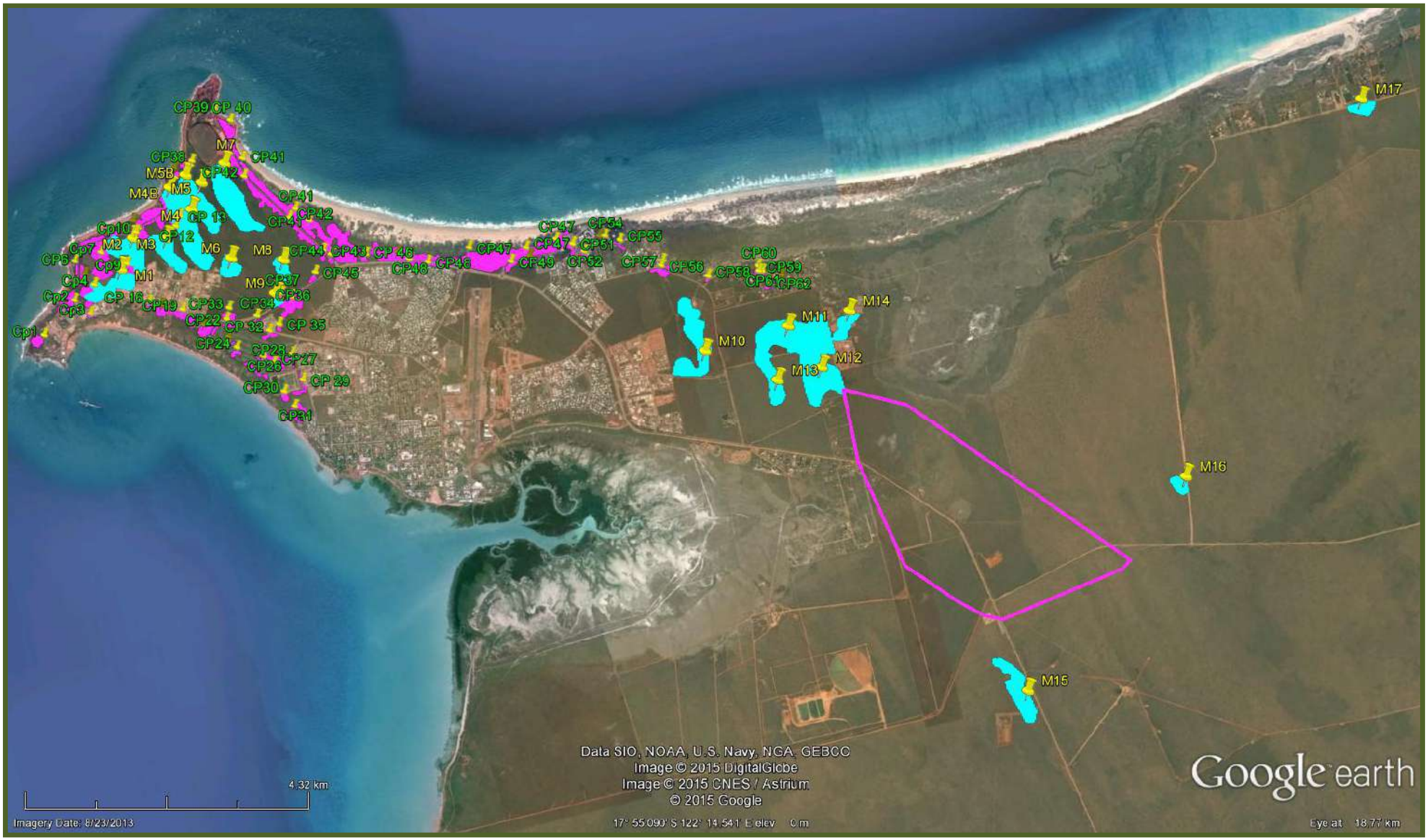
Map 2.5 shows an overview of all the *C paractia* patches across Northern Broome Peninsula Cp 47 - Cp63 (mapped - filled in pink, unmapped - outlined in pink), Monsoon Vine Thicket (Registered- filled purple, mapped 2014 - outlined purple, unmapped - red).



Map 2.6 shows a close up of the areas of *C. paractia* that were cleared in 2014(outlined in red). The areas within CP7 and CP4 that were cleared under permit no. CPS 3104/5 are shown as solid white block outlined in red. The area within CP7 that was subject to overclearing outside of the permitted area is shown as black and outlined in red.

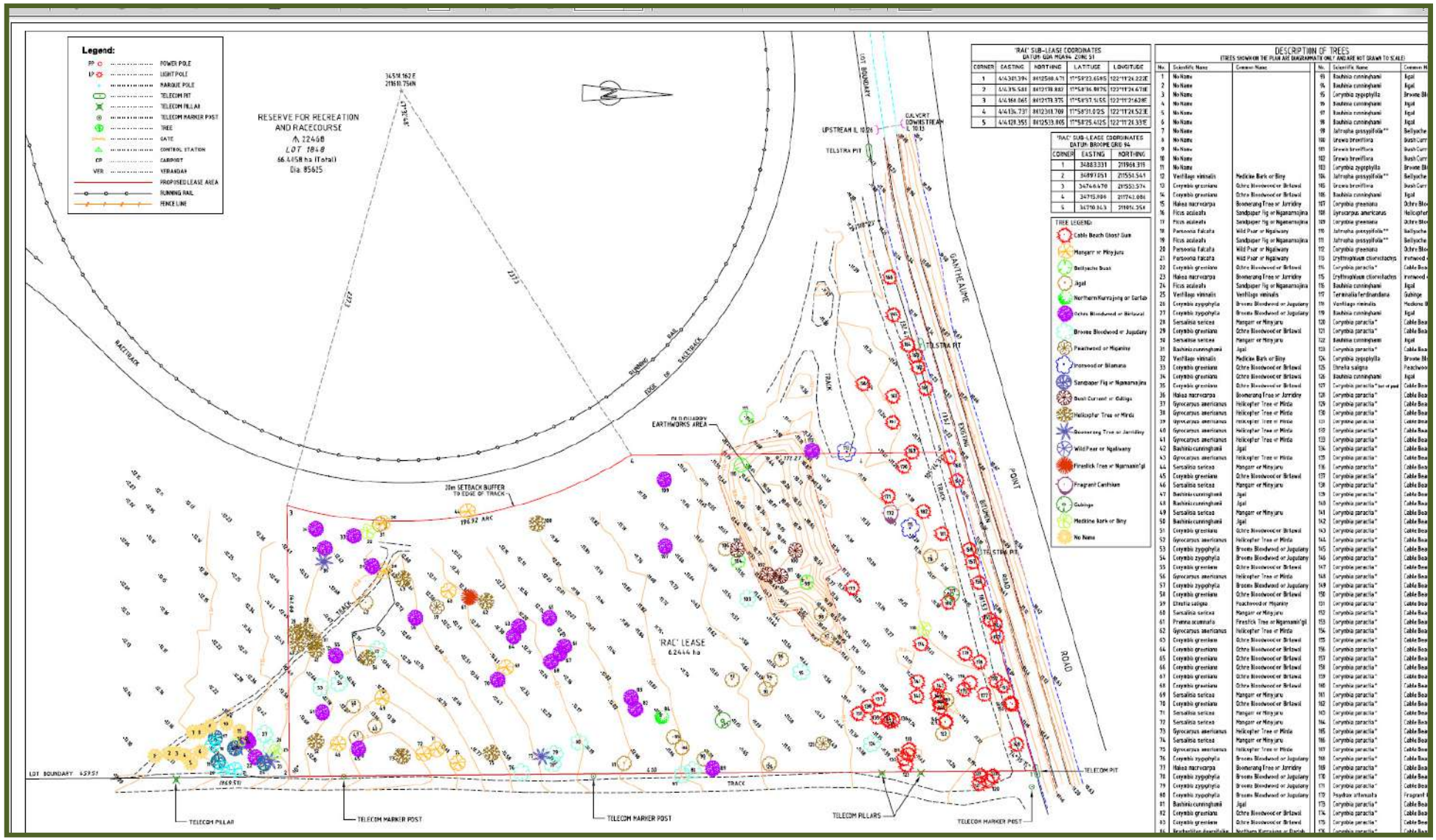


Map 2.7 shows a close up of the areas of *C. paractia* patches (Cp1 - Cp63) in pink and Minyjuru patches (M1-17) in blue and the unsurveyed *C.paractia* patch (outlined in pink).



Map 2.8 shows a close up of the areas of *C. paractia* patches (Cp1 - Cp63) in pink and Minyjuru patches (M1-17) in blue and the unsurveyed Paractia patch (outlined in pink) and the location of the *Corymbia flavescens* and *Corymbia paractia* vouchers (shown as red "v" balloons).

Map 2.9 is an extract of the map of *C. paractia* (and other) trees within the proposed Wilderness Retreat as provided by Willing in his short report to Northwest Property Consultants (2014)



4.1 Quadrat Data

To assess the variation of the habitat, 4 localities were subject to a detailed quadrat sampling effort. Below in Table 1.6 is a quick view comparison of the four 50m x50m quadrats sampled within *C.paractia* habitat within the Broome townsite. Maps 1.0 shows the location of the sampling quadrats. The raw data collected is provided in Appendix 1. See section 5.2 for the discussion of the results.

