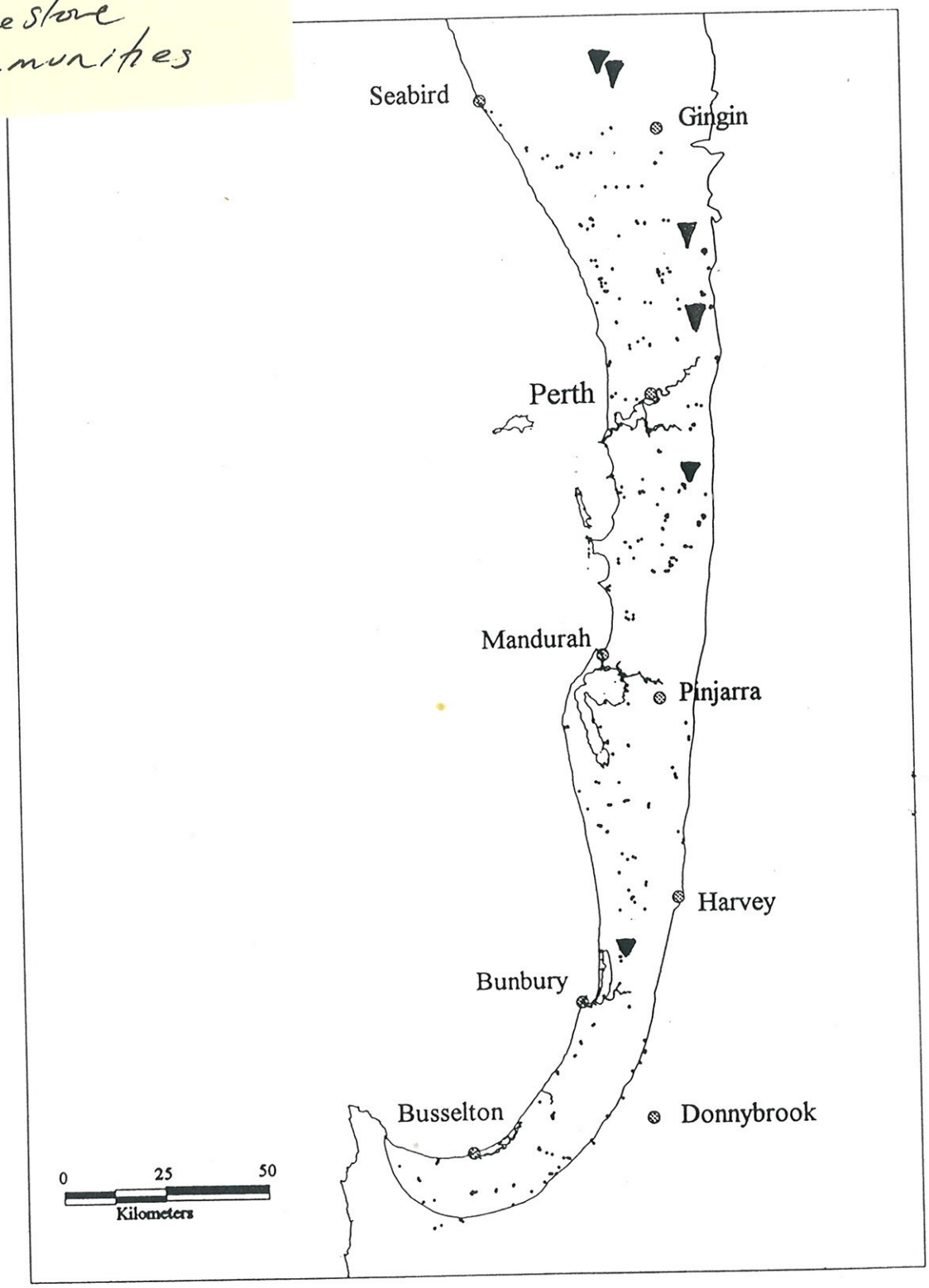
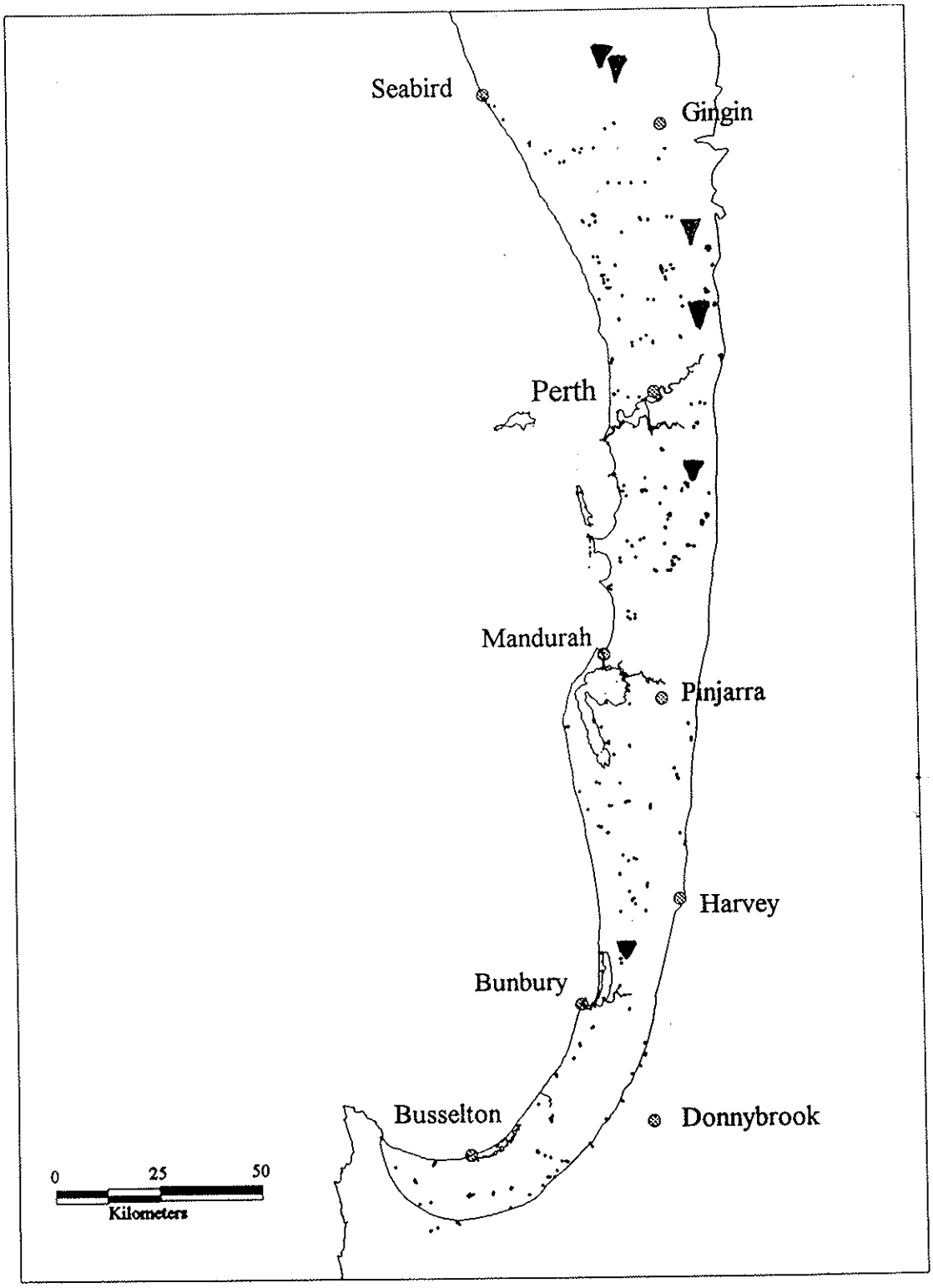
Distribution
Muchea
Limestone
Communities




Seabird
Gingin
Perth
Mandurah
Pinjarra
Harvey
Bunbury
Busselton
Donnybrook
0
25
50
Kilometers

Department of Environmental Protection System 6 Update: Site Based Flora List for CG 1711 Beermullah West Rd (Subm no 285)
(90 taxa, Beer01-02, B.J. Keighery, 7/6/96)

Anthericaceae

Sowerbaea laxiflora
Thysanotus arenarius
Thysanotus sp. manglesianus/patersonii scps
Thysanotus thyrsoideus
Tricoryne elatior

Apiaceae

Daucus glochidiatus
Hydrocotyle hispidula

Asteraceae

* Arctotheca calendula
* Hypochaeris glabra
Lagenifera huegelii
Podolepis gracilis swamp (GJK 13126)
Pogonolepis stricta
Siloxerus humifusus
* Sonchus oleraceus
* Urospermum picroides

Centrolepidaceae

Centrolepis aristata

Cyperaceae

Gahnia trifida
Lepidosperma angustatum
Lepidosperma longitudinale
Schoenus sp. 2 (GJK 5739) scps

Dilleniaceae

Hibbertia racemosa

Droseraceae

Drosera menziesii subsp. menziesii

Euphorbiaceae

Poranthera microphylla

Gentianaceae

* Centaurium erythraea

Goodeniaceae

Dampiera alata
Goodenia pulchella

Iridaceae

* Romulea rosea

Lauraceae

Cassytha flava
Cassytha glabella

Loganiaceae

Mitrasacme paradoxa

Mimosaceae

Acacia saligna

Myrtaceae

Eucalyptus decipiens
Kunzea recurva
Melaleuca huegelii
Melaleuca incana
Melaleuca viminea

Orchidaceae

Microtis media

Papilionaceae

Hardenbergia comptoniana
Kennedia prostrata
* Lotus angustissimus
* Trifolium campestre

Phormiaceae

Dianella revoluta

Poaceae

Agrostis avenacea
* Aira caryophyllea
* Avena barbata
* Briza maxima
* Briza minor
* Bromus diandrus

Danthonia occidentalis
* Lolium rigidum
* Polypogon monspeliensis
Stipa flavescens
* Vulpia bromoides
* Vulpia myuros

Polygalaceae

Comesperma virgatum

Primulaceae

* Anagallis arvensis

Proteaceae

Dryandra nivea
Dryandra sessilis
Grevillea evanescens
Hakea prostrata
Hakea varia

Ranunculaceae

Clematis pubescens

Rubiaceae

Opercularia vaginata

Santalaceae

Exocarpos sparteus

Sapindaceae

Diplopeltis huegelii

Scrophulariaceae

* Bellardia trixago

Selaginellaceae

Selaginella gracillima

Xanthorrhoeaceae

Xanthorrhoea preissii

Department of Environmental Protection System 6 Update: Site Based Flora List for Bootine Rd
(Boot01-03, B.J. Keighery, 19/2/96)

Amaranthaceae

Ptilotus manglesii

Anthericaceae

Dichopogon preissii
Thysanotus arenarius
Thysanotus patersonii
Tricoryne elatior

Apiaceae

Apium annuum
Apium prostratum
Eryngium pinnatifidum

Asteraceae

Angianthus sp. scps
* Aster subulatus
* Conyza sp. scps
Cotula coronopifolia
* Hypochaeris sp. scps
Pogonolepis stricta
Senecio lautus subsp. dissectifolius
* Sonchus asper
* Sonchus hydrophilus

Casuarinaceae

Casuarina obesa

Centrolepidaceae

Centrolepis aristata

Chenopodiaceae

* Atriplex prostrata

Cupressaceae

Actinostrobus pyramidalis

Cyperaceae

Baumea juncea
Gahnia trifida

Isolepis cernua
Lepidosperma longitudinale
Schoenus sp. scps

Gentianaceae

* Centaurium erythraea

Goodeniaceae

Dampiera alata
Goodenia micrantha
Scaevola holosericea
Scaevola lanceolata

Haloragaceae

Haloragis aculeolata

Juncaceae

* Juncus bufonius

Juncaginaceae

Triglochin mucronatum

Lauraceae

Cassytha glabella
Cassytha pubescens
Cassytha sp. "furry, sessile fls" Fish-3 scps

Loganiaceae

Mitrasacme paradoxa

Malvaceae

Alyogyne huegelii

Mimosaceae

Acacia pulchella
Acacia saligna

Myoporaceae

Myoporum caprarioides

Myrtaceae

Eucalyptus rudis
Kunzea recurva

Melaleuca huegelii
Melaleuca incana
Melaleuca lateriflora
Melaleuca lateritia
Melaleuca rhaphiophylla
Melaleuca teretifolia
Melaleuca viminea

Orchidaceae

Microtis media

Papilionaceae

Daviesia physodes
Viminaria juncea

Plantaginaceae

Plantago sp. scps

Poaceae

Agrostis sp. scps
* Briza maxima
* Briza minor
Danthonia sp. scps
* Ehrharta calycina
* Hainardia cylindrica
Hemarthria uncinata
* Lolium rigidum
* Polypogon monspeliensis
* Vulpia sp. scps

Polygalaceae

Comesperma integerrimum

Primulaceae

* Anagallis arvensis
Samolus junceus
Samolus repens

Proteaceae

Grevillea evanescens
Grevillea obtusifolia
Hakea varia

Restionaceae

Leptocarpus coangustatus

Rhamnaceae

Cryptandra sp. scps

Rubiaceae

Opercularia vaginata

Sapindaceae

Dodonaea aptera

Scrophulariaceae

* Bellardia trixago

Surianaceae

Stylobasium australe

Thymelaeaceae

Pimelea ferruginea

Xanthorrhoeaceae

Xanthorrhoea preissii

Department of Environmental Protection System 6 Update: Site Based Flora List for Lots 2358 and 1718 Bootine Rd (Subm no. 285)
(~~118~~ 79 taxa,Boot01-03, B.J. Keighery, 7/6/96)

Amaranthaceae

Ptilotus manglesii

Anthericaceae

Dichopogon preissii
Thysanotus arenarius
Thysanotus sp. manglesianus/patersonii scps
Tricoryne elatior

Apiaceae

Apium annuum
Apium prostratum

Asteraceae

Angianthus tomentosus
* Aster subulatus
* Conyza sp. scps
Cotula coronopifolia
* Lactuca serriola
* Leontodon saxatilis
Pogonolepis stricta
Senecio lautus subsp. dissectifolius
* Sonchus asper
* Sonchus hydrophilus

Casuarinaceae

Casuarina obesa

Centrolepidaceae

Centrolepis aristata

Chenopodiaceae

* Atriplex prostrata

Cupressaceae

Actinostrobus pyramidalis

Cyperaceae

Baumea juncea
Gahnia trifida

Isolepis cernua
Lepidosperma longitudinale
Schoenus sp. 2 (GJK 5739) scps

Gentianaceae

* Centaurium erythraea

Goodeniaceae

Dampiera alata
Goodenia micrantha
Scaevola globulifera
Scaevola lanceolata

Haloragaceae

Haloragis aculeolata

Juncaceae

* Juncus bufonius

Juncaginaceae

Triglochin mucronatum

Lauraceae

Cassytha glabella
Cassytha pubescens

Loganiaceae

Mitrasacme paradoxa

Malvaceae

Alyogyne huegelii var. huegelii MS

Mimosaceae

Acacia pulchella
Acacia saligna

Myoporaceae

Myoporum caprarioides

Myrtaceae

Eucalyptus rudis
Kunzea recurva

Melaleuca huegelii
Melaleuca incana
Melaleuca lateriflora
Melaleuca lateritia
Melaleuca rhaphiophylla
Melaleuca teretifolia
Melaleuca viminea

Orchidaceae

Microtis media

Papilionaceae

Daviesia physodes
Viminaria juncea

Plantaginaceae

Plantago sp. scps

Poaceae

Agrostis avenacea
* Briza maxima
* Briza minor
Danthonia occidentalis
* Ehrharta calycina
* Hainardia cylindrica
Hemarthria uncinata
* Lolium rigidum
* Polypogon monspeliensis
* Vulpia myuros

Polygalaceae

Comesperma integerrimum

Primulaceae

* Anagallis arvensis
Samolus junceus
Samolus repens

Proteaceae

Grevillea evanescens
Hakea varia

Restionaceae

Leptocarpus coangustatus

Rhamnaceae

Cryptandra arbutiflora

Rubiaceae

Opercularia vaginata

Sapindaceae

Dodonaea aptera

Scrophulariaceae

* Bellardia trixago

Surianaceae

Stylobasium australe

Thymelaeaceae

Pimelea ferruginea

Xanthorrhoeaceae

Xanthorrhoea preissii

DRAFT - B.J. KEIGHERY DECEMBER 1996
Suggested name of area (1996)

Some Other Commonly used Names:
Airfield Road, Northern Ironstones

Area (ha):
cadastral boundary - 199.4 , 50% bushland (aerial photo), no remnant vegetation (GIS): approx. one third of the area described, see map.