Quadrat No.	Minyjuru patch overlap	Bush Forever Score	Fauna observed	Indigenous species	Dominant native species cover	Weed species	Time since last fire	Threats	Notes
P1	CP17	Good	Black Kite Diamond Dove No termite mounds	42	*Triodia schinzii (30%)* *Waltheria indica (8%)* *Corymbia paractia (3%)*	4 *Antigonon leptopus* *Azadirachta indica* *Leucaena leucocephala* *Passiflora foetida*	No sign of recent fire	Weeds, Rubbish dumping Fire	Father Emo's track off Port Drive
P2	CP2	Very Good	Gilberts Dragon No termite mounds	33	*Triodia schinzii (10%)* *Acacia monitcola (8%)* *Gyrocarpus americanus (8%)*	1 *Passiflora foetida*	No sign of recent fire	Weeds, Rubbish dumping Off road driving Fire	Aquaculture Dune
P3	CP41	Very Good	Northern Blue-tongue Lizard Blue-winged Kookaburra Silver-crowned Friarbird No termite mounds	40	*Triodia schinzii (60%)* *Terminalia ferdinandiana (5%)* *Acacia colei (3%)* *Corymbia paractia (3%)*	3 *Aerva javanica* *Merremia dissecta* *Passiflora foetida*	Burnt 3-5 years ago	Weeds Fire	Minyirr Park
P4	CP56	Poor	Agile Wallaby, Red-collared Lorikeet Silver-crowned Friarbird Rainbow Bee-eater Little Corella No termite mounds	48	**Cenchrus ciliaris (60%)* *Flueggea virosa (5%)* *Bauhinia cunninghamii (3%)* *Gyrocarpus americanus (3%)* *Corymbia paractia (3%)*	9 *Aerva javanica* *Azadirachta indica* *Cenchrus ciliaris* *Clitoria ternatea* *Hyptis suaveolens* *Macroptilium atropurpureum* *Merremia dissecta* *Passiflora foetida* *Stylosanthes scabra*	Burnt 3-5 years ago	Weeds Rubbish dumping Proposed new road	Lullfitz Drive

Table 1.6 Comparative quadrat data

4.2 Other TECs and PECs

The Broome Peninsula is a wealth of diversity, rarity, ecological and cultural value. On the Peninsula exists one federally (EPBC Act, 1999) Endangered ecosystem, the Monsoon Vine Thickets of the Dampier Peninsula at their southern-most extent; the federally Vulnerable (EPBC Act, 1999) species-rich faunal community of the intertidal mudflats of Roebuck Bay; three state-listed (Priority 1) Priority Ecological Communities: Dwarf Pindan Heath, Minyjuru (Mangarr) on Relict Dunes and *Corymbia paractia* dominated community on dunes. None of the PECs had been extensively surveyed prior to this and the concurrent Minyjuru on Relict Dunes survey work. The extent of the Dwarf Pindan Heath remains only partially known, while there are still some small Monsoon Vine Thicket areas to be surveyed and mapped.

One Critically Endangered plant, *Keraudrenia exastia* has been extensively mapped in the Broome Peninsula, and is found overlapping CP4 and CP5. Other Declared Rare and Priority Flora and Fauna have also been found in the region, though not subject to extensive mapping. These data points can be accessed through the Department of Parks and Wildlife.

Maps 2.4, 2.5, 2.7 show the location of other TEC's and PEC in relation to the *C.paractia* PEC within the Broome Peninsula.

5.0 Observations and Discussions

This section examines some of the observations of fauna and flora made within the *Corymbia paractia* PEC during the survey work. It also briefly discusses the ecological role of the PEC in the wider landscape.

5.1 Fauna

Corymbia paractia trees with their creamy, white flowers in the period October-December are significant nectar sources for both native stingless bees *Trigona hockingsii*, and feral European bees *Apis mellifera*. The flowers are also seen to attract cockchafer beetles, known locally as "Christmas Beetles" (see cover photo).

At the same time Cicadas, **Liyirr** in Yawuru, emerge from their underground phase, often swarming up the white trunks of the *C. paractia* leaving attached their discarded brown pupa cases. After emergence, the cicadas move up into the tree crowns to begin their drumming and aerial life phase. Many fall victim to swooping Dollar Birds *Eurystomus orientalis* and Black-faced Cuckoo Shrikes *Coracina novaehollandiae.*

Nocturnal flying foxes *Pteropus alecto* and *P. scapulatus*, known as **Nimanburr** and **Ngalminyaminya** in Yawuru respectively, are also known to be important nectar seekers and probable pollinators of the *C. paractia* flowers. Large flying fox roosts are located close to Streeters Jetty in *Rhizophora* mangroves. Claw marks, attributed to Northern Brushtail or **Langkurr** in Yawuru, Possums *Trichosaurus arnhemensis*, are sometimes seen on the bark of *C. paractia* trees. This suggests that the flowers and leaves are sought out by them for food.

The flowers are also noted nectar sources for a range of local bird species eg. Red-collared Lorikeets *Trichoglossus rubritorquis*, Silver-crowned Friarbirds *Philemon argenticeps*, and Brown Honeyeaters or **Jilygily** *Lichmera indistincta.* Because of their emergent crowns, Blue-winged Kookaburras or **Jawarrjawarr** *Dacelo leachii,* frequently use Cable Beach Ghost Gums as lookouts and territory markers.

Mature trees occasionally feature branch or stem hollows, sometimes the result of termite attack, which provide refuge for Goannas *Varanus spp.,* Frill-necked Lizards **Gulamana** *Chlamydosaurus kingii* and Barking Owls *Ninox connivens,* with the latter nesting there.

Bark plates, especially around the base of trees, often support skinks such as *Carlia* and *Lerista* spp. and geckos *Diplodactylus* and *Oedura* spp.

5.2 Flora

This survey strongly endorses Trudgen's (1988) finding that *C. paractia* is closely associated with four key habitats. (See 2.4)

A) Monsoon Vine Thicket

Typical associates include Dune Wattle (*Acacia bivenosa*), Bush Currant (*Grewia breviflora*), Goowal (*Flueggea virosa*) as shrubs over Feathertop Spinifex (*Triodia schinzii*).

B) Gubinge Woodlands

Typical associates include Gubinge Tree (*Terminalia ferdinandiana*) and Minyjuru (*Sersalisia sericea*) over Feathertop Spinifex (*Triodia schinzii*).

C) Pindan

Typical associates include Ochre Bloodwood (*Corymbia greeniana*), Broome Bloodwood (*C. zygophylla*), Soap Bush (*Acacia colei*), several *Hakea* spp. over Feathertop Spinifex (*Triodia schinzii*).

D) Dwarf Pindan Heath

Typical associates include Wongai Wattle (*Acacia tumida* var. *kulparn*) with Caustic Bush (*Grevillea pyramidalis*) as shrubs over a hummock grassland of Feathertop Spinifex (*Triodia schinzii*) with *Eriachne sp.* and Woolybutt Grass *Eragrostis eripoda.*

Furthermore Cp4 and Cp5 overlap with the DRF (EPBC-listed) *Keraudrenia exastia* adjacent to the Port of Broome.

Analysis of the quadrat data (see Table 1.6 and Table 1.7) revealed that the anomalous dune community, sampled as P2, was significantly poorer in plant species (34) as compared to the other sites; P1 (46), P3 (56) and P4 (52). Where undisturbed, the Spinifex *Triodia schinzii* was invariably an important associate. The sedge *Cyperus conicus* was present on all quadrats, as was the climbing weed *Passiflora foetida.*

Quadrat	Location	Trees	Shrubs	Grasses	Sedges	Climbers	Herbs	Total sp.
P1	Port Drive	**9**	**12**	**5** (TS 30%)	**1**	**9**	**10**	**46**
P2	Aquaculture Dune	**9**	**6**	**3** (TS 10%)	Mistletoe **1** Sedges **1**	**5**	**9**	**34**
P3	Minyirr	**9**	**10**	**4** (TS 60%)	**1**	**11**	**21**	**56**
P4	Lullfitz Drive	**9**	**14**	**2** (Buffel 60%)	Mistletoe **1** Sedges **1**	**11**	**14**	**52**

Table 1.7 Compartive life forms across the *C. paractia* quadrats

Herbarium vouchers were collected for both *Corymbia flavescens* and *Corymbia paractia* as shown in Map 2.0 and submitted to the WA Herbarium (Perth).

Table 1.8 Herbarium vouchers for *Corymbia paractia* PEC survey near Broome: December 2013 - submitted by Tim Willing.

Waypoint	Species	Date	Sample	Description
WP 389	*Corymbia flavescens*	6th December 2013	Flowers	Crab Creek Road: 7km by road E from T Junction at 17°58' 33.82"S 122° 21' 16.29"E near pindan see cliff. 10m tri-trunked tree. Associates: *Tinospora smilacina,* Abrus precatorius, *Ehretia saligna, Grewia breviflora, Bauhinia cunninghamii*
WP 407 A, B, C, D	*Corymbia paractia*	6th December 2013	Flowerbuds	East side of Waterbank Homestead Road near Coconut Well at 17°51'04.87"S 122°13'48.42"E 9m tree
WP 425 A, B, C, D	*Corymbia paractia*	11 December 2013	Flowers and immature fruits	West side of Broome Highway, near OTC Building at 17°53'39.54"S 122°15'34.15"E 6.5m tree

6.0 Threats

In undertaking the survey and conditions assessment, the following threats have been identified in order of priority outlined below. Lack of clear understanding and recognition of this PEC by local government, developers and the public remains a significant issue.

6.1 Urban expansion/clearing

Clearing for urban expansion and industrial development is among the greatest past, future and current threats to this PEC. There is little doubt that this community has been little appreciated or well defined since Malcolm Trudgen's 1988 report, when it was identified as *Eucalyptus confertiflora.*

Fragmentation of *C. paractia* populations is a particular feature of the Broome Golf Course, where turf fairways alternate with linear strips of remnant bushland. The use of treated nutrient-enriched sewage water for irrigation throughout this area (CP 20, 21, 22, 23, 24, 25, 26, 27, 28 and 29) significantly enhances weed growth - especially of rampant climbers (*Macroptilium atropurpureum, Merremia* spp., *Passiflora foetida*) and seedlings of Neem Tree (*Azadirachta indica*). This is an area where there is little visible seedling recruitment of *C. paractia* populations.

Industrial development (especially for Browse Basin-associated laydown areas near Broome Port) was identified as a significant threat for populations CP2, 3 & 7).

As around half of the identified PEC within the township lies outside of designated conservation reserves, ongoing development can be expected to have considerable impact on the extent, connectivity and ecological processes associated with this PEC. The most secure population is undoubtedly that in Minyirr Park.

6.2 Weeds and Rubbish

Because *C. paractia*'s favoured habitat around the Broome Peninsula often focuses on low-lying swales and drainage basins, these habitats invariably function as weed hotspots. Wild Passionfruit *Passiflora foetida* was noted as the most common weed associate of the PEC. As many as nine weeds were recorded at Quadrat P4 in CP56. Four were climbers: Darwin Pea *Clitorea ternatea*, Siratro *Macroptilium atropurpureum*, Hairy Merremia *Merremia dissecta* and Wild Passionfruit *Passiflora foetida*. Four others were what might be termed "pastoral weeds" - Kapok Bush *Aerva javanica,* Buffel Grass *Cenchrus ciliaris*, Horehound *Hyptis suaveolens*, and Townsville Stylo *Stylosanthes scabra.* Finally, Neem Tree *Azadirachta indica*, whose fruits are spread by birds, is another frequent associate, rapidly invading many bushland habitats around Broome.

Table 1.9 shows the incidence of weeds across the patches Cp1-Cp63. The highest incidence weed is *Passiflora foetida* which is found across 59 patches. *Cenchrus ciliaris* is the next highest incidence and found across 27 patches. Weeds that are generally considered high threat weeds, including *Merremia dissecta, Azadirachta indica, Hyptis suaveolens, Macroptilium atropurpureum, Merremia aegyptia, Leucaena leucocephala* were found across between 22 and 10 patches. The remaining weeds, found across less than 7 patches and some only in one patch were generally considered low risk weeds excepting *Clitoria ternatea* and *Jatropha gossypifolia* which were found across 5 and 3 patches respectively.

Scientific Name	Common Name	Incidence of weed across Cp patches
Passiflora foetida	Passionfruit	**59**
Cenchrus ciliaris	Buffel Grass	**27**
Merremia dissecta	Hairy Merremia	**22**
Azadirachta indica	Neem Tree	**18**
Hyptis suaveolens	Mint Bush	**18**
Macroptilium atropurpureum	Siratro	**17**
Merremia aegyptia	Egyptian Merremia	**15**
Leucaena leucocephala	Coffee Bush	**10**
Stylosanthes hamata	Caribbean Stylo	**7**
Clitoria ternatea	Darwin Pea	**5**
Jatropha gossypifolia	Bellyache Bush	**3**
Aerva javanica	Kapok Bush	**2**
Anacardium occidentale	Cashew Tree	**2**
Antigonon leptopus	Mexican Rose	**2**
Calotropis procera	Rubber Bush	**1**
Chloris sp.	Windmill Grass	**1**
Delonix regia	Poinciana Tree	**1**
Gomphrena celosioides	Gomphrena Weed	**1**
Khaya senegalensis	African Mahogany	**1**
Senna occidentalis	Coffee Senna	**1**
Stachytarpheta cayennensis	Blue Snakeweed	**1**
Stylosanthes scabra	Tall Stylo	**1**
Ziziphus mauritiana	Taylorfruit	**1**

Table 1.9 Incidence of weeds across the *C. paractia* patches CP1-63.

Another serious threat to the PEC is casual rubbish dumping in coastal bushland facilitated by numerous tracks. Rubbish noted included car bodies (CP9) and was especially noticeable in the zone between the Sewage Ponds and DEMCO subdivision (CP30 and 31).

6.3 Fire

While *C. paractia* is adapted to periodic fires (as most Eucalypts), hot late season fires fanned by strong winds can burn out the trunks of mature trees. Individuals generally recover by suckering or from epicormic shoots beneath the bark.

As nearly all this PEC is located close to defacto coastal tracks, it is vulnerable to too frequent fires and arson, which are an increasing problem for Broome bushland generally.

6.4 Hydrological Changes

Because this community frequently occupies drainage basins and swales (ie: low -lying points in the landscape), it is often impacted by human modifications to drainage. For example, construction of drainage channels and sumps can redirect water away from areas, which were once subject to occasional seasonal flooding. Conversely, *C. paractia* is also capable of re-establishing in roadside sumps if engineers allow it to persist (Pic 2.5).

Drainage from residential subdivisions east of Gubinge Road entering Minyirr Park (CP 47) are the conduit for weed invasion eg. Harman Rd drain, from upstream gardens - 15 weeds were recorded here.

Pic 2.5 *C. paractia* in drainage sump at southern Minyirr Park **Photo: Willing.**

6.5 Coastal Erosion

Cliff erosion behind Reddell Beach is leading to slumping of pindan and loss of mallee-form *C. paractia* trees at CP11. See Pic 1.5.

With rising sea-levels, other near-coastal communities (eg CP1, 2, 14, 15, 40) are likely to be threatened in the longer term.

7.0 Recommendations

1) A major belt of scattered *C. paractia* trees which form an inland savannah woodland extends from the east side of the Broome Tip, up the western side of the Broome Highway past OTC and the ABC Transmitter Mast (See section 2.3). From here the inland woodland crosses both the Broome Highway and the Cape Leveque Roads before entering the Broome Water Reserve. This community urgently requires further survey to examine its extent/area, condition and ecology. See Map 2.1 and 2.3. This is particularly the case as new development blocks are currently being planned around the Crab Creek Road/Broome Road for the Broome Industrial Park and will substantially impact on this community. Such a survey needs to be conducted in December when trees are flowering to determine how far inland this community extends. For example, Ghost Gums at Twelve Mile appear to be *C. flavescens* (with pink buds) but where the interface between *C. paractia* and *C. flavescens* occurs is presently unknown. Note: July 2015 Clearing for the Broome Industrial Park and realignment of Crab Creek Road has already commenced. This survey should be conducted as soon as possible before more unwitting clearing of this PEC is undertaken.

2) More horticultural use of *C. paractia* within Broome (eg. as a street and park tree) is needed as existing remnant trees senesce into old age with virtually no active recruitment observed. The Broome Shire could play a lead role in this regard, as could the Golf Club.

3) The authors recommend a review of the description of the *Corymbia paractia* PEC on the basis of the author's taxonomic update and summary of Malcolm Trudgen's (1988) vegetation units "as being a component of monsoon vine thicket (TEC), Gubinge *(Terminalia ferdinandiana)* woodlands, coastal pindan, the *Keraudrenia exastia* community (DRF) and dwarf pindan heath (PEC) on the Broome Peninsula". The description should also reflect any Traditional Ecological Knowledge that may be held by the Yawuru people about this ecosystem, including references to language names for the *C. paractia* trees and associated species. DPaW should also define the spatial extent of the *Corymbia paractia* PEC within the townsite as occupying a fish-hook shaped belt of near-coastal habitats proceeding clockwise from the Demco Car Park through the following areas: Unallocated Land, Sewage Farm, Effluent Plant, Golf Course (Reserve 29300), between Habitat Resort and the Roebuck Bay dunes, Unallocated Land, Pistol Club (Reserve 36426), Unallocated Land, "Keraudrenia Reserve" and other areas of Port Reserve 28650 as mapped, "Oiltanks Beach" (Reserve 35828), Kavite Road corridor and adjacent lands including the cliffs at Reddell Beach (excluding the Bishops & Nuns blocks), near-coastal areas of Racecourse lands (Reserve 22648), near Gantheaume Point (Reserves 19289 & 43080), Reserve 35157 and the entire length of Minyirr Park as far north as the Surf Club Car Park.

4) It is important that ecologists work with Nyamba Buru Yawuru Land and Sea Unit and the Yawuru Language Centre, in addition to senior Yawuru people to identify important cultural knowledge regarding *C. paractia*, significant Mayi/Bush medicine associations and other cultural areas, and better understand the Traditional management of these areas. This will aid management of areas within conservation areas and better guide planning and development so that important cultural areas are appropriately valued and not inadvertently lost through careless planning.

5) Data gathered through the process of this survey work, and any additional work with Traditional owners should form the basis of an application for the ecosystem to be upgraded from a Priority one Priority Ecological Community (PEC), which describes a poorly-known ecological community to a Threatened Ecological Community (TEC). The authors recommend that the *C. paractia* community should be considered for assessment within the **Vulnerable** criterion, given that

it has been adequately surveyed and that around 50% of the area is outside of conservation areas, leaving it vulnerable to threats: including development, weed invasion and unmanaged fire. The loss of 8.75ha of Minyjuru PEC during the compilation of this report, and applications for more clearing already underway suggests that the acceleration of development in the Broome area will likely put many more hectares of this restricted community at risk.

6) New maps created for the PECs and registered with the Department of Parks and Wildlife (*Corymbia paractia* community and concurrent work with the Priority 1 Minyjuru on relict dunes community) need to be forwarded by the Department for use by local agencies; most importantly, those undertaking extensive planning and development where the communities occur, i.e.: Broome Shire, Broome Port Authority and Nyamba Buru Yawuru, and those responsible for managing conservation and fire management; inclusive of those previously listed, as well as the Department of Fire and Emergency Services.

7) Recommendations in Table 1.2 for each *C. paractia* patch should be considered by the relevant authorities including where small changes to development zones, conservation areas and management plans can considerably alter the % and quality of *C. paractia* PEC that can be protected and managed effectively.

8) Condition assessments need to be undertaken and management plans developed for *C. paractia* community that occurs within designated conservation reserves, including the Yawuru Conservation Park, Shire reserves outside the park, and the impending Yawuru Indigenous Protected Area. These need to be incorporated into larger reserve plans to enable rangers and on-ground managers to address identified threats, such as weeds and fire and improve conservation management.

9) In the process of undertaking the survey, two locations of unmapped and unregistered occurrences of the Endangered Monsoon Vine Thicket community have been identified. It is recommended that mapping and condition assessment of remaining MVT within the Broome townsite be completed in order to improve sustainable development planning, avoid erroneous clearing and expensive non-compliance with the EPBC Act (1999). Maps 2.4 and 2.5 show the location of the areas that are yet to be mapped. Environs Kimberley, with Society for Kimberley Indigenous Plants have begun preliminary negotiations and survey with Nyamba Buru Yawuru and appropriate Cultural law bosses for this significant area.

10) In the process of undertaking the survey at least one unmapped occurrence of the Priority 1 ecological community Dwarf Pindan Heath was identified. This area is shown in Maps 2.4 and 2.5 and is approximately 14.3ha in size. It is recommended that mapping and condition assessment of this and other remaining unmapped PECs within the Broome townsite be completed in order to improve sustainable development planning, avoid erroneous clearing and expensive non-compliance with the Wildlife Act (1950).

11) Remnant *C. paractia* trees that have been mapped need to become part of the Broome Shire Tree Register, and if not active, part of a local tree register managed by Broome's Department of Parks and Wildlife. Local government and state government departments, as well as Nyamba Buru Yawuru, Landcorp etc. should cooperate to utilise the collected data to eliminate unnecessary loss and damage to remnant *C. paractia* trees through local developmental processes.

12) Any new development areas that contain aged *C. paractia* PEC should first seek to retain the integrity of the patch by placing a buffered protection zone around the patch and avoid clearing. If development is permitted to proceed where a *C. paractia* patch occurs, it should only do so under strict conditions so that the as many aged *C. paractia* specimens as possible are retained as remnant trees within the development.

13) Detailed contour maps need to be sourced and overlayed with current mapping of the *C. paractia* PEC and used, along with historic and current aerial maps, to better define current and pre-township *C. paractia* communities. This will also assist engineers and persons involved in future drainage planning for the Broome townsite.

8.0 Acknowledgements

Tim Willing, co-author of the report, acknowledges the financial support of North West Property Consultants in commencing this survey. However survey completion necessitated a labour intensive volunteer contribution toward better understanding of this Priority ecosystem and improving planning and management.

Louise Beames (Environs Kimberley) uploaded and collated the data, produced the maps and co-authored the report.