Local Authorities (Suburb)
Shire of Gingin

Zoning (MRS & town planning)
rural

Ownership categories: Street name, Lot number
Lot 2115 (David Hodby Nominees Pty Ltd, 81 Smyth Road NEDLANDS 6009 - DEP letter 4/12/95)

Reserve Status
NA

LANDFORM AND SOIL

Landscape features: sheet ironstone, vegetated wetland, vegetated uplands
Geomorphology and soils
Pinjarra Plain
Guildford formation (Qpa - ironstones not mapped)
Bassendean Dunes
Bassendean sands (Qpb)
Bassendean Dunes/Pinjarra Plain
Bassendean sands over Guildford Formation (Qpb/Qpa)
Wetlands (within the Bassendean Dunes and Pinjarra Plain)
Holocene swamp deposits (Qhw)

REGIONAL VEGETATION AND FLORA

Vegetation Complex
Foothills
Coonambidge Complex (Dandaragan Plateau)
Pinjarra Plain
Yanga Complex
Bassendean Dunes
Bassendean Complex - North

Floristic Community Types: incomplete sampling, some types inferred
Supergroup 2 - Seasonal Wetlands
8 Herb rich shrublands in clay pans
Supergroup 3 - Uplands, centred on Bassendean Dunes and the Dandaragan Plateau
*23c North-eastern *Banksia attenuata - B. menziesii* woodlands
Supergroup 4 - Uplands centred on Spearwood and Quindalup Dunes
*28 Spearwood *B. attenuata* or *B. attenuata - Eucalyptus* woodlands

REGIONAL WETLANDS

Wetland Types: sumpland, palusplain
Consanguineous suite
Bassendean - Pinjarra transition OR Bassendean with fluvial features
Mungala (B/P.2)
Muchea (B/P.3)
Coastal Plain Rivers
Ellen Brook (R.3)
Wetland Management Objective: Resource Enhancement, Multiple Use
Lake EPP: none identified

THREATENED COMMUNITIES

Not assessed, Critically Endangered (Perth to Gingin Ironstone Association) - Vulnerable (floristic community type 8),

AREA DESCRIPTION

Vegetation and Flora
Structural units: limited survey)
Eucalyptus calophylla Woodland, *Banksia* Woodland, *Kunzea littoricola* and *Melaleuca viminea* Tall Shrubland, Closed Herblands of *Stylidium longitubum, Myriocephalus helichrysoides, Villarsia capitata, Rhodanthe spicatum* and *R. manglesii* in combination and alone, Closed Herbland, *Agrostis preissii* Grassland, *Amphibromus neesii* Grassland, exotic Grassland,
Remnant Vegetation (canopy only): Shrubland over exotic Grassland approximatle 40%
Vegetation Condition: >50% Very Good to Good,<50% Degraded to Completely Degraded

Total Flora: 60 native taxa, 17 weeds (site generated list and some additional records only, estimated <50% expected flora)
DRF/Priority - GIS: none recorded
DRF/Priority and significant flora from survey - *Grevillea curviloba* subsp. *incurva* (1), *Haloragis tenuifolia* (1), *Grevillea evanescens* (1), *Eryngium pinnatifidum* subsp. *palustre* MS (2), *Myriophyllum echinatum* (3), *Stylidium longitubum* (3)
Taxa typical to heavy soils on northern ironstones and clays: *Myriocephalus helichrysoides*, *Kunzea littericola*, *Rhodanthe spicatum*, *R. manglessii*, *Haemodorum simplex*, *Pogonolepis stricta*, *Podolepis gracilis* (swamp form), *Amphibromus neesii*, *Agrostis preissei* and priority flora above

Fauna
Mammals: not surveyed
Linkage: no adjacent bushland, channel wetland canopy bushland linkage to north, south, east, west recognised available Bushland in System area fragmented linkage opportunities available within System area boundary

Special Attributes: Only known area of northern ironstones and while the area is grazed and partially cleared there is a good cover of both the shrub and herb flora on the ironstone flats believed to be chracteristic of this community. Area grazed by cows and kangaroos but floristically the area is intact. Seedlings of both *Grevillea* species were evident and with reduced grazing and weed control the area has the potential to regenerate to very good condition.

INTERNATIONAL AND NATIONAL SIGNIFICANCE
Not listed

CONSERVATION RECOMMENDATIONS
Criteria met for inclusion: Representation of ecological communities, Diversity, Rarity, Maintaining ecological systems or natural processes, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of conservation value, but which may be applied when evaluating areas having similar values
Constraints: Private land, MRS Urban zoning, Mineral Resource Area, Mineral Lease,
Recommendation:

DRAFT - B.J. KEIGHERY DECEMBER 1996
Suggested name of area (1996)

Some Other Commonly used Names:
Part Submission 285, Bootine Road

Area (ha):
cadastral boundary - 80.2, 50% bushland (aerial photo), no remnant vegetation mapped (GIS), approx. 75% area described

Local Authorities (Suburb)
Shire of Gingin

Zoning (MRS & town planning)
rural

Ownership categories: Street name, Lot number
Kimberley Lance Hill and Beryl Christine Hill
C/O PO Bullsbrook Tel 571 1792
NO CONTACT

Reserve Status
NA

LANDFORM AND SOIL
Landscape features: low limestone ridge, vegetated wetland
Geomorphology and soils
Pinjarra Plainπ
Guildford formation (Qpa)

REGIONAL VEGETATION AND FLORA
Vegetation Complex
Plateaus
Pinjarra Plain
Mungala Complex

Floristic Community Types: not sampled types inferred
Supergroup 2 - Seasonal Wetlands
*7 Herb rich saline shrublands in clay pans
*18 Shrublands on calcareous silts
*S7 Northern woodlands to forests over tall sedgelands alongside permanent wetlands

REGIONAL WETLANDS
No wetlands mapped
Wetland Types: floodplain, palusplain, river, creek, artificial channel
Consanguineous suite
Bassendean - Pinjarra transition OR Bassendean with fluvial features
Beermullah (B/P.1)
Wetland Management Objective: Conservation, Resource Enhancement, Multiple Use
Lake EPP: none identified

THREATENED COMMUNITIES
Critically Endangered (Muchea Limestones) - Vulnerable (floristic community type 8& 18)

AREA DESCRIPTION
Vegetation and Flora
Structural units: limited survey from outside fenceline
Eucalyptus decipiens Woodland, *Casuarina obesa* Woodland, *Melaleuca rhaphiophylla* Low Forest, *Actinostrobus pyrimidalis*, *Grevillea evanescens* and *Calothamnus quadrifidus* Tall Open Scrub, *Melaleuca huegelii* Tall Shrubland, *Viminaria juncea* Tall Shrubland, mixed Open Low Heath, *Senecio lautus* subsp. *dessectifolius* Herbland, mixed Herbland, *Gahnia trifida* Sedgeland, exotic Grassland
Remnant Vegetation (canopy only): 25 % of area shrubs/trees over pasture
Vegetation Condition: 50% Very Good to Good with 50 % Degraded to Completely Degraded
Total Flora: not known
DRF/Priority - GIS: 4 ID 6164
DRF/Priority and significant flora from survey - *Grevillea evanescens* (1), *Haloragis aculeolata* (2)
Muchea limestone taxa: *Alyogyne huegelii* var. *huegelii* MS, *Eryngium* sp. Muchea, *Hibbertia spicata* subsp. *spicata*, *Senecio lautus* subsp. *dessectifolius*, *Calothamnus quadrifidu*/*Eucalyptus decipiens*, *Melaleuca huegelii*

Fauna
Mammals: not surveyed
Linkage: bushland linkage to south - east to CALM purchased land and vegetated creekline to the south

Special Attributes:
Adjacent to best known area of vegetation on Muchea Limestones which has previously been purchased by CALM. Over much of the area there is a good cover of the tree, shrub and herb flora on the clay/limestone flats believed to be chracteristic of this community. Area grazed by cows and kangaroos but floristically the area is

intact. With reduced grazing and weed control the area has the potential to regenerate to very good condition. Being adjacent to the small purchased block this would also buffer influences on the smaller area as well as including elements of the Muchea limestone communities not present in the CALM land (*Actinostrobus pyrimidalis*, *Grevillea evanescens* and *Calothamnus quadrifidus* Tall Open Scrub and *Casuarina obesa* Woodland over mixed Herbland) and add significantly to areas of other communities.

a/

INTERNATIONAL AND NATIONAL SIGNIFICANCE
Not listed

CONSERVATION RECOMMENDATIONS
Criteria met for inclusion: Representation of ecological communities, Diversity, Rarity, Maintaining ecological systems or natural processes, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation, Criteria not relevant to determination of conservation value, but which may be applied when evaluating areas having similar values
Constraints: Private land, MRS Urban zoning, Mineral Resource Area, Mineral Lease,
Recommendation:

CONSERVATION BRANCH
INTRA DEPARTMENTAL ADVICE
NB: For Internal Use Only

TO:	Gary Whisson
SUBJECT:	DBNGP proposed re-alignment & widening at Airfield Rd/Brand Hgwy
FROM:	Nick Casson
DATE:	fieldtrip 30/11/99
PRESENT:	Xuan Nguyen, Teresa Gepp, Bill Jines, Anna Kilborn, Anthony Bougher, John Miles

Met at @ 10:15am.
A. Kilborn indicated the layout of the pipeline and wetlands.

B. Jones again indicated that room for further expansion was required should more pipelines be warranted; either 30m west & 40m east or 70m east of the existing line. He also indicated that there may be a couple of possibilities in terms of placing the pipeline. 1) directional drilling for up to 1km under the middle wetland (B); 2) a diversoin around the eastern edge of wetland B; 3) a diversion well to the north across to the eastern rail reserve; 4) several other options as shown on the attached paper.

B. Jones also indicated that the Wagyl was an issue with these wetlands and that half of the Nungyar people did not mind further disturbance and half thought it was just further insult. If the concensus is against further insult this will take precedent and all waterways and sumps will have to be avoided or crossed above ground.

On the ground the 3 'wetlands' closest to the pipeline were examined (A, B & C on the attached sheet) and the ironstone/clay mosaic to the southwest of the crossing of the creek and gas pipeline south of Airfield Rd.

I made the comments that : i) the departments position would have to be considered; ii) it was likely the use of the road reserve would not be condoned unconditionally given the semi-continous corridor and semi-secure nature of the vegetation there; iii) the option to divert around wetland B to the east would be constrained by the minimum buffers required under the EPPs and other guidelines; iv) the pipeline could alter the shallow subsurface waterflow and influence the hydrology; v) there appeared to be secondary salinity developing in the south-east corner of wetland B.

Partial species lists for areas visited; only opportunitstic sampling was undertaken.

NE Wetland
Light to mid grey, hard-setting clay
Water flowing out of this wetland into the middle wetland to the south-west in the drain/'creek'.
Water plants in the channel, apart from the Villarsia which was under the Melaleucas with the orchids.
Weeds included Rumex, and Pelargonium species.
Dominants
Melaleuca rhaphiophylla
Cassytha (covered)
(Melaleuca viminea - some on fringe - likely clay remnant?, and higher, less-wet part of wetland fringe eg east south-east?)
Other
Otellia (completely aquatic)
Villarsia violifolia (significant plant for east coastal plain)
Cotula coronopifolia
Schoenus ?natans ("duckweed" - a rhizomatous mat)
Micotis media ssp media ((?atrata))
Trigochlin procera
Lobelia alata

Between the two wetlands
Hard setting light to med grey clay, with minor outcrops of ironstone.
Weeds were predominantly Hordeum species, some Trifolium or Lotus.
Water plants in channel.

Middle Wetland
Light to mid grey, hard-setting clay
According to Anthony of Dames & Moore there are Ibis nests in this wetland.
Dominants
Melaleuca rhaphiophylla
Cassytha (covered)
Other
Schoenus ?natans
Lobelia alata
Cotula coronopifolia
Centaurium 'spicatum'
Samolus junceus
Microtis media ssp media
Pterostylis pyramidalis (large colonies, leaves >5mm wide; less likely to be P. aff nana "slender snail orchid'.

Ridge onthe eastern border of the midle wetland
Sand white (to grey).
Mainly marri with some rivergum (most quite sick with leaf miner).
Substantial collapse of vegetation along the top of the ridge.