The authors acknowledge the Yawuru people as the traditional custodians and Native Title holders of the area surveyed. The authors thank the Nyamba Buru Yawuru Land and Sea Management Unit for their cooperation with the survey and report and we hope that the detailed information and datasets (accessible through the Species and Communities Branch DPaW) will aid in local management and planning for this Priority Ecological Communities throughout Yawuru Country including Minyirr Park, the Yawuru Conservation Park and the Yawuru Indigenous Protected Area.

Field assistance with quadrat measuring and sampling was ably provided by Chris Howe-Piening and Phil Docherty (SKIPAS, Broome).

Dave Dureau (Broome Botanical Society) provided valuable observations and advice on local ecology and planning history from a lifetime spent in the area.

Kylie Weatherall (SKIPA/Environs Kimberley) assisted with data entry and organising SKIPA volunteers. Nadia Rebasti and Philippa Girgin (SKIPA) assisted with the digitalising of the Quadrat data

Phil Docherty (SKIPA/BBS) for reviewing report and advising on *C. paractia* loss within the Broome Port.

Perth-based botanist Kevin Kenneally kindly entered the surveyors voucher specimens into the WA Herbarium (South Perth) in October 2014.

9.0 References

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APPENDIX 1

P1 -P4 Quadrat Data Sheets

P1 - Father Emo track off Port Drive

P2 - Aquaculture Dune

P3 - Minyirr Park

S4 - Lullfitz Drive

P1 -P4 Pictures

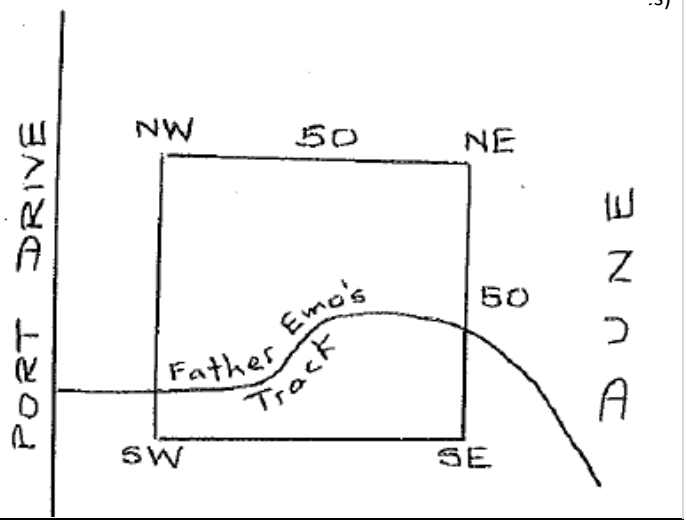
Quadrat P1

BROOME Flora Quadrat

Project No.		Project Name:	2 - 4.30pm		
Survey Area	Paractia Quadrat	Date	2 December 2013		
Site No. :	P1	Recorders:	Tim Willing, Phil Docherty, Chris Howe - Piening		
Location:	Father Emo's Track off Port Drive				
Photo:	IMG 2279 - 2286				
Datum and Zone:	51 K	Site staked?:	No	(Peg No.s	)
AMG Peg 1 (NW):	0416064		AMG Peg 2 (NE)	0416109	
WP 368	8010891		WP 369	8010895	
AMG Peg 4 (SW)	0416055		AMG Peg 3 (SE)	0416120	
WP 367	8010839		WP370	8010848	
Habitat:	Pleistocene dune base - woodland with vine thicket elements				
Soil:	Dry - reddish-pink sand				
Rock type:	N / A				
Vegetation:	Corymbia paractia low woodland over Waltheria indica				
	shrubland over open Triodia schinzii hummock grassland				
BF Veg condition:	Poor				
(disturbance)	4 Weeds (*Antigonon, *Azadirachta, *Leucaena, *Passiflora)				
Fire Age Burnt			no sign of recent fire		

Notes:
Black Kite
Diamond Dove
No termite mounds
Threats: Weeds, Rubbish esp. garden waste, Fires

Sketch of quadrat layout *(include N point, tracks, quadrat corners (numbered clockwise from NW), stakes, sig landform features)*



Quadrat P1

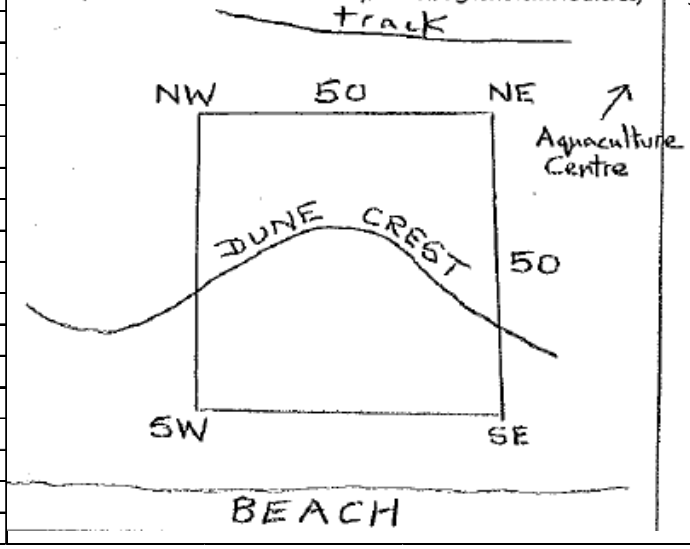
Species	Height	Cover	Notes
TREES			
Corymbia paractia	8	3%	Dominant
Corymbia greeniana	7		Scarce in NW (1)
Sersalisia sericea	6		Scattered (4)
** Azadirachta indica*	5		Colonizing under trees
Ehretia saligna	5		Scattered
** Leucaena leucocephala*	5		Colonizing
Acacia colei	4		Scattered
Bauhinia cunninghamii	4		Occasional
Brachychiton diversifolius	4		Few in S
SHRUBS			
Persoonia falcata	3.5		Occasional
Planchonia careya	3.5		Few in W
Clerodendrum tomentosum	3		Occasional (E)
Grewia breviflora	3		Scattered
Gyrocarpus americanus	3		Few in W
Gardenia pyriformis	3		Occasional (E)
Premna acuminata	3		Occasional
Terminalia ferdinandiana	3		Occasional
Carissa lanceolata	1.5		Occasional
Ficus aculeata	1.5		Occasional
Trichodesma zeylanica	1.5		Patch in SW
Tephrosia rosea	1		Scarce in E
GRASSES			
Triodia schinzii	0.5	30%	Dominant
Cymbopogon ambiguus	1		Patches
Aristida holathera	0.6		Scattered
Aristida hygrometrica	0.5		Scattered
Triodia acutispicula	0.4		One patch
SEDGES			
Cyperus conicus	0.3		Several patches
CLIMBERS			
Abrus precatorius			Patches under trees
** Antigonon leptopus*			Garden escape
Bonamia linearis			Scarce in E
Cassytha filiformis			Under Bauhinia
Galactia tenuiflora			Occasional
Jasminum didymum			Scattered
** Passiflora foetida*			Abundant
Tinospora smilacina			Scarce (1)
Tylophora cinerascens			Abundant
HERBS			
Crotalaria medicaginea	0.8		Scattered
Waltheria indica	0.8	8%	Abundant
Solanum cunninghamii	0.5		Occasional
Corchorus pumilio	0.4		Frequent
Sida sp. B Kimb. Flora	0.4		Occasional (E)
Spermacoce occidentalis	0.4		Occasional (NE)
Polycarpaea corymbosa	0.3		Occasional (NE)
Sida rohlenae	0.3		Patch near track
Phyllanthus trachygyne	0.2		Occasional (NE)
Zornia prostata	0.2		Frequent
TOTAL (46)			

Quadrat P2

BROOME Flora Quadrat

Project No.		Project Name:	7 - 9.30am		
Survey Area	Paractia Quadrat	Date	3 December 2013		
Site No. :	P2	Recorders:	Tim Willing & Chris Howe - Piening		
Location:	Aquaculture Dune				
Photo:	IMG 2287 - 2298				
Datum and Zone:	51 K	Site staked?:	No	(Peg No.s	)
AMG Peg 1 (NW):	0415539		AMG Peg 2 (NE)	0415586	
WP 372	8009553		WP 373	8009555	
AMG Peg 4 (SW)	0416090		AMG Peg 3 (SE)	0415585	
WP 371	8010853		WP374	8009508	
Habitat:	Coastal Monsoon vine thicket on South - facing dune				
Soil:	Dry - reddish-orange sand				
Rock type:	Laterite and Broome Sandstone exposed on beach				
Vegetation:	Gyrocarpus americanus low open woodland over Acacia monticola				
	open shrubland over Triodia schinzii				
	very open hummock grassland				
BF Veg condition:	Very Good				
(disturbance)	* Passiflora foetida				
Fire Age Burnt			no sign of recent fire		

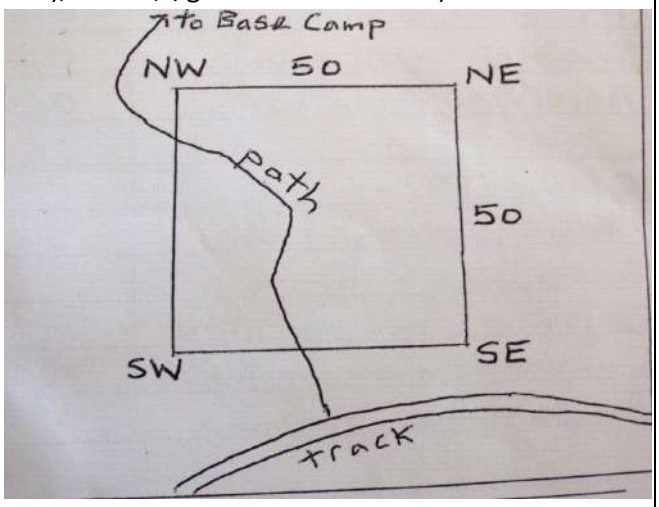
Notes:	Sketch of quadrat layout *(include N point, tracks, quadrat corners (numbered clockwise from NW), stakes, sig landform features)*
Gilbert's dragon	
Minor rubbish - campsites on dune	
No termite mounds	
Threats: Weeds / Rubbish / Fire / Off-road Vehicles	



Quadrat P2

Site No.: P2			
Species	**Height**	**Cover**	**Notes**
TREES			
Corymbia paractia	6		Scattered on seaward dune slope
Gyrocarpus americanus	5	8%	Dominant
Grewia breviflora	3.5		Vine ticket
Terminalia ferdinandiana	3.5		Scarce (1) on seaward dune
Corymbia zygophylla	3		Scarce (1) on dune
Ficus aculeata	3		On back dune
Acacia bivenosa	2.5		On dune crest
Ehretia saligna	2.5		Scattered
Premna acuminata	2.5		On dune crest
SHRUBS			
Acacia monticola	2	8%	Dominant
Acacia tumida	2		On seaward dune
Bauhinia cunninghamii	2		Scarce
Santalum lanceolatum	2		Frequent
Acacia colei	2		Scarce on dune
Tephrosia rosea	1		Occasional on dune
GRASSES			
Triodia schinzii	0.4	10%	Dominant
Aristida hygrometrica	0.3		Occasional
Spinifex longifolius	0.5		On dune crest
CLIMBERS			
Abrus precatorius			Frequent
Cassytha filiformis			Frequent
** Passiflora foetida*			Scattered
Tinospora smilacina			Occasional
Tylophora cinerascens			Scarce (1)
MISTLETOES			
Lysiana spathulata			On *Acacia tumida*
SEDGES			
Cyperus conicus	0.3		Scarce (1) in thicket
HERBS			
Gyrostemon tepperi	0.5		Back dune
Mallotus nesophilus	0.5		Three in thicket
Crotalaria medicaginea	0.4		Occasional
Sida sp. B Kimb. Flora	0.4		Occasional
Solanum cunninghamii	0.4		On dune crest
Waltheria indica	0.4		Occasional back dune
Euphorbia myrtoides	0.3		Occasional
Melhania oblongifolia	0.3		Scattered
Spermacore occidentalis	0.3		Back dune
TOTAL (34)			

Quadrat P3

Kimberley Flora Quadrat BROOME							
Project No.			Project Name:	6-8.45 a.m.			
Survey Area	Paractia Quadrat		Date	4-Dec-13			
Site No. :	P3		Recorders:	Tim Willing and Chris Howe-Piening			
Location:	Minyirr Park						
Photo:	IMG 2299 - 2305						
Datum and Zone:	51k		Site staked?:	**No**			
Peg 1 (NW):	0415161			Peg 2 (NE)	0415210		
WP 378	8013306			WP 379	8013299		
Peg 4 (SW)	0415069			Peg 3 (SE)	0415199		
WP 377	8014244			WP 380	8013246		
Habitat:	Gubinge groves, inland of coastal Holocene dunes						
Soil:	Dry - reddish pindan loam						
Rock type:	n/a						
Termite Mound	Height:		Shape:		Colour:		
Vegetation:	Terminalia ferdinandiana and Corymbia paractia low open woodland						
	over Acacia colei open shrubland over Triodia schinzii hummock						
	grassland						
Veg condition	Excellent	Very good	**GOOD**	Poor	Very Poor	completely degraded	
(disturbance)	Three weeds (*Aerva, *Merremia and *Passiflora)						
Fire Age Burnt	<1 year ago	1-2 yrs ago	**3-5 Yrs ago**	no sign of recent fire	very long unburnt		
Notes:				Sketch of quadrat layout (include N Points, tracks, quadrat corners numbered clockwise from from NW), stakes,s/g landform features)			
Dead Northern Blue-tongue lizard							
(Tiliqua scincoides)							
Blue-winged Kookaburra							
Silver-crowned Friarbird							
No termine mounds							
Threats: Fire, weeds (nb *Cenchrus setiger and							
*Stylosanthes hamata seen along track)							

Quadrat P3

Site No.: P3			
Species	**Height**	**Cover**	**Notes**
TREES			
Corymbia paractia	6	3%	co-dominant
Terminalia ferdinandiana	5.5	5%	co-dominant
Corymbia greeniana	4		Four - scattered
Gyrocarpus americanus	3.5		occasional
Ehretia saligna	3		occasional
Ficus aculeata	3		scattered
Hakea macrocarpa	3		Patch in NE
Grevillea pyramidalis	2.5		Patch in NE
Persoonia falcata	2.5		Scarce (1)
SHRUBS			
Acacia colei	2	3%	Dominant
Clerodendrum tomentosum	2		under *Terminalia*
Sersalisia sericea	2		under *Terminalia*
Myoporum tenuifolium	1.5		occasional (3)
Trichodesma zeylanica	1.5		patch in SW
Acacia tumida var.kulparn	1.5		occasional
Acacia bivenosa	1		occasional (4)
Clerodendrum floribundum	1		occasional (NW)
Gardenia pyriformis	1		occasional
Gossypium aff.australe	1		occasional (N)
GRASSES			
Cymbopogon ambiguus	1		patch
Triodia schinzii	0.4	60%	Dominant
Triodia acutisepala	0.4		scarce - under *Terminalia*
Aristida holathera	0.3		scattered
CLIMBERS			
Abrus precatorius			under *Terminalias*
Cassytha filiformis			abundant in *Triodia*
Cajanus marmoratus			scattered in N
Cucumis maderaspatanus			scarce (1)
Jacquemontia pannosa			pale pink flowers
Jasminum didymum			under *Terminalia*
**Merremia dissecta*			under *Terminalia*
**Passiflora foetida*			scattered
Rhynchosia minima			occasional (3)
Tinospora smilacina			occasional
Trianthema portulacastrum			occasional
SEDGES			
Cyperus conicus	0.3		two patches (SW)
HERBS			
**Aerva javanica*	0.8		under *Terminalia* (2)
Santalum lanceolatum	0.8		scattered
Streptoglossa macrocephala	0.8		abundant in *Triodia*
Tephrosia remotiflora	0.8		scattered
Crotalaria medicaginea	0.6		scarce
Grewia retusifolia	0.6		under *Terminalia* (1)

Breynia cernua	0.5		occasional
Carissa lanceolata	0.5		occasional
Codonocarpus cotinifolius	0.5		scarce (1)
Flueggea virosa	0.5		occastional (N)
Premna acuminata	0.5		scarce (1)
Brachychiton diversifolius	0.4		under *Terminalia*
Melhania oblongifolia	0.4		scattered
Polygala tepperi	0.4		scarce (1)
Corchorus pumilio	0.3		occasional
Heliotropium tenuifolium	0.3		occasional
Hybanthus aurantiacus	0.3		scattered
Phyllanthus trachygyne	0.3		occasional
Solanum cunninghamii	0.3		occasional
Tephrosia leptoclada	0.3		occasional in SW
Goodenia sepalosa	0.2		scattered (3)
TOTAL (56)			

Kimberley Flora Quadrat BROOME

Project No.		Project Name:	2.30 - 4.30 p.m.
Survey Area	Paractia Quadrat	Date	4-Dec-13
Site No. :	P4	Recorders:	Tim Willing a g, Phil Docherty and C hris
Location:	Lullfitz Drive		Howe- Piening
Photo:	IMG 2307-2311		
Datum and Zone:	51k	51k Yes / No	Peg No.s
Peg 1 (NW):	0417340	Peg 2 (NE)	0417390
WP 381	8018499	WP 386	8018505
Peg 4 (SW)	0417344	Peg 3 (SE)	0417392
WP 382	8018450	WP 385	8018457

Habitat: Coastal pindan: transition to monsoon vine thicket

Soil: Red sandy pindan loam

Rock type: n/a

Termite Mounds Height: Shape: Colour:

Vegetation: Corymbia paractia low open woodland over Bauhinia cunninghamii and Flueggea virosa. Tall open shrub land over *Cenchus ciliaris bunch grassland

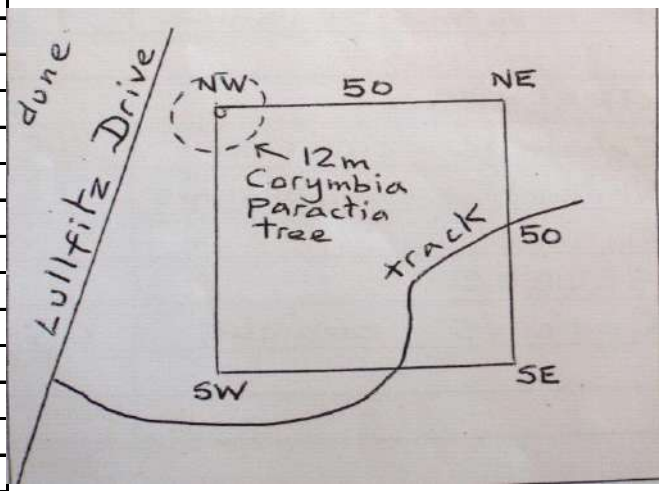
Veg condition	Excellent	Very good	Good	**Poor**	Very Poor	completely degraded
(disturbance)	9 weeds present (*Aerva, *Azadirachta, *Cenchus, *Clitorea, *Hyptis, *Macroptilium, *Merremia, *Passiflora					
Fire Age Burnt	<1 year ago	1-2 yrs ago	**3-5 Yrs ago**	no sign of recent fire	very long unburnt	*Stylosanthes)

Notes:

Scats of Agile Wallaby
Red-collared lorikeets feeding on C.paractia flowers
Silver-crowned friarbird
Rainbow bee-eater
Grey-crowned babbler
Little corella
No termite mounds

Threats: Weeds/Development/Rubbish/Fire
(+ earmarked for new road junction)

Sketch of quadrat layout (include N Points, tracks, quadrat corners numbered clockwise from from NW), stakes,s/g landform features)



Quadrat P4

Site No.: P4			
Species	**Height**	**Cover**	**Notes**
TREES			
Corymbia paractia	12	3%	Dominant (5) trees
Corymbia greeniana	5		occasional
Gyrocarpus americanus	4.5		scarce (1)
**Azadirachta indica*	4.5		colonizing under trees
Brachychiton diversifolius	4		occasional
Hakea macrocarpa	4		occasional
Santalum lanceolatum	3.5		occasional
Atalaya hemiglauca	3		one patch
Ficus aculeata	3		occasional
SHRUBS			
Acacia colei	2.5		scattered
Bauhinia cunninghamii	2.5	3%	co-dominant
Flueggea virosa	2.5	5%	co-dominant
Carissa lanceolata	2		occasional
Clerodendrum tomentosum	2		in SE
Breynia cernua	2		large patch
Exocarpos latifolius	2		occasional (3)
Grewia breviflora	2		frequent
Cullen martinii	1.5		in SE
**Hyptis suaveolens*	1.5		in SE
**Aerva javanica*	1		patches in SE
Premna acuminata	1		occasional
Tephrosia rosea	1		Occasional (W)
Trichodesma zeylanica	1		frequent (W)
GRASSES			
**Cenchrus ciliaris*	0.8	60%	Dominant
Whiteochloa cymbiformis	1		scarce
SEDGES			
Cyperus conicus	0.3		one patch in SE
MISTLETOES			
Amyema benthamii			on *Flueggea*
CLIMBERS			
Abrus precatorius			scattered (5)
Capparis lasiantha			Scarce (1)
**Clitoria ternatea*			on Lullfitz verge
Jacquemontia paniculata			occasional
Jasminum didymum			on Lullfitz verge
**Macroptilium atropurpureum*			on Lullfitz verge
**Merremia dissecta*			on Lullfitz verge
**Passiflora foetida*			scattered
Tinospora smilacina			occasional
Tylophora cinerascens			frequent
Ventilago viminalis			occasional
HERBS			
Crotalaria medicaginea	0.8		occasional (W)
**Stylosanthes scabra*	0.8		4 plants (SE)

Waltheria indica	0.8		abundant (E)
Hakea arborescens	0.5		two seen
Abutilon otocarpum	0.5		scarce (1)
Mallotus nesophilus	0.4		under trees
Melhania oblongifolia	0.4		common in SE
Sida cordifolia	0.4		in SE
Corchorus pumilio	0.3		common in SE
Crotalaria crispata	0.3		scattered
Solanum cunninghamii	0.3		scattered
Tephrosia remotiflora	0.3		occasional
Bonamia linearis	0.2		scarce (1)
Rhynchosia minima	0.2		occasional (SE)
TOTAL (52)			

Quadrat P1 "Father Emo's Track", east side of Port Drive

Quadrat P1a: Cable Beach Ghost Gum *(Corymbia paractia)* with dense undergrowth and Spinifex *(Triodia schinzii)* in foreground. Photo: Willing, 2 December 2013.