Wetland to east of DBNGP & south of Airfield Rd
white (to grey sand), apparently slightly humic in the centre rather than clayey
Dominants ('centre')
Eucalyptus rudis
Melaleuca preissiana
Banksia littoralis
Astartea aff. fascicularis
Dominants ('edge')
Kunzea ericifolia
Regelia ciliatum
Xanthorrhoea (8m tall!!!!)
Jacksonia furcellata
Hypocalymma angustatum
Acacia saligna
Restio ?stenostachyus
Open western crescent
Stylidium ?roseoalatum - carpet
Siloxerus humifusus - carpet
Homalosciadium homalocarpum
Melaleuca rhaphiophylla
Villarsia violifolia (rather than Centella)
Lobelia ?tenuior
Cotula coronopifolia

Ironstone pockets amongst clay to south-east of Timaru Reserve and south west of DBNGP/creek crossing
Ironstone outcrop has :
minor Acacia saligna (seedlings)
minor Dryandra sessilis
minor Podotheca gnaphaloides
around fringe Podolepis gracilis - 'clay form'
Light to mid grey clay has :
Melaleuca viminea
Hakea varia
Centrolepis aristata
?Myriocephalus helichrysoides (a low spreading white daisy?)
*Vulpia sp common

Road verge on the mid-north bounary of Timaru Reserve
Grevillea obtusifolia
Grevillea curviloba
Verticordia (pink/purple) densiflora

Ironstone in mid-north of Timaru Reserve
Tricoryne/Thysanotus(Opercularia)
Centrolepis aristata
Caesia sp (several fruits in spike)
Millotis sp
Prasophyllum ringens
Thelymitra ?pauciflora/mucida
Microtis media ssp. Densiflora (irregular labellum & flowers in all stages of development)

CONSERVATION BRANCH
EXTERNAL ADVICE

TO: Anna Kilborn (Dames & Moore)
SUBJECT: DBNGP proposed re-alignment & widening at Airfield Rd/Brand Hgwy
FROM: Nick Casson/Gary Whisson/Xuan Nguyen
DATE: 7/12/99

Following a meeting on the 30/11/99 to look at the DBNGP alignment through plant communities to the north and south of Airfield Rd, Muchea.

The Department has considered the options provided by Dames and Moore and lists it preferences as :

A) an alignment further west than the five considered on 30/11/99. This would need a great deal of planning because from Muchea north there are wetlands and diffuse drainage systems. In the north of the alternative there are a couple of wetlands in paddocks; these appear to be better separated than above Airfield Rd, and also to have less well developed vegetation ("CW"). To the south is the Dandaragan/Bassendean interface with drainage zone ("DB"). It appears that there might also be other small pockets of ironstone vegetation on private land. The proposed alternative would have to be investigated for plant communities and flora and their significance assessed.

B) Option 2 as considered on 30/11/99.
This has the advantages that it could be situated sufficiently to the west in the corridor to allow 1 to 2 expansions.
It also has the potential to rejoin the existing alignment on the western side of the wetland to the south of Airfield Rd and the east of the existing alignment; so as to not encroach on the wetland. This wetland is different in substrate, range of species and has the potential to have a greater range of orchids than the three to the north. Survey for orchids is probably warranted in all of the lakes.

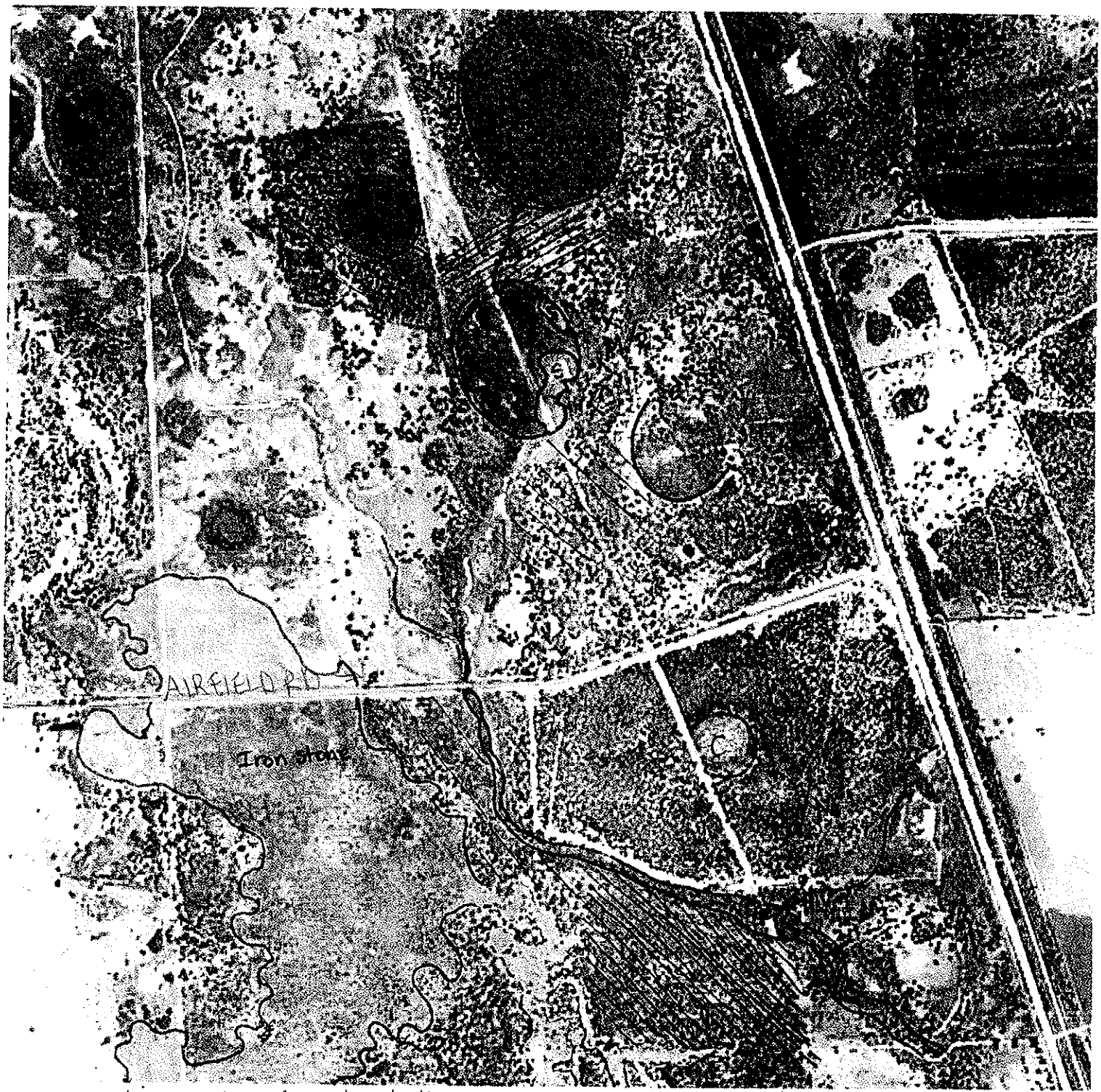
C) Option 5 has the advantage that it passes through significantly degraded and collapsing vegetation with little more than overstorey and weeds. However, it has major constraints due to the fact that it passes between all three of the lakes. The 50m setbacks (or 1 AHD) from wetland dependent vegetation (including *Eucalyptus rudis* which is in the gap between the lakes) required for wetland protection make the option unlikely for one pipeline and untenable for any more.

The prospect of directional drilling was mentioned, and it was indicated that it had the scope to pass below the lake that is currently on the alignment. There would be two major constraints on such an option. First, the lakes to the east of the alignment would also have to be drilled under (the one above the existing crossed-lake and the two below - the last on sand). Second, it would have to be very clearly demonstrated that such drilling would not affect the hydrology of the wetlands and consequently the persistence of the indigenous wetland vegetation.

Rough Vegetation guide

At least 6 (i to vi) community types from brief inspection.

PHOTO 5155 MOORE 1996 aerial photo



S – saline + Halosarcia & tree death.

(i) A – } clayey substrate lakes
B – }

(ii) C – sand-based lake

Ba – Banksia dominated woodland

(iv) M – Marri / euc. woodland

(vi) P – Euc. gidic

clay > / ironstone mosaic highly degraded

(v) clay > / ironstone pocket mosaic likely Sa

X – graveyard death - localised sand ridge ? / low dune

(iii) F –

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Lot 1711 Beermullah Rd SITE NUMBER BEER 01

DATE TRIP 24-11-95 RECORDERS BJK NCT TS

DATE TRIP _____ RECORDERS _____

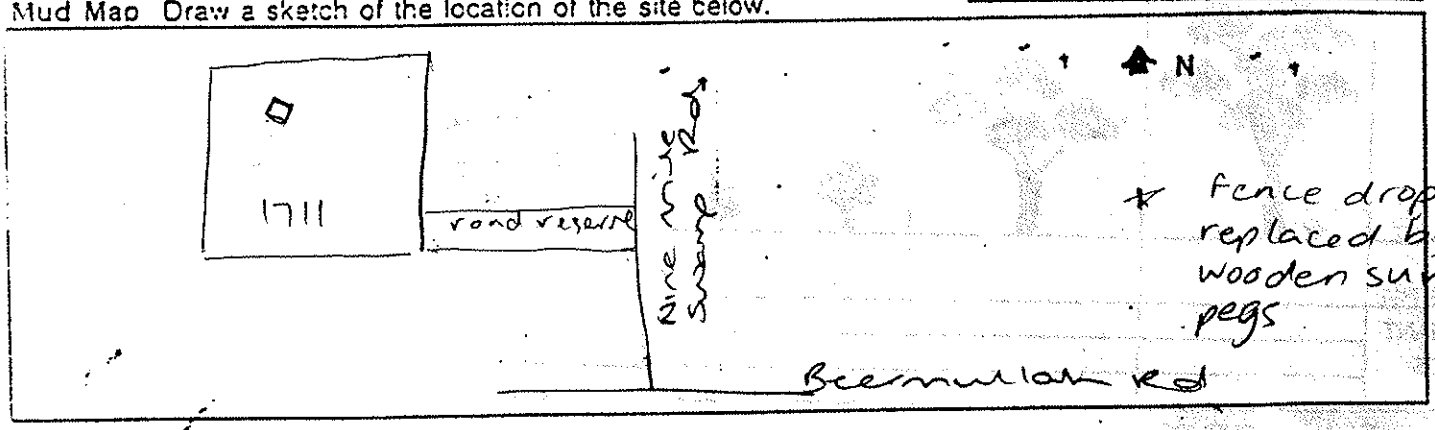
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



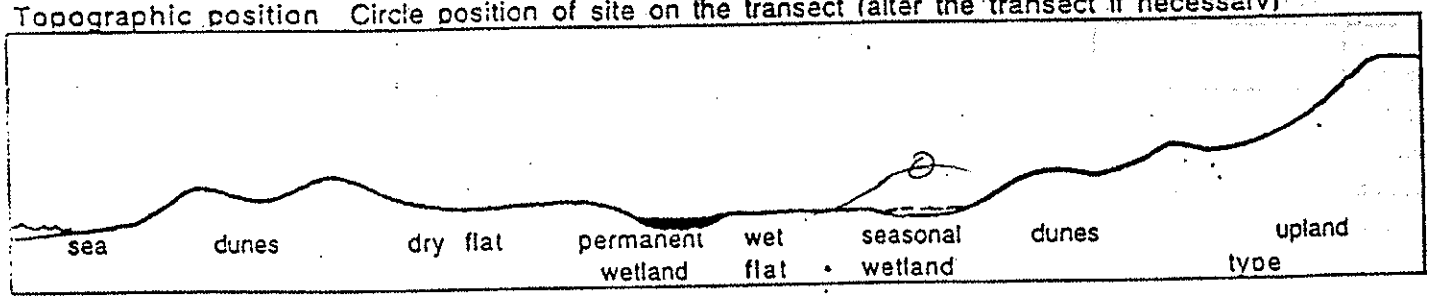
Road Location

Geographic Location Latitude 31°13 374 S Longitude 115°46.306'E Altitude

Reference Map EPE ± 43mt

Photograph Photographer's Name NCT Photo No 17

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope (flat) gentle steep Aspect N NE E SE S SW W NW

Surface Soil sandy clay Colour brown

Exposed rock type % surface

Sub-surface Soil Colour

Rock type limestone depth to rock 10

Drainage (well) mod poor depth water cm Wet all year winter/spring

Litter 30-70 % cover Depth 3 cm

Bare Ground 2-10 %cover

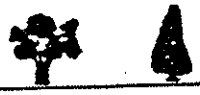
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

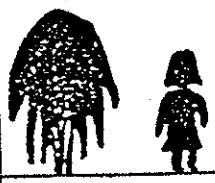
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)				30 - 70	
DOMINANT SPECIES				E. decipiens	

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM					
COVER CLASS (%)	10 - 30		30 - 70		
DOMINANT SPECIES	Med hueg		Xanthorrhoea		

	GRASSES	HERBS	SEDGES over 0.5m	under 0.5m
LIFE FORM				
COVER CLASS (%)	2 - 10			
DOMINANT SPECIES	exotics			
	Stipa flav			
	Danthonia			

4. VEGETATION CONDITION

1 'PRISTINE'	
2 EXCELLENT	
3 VERY GOOD	
4 GOOD	✓
5 DEGRADED	

COMMENTS

severely grazed - goats roos + rabbits

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No BEER 01
Date 24/11/95

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
Euc. decipiens			
MALLEES			
SHRUBS			
Mel hueg.			
Xanth preissii			
Clematis pubas (seedling)			VSP
Hard comp.			
Acacia stolig (seedling)			
Conesperma virgatum	VSP		

SHRUBS (cont.)	No	Fl	ID
GRASSES			
Stipa ? flavescens	VSP		
* Avena barb			
* Vulpia brom.	VSP		✓
* Vulpia myuros	VSP		✓
Danthonia sp.	VSP		
* Briza maxima			
* Lolium rigidum			
* Bromus diandrus			
* Aira cary			
HERBS			
Eryngium = ROOT 01			
Daucus glochid			
Trachymene elatior			
* Anagallis arvensis			
* Sonchus oleraceus			
* Urosp picroides			
Pimelea revoluta			
Microtis media	VSP		
Leg. hueg			
* Cent. erythr			
* Trifolium cappilare yell			
Thys. pat/many (dead)			

HERBS (cont.)	No	Fl	ID
* Rom rosea			
SEDGES			
Cahaia int.			
Lepid angust.			

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA BEERMULLAH RD LOT 1711 SITE NUMBER BEER 02

DATE TRIP 24-11-95 RECORDERS BJK NOT TS

DATE TRIP _____ RECORDERS _____

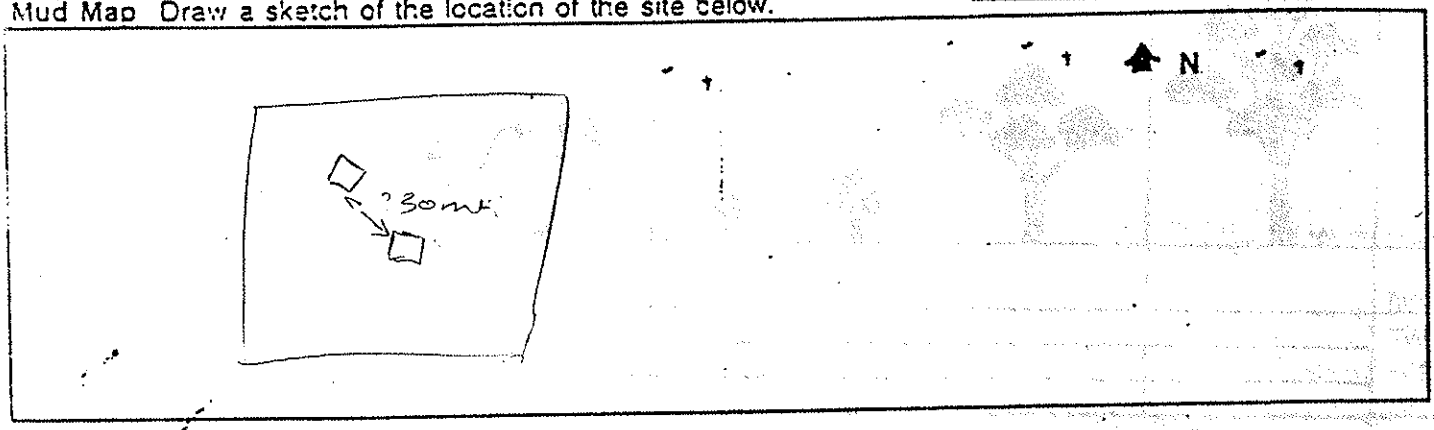
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 34 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



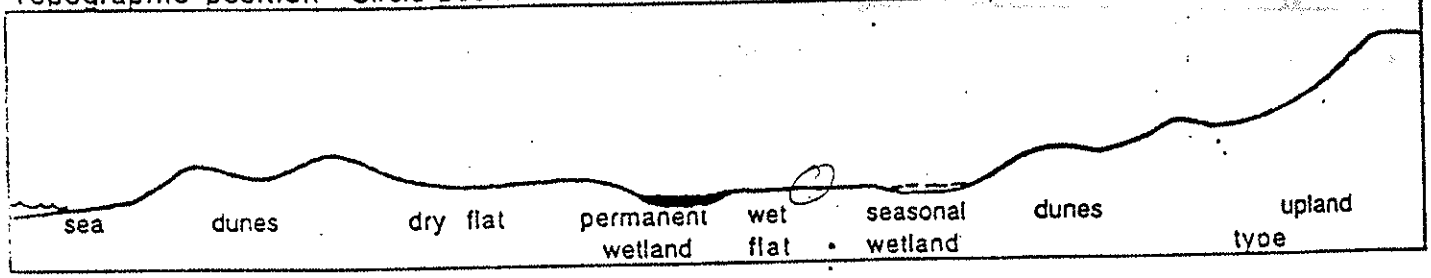
Road Location

Geographic Location Latitude 31°13·334'S Longitude 115°46·267'E Altitude

Reference Map EPE ± 43mt

Photograph Photographer's Name TS Photo No 18

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat gentle steep *Aspect* N NE E SE S SW W NW

Surface Soil loam *Colour* dk brown

Exposed rock *type* % surface

Sub-surface Soil *Colour*

Rock *type* limestone depth to rock 20cm

Drainage well mod poor depth water cm *Wet* all year winter/spring

Litter 30-70% cover

Depth up to 1 cm

Bare Ground zero %cover

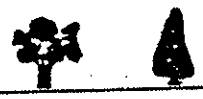
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

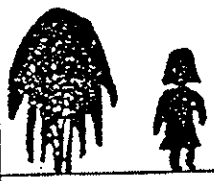
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m
LIFE FORM					30m 10m
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM					2m 1m
COVER CLASS (%)	30-70		10 - 30	2-10	
DOMINANT SPECIES	Mel huegl		Xanthorrhoea	Mel inc-Grevolea = leaves	

	GRASSES	HERBS	SEDGES over 0.5m	under 0.5m
LIFE FORM				1m
COVER CLASS (%)	30-70	2-10	2-10	2-10
DOMINANT SPECIES	exotics	Tricoryne	Hakea trifida	Lepidosperma

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	
3	VERY GOOD	
4	GOOD	✓
5	DEGRADED	

COMMENTS

grazed by goats, roos & rabbits

quite a few seedlings

Grevillea spp. prostrate upright branches

eaten

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No BEER Ø2
Date 24/11/95

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (19940 and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Mel. hueg.			
Mel. incana			
Mel viminea			
Xanth. preissii			
Cre lobbusi (dra = ?evanescens			
Acacia saligna			
Dry nivea			
Kunz. recurva			
Kunzea prost.			
Dry ?sessilis (seedling)		none seen	
Hibb. racemosa			
Cassytha = boot Ø2			
Diplopeltis huegi 'glabrous'		VSP	
Comesperma = Ø1			
Cassytha glabella			
Exocarpos sparteus			

SHRUBS (cont.)	No	Fl	ID
*Lolium rigidum			
GRASSES			
*Vulpia myuros		VSP	
Agrostis avenacea		VSP	
*Vulpia bron		VSP	
*Pol-pogon mono			✓
Dichopogon = Ø1			✓
Stipa = Ø2			
* Briza max			
* Briza minor			
* Aira cary			
HERBS			
* Anag. arv.			
* BIK. taxago			
Trigonne elatior			
*Centaurium erythr.			
Lag hueg.			
Podonolepis stricta			
Podolepis gracilis (pink)		VSP area	
Crood. pulchella			✓
* Cotul. angust			
* Trifol. ? camp. (lge yel)			
Thyscant. tenuis (mint)			
Dichopogon glocklid			
Damp. ?alata			✓

HERBS (cont.)	No	Fl	ID
Drosera menz ssp menz			
Daucus glochid.			
Opare ? veg			
* Hyp globra			
Millia parodox			
Lycopodium			
Thys. arenu			
Sowd laxiflora			
Hydrocotyle rugulosa = HISP			
Eryngium = boot Ø1			
✓ Podoth. microphylla			
✓ * Arc calend			
✓ Silox humifusum			
SEDGES			
Cahnia trifida			
Lepid long			
Schoenus sp 2		VSP	
Lepid angust			
Centro laxist			
HERBS			
* Sonch. oleac			
ADJ			
Hak. pros.			
Hak. / varia			
Pto			

no adults seen check seedlings

DEP SYSTEM 6 UPDATE SUBMISSION SURVEY SHEET B.J. KEIGHERY 9/95

BUSHLAND AREA Airfield Road SITES YES/NO

DATE 3/4/95 RECORDERS KK, NT, VL

Observations edge transects

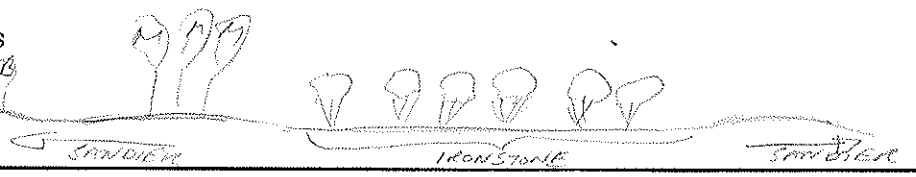
Geographic Location	Latitude 31°27.367	S Longitude 115°55.802	E ± 55m

Reference Map Pole 17

Photograph	Photographer's Name NT	Photo No

Transect of landscape units

dunes
dry/wet flats
sumplands
uplands
type



Soil red clay		Colour
Exposed rock /	type ironstone	% area exposed @ 5% area

VEGETATION

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtianna*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B.attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. raphiophylla*	*M. lanceolata*	*M. cuticularis*		
Others	*Callitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E. foecunda*	*E. latens*

Ironstone area is a combination of sites Ø1 & Ø2 patches of both Asteraceae sp (see Ø1 sheet), Myrtaceae, Banksia prionotes, Stylidium sp. (all just finished flowering) Ø2 Haemodorum spicatum, Amphipogon, Vill sp, Grevillea all grazed by cows

Vegetation Condition - Keighery 1994 (Trudgen 1993)	
1 = 'Pristine' (Excellent)	
2 = Excellent (Very Good)	
3 = Very Good (Good)	Average conditions area is grazed by cows and kangaroos, all grevilleas are eaten
4 = Good (Poor)	(G.obtusiloba & G.tarunbaa)
5 = Degraded (Very Poor)	G.obt is bush to 2m)
6 = Completely Degraded	Seedlings of grevilleas are present

partial clearing	used as pasture					
weeds						
selective removal of species		timber cutting	mowing	% dieback		
fire frequency						
'enrichment plantings'					roos / kangaroos	
animal impact	horse	foxes	rabbits	cats	dogs	goats	pigs	overgrazing by native mammals
soil movement	mining		dumping		rubbish dumping			roadworks
changes in water regimes			flooding		drainage	watering		nutrient influx
Tracks	fire breaks		walk trails		off road vehicle use			animal tracks
Service corridors		SEC	Main Roads		Water Authority.			Telecom
Other								

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
Trees >30m Trees 15-30m Trees 5-15m Trees <5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low Woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee tree form Mallee shrub form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs >2m Shrubs 1.5-2.0m Shrubs 1.0-1.5m Shrubs 0.5-1.0m Shrubs 0.0-0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat plants Hummock Grass Bunch grass >0.5m Bunch grass <0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-Dense Hummock Grass Tall Grass Low Grass Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges >0.5m Sedges <0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

VSP's

Dryandra sessilis
Eam. planat. ssp planifolia.
Podolepis gracilis (SWAMP)
Grevillea Scarlioba ssp macrura
Grevillea levenescens'
Mynophyllum echinatum
Myriocephalus heterogonidius

Trachymitra sp.
Microtis media
* Trifolium dubium
* Cuscuta

Schoenus aff. odontocarpus (variants)
* Vulpia myuros
Biddyconia bellidoides
Acacia acuminata
Amphipogon neesii
* Arcto. calendula
Juncus bufonius (native)
Isotoma hypocraterif.
Mynophyllum echinatum
Leptoceras tenuiculus
* Hyanochaeris minuta ssp
Isotepis old.
Borya scirpoidea.

Others
Conostylis aristata
Stylid. longitubum
Myriocephalus heterog.
Rhodanthe spicatum
Conostylis glabra
Haemodorum simplex
Tribonanthes australis
Posoqueriopsis stricta
* Hypochaeris glabra

Flora comments

Fauna comments

Adjacent bushland

AD

Swan Coastal Plain Survey - SURVEY RECORDING SHEET Please use pencil

BUSHLAND AREA: AIRFIELD RD

QUADRAT No. AIRF 01 VEGETATION TYPE

DATE TRIP 6/7/94 BOTANIST GJK, BJK

VOLUNTEERS

DATE TRIP BOTANIST

VOLUNTEERS

Keighery and Keighery, 1990
Adapted from Griffin and Keighery, 1989
MOORE RIVER to JURIEN SANDPLAIN
SURVEY. WILDFLOWER SOCIETY of WA

1. LOCATION of the QUADRAT

a. Mud Map Draw a sketch of the location of the quadrat

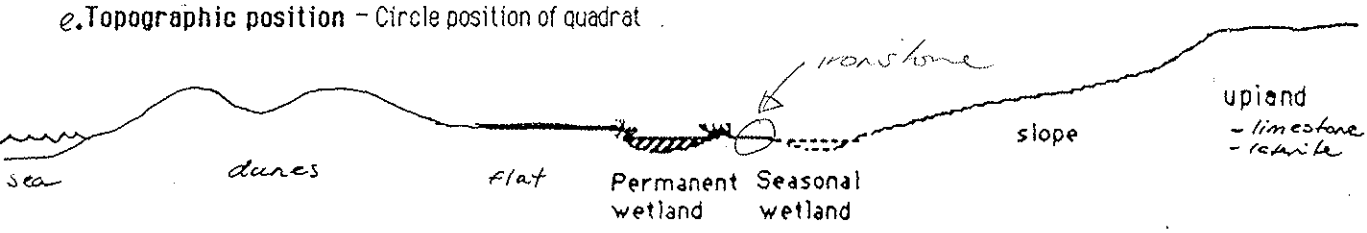
N

Site located to W pole 17 for 20m at 5m wide on road verge - Structural data from paddock

b Road Location	c. Latitude	Longitude
	31°27.367'	115° 54.02'
		Altitude

d. **Photograph** Photographer's name Photo No

e. **Topographic position** - Circle position of quadrat



2. SITE DATA - Circle the correct response

Slope (flat) gentle steep

Aspect N | NE | E | SE | S | SW | W | NW

Surface soil red clay pebbles - 50% surface ironstone

Sub-surface soil ironstone surface to 20/30 cm

Drainage well mod (poor)

Wet All year (winter/spring)

Litter (% cover) <2%

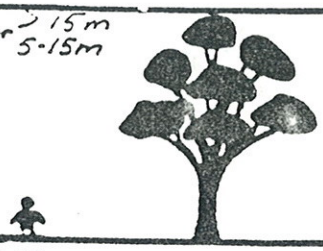
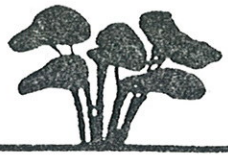
% Bare ground <2%

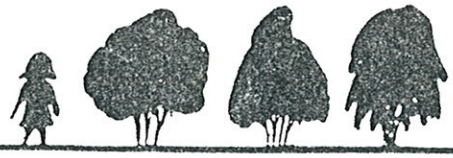
P.T.O.