Quadrat P1b: The trunk base of an unusually large *Corymbia paractia* with survey tape for scale. Note at left bird-distributed Neem Trees (Azadirachta indica*) becoming established in its shade. Photo: Willing, 2 December 2013.**

Quadrat P1c: View towards SE on quadrat showing weedy **Leucaena leucocephala* established and emergent in vine thicket shrubs of *Flueggea virosa*. Photo: Willing, 2 December 2013.

Quadrat P2 Dune at "Oiltanks Beach" near Aquaculture Centre

Quadrat P2a: Aerial view with quadrat at centre on seaward-facing dune slope. Inpex, OTS and Toll laydown yards - flanking Port Drive - lie in the background with the Aquaculture Centre at right. Kavite Road is at left.
Photo: Willing, March 2014

Quadrat P2b: *Corymbia paractia* community on seaward dune slope, with a Gubinge Tree *(Terminalia ferdinandiana)* on eroding orange Pleistocene dune. Helicopter Trees *(Gyrocarpus americanus)* bear pale green foliage. Rocks of Broome Sandstone lie in foreground. This is the only known site on the Broome Peninsula, where a *C. paractia* population is located on a seaward-facing dune slope. Photo: Willing, 3 December 2013.

Quadrat P2c: Scratchy Wattle *(Acacia monticola)* in foreground with *Corymbia paractia* and lime-green canopies of Helicopter Tree *(Gyrocarpus americanus)* on seaward-facing dune slope. Photo: Willing, 3 December 2013.

Quadrat P3 Minyirr Park, west from Gantheaume Point Road

Quadrat P3a: Cable Beach dunes showing belt of Monsoon Vine Thicket (rounded green crowns) following the dune base. Moving inland lie groves of Gubinge Trees *(Terminalia ferdinandiana),* often interspersed with Cable Beach Ghost Gums *(Corymbia paractia).* Coastal pindan vegetation flanks Gantheaume Point Road at lower right. Minyirr Park Base Camp lies at centre, with the quadrat located between there and the road bend in the foreground.

Photo: Willing, March 2014

Quadrat P3b: *Corymbia paractia* trees at centre with Gubinge trees *(Terminalia ferdinandiana)* in background and at left. Spinifex *(Triodia schinzii)* in foreground, interspersed with low shrubs of *Streptoglossa macrocephala.*
Photo: Willing, 4 December 2013.

Quadrat P3c: The aromatic low shrub *Streptoglossa macrocephala* (Asteraceae) is closely associated with the mixed community of Gubinge *(Terminalia ferdinandiana)* and Cable Beach Ghost Gum *(Corymbia paractia)* in the central zone of Minyirr Park. Photo: Willing, 4 December 2013.

Quadrat P4 East side of Lullfitz Drive

Quadrat P4a: Lullfitz Drive, looking northwards, with Hidden Valley sand dunes at left, showing belt of Monsoon Vine Thicket along its inland base. Neem trees *(*Azadirachta indica)* are spreading rapidly through this community. The quadrat corner is the unusually tall *Corymbia paractia* tree, casting a shadow over the road. The disturbed area in the foreground and to the right has been extensively colonised by weeds. Photo: Willing, March 2014

Quadrat P4b: The unusually tall 12m *Corymbia paractia* tree, immediately east of Lullfitz Drive. This quadrat exhibited a high density of weeds: including four invasive climbers *(*Clitoria ternatea, *Macroptilium atropurpureum, *Merremia dissecta* and *Passiflora foetida).* This tree is likely to be lost in coming years when Fairway Drive is extended northwards to join Lullfitz Drive, as it lies at the proposed new junction. Photo: Willing, 4 December 2013.

Quadrat P4c: Shrubs of Goowal *(Flueggea virosa)*, one of the dominants on the quadrat, with the legume *Cullen martinii* in left foreground. Almost the only grass present was the introduced Buffel *(*Cenchrus ciliaris).*

Photo: Willing, 4 December 2013.

APPENDIX 2

Trudgen's Vegetation Units on the Broome Coastline: as reproduced by Woodman Environmental Consulting (2008) pages 9-12

Trudgen's Vegetation Units on the Broome Coastline: as reproduced by Woodman Environmental Consulting (2008) pages 9-10

Table 3:	Vegetation Units on the Broome Coastline as described by Trudgen (1988)	
Group	**Vegetation Unit**	**Description**
The Strand	Cm: *Canavallia rosea* herbland	Unit occurred on a narrow strip along the base of the dunes; consisted of very open vegetation with small amounts of *Canvallia rosea*, *Spinifex longifolius* and *Salsola kali*; *Ipomoea pes-caprae* was also present
Holocene and Pleistocene Dunes (Coastal)	Sl: *Spinifex longifolius* dense hummock grassland	Unit occurred on very small and young dunes of white beach sand on base of low Pindan cliff; dense cover of *Spinifex longifolius* with *Canavallia rosea* and small amounts of *Salsola kali* and *Panicum* sp.
	AbCcSl: *Acacia bivenosa*, *Crotalaria cunninghamii* shrubland over *Spinifex longifolius* mid-dense hummock grassland	Unit occurred on Holocene white sand dunes fronting on Cable Beach, extending to the swale to the second stabilised dune; upper shrub layer of *Acacia bivenosa* and *Crotalaria cunninghamii* over mid-dense layer of *Spinifex longifolius* with *Chamaesyce* sp., *Salsola kali* and *Canavalia rosea*.
	AbCc: *Acacia bivenosa*, *Crotalaria cunninghamii* shrubland	Unit occurred on seaward face and crest of second stabilised dune; shrub layer of *Acacia bivenosa* and *Crotalaria cunninghamii*; no layer of *Spinifex longifolius*, and *Canavalia rosea* and *Salsola kali* occur only on disturbed areas; other species noted were *Santalum lanceolatum*, *Tephrosia rosea*, *Mallotus nesophilus*, *Whiteochloa airoides*, *Chamaescyce* sp., *Boerhavia* sp. and *Tinospora smilacina*
	AbSl: *Acacia bivenosa*, *Crotalaria cunninghamii* open heath over *Spinifex longifolius* hummock grassland	Unit occurred on Pleistocene dunes close to the beach; has shrub layer of *Acacia bivenosa* and *Crotalaria cunninghamii* over hummock grassland of *Spinifex longifolius*; other species present including *Tinospora smilacina*, *Mukia maderaspatana*, *Chamaesyce* sp., *Tephrosia rosea*, *Gyrostemon tepperi*, *Crotalaria medicaginea*, *Lysiana spathulata*
	AbPh: *Acacia bivenosa*, *Crotalaria cunninghamii* shrubland over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred behind AbSl, with same dominant species in the shrub layer; *Plectrachne helmsii* however is dominant understorey species; *Tephrosia rosea*, *Chamaescyce* sp. and *Gyrostemon tepperi* also present.
	LcAbCcWa: *Lysiphyllum cunninghamii* high oepn shrubland over *Acacia bivenosa*, *Crotalaria cunninghamii* open shrubland to open heath over *Whiteochloa airoides* open grassland to grassland	Unit occurred on irregular upper parts of Pleistocene dunes along the east side of 'Hidden Valley'; species included *Lysiphyllum cunninghamii*, *Terminalia petiolaris*, *Acacia bivenosa*, *Crotalaria cunninghamii*, *Marsdenia cinerascens*, *Tephrosia rosea* and *Whiteochloa airoides*.
Inland Dunes	PtEzPh: *Pouteria sericea*, *Eucalyptus zygophylla*, *E. dampieri* low woodland over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred on dune that runs roughly WSW-ENE in the area of Gantheaume Point; open woodland of *Pouteria sericea*, *Eucalyptus zygophylla* and *Eucalyptus dampieri* with occasional *Lysiphyllum cunninghamii* and *Gyrocarpus americanus*; with a shrub layer of *Carissa lanceolata*, *Santalum lanceolatum*, *Acacia holosericea*, *Acacia tumida*, *Distichostemon hispidulus*, *Hakea macrocarpa* and *Erythrophloeum chlorostachys*.
Vine Thickets and deciduous woodlands to forests	Mn: *Mallotus nesophilus* open scrub	Unit occurred on the lee slope of the secon ddune from the beach near the southern end of Cable Beach; moderately dense cover of *Mallotus nesophilus*, above *Flueggea virosa*, *Santalum lanceolatum* and *Grewia breviflora*.