3. VEGETATION STRUCTURE AND COVER Record appropriate cover class

Cover Class – percentage classes

0%	under 2%	2–10%	10–20%	20–30%	30–50%	50–70%	over 70%

LIFE FORM	TREES		MALLEES		
	>15m or 5-15m 	under 5m	MALLEE SHRUB less than 8m	MALLEE TREE 8m or more 	15m 10m 5m
COVER CLASS (%)	>15m 5-15m				
Dominant Species					

LIFE FORM	SHRUBS over 2m	SHRUBS use the height classes indicated 2.0-1.5m	1.5-1.0m	1.0m - .5m	SHRUBS under .5m	Height (metres) 3m 2m 1m
						
COVER CLASS (%)		10-20%				
Dominant Species		Kun. lit Mel vim				

LIFE FORM	BUNCH GRASSES under .5m	HERBS under .5m (except creepers) annuals	SEDGES over .5m Dense Herbs + low Sedges	SEDGES under .5m annual	2.0m 1.5m 1.0m .5m
COVER CLASS (%)	Herbs	30-70%	>70%	30-50	Low Sedges
Dominant Species		mixed		mixed	

4. VEGETATION CONDITION

patches Helipt many

PRISTINE	
EXCELLENT	
VERY GOOD	
GOOD	
DEGRADED	

comments

grazed, needs 30-50%

BUSHLAND PLANT SURVEY RECORDING SHEET - use pencil only p3

4. SPECIES PRESENCE

SITE No AIRF 01

Date 6/9/94

Label each plant with plants number, site code, date and plant's name or working name if required
Record on Sheet
- Column 1 flowering time- TICK if species flowering
- Column 2 plant name
- Column 3 plant no
- Column 4 identification check

⊗ only in bush block

TREES				SHRUBS				HERBS			
Fl		No	ID	Fl		No	ID	Fl		No	ID
								0	*Romulea rosea		
								0	Schoenus odontocarpus		
								0	Schoenus sp2		
MALLEES								0	Haloragis tenuifolia		
								0	Pultenaea novae-hollandiae		
								0	Cotula coryp.		
								0	Drosera stenopetala		
								0	Amphibromus neesii		
								0	Monoscis debilis		
SHRUBS								0	Juncus holoschoenus		
0	⊗ Kunzea ericoides							0	Thelymitra antennifera		
0	⊗ Melaleuca sp			GRASSES				0	Burbina semibarbata		
0	⊗ Grevillea [biternata] curviloba ssp incurva							0	Cotula australis		
0	⊗ Grevillea obtusiloba							SEDGES			
0	⊗ Dryandra sessilis							0	Triglochin centrocarpa		
0	Acacia saligna			HERBS				0	Isolepis marg.		
0	Jack hewittiana			0	Tribonanthes aust			0	*Trifolium dubium		
				0	Villarsia capitata			0	Polygala multifida		
				0	Glossostigma diand.			0	*Rumex maximus		
				0	Centrolepis aristata			0	Callitriche stagnalis		
				0	Centrolepis strigosa			0	Crassula ?decumbens (exserta)		
				0	Helipterum spectatum			0	*Spergularia rubra		
SEDGES ✗				0	HERBS Helipterum sp many			0	Stylid graminifolium		
				0	Caphurus tenuifolius			0	Myoso. holosericeus		
				0	Centrolepis aristata						
				0	Thelymitra antenn.						
				0	Juncus bufonis						
				0	*Cerastium sp						
				0	*Hesperanthera falcata						

AIRF

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA AIRFIELD RD SITE NUMBER AIR02

DATE TRIP 3-11-95 RECORDERS BTK NCT VE

DATE TRIP _____ RECORDERS _____

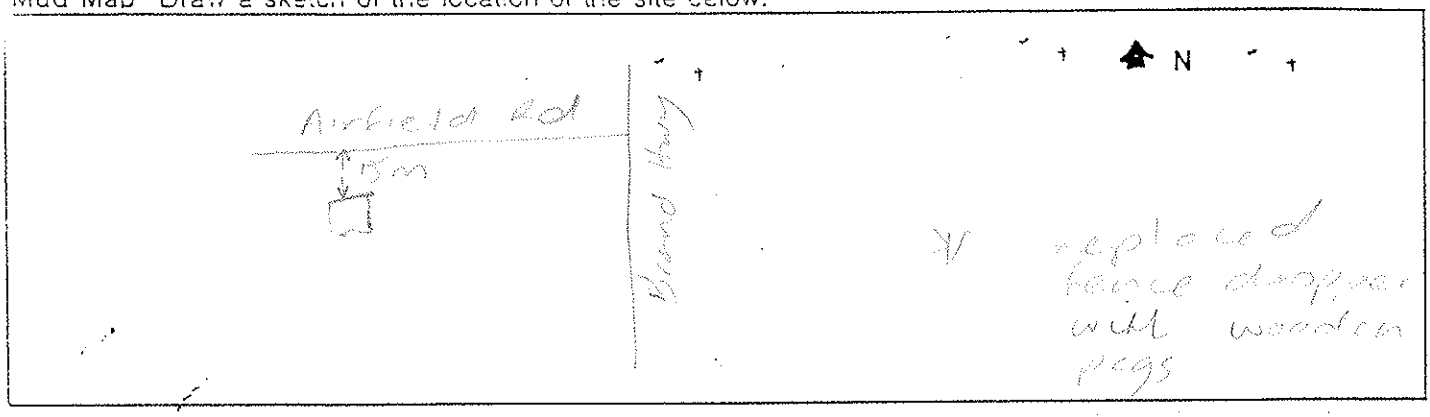
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



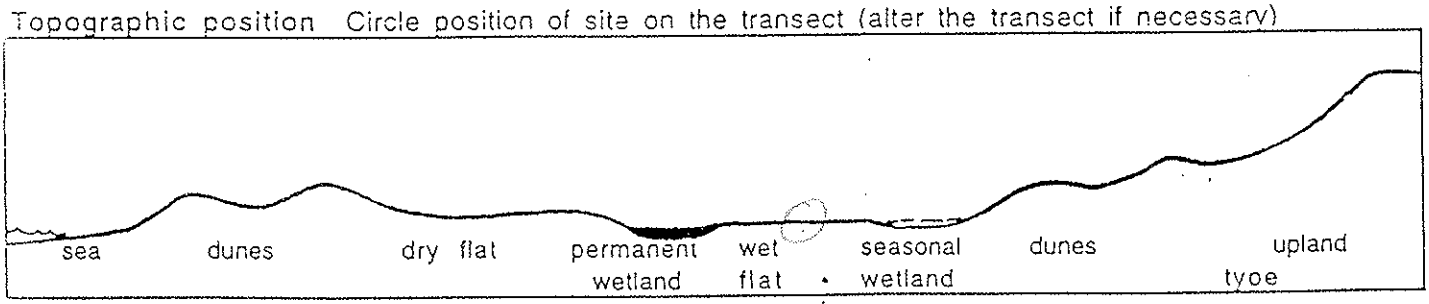
Road Location Airfield Rd

Geographic Location Latitude 31° 27 334 S Longitude 115° 59 075 E Altitude

Reference Map 608 : 12 mm

Photograph Photographer's Name Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope (flat) gentle steep *Aspect* N NE E SE S SW W NW

Surface Soil sandy clay *Colour* dark red/brown

Exposed rock *type* % surface

Sub-surface Soil laterite *Colour*

Rock *type* depth to rock

Drainage well mod (poor) depth water cm *Wet* all year winter/spring

Litter 2-10 % cover

Depth 1 leaf cm

Bare Ground <2 %cover

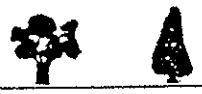
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

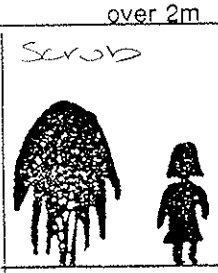
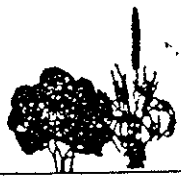
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

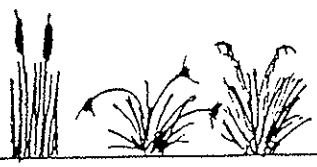
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES over 30m	TREES 15 - 30m	TREES 5 - 15m under 5m	MALLEES over 8m	MALLEES under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS over 2m	SHRUBS 2m - 1.5m	SHRUBS 1.5 - 1m	SHRUBS 1 -0.5m	SHRUBS under 0.5m
LIFE FORM					
COVER CLASS (%)	10-30				
DOMINANT SPECIES	Kunz ntho Mel vim				

	GRASSES	HERBS	SEDGES over 0.5m	SEDGES under 0.5m
LIFE FORM				
COVER CLASS (%)	30-70	70+		30-70
DOMINANT SPECIES	Bro cary Lolio mgr. Briza Yilin	Stel. media / longifolium Myriophyllum		Cyperaceae ~~Schoenus~~ Typha ord.

4. VEGETATION CONDITION

1 'PRISTINE'	
2 EXCELLENT	
3 VERY GOOD	
4 GOOD	✓
5 DEGRADED	

COMMENTS

been ? being grazed.

Weeds

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE — Label each plant with plants number, site code, date and plant's name or working name if required

SITE No AIREØ2
Date 3/11/95

Record on Sheet
- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

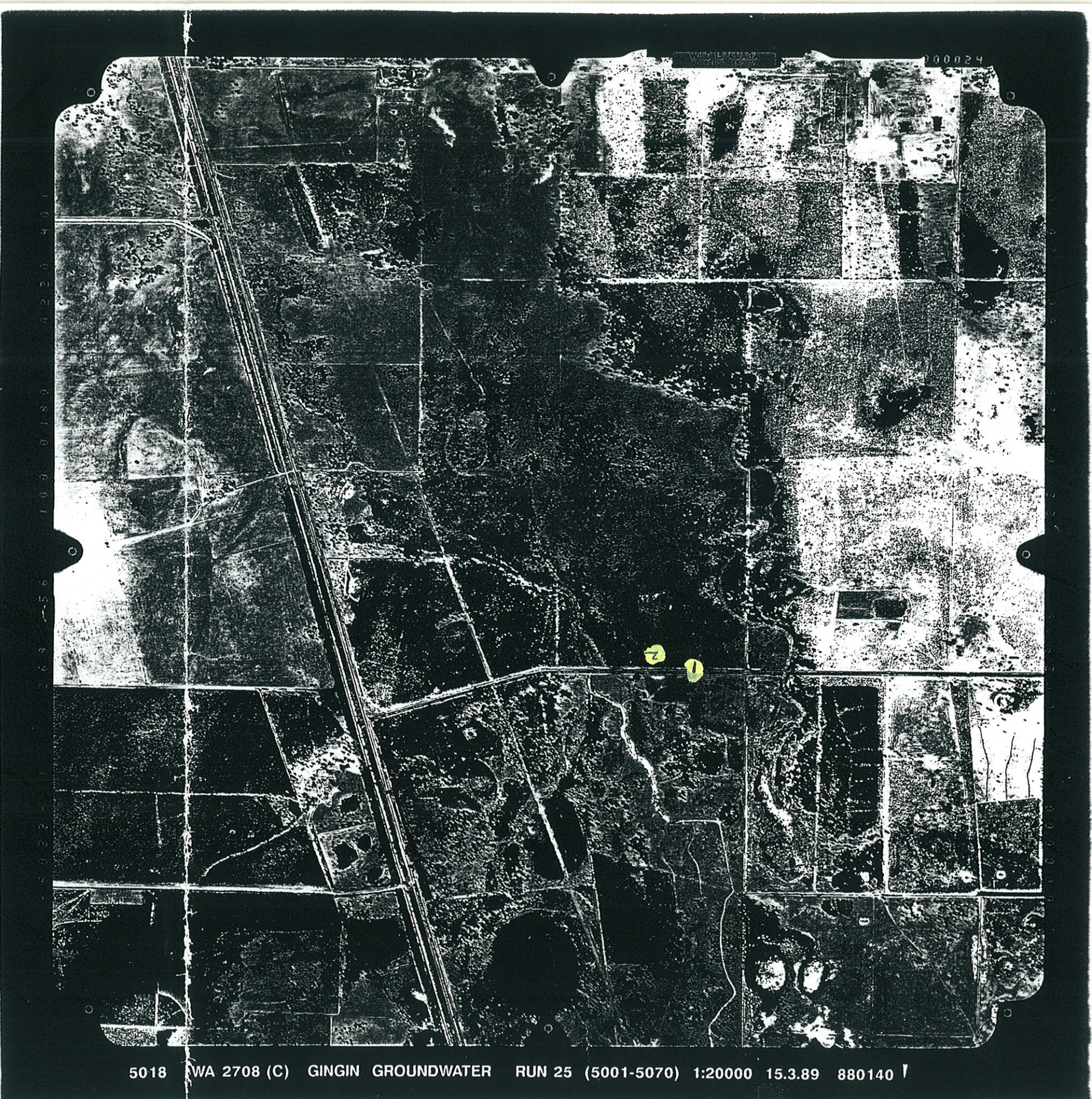
From *'Bushland Plant Survey'* written by B. Keighery (19940 and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Mel. viminea			
Kunzea lit. (VSP area)			

SHRUBS (cont.)	No	Fl	ID
HERBS			
Sow loc.			
Trigonis. flag.			
GRASSES			
*Briza min			
*Vulpia myuros	VSP		
*Ehrharta long.			
*Lolium rig.			
*Ehr. longiflora			
*Bromus rubens			
Amph. nest			
Austrostipa pressii	(VSP area)		
HERBS			
*Hakea rostrata			
Stylid. longitubum.			
*Trifolium dubium			
*Trifolium subterraneum			
Bulbine semibarbata	(VSP)		
Cot. coron.			
Myriadenium echinatum	[VSP ADJACENT]		
Pimelea hal.			
Stell. pungiana			
Hydro. tetragonocarpa	VSP		
Haem. simplex			
Eryn. pin.			
Haloragis ?tenuifolia =VSP			

HERBS (cont.)	No	Fl	ID
*Hypochoeris glabra			
*Hypochoeris radicata			
Parent. viscosa			
*Lotus angust.			
*Orth. juncea			
Good. micrantha			
Dros. menz ssp menz			
Will. rap.			
*Hyp. glab.			
Lepto. =Mono. simp.			
*Cuscuta epithy.			
*Spergularia rubra (Vets used)			
Triglochin sp (dead)			
Microtis media			
SEDGES			
Lepto. scop.			
~~Schoenus apogon~~			
Juncus bufonius			
Juncus capitatus			
Cyp. tenellus			
Isolep. cer.			
?Stackhousia (Only had one make sure)			

(?Brunia) from area



AIRFIELD ROAD

NORTHERN IRONSTONE

Suggested name of area (1996)

Some Other Commonly used Names:
Airfield Road, Northern Ironstones

Area (ha):
cadastral boundary - 199.4 , 50% bushland (aerial photo), no remnant vegetation (GIS): approx. one third of the area described, see map.