Table 3:	**Vegetation Units on the Broome Coastline as described by Trudgen (1988)**	
Group	**Vegetation Unit**	**Description**
	EcAbFv: *Eucalyptus confertiflora* low open woodland over *Acacia bivenosa*, *Flueggea virosa* open heath	Unit occurred on the bottom of the lee side of the inland dune at the south end of Cable Beach on pindan soil; scattered *Eucalytpus confertiflora* over *Acacia bivenosa*, *Flueggea virosa*, *Grewia breviflora*, *Carissa lanceolata*, *Jasminum didymum*, *Marsdenia cinerascens*, *Plectrachne helmsii*.
	LcOaMn: *Lysiphyllum cunninghamii*, *Opilia amentacea*, *Mallotus nesophilus* open heath	Unit occurred on the leeward slope of the inland dune behind Cable Beach; contains *Lysiphyllum cunninghamii*, *Mallotus nesophilus*, *Opilia amanateacea*, *Myopogoum acuminatum*, *Marsdenia cinerascens*, *Carissa lanceolata*, *Jasminum didymum*, *Amyema benthamii*, *Whiteochloa airoides*, *Santalum lanceolatum*, *Opilia amantacea*.
	GaPaFvGb: *Gyrocarpus americanus*, *Premna acuminata*, *Lysiphyllum cunninghamii* low woodland over *Flueggea virosa*, *Grewia breviflora* high shrubland to open scrub	Unit occurred on the flat area of Pindan soil behind dunes parallel to Cable Beach, on richer soil and higher moisture availability; contained *Gyrocarpus americanus*, *Premna acuminata*, *Ehretia saligna*, *Eucalyptus confertiflora*, *Pouteria sericea*, *Lysiophyllum cunninghamii*, over shrubs of *Grewia breviflora* and *Flueggea virosa*; other species present including *Terminalia ferdinandiana*, *Mallotus mesophilus*, *Marsdenia cinerascens*, *Carissa lanceolata*, *Abutilon indicum*, **Passiflora foetida*, *Plectrachne helmsii*.
	TpMc: *Terminalia petiolaris*, *Clerodendrum tomentosum*, *Pouteria sericea* low woodland over Grewia *breviflora*, *Marsdenia cinerascens* high shrubland over *Triodia pungens* hummock grassland	Unit occurred on dunes behind Cable Beach on white sand over orange-pink sand; tree layer of *Terminalia petiolaris*, *Clerodendrum tomentosum*, *Pouteria sericea* over open shrub/vine layer of *Grewia breviflora*, *Marsdenia cinerascens*, *Flueggea virosa* with other species such as *Amyema benthamii*, *Acacia bivenosa*, *Myoporum acuminatum*, *Santalum lanceolatum* and *Tephrosia rosea* present, over *Triodia pungens* and *Whiteochloa airoides*.
	LcGbFv: *Lysiphyllum cunninghamii* high oepn shrubalnd over *Grewia breviflora*, *Mallotus nesophilus* high shrubland over *Flueggea virosa* shrubland	Unit occurred in a swale between two dunes next to Cable Beach; scattered *Terminalia petiolaris* with *Lysiphyllum cunninghamii* over *Mallotus nesophilus* and *Grewia breviflora* over lower shrub/vine layer of *Flueggea virosa*, *Tinospora smilacina*, *Myoporum acuminatum*, *Opilia amentacea* and *Tephrosia rosea*.
	FvLcAb: *Flueggea virosa*, *Lysiphyllum cunninghamii*, *Acacia bivenosa* open scrub	Unit occurred Top of south-east facing slope of Pleistocene dune inland from Bali-Hai; transitional from the heath/shrubland vine thicket to the *Acacia bivenosa* units of the dunes; *Flueggea virosa*, *Lysiphyllum cunninghamii*, *Acacia bivenosa* and *Grewia breviflora* with *Tinospora smilacina*, also *Crotalaria cunninghamii*, **Passiflora foetida*, *Chamaescyce* sp., *Ficus opposita*, *Marsdenia cinerascens*, *Tephrosia rosea*, *Bridelia tomentosa*, *Trichodesma zeylanica*, *Caesalpinia major*, *Terminalia petiolaris*, *Lysiana spathulata*, *Jasminum didymum* and *Whiteochloa airoides*.

Table 3:	Vegetation Units on the Broome Coastline as described by Trudgen (1988)	
Group	**Vegetation Unit**	**Description**
Vine Thickets and deciduous woodlands to forests (cont.)	TPMaFv: *Terminalia petiolaris* low open woodland over *Myoporum acuminatum* high shrubland to open scrub over *Flueggea virosa* high shrubland	Observed at 'Hidden Valley', broad swale between Holocene and Pleistocene dunes to the north of Bali-Hai; scattered *Terminalia petiolaris* over *Myoporum acuminatum, Grewia breviflora* and *Mallotus nesophilus*; over *Flueggea virosa*; with other species including *Ficus opposita, Exocarpos latifolius, Acacia bivenosa, Bridelia tomentosa, Marsdenia cinerascens, Adriana tomentosa, Hypoestes floribunda, Plectrachne helmsii, Clerodendrum tomentosum* and *Caesalpinia major*.
	Ah: *Atalaya hemiglauca* low open forest to low closed foreset	Two stands of this unit were recorded, with dense cover of *Atalaya hemiglauca* over very sparse understorey.
***Terminalia ferdinandiana* ('Gubinge') Woodlands**	Tf: *Terminalia ferdinandiana* open woodland ovr *Eucalyptus confertiflora, Pouteria sericea* low open woodland	Unit occurred on pindan soils; open cover of *Terminalia ferdinandiana* over *Pouteria sericea* and *Eucalyptus confertiflora*, over mixed shrub layer with *Hakea arborescens, Ficus opposita, Jasminum didymum, Ehretia saligna, Flueggea virosa, Grewia polygama, Carissa lanceolata* and *Streptoglossa macrocephalus* over *Plectrachne helmsii*.
	TfEcEdPs: *Terminalia ferdinandiana, Eucalyptus confertiflora, Eucalyptus dampieri, Poulteria sericea* low woodland	Unit occurred on pindan soils on flat to slightly sloping area behind dunes next to Cable Beach; tree layer including *Terminalia ferdinandiana, T. petiolaris, Pouteria sericea, Eucalyptus dampieri, Eucalyptus confertiflora, Exocarpos latifoltus, Ehretia saligna* and *Lysiphyllum cunninghamii* over diverse shrub layer of various species over grass layer dominated by *Plectrachne helmsii* with *Aristida brownii* and *Eriachne* sp.
Pindan	AtGp: *Acacia tumida, Grevillea pyramidalis* oepn heath over *Plectrachne helmsii* hummock grassland with *Eriachne* sp. and *Eragrostis eriopoda*	Unit occurred on pindan with thin sand overlay with no dunal protection from winds, dominated by *Acacia tumida* and *Grevillea pyramidalis* with scattered *Eucalyptus confertiflora* and *Gyrostemon tepperi, Distichostemon hispidulus, Solanum cunninghamii, Persoonia falcata, Dolichandrone heterophylla, Gardenia pyriformis* and *Terminalia ferdinandiana*, over *Plectrachne helmsii* with other species such as *Triodia pungens, Eragrostis eriopoda* and *Eriachne* sp.
	EahPh: *Eucalyptus* aff. *aspera, Eucalyptus zygophylla* low open woodland over *Acacia holosericea* shrubland to open heath over *Plectrachne helmsii* hummock grassland to mid dense hummock grassland	Unit abuts Pleistocene dunes, however can also abut Holocene dunes; tree layer of *Eucalyptus* aff. *aspera* and *Eucalyptus zygophylla* with *Hakea macrocarpa* and *Erythropleum chlorostachys* over shrubland to open heath of *Acacia holosericea*, with other shrubs including *Grevillea pyramidalis, Ehretia saligna, Ficus opposita, Persoonia falcata* and *Terminalia ferdinandiana, Dolichandrone heterophylla, Gardenia pyriformis* and *Gyrostemon tepperi*, over *Plectrachne helmsii*.
	EcPh: *Eucalyptus confertiflora, E. dampieri* and *E. zygophylla* low open woodland over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred on flat to gently sloping Pindan; low *Eucalyptus* trees with *Eucalyptus confertiflora* being most dominant over mixed shrub layer including *Ehretia saligna, Ficus opposita, Erythrophleum chlorostachys, Gardenia pyriformis, Grewia polygama, Gossypium australe, Dolichandrone heterophylla* and *Persoonia falcata* over *Plectrachne helmsii*.

Table 3:	Vegetation Units on the Broome Coastline as described by Trudgen (1988)	
Group	**Vegetation Unit**	**Description**
Pindan (cont.)	EcTfE: *Eucalyptus confertiflora, Terminalia ferdinandiana* shrubland over *Eriachne* sp. and *Plectrachne helmsii* grassland	Unit occurred on pindan slope above the beach on the north side of Gantheaume Point; dominated by *Eucalyptus confertiflora* and *Terminalia ferdinandiana* with *Persoonia falcata, Santalum lanceolatum* and *Grevillea pyramidalis* over *Eriachne* sp. and *Plectrachne helmsii.*
	EcAhPh: *Eucalyptus confertiflora* low open woodland over *Acacia holosericea* high open shrubland over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred upslope of EcTfE; has a taller and more open stratum of *Eucalyptus confertiflora* over *Acacia holosericea* and *Lysiphyllum cunninghamii* over shrubs including *Terminalia ferdinandiana, Santalum lanceolatum, Gardenia pyriformis, Hakea macrocarpa, Grevillea pyramidalis, Erythrophleum chlorostachys* and *Distichostemon hispidulus*, over *Plectrachne helmsii* with *Eragrostis eriopoda* and *Eriachne* sp.
	EdHaPh: *Eucalyptus dampieri* low woodland over *Hakea arborescens* high shrubland over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred on pindan red sand gently sloping to the base of dunes behind Cable Beach; *Eucalyptus dampieri* is the most abundant tree with *Eucalyptus confertiflora* and *Eucalyptus zygophylla* also present, over a shrub layer dominated by *Hakea arborescens* with *Acacia holosericea* and other shrub species over *Plectrachne helmsii.*
	EdAeAPh: *Eucalyptus dampieri* low open woodland over *Acacia eriopoda* open scrub over *Adriana tomentosa* shrubland over *Plectrachne helmsii* mid-dense hummock grassland	Unit occurred on undulating pindan soil in 'Hidden Valley' enclosed by Holocene and Pleistocene dunes; open tree layer of *Eucalyptus dampieri* over upper shrub layer of *Acacia eriopoda* and some *Hakea arborescens*, above *Adriana tomentosa, Tephrosia rosea* and *Crotalaria medicaginea* over *Plectrachne helmsii.*
	EdAeHPh: *Eucalyptus dampieri* low open woodland over *Acacia eriopoda, Hakea macrocarpa, Hakea arborescens* open scrub over *Plectrachne helmsii* mid dense hummock grassland	Unit occurred on pindan soil on a slight slope into the vine thicket area; open tree layer of *Eucalyptus dampieri* with occasional *Eucalyptus confertiflora* over shrubs dominated by *Acacia eriopoda* with *Hakea macrocarpa, Hakea arborescens*, and *Acacia holosericea, Ventilago viminalis, Lysiphyllum cunninghamii* and *Ehretia saligna* over *Plectrachne helmsii* and other grasses.
***Melaleuca* woodlands to forests**	Md: *Melaleuca dealbata* low open forest	Unit occurred in 'Hidden Valley' on and between Holocene dunes; dense areas contain *Melaleuca dealbata* over *Terminalia petiolaris, Mallotus nesophilus, Myoporum acuminatum, Flueggea virosa, Marsdenia cinerascens, Jasminum didymum, Cassytha filiformis, Ptilotus exaltatus, Acacia bivenosa* and *Whiteochloa airoides*; in areas of less-dense *Melaleuca* cover, the cover is predominantly dune vegetation species such as *Acacia bivenosa* and *Myoporum acuminatum* rather than vine thicket species.
Degraded Areas	CC: **Cenchrus ciliaris* grassland	Occurred in an area on Gantheaume point that had been badly degraded with the shrub layer removed; also included what was thought to be a native grass of the genus *Sorghum.*
	Am: *Acacia monticola* 'heath'	Occurred around Gantheaume Point, in an area where stripping of a layer of lateritic material for roadworks had occurred; *Acacia monticola* with *Goodenia scaevolina, Cassytha filiformis* and *Gyrostemon tepperi* were still present.

APPENDIX 3

Original description of *Corymbia paractia*

By K. D Hill and L.A.S Johnson

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ACUT **Interserial hybridogenous species (Confertiflorae – Grandifoliae)**

113. ACUTTO **Corymbia paractia** *K.D. Hill & L.A.S. Johnson*, **sp. nov.**

Species characteribus inter eis *C. dendromeringis* et *C. flavescentis* distinguitur: folia intermedia late ovata cordataque, setosa setoglandulis trichomata brevia ferentibus; folia adulta subnitentia, lanceolata vel late lanceolata; pedunculi breves mediocresve; pedicelli mediocres ad longiusculi.

Type: Western Australia: growing naturally in remnant vegetation in grounds of city council nursery, Broome, *K. Hill 978, L. Johnson & D. Benson*, 31 July 1984 (holo NSW).

Tree, often several-stemmed, to 12 m. *Bark* smooth, white, shedding in thin scales, which are often patchily adherent on lower trunk. *Intermediate leaves* opposite, setose with bristle-glands bearing simple hairs, becoming ± bristle-free, broad-lanceolate to elliptical, rounded to obtuse, cordate in earlier stages, to 13 cm long, to 70 mm wide; *petioles* 8–12 mm long. *Adult leaves* disjunct, bristle-free, amphistomatic and concolorous, lanceolate to broad-lanceolate, acuminate, 7–15 cm long, 10–25 mm wide; *petioles* 4–10 mm long; *oil glands* obscured. *Inflorescences* at flowering borne laterally on leafless lengths of branchlets, moderately condensed; *umbellasters* to 7-flowered; *peduncles* 2–10 mm long; *pedicels* 5–15 mm long; intermediate internodes 1 or few, 0–3 mm long; basal internode 2–4 mm long. *Mature buds* pyriform, 4–5 mm long, 3–4 mm diam.; *calyptra* 1/4–1/3 as long as hypanthium, hemispherical, apiculate. *Fruits* ovoid, 9–11 mm long, 7–9 mm diam. Fig. 127.

Flowering: Oct–Dec.

Distinguished by the combination: intermediate leaves broadly ovate and cordate, with bristle-glands bearing short, simple trichomes; adult leaves slightly glossy, lanceolate to broad-lanceolate; peduncles short; pedicels longish.

Known only from a small area on the west coast of the southern part of the Dampier Peninsula, around Broome (Fig. 128). Locally abundant in dry monsoon savannah shrubland dominated by *Acacia* species. This species is restricted to a narrow strip where coastal beach dunes merge into the sandy red earths of the Pindan.

C. paractia is known from a limited area near and for a few kilometres north from Broome, from which *C. dendromerinx* (series *Confertiflorae*) and *C. flavescens* (series *Grandifoliae*) are both absent (K. Kenneally, pers. comm.), although the former occurs to the north-east and east (Fig. 107), and the latter to the north-east and south-west (Fig. 124). The populations of *C. paractia* exhibit some variation in the presence or amount of intermediate-phase foliage, occurring as reversion-shoots, in the crown, and in length of inflorescence internodes. They are nevertheless generally consistent morphologically as well as in habit and habitat, and are usefully regarded as a stabilised hybridogenous species, continuing in existence probably without further input from either *C. dendromerinx* or *C. flavescens*, in contrast to occasional individual hybrids between those species found where they co-occur (see under those species and Appendix 1).

Characters in which *C. paractia* is intermediate between those species of otherwise well-distinguished series include: the thinly flaky irregularly tessellated and irregularly partially persistent bark, shape and degree of glossiness of the intermediate and adult leaves, presence on intermediate growth of bristle-glands bearing simple lateral trichomes (approaching those of *C. dendromerinx*), nature of the conspicuous pointed leaf-buds as in series *Grandifoliae* generally, branching and dimensions (including thickness of parts) of the inflorescence.

This complex of characters does not support involvement of the parapatric or partly sympatric *C. bella* in the ancestry, nor does it agree with the features of series

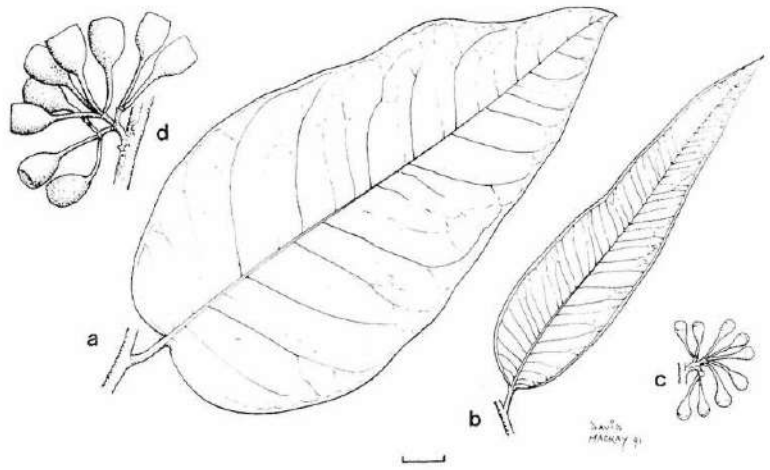

Fig. 127. *C. paractia* a, intermediate leaf. b, adult leaf. c, inflorescence and buds. d, inflorescence and fruits (a, d from *Hill 978 et al.*, b, c from *Brooker 10110*). Scale bar = 1 cm.

Polysciadae (where leaf-shape can be somewhat similar), the members of which, moreover, occur on quite different substrates from that of *C. paractia*.

The epithet is from the Greek *paraktios*, on the seaside, in reference to the beach-dune habitat.

Conservation status: Of limited distribution and potentially under threat from coastal tourist developments. 2K.

Selected specimens (from 12 examined): Western Australia: 6 miles [c.10 km] NNE of Broome township, *Lazarides 6581*, 25 Sep 1959 (CANB, NSW); 6 km N of Broome P.O., *Brooker 10110*, 18 Oct 1988 (CANB, NSW); Station Hill, Cable Beach, Broome, *Kenneally 11353*, 1 Dec 1992 (PERTH, NSW); 1 km E of racecourse, Broome, *Brooker 10107*, 17 Oct 1988 (CANB, NSW); Forest Dept office, Broome, *Willing 112, 113*, 29 Oct 1983 (PERTH).

shrubland dominated by *Acacia* species. This species is restricted to a narrow strip where coastal beach dunes merge into the sandy red earths of the Pindan.

C. paractia is known from a limited area near and for a few kilometres north from Broome, from which *C. dendromerinx* (series *Confertiflorae*) and *C. flavescens* (series *Grandifoliae*) are both absent (K. Kenneally, pers. comm.), although the former occurs to the north-east and east (Fig. 107), and the latter to the north-east and south-west (Fig. 124). The populations of *C. paractia* exhibit some variation in the presence or amount of intermediate-phase foliage, occurring as reversion-shoots, in the crown, and in length of inflorescence internodes. They are nevertheless generally consistent morphologically as well as in habit and habitat, and are usefully regarded as a stabilised hybridogenous species, continuing in existence probably without further input from either *C. dendromerinx* or *C. flavescens*, in contrast to occasional individual hybrids between those species found where they co-occur (see under those species and Appendix 1).

Characters in which *C. paractia* is intermediate between those species of otherwise well-distinguished series include: the thinly flaky irregularly tessellated and irregularly partially persistent bark, shape and degree of glossiness of the intermediate and adult leaves, presence on intermediate growth of bristle-glands bearing simple

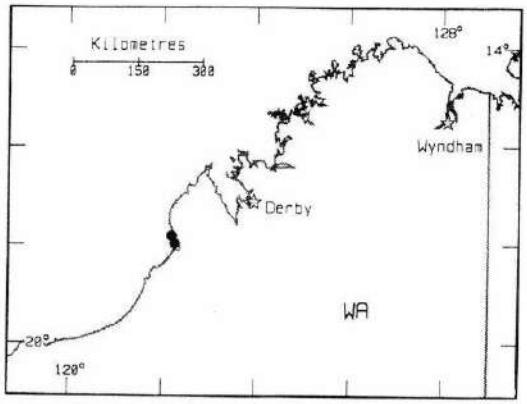

Fig. 128. Distribution of *C. paractia*.

lateral trichomes (approaching those of *C. dendromerinx*), nature of the conspicuous pointed leaf-buds as in series *Grandifoliae* generally, branching and dimensions (including thickness of parts) of the inflorescence.

This complex of characters does not support involvement of the parapatric or partly sympatric *C. bella* in the ancestry, nor does it agree with the features of series *Polysciadae* (where leaf-shape can be somewhat similar), the members of which, moreover, occur on quite different substrates from that of *C. paractia*.

The epithet is from the Greek *paraktios*, on the seaside, in reference to the beach-dune habitat.

Conservation status: Of limited distribution and potentially under threat from coastal tourist developments. 2K.

Selected specimens (from 12 examined): Western Australia: 6 miles [c.10 km] NNE of Broome township, *Lazarides 6581*, 25 Sep 1959 (CANB, NSW); 6 km N of Broome P.O., *Brooker 10110*, 18 Oct 1988 (CANB, NSW); Station Hill, Cable Beach, Broome, *Kenneally 11353*, 1 Dec 1992 (PERTH, NSW); 1 km E of racecourse, Broome, *Brooker 10107*, 17 Oct 1988 (CANB, NSW); Forest Dept office, Broome, *Willing 112, 113*, 29 Oct 1983 (PERTH).