Local Authorities (Suburb)
Shire of Gingin

Zoning (MRS & town planning)
rural

Ownership categories: Street name, Lot number
Lot 2115 (David Hodby Nominees Pty Ltd, 81 Smyth Road NEDLANDS 6009 - DEP letter 4/12/95)

Reserve Status
NA

LANDFORM AND SOIL

Landscape features: sheet ironstone, vegetated wetland, vegetated uplands

Geomorphology and soils

Pinjarra Plain
Guildford formation (Qpa - ironstones not mapped)

Bassendean Dunes
Bassendean sands (Qpb)

Bassendean Dunes/Pinjarra Plain
Bassendean sands over Guildford Formation (Qpb/Qpa)

Wetlands (within the Bassendean Dunes and Pinjarra Plain)
Holocene swamp deposits (Qhw)

REGIONAL VEGETATION AND FLORA

Vegetation Complex

Foothills
Coonambidge Complex (Dandaragan Plateau)

Pinjarra Plain
Yanga Complex

Bassendean Dunes
Bassendean Complex - North

Floristic Community Types: incomplete sampling, some types inferred

Supergroup 2 - Seasonal Wetlands
8 Herb rich shrublands in clay pans

Supergroup 3 - Uplands, centred on Bassendean Dunes and the Dandaragan Plateau
*23c North-eastern *Banksia attenuata - B. menziesii* woodlands

Supergroup 4 - Uplands centred on Spearwood and Quindalup Dunes
*28 Spearwood *B. attenuata* or *B. attenuata - Eucalyptus* woodlands

REGIONAL WETLANDS

Wetland Types: sumpland, palusplain

Consanguineous suite

Bassendean - Pinjarra transition OR Bassendean with fluvial features
Mungala (B/P.2)
Muchea (B/P.3)

Coastal Plain Rivers
Ellen Brook (R.3)

Wetland Management Objective: Resource Enhancement, Multiple Use

Lake EPP: none identified

THREATENED COMMUNITIES

Not assessed, Critically Endangered (Perth to Gingin Ironstone Association) - Vulnerable (floristic community type 8),

AREA DESCRIPTION

Vegetation and Flora

Structural units: limited survey)
Eucalyptus calophylla Woodland, *Banksia* Woodland, *Kunzea littoricola* and *Melaleuca viminea* Tall Shrubland, Closed Herblands of *Stylidium longitubum, Myriocephalus helichrysoides, Villarsia capitata, Rhodanthe spicatum* and *R. manglesii* in combination and alone, Closed Herbland, *Agrostis preissii* Grassland, *Amphibromus neesii* Grassland, exotic Grassland,

Remnant Vegetation (canopy only): Shrubland over exotic Grassland approximatle 40%

Vegetation Condition: >50% Very Good to Good,<50% Degraded to Completely Degraded

Total Flora: 60 native taxa, 17 weeds (site generated list and some additional records only, estimated <50% expected flora)
DRF/Priority - GIS: none recorded
DRF/Priority and significant flora from survey - *Grevillea curviloba* subsp. *incurva* (1), *Haloragis tenuifolia* (1), *Grevillea evanescens* (1), *Eryngium pinnatifidum* subsp. *palustre* MS (2), *Myriophyllum echinatum* (3), *Stylidium longitubum* (3)
Taxa typical to heavy soils on northern ironstones and clays: *Myriocephalus helichrysoides*, *Kunzea littericola*, *Rhodanthe spicatum*, *R. manglessii*, *Haemodorum simplex*, *Pogonolepis stricta*, *Podolepis gracilis* (swamp form), *Amphibromus neesii*, *Agrostis preissei* and priority flora above

Fauna
Mammals: not surveyed
Linkage: no adjacent bushland, channel wetland canopy bushland linkage to north, south, east, west recognised available Bushland in System area fragmented linkage opportunities available within System area boundary

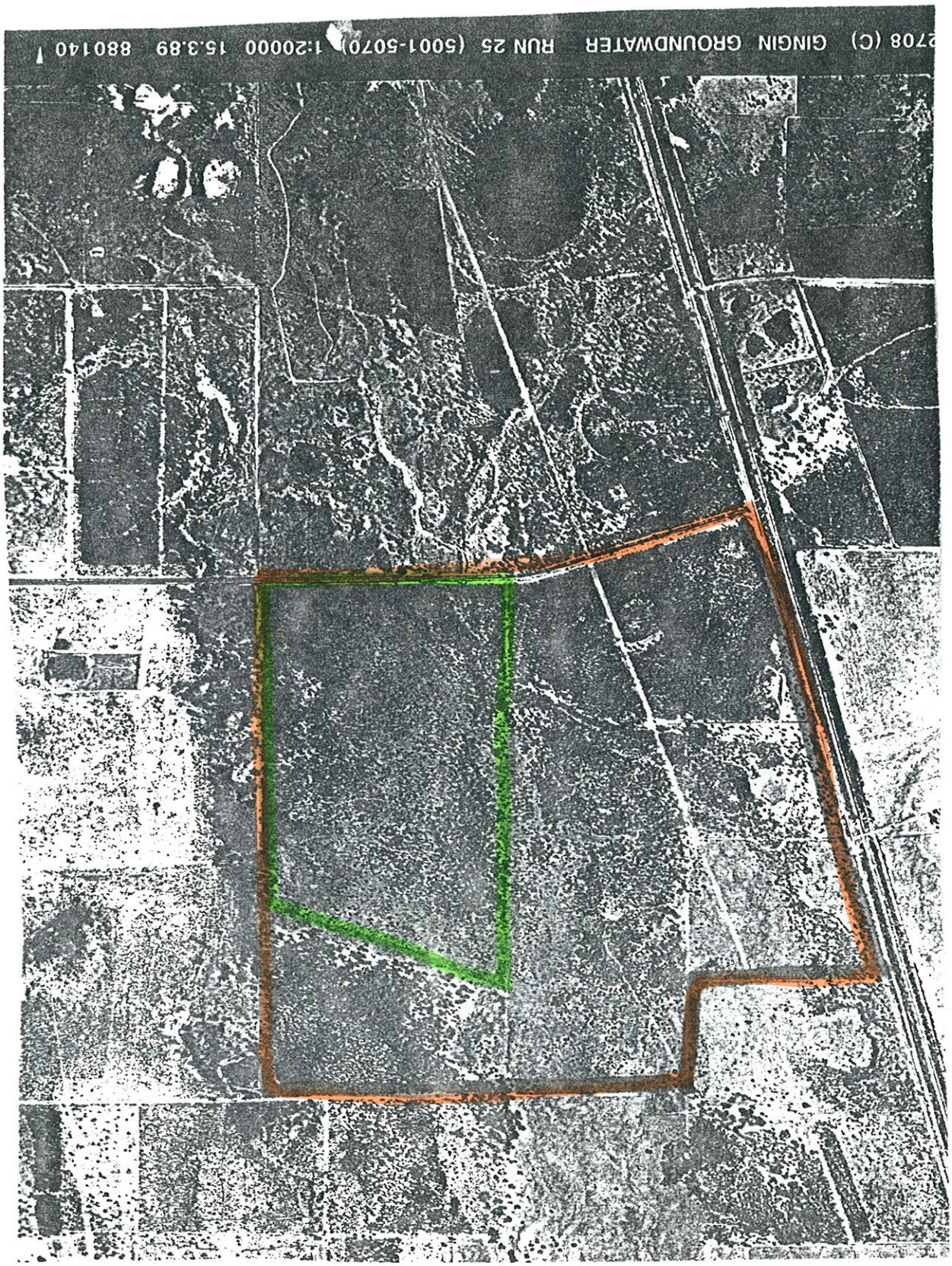
Special Attributes: Only known area of northern ironstones and while the area is grazed and partially cleared there is a good cover of both the shrub and herb flora on the ironstone flats believed to be chracteristic of this community. Area grazed by cows and kangaroos but floristically the area is intact. Seedlings of both *Grevillea* species were evident and with reduced grazing and weed control the area has the potential to regenerate to very good condition.

INTERNATIONAL AND NATIONAL SIGNIFICANCE
Not listed

CONSERVATION RECOMMENDATIONS
Criteria met for inclusion: Representation of ecological communities, Diversity, Rarity, Maintaining ecological systems or natural processes, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation.
Constraints: Private land

NORTHERN IRONSTONE

Orange = cadastral boundary
Green = area described



Mucher Limestone
Community Lot 4
Bush Forever Site
465

DEP SYSTEM 6/BUSHPLAN – SURVEY SHEET B.J. KEIGHERY 6/97

BUSHLAND AREA 465 – Lot 4 SITES (YES/NO)

DATE 12/8/97 RECORDERS BJK

Observations edge (transects)

Geographic Location	Latitude	S Longitude	E
Reference Map			

Photograph	Photographer's Name BJK	Photo No 16

Transect of landscape units (draw in transect incorporating features listed and any other relevant unit)

dunes
dry/wet flats
sumplands
uplands
type

Soil - surface **sub -soil**

Exposed rock type % area

edge outside site

FLORA/VEGETATION (list dominant and significant plants below, see over for vege association descriptions)

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtianna*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B. attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. rhaphiophylla*	*M. lanceolata*		*M. cuticularis*	
Others	*Callitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E. foecunda*	*E. latens*

SIGNIFICANT SPECIES / DOMINANT SPECIES

See Trudgen + Keighery 1995 and site sheets 8/12/97

(see over for vegetaion descriptions)

Vegetation Condition - Keighery 1994 (Trudgen 1993) (show range and indicate predominant class)

1 = 'Pristine' (Excellent)
2 = Excellent (Very Good) some patches of weeds
3 = Very Good (Good)
4 = Good (Poor)
5 = Degraded (Very Poor)
6 = Completely Degraded

Specific aspects of disturbance

partial clearing outside Bushplan Site

weeds (list): Briza maxima most common, Gasoul Homeland grazing

selective removal of species: timber cutting mowing fire grazing dieback %area

fire frequency: 2 6yrs <90

'enrichment plantings' (list)

animal impact: horse foxes rabbits cats dogs goats pigs overgrazing by native mammals

soil movement: mining dumping rubbish dumping roadworks

changes in water regimes: flooding drainage watering nutrient influx

Tracks: (fire breaks) walk trails off road vehicle use animal tracks

Service corridors: SEC Main Roads Water Authority. Telecom

Other

VEGETATION (describe each unit of vegetation using dominants and life form/height class and canopy cover according to the Muir/Keith codes above)

Fauna comments

Kangaroos, feral cats seen

Adjacent bushland (refer to aerial photograph)

OTHER COMMENTS

Boundary (E) in centre of wetland, intact veg either side mapping in TRK 1995 more accurate

Photo 17 along road at intact veg

Photo 18 across clearing out to bushplan site

BS 465 — Lot 4

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No 2

Date 2/8/99

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name-
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Vim. juncea			
Hakea juncea (small)			
Pel. radula			
Dry sp.			
Petrophila diversifolia			
Xanth. preissii			
Pimelea	Vst		
Comp.			
Hak. subsecunda			
Med. incana (single)			

SHRUBS (cont.)	No	Fl	ID
Sandy patch			
ADJ – wet flats			
Schoenus brevifolius			
Schoenus subbulbosus			
~~GRASSES~~			
HERBS			
Burch. multi			
Drosera frost			
Drosera heterophylla			
Drosera gigantea			
Pet occid			
Borya sp.	Vst		
Stylid bulb			
Thys patersonia			
Lepi / Isotoma			
Goodenia coerulea			
Opet vaginata			
Trib. australis			

HERBS (cont.)	No	Fl	ID
Adj			
Velleia trinervis			
Hakea subsecunda			
Hibb	Vst		
Lepid. lang			
SEDGES			
Mesomelaena tetragona			
Lepid. scariosum			
Cyth. odoratus			
?Schoenus			
Tet oct			
Lax. fascic			
Adj			
Jack grandis			

Lot 4 465 (2) 12/6/99

BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

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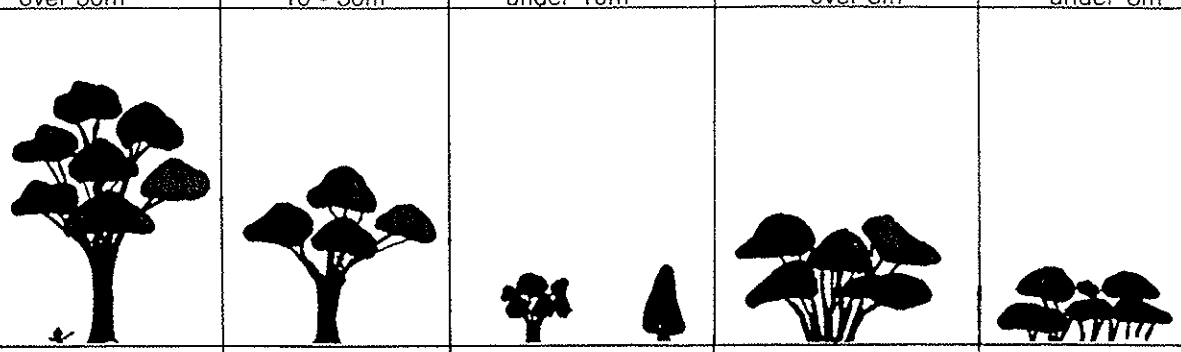
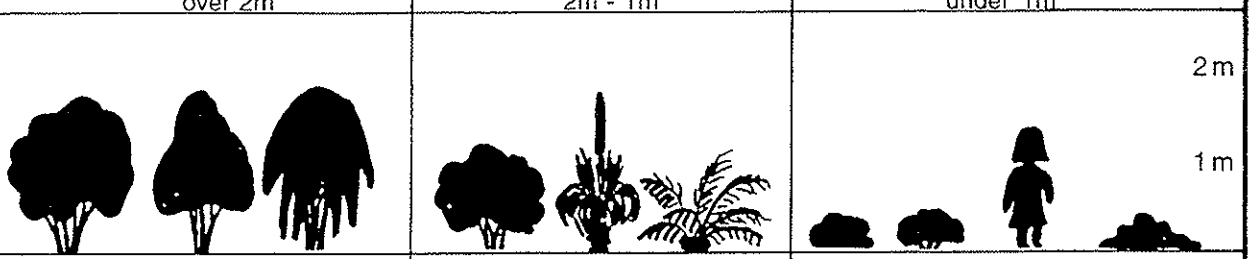
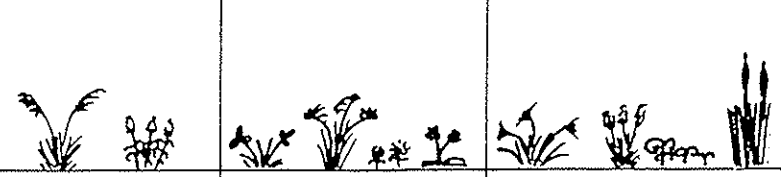
3. VEGETATION STRUCTURE AND COVER

For each layer **record** - appropriate **life form**, **cover class** (see below).and **dominant species** in each layer.

Cover Class **2-10%** **10-30%** **30 - 70%** **over 70%**

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS		SHRUBS
	over 2m	2m - 1m	under 1m
LIFE FORM			
COVER CLASS (%)	30 - 70%		2 - 10%
DOMINANT SPECIES	Viminaria juncea		Xanth. preiss.

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				
COVER CLASS (%)	?	10 - 30%	30 - 70%	
DOMINANT SPECIES	Exotics	Pat. acida	Lepid. angust. Cyth. arenarium	

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	
3	VERY GOOD	✓
4	GOOD	
5	DEGRADED	

COMMENTS

Time of year limits determination

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No 1
Date 12/8/99

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name-
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Vim. juncea			
Meb. incana			
Acacia saligna			
Bank. ser.	✓		
Xanth. preissii			
Dry. linearis			
Banksia comptonii			
Tet. octandra			
Acacia sp. pinjarra			
Allocasuarina humilis			
Scaevola sp. (Stirling)	✓		
Paricalanna / ellipticifolia			
Hakea subcarnosa			
Petrosonia occidentalis			
Petrophile media			
Verticordia densiflora			

SHRUBS (cont.)	No	Fl	ID
GRASSES			
* Gras 1			
* Gras 2			
* Ehrharta calycina			
Nauchea Velcop.			
Grass 3	✓		
HERBS			
* Hyp. glabrum			
Petrorhagia dubia Stirling	✓		
Thysanotus Spectans (Star)			
Drosera Frost Star			
Goodenia coerulea			
Haemodorum			
Patersonia occidentalis			
Conostylis			

HERBS (cont.)	No	Fl	ID
SEDGES			
Mesomelaena tetragona			
Tet. octandra			
Cyathochaeta avenacea			
Hypolaena exsulca			
Loxocarya fasciculata			
Ab. / Abolboda pallida			
M. pulchella			
Ellarbrookia kunzeoides			

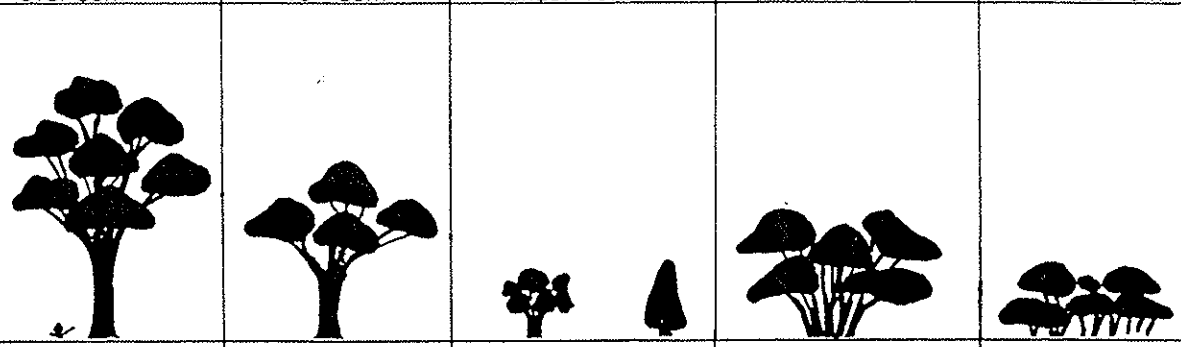
BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

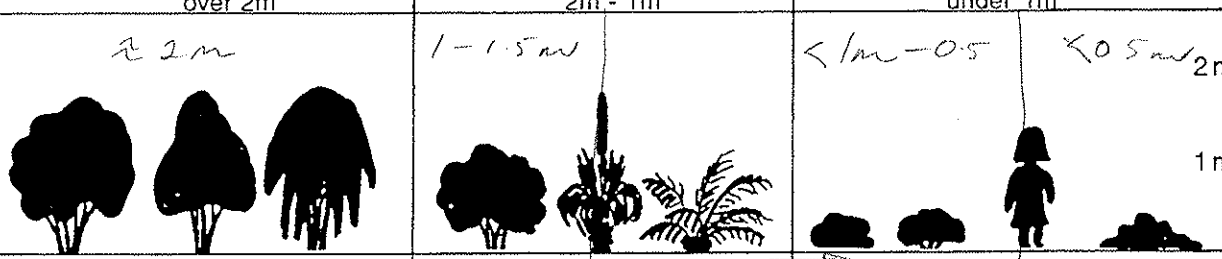
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

3. VEGETATION STRUCTURE AND COVER

For each layer **record** - appropriate **life form**, **cover class** (see below).and **dominant species** in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS			SHRUBS	
	over 2m	2m - 1m		under 1m	
LIFE FORM					
COVER CLASS (%)	30 - 70%	10-30%	30-70%		10-30%
DOMINANT SPECIES	V. minuria juncea	Ac. benthamii	Banksia ket.	1	track. compac.
		Mel. inc	Xanth. prei		Dry sand

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				
COVER CLASS (%)	2-10%			
DOMINANT SPECIES	Tecoma		Meso. ket.	
			Cyath. aven	

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	✓
3	VERY GOOD	✓
4	GOOD	
5	DEGRADED	

COMMENTS

patches of grassy weeds towards edge

Lorry 465 (3) grey sand, slight rise 14/6/99

BUSHLAND PLANT SURVEY RECORDING SHEET 2 - use pencil only

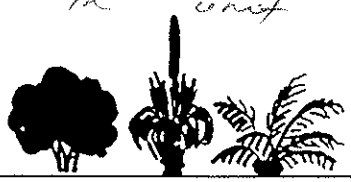
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

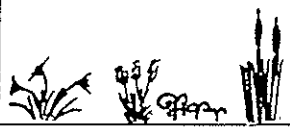
3. VEGETATION STRUCTURE AND COVER

For each layer **record** - appropriate **life form**, **cover class** (see below).and **dominant species** in each layer.

Cover Class **2-10%** **10-30%** **30 - 70%** **over 70%**

	TREES			MALLEES	
	over 30m	10 - 30m	under 10m	over 8m	under 8m
LIFE FORM			Other areas Scattered Canopy grade occ Eucalypt Myrtaceae		30m 10m
COVER CLASS (%)					
DOMINANT SPECIES	/				

	SHRUBS		SHRUBS	
	over 2m	2m - 1m	under 1m	
LIFE FORM	not at present old post fire plants	petrea Kingia in understorey 	1 - 0.5	<0.5 2m 1m
COVER CLASS (%)	10 - 30%		10-30%	30 - 70%
DOMINANT SPECIES	Jacksonia sternbergiana		Xanthorrhoea preissii	Grevillea crithmifolia Dryandra lindleyana

	GRASSES	HERBS	SEDGES	OTHER
LIFE FORM				1m Vine
COVER CLASS (%)			30 - 70%	10 - 30%
DOMINANT SPECIES			Mesomelaena tetragona	Acacia rostellifera

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	)
3	VERY GOOD	
4	GOOD	
5	DEGRADED	

COMMENTS

Burnt ~ 6 yrs ago, whole site

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No 3

Date 12/8/97

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
MALLEES			
SHRUBS			
Jack Clem			
Cooch onst			
Dry lina			
Kuth pressi			
Petal. Eremea			
Hibb aff rhadinopoda	49		
Jack - rounds			
Jac Eremea			

SHRUBS (cont.)	No	Fl	ID
GRASSES			
* Briza max			
Amphi rest			
HERBS			
Thys juct			
Cassytha			
Hakea			
Trigonotheca nudata			
Drig virosa			
Conv sahara			
Stylid Dich			
Stac. ramosa			

(2) HERBS (cont.)	No	Fl	ID
Senecio [illegible] lage Mac			
an Mac			
Lom Aur			
Cam Mar			
Blancoa canina			
Hak Cly			
Rostro			
D-F Sarm to the			
site			
SEDGES			
Mesa lat			
Cyath cuthaeca			
Lepy Angusta			
Tet ach			
Schoenus subulatus			
Schoeno rigens			
Andr			
Ortch fim. bend			
Lomat. Sph			
Conyntha mic			
Styl. lch			

DEP SYSTEM 6/BUSHLAN – SURVEY SHEET B.J. KEIGHERY 6/97

BUSHLAND AREA BS 465 – Lot 31 SITES YES/NO

DATE 12/8/97 RECORDERS BJK

Observations edge transects

Geographic Location	Latitude	S Longitude	E
Reference Map	BS 69		

Photograph	Photographer's Name	BJK	Photo No	see sheet 8

Transect of landscape units (draw in transect incorporating features listed and any other relevant unit)

dunes
dry/wet flats
sumplands
uplands
type

Soil - surface			**sub -soil**
Exposed rock	type	% area	

FLORA/VEGETATION (list dominant and significant plants below, see over for vege association descriptions)

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtianna*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B.attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. rhaphiophylla*	*M. lanceolata*		*M. cuticularis*	
Others	*Callitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E. foecunda*	*E. latens*

SIGNIFICANT SPECIES / DOMINANT SPECIES

See Site Sheets 1 & 2 and adjacent lot 4

(see over for vegetaion descriptions)

Vegetation Condition - Keighery 1994 (Trudgen 1993) (show range and indicate predominant class)

1 = 'Pristine' (Excellent)	localised disturbance associated
2 = Excellent (Very Good)	two soil 'cycles' and loading
3 = Very Good (Good) *	ramp area,
4 = Good (Poor)	
5 = Degraded (Very Poor)	
6 = Completely Degraded	

Specific aspects of disturbance

partial clearing see above Lot 31 possibly cleared in past, all vent trenkless, adj trenched

weeds (list): * Ehrharta calycina, Hyp glab

selective removal of species: timber cutting mowing fire grazing dieback %area

fire frequency:

'enrichment plantings' (list)

animal impact: horse foxes rabbits cats dogs goats pigs overgrazing by native mammals

soil movement: mining dumping rubbish dumping roadworks

changes in water regimes: flooding drainage watering nutrient influx

Tracks: fire breaks walk trails off road vehicle use animal tracks

Service corridors: SEC Main Roads Water Authority. Telecom

Other

VEGETATION (describe each unit of vegetation using dominants and life form/height class and canopy cover according to the Muir/Keighery codes above)
Fauna comments
Adjacent bushland (refer to aerial photograph)

OTHER COMMENTS

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Lot 31 DS 465 SITE NUMBER 1

DATE TRIP 14/6/99 RECORDERS BJK

DATE TRIP _____ RECORDERS _____

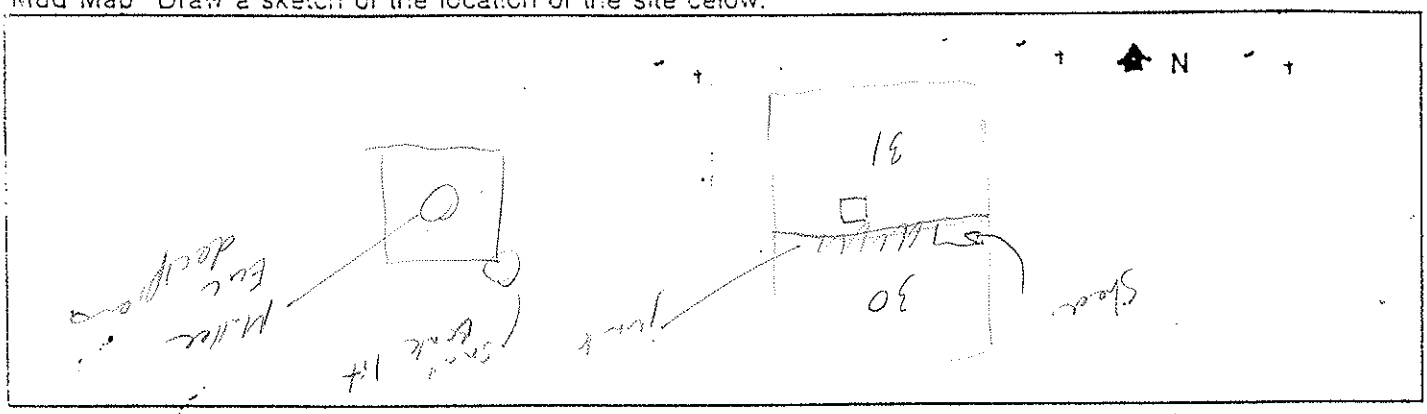
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 1 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



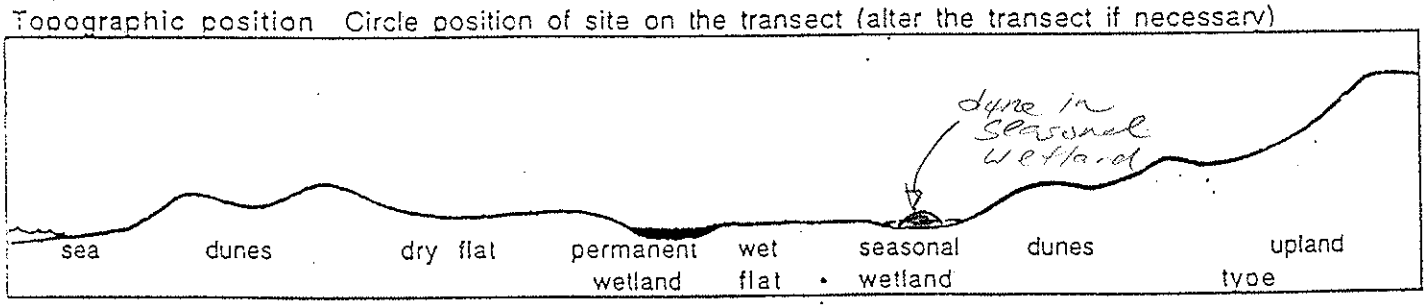
Road Location Phoebe St Gooralls

Geographic Location Latitude S Longitude E Altitude

Reference Map

Photograph Photographer's Name BJK Photo No 19

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope (flat) gentle steep Aspect N NE E SE S SW W NW

Surface Soil sand (humus rich) Colour grey

Exposed rock type pieces of limestone % surface

Sub-surface Soil Colour

Rock type depth to rock

Drainage (well) mod poor depth water cm Wet all year winter/spring

Litter	70 % cover	Bare Ground	0 %cover
Depth	3/4 cm		

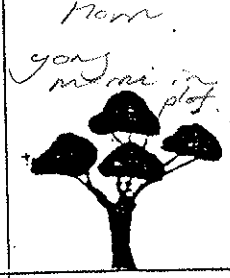
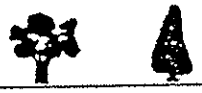
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

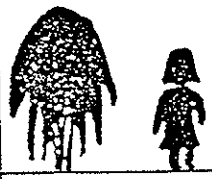
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

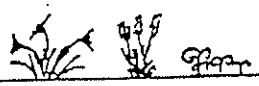
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below), and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m
LIFE FORM					
COVER CLASS (%)		10-30%	10-30%	30-70%	
DOMINANT SPECIES			Hakea prost Banksia lit Euc. marg.	Euc. decipiens	

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM					
COVER CLASS (%)					
DOMINANT SPECIES				Yate prec	

	GRASSES	HERBS	SEDGES	over 0.5m	under 0.5m
LIFE FORM					
COVER CLASS (%)					2-10%
DOMINANT SPECIES					Tet oct

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	
3	VERY GOOD	
4	GOOD	
5	DEGRADED	

COMMENTS

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No Lot 31 / 1
Date 12/8/11

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet
- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

specimen

From '*Bushland Plant Survey*' written by B. Keighery (19940 and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
Eucalyptus marginata (sapling)			
Eucalyptus calophylla (")			
Banksia littoralis			
Hakea prostrata			
MALLEES			
Euc. decipiens (seedlings also)			
SHRUBS			
Xanthorrhoea preissii		✓	
Hemiandra aff. pungens	✓		
Dryandra lindleyi			
Phylotheca calycina			
Adenanthos barbigera			
Banksia grandis		✓	
Acacia pulchella (yg)	✓		
Scaevola sp. (sterile)	✓		
Hibbertia hypericoides			
Conospermum sp. (sterile)	✓		
Melaleuca aff a	✓		

SHRUBS (cont.)	No	Fl	ID
GRASSES			
* Briza maxima			
Grass sterile ? Stipa			
HERBS			
Drosera erythro			
Drosera macran scp form			
Trigger alchor			
* Sonchus oleraceus			
Arno. preissii			
Kennedia prostata			
Lomandra preissii (Rush)			

HERBS (cont.)	No	Fl	ID
SEDGES			
Tetra octandra			
Baumea juncea	VG		
Lepto tasic			
Cyath. arenaria			
ADJ			
Senecio			

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA BS 465 (of 31) SITE NUMBER 2

DATE TRIP 12/8/99 RECORDERS BJK

DATE TRIP _____ RECORDERS _____

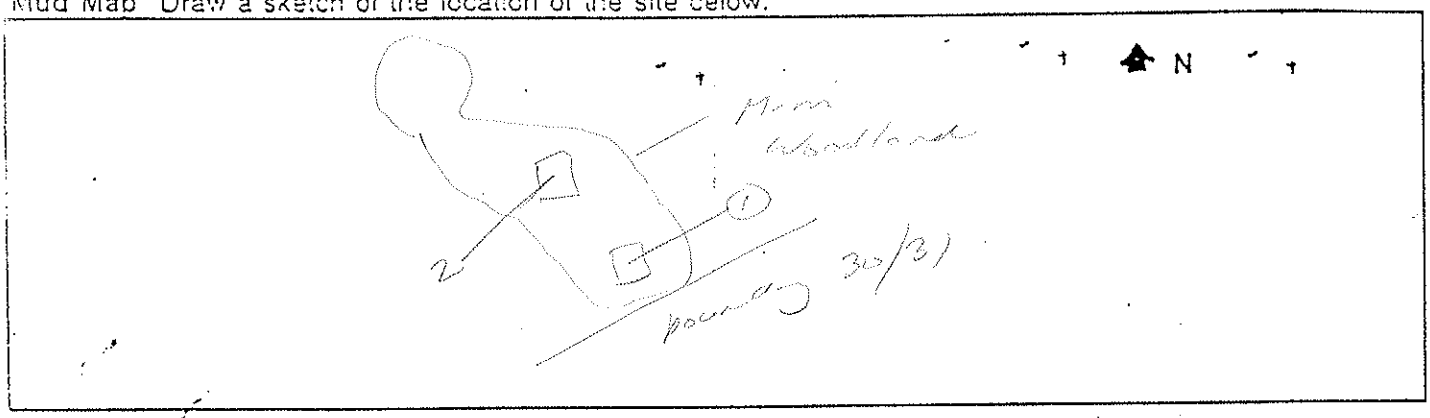
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



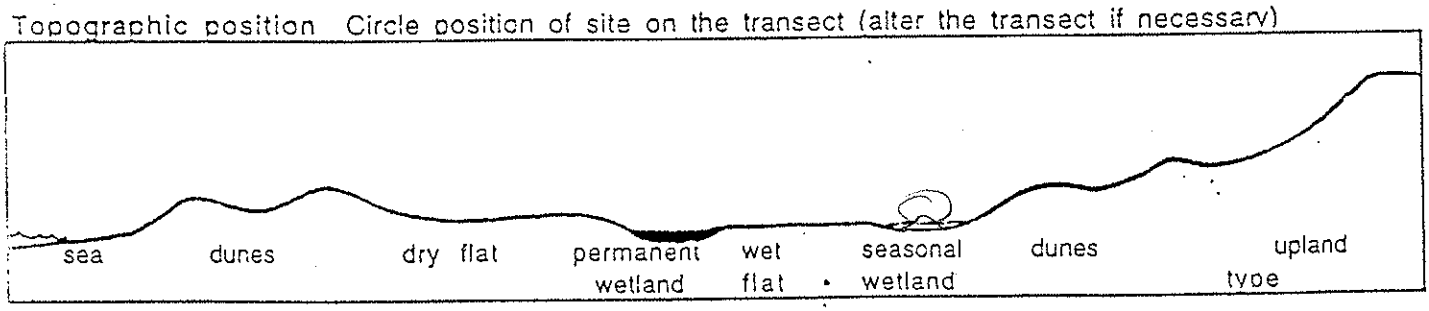
Road Location Phoebe St, Gosnells

Geographic Location Latitude S Longitude E Altitude

Reference Map

Photograph Photographer's Name BJK Photo No 20

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope (flat) gentle steep Aspect N NE E SE S SW W NW

Surface Soil brown to red sandy/humus rich Colour

Exposed rock type % surface

Sub-surface Soil Colour

Rock type depth to rock

Drainage (well) mod poor depth water cm Wet all year winter/spring

Litter	70 % cover	Bare Ground	0 %cover
Depth	½ cm		

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

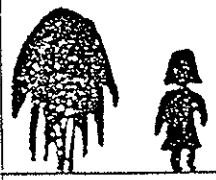
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

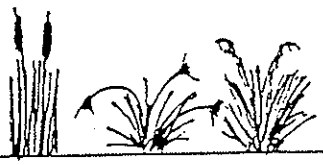
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES over 30m	TREES 15 - 30m	TREES 5 - 15m under 5m	MALLEES over 8m	MALLEES under 8m
LIFE FORM		Outside Site			30m 10m
COVER CLASS (%)		2-10%	<2%	10-30%	
DOMINANT SPECIES		Euc cal (Muiri Saplings)	Bank lit Ac saligna(sap)	Euc. loxoph	

	SHRUBS over 2m	SHRUBS 2m - 1.5m	SHRUBS 1.5 - 1m	SHRUBS 1 -0.5m	SHRUBS under 0.5m
LIFE FORM					2m 1m
COVER CLASS (%)			2-10%	30-70%	
DOMINANT SPECIES			Ac. pul	Xant prei	

	GRASSES	HERBS	SEDGES over 0.5m	SEDGES under 0.5m
LIFE FORM				1m
COVER CLASS (%)		10-30%	10 - 30%	
DOMINANT SPECIES		Tri elat	Tet ost	

4. VEGETATION CONDITION

1 'PRISTINE'	
2 EXCELLENT	)
3 VERY GOOD	)
4 GOOD	
5 DEGRADED	

COMMENTS

few weeds, ? Eleocharis acuta.

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE — Label each plant with plants number, site code, date and plant's name or working name if required

SITE No Lot 31/12
Date 12/8/95

Record on Sheet
- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (19940 and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
Euc. calophylla			
Euc. marg			
Bank lit			
Acacia saligna			
Bank. grandis			
MALLEES			
Euc. decipiens			
SHRUBS			
Acacia pulchella			
Phylanthus calycinus			
Xanth preissii			
Hibb hyp			
Verti Ipeng	VP		
Dry link			
Scaevola =1			
Senecio/Haloragis	VP		
Hak. prostrata			

SHRUBS (cont.)	No	Fl	ID
GRASSES			
* Briza			
Microlaena stipoides			
HERBS			
Tricoryne elatior			
Dros. macrantha ssp home			
Arno. preissii			
Drosera erythro			
Hensmed. prost			
* Anag. arvensis			

HERBS (cont.)	No	Fl	ID
SEDGES			
Tet octandra			
Baumea juncea			
Lok Hak			
AA area to W			
Hovea pungens			
Hakea lucida			
Vim juncea			
Mimbalia			
Stirling lit			
ROADSIDE — Phoebe St			
Hovea pungens			

DEP SYSTEM 6 UPDATE SUBMISSION SURVEY SHEET N/ B.J. KEIGHERY 9/95

BUSHLAND AREA Boddington W Rd/Pinjarra SITES YES/NO

DATE 8/11/95 RECORDERS

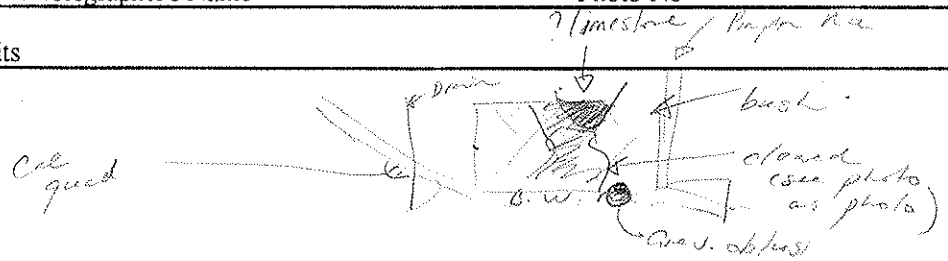
Observations (edge) transects

Geographic Location	Latitude 31° 13·65	S Longitude 115° 42·72°	E
Reference Map	E (G. oblita) 31° 14·033	115° 43·287°	

Photograph	Photographer's Name	Photo No

Transect of landscape units

dunes
dry/(wet flats)
sumplands
uplands
type



Soil	Sand → Sand over clay	Colour Grey
Exposed rock	type	% area

VEGETATION

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtianna*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B.attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. raphiophylla*	*M. lanceolata*	*M. cuticularis*		
Others	*Callitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E. foecunda*	*E. latens*

Very similar to E. salmonophloia in Moore R. Nat. Pk (1 site)

Melaleuca/Mal. var/Mel. but Dense Heath & .
(patches)

Rise Bank Woodland (mostly to S)

Wetland to E E. rudis & marginata Manni over

(A) Wh. Lupin, Gna. oblita (USK), Typha, Juncus sp. (USK), Typha sp. - one veget

Vegetation Condition - Keighery 1994 (Trudgen 1993)
1 = 'Pristine' (Excellent)
2 = Excellent (Very Good)
3 = Very Good (Good) Wetland
4 = Good (Poor)
5 = Degraded (Very Poor)
6 = Completely Degraded

partial clearing								
weeds								
selective removal of species		timber cutting		mowing		%	dieback	
fire frequency								
'enrichment plantings'								
animal impact	horse	foxes	rabbits	cats	dogs	goats	pigs	overgrazing by native mammals
soil movement	mining		dumping		rubbish dumping			roadworks
changes in water regimes			flooding		drainage		watering	nutrient influx
Tracks	fire breaks		walk trails		off road vehicle use			animal tracks
Service corridors	SEC		Main Roads			Water Authority.		Telecom
Other								

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
Trees >30m Trees 15-30m Trees 5-15m Trees <5m	Dense Tall Forest Dense Forest Dense Low Forest A Dense Low Forest B	Tall Forest Forest Low Forest A Low Forest B	Tall Woodland Woodland Low Woodland A Low Woodland B	Open Tall Woodland Open Woodland Open Low Woodland A Open Low Woodland B
Mallee tree form Mallee shrub form	Dense Tree Mallee Dense Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs >2m Shrubs 1.5-2.0m Shrubs 1.0-1.5m Shrubs 0.5-1.0m Shrubs 0.0-0.5m	Dense Thicket Dense Heath A Dense Heath B Dense Low Heath C Dense Low Heath D	Thicket Heath A Heath B Low Heath C Low Heath D	Scrub Low Scrub A Low Scrub B Dwarf Scrub C Dwarf Scrub D	Open Scrub Open Low Scrub A Open Low Scrub B Open Dwarf Scrub C Open Dwarf Scrub D
Mat plants Hummock Grass Bunch grass >0.5m Bunch grass <0.5m Herbaceous spp.	Dense Mat Plants Dense Hummock Grass Dense Tall Grass Dense Low Grass Dense Herbs	Mat Plants Mid-Dense Hummock Grass Tall Grass Low Grass Herbs	Open Mat Plants Hummock Grass Open Tall Grass Open Low Grass Open Herbs	Very Open Mat Plants Open Hummock Grass Very Open Tall Grass Very Open Low Grass Very Open Herbs
Sedges >0.5m Sedges <0.5m	Dense Tall Sedges Dense Low Sedges	Tall Sedges Low Sedges	Open Tall Sedges Open Low Sedges	Very Open Tall Sedges Very Open Low Sedges
Ferns Mosses, liverwort	Dense Ferns Dense Mosses	Ferns Mosses	Open Ferns Open Mosses	Very Open Ferns Very Open Mosses

Beermullah W Rd

(A) Triangle Pinpin Rd — Main Hab Use Yunne / Swamp.

Limestone in red Sand to N Road

N & mes E 2.2 kms from T/O Pinpin Rd. 100m from gate at end Rd Vegetation & Ground Vert plants (No spec), Gras abbus along verge for ± 06kms.

(B) Pinpin Rd from gate: on corner triangle 5-5 kms N BWR Cle quad, Kund recurva.

VSP VSP VSP

Mel lat, Mel lanc, Mel lan x lat, Mel sp (spl, VSP)

Xanth spreas, Dim imbricata (VSP) Gras abbus (VSP prostrate) Mel ind (low), Ac salig (alata a bars), Lep long, Lepid 2km

No herbaceous species observed except 2 exotic S.

ADJ area Eukmun tribda, Hak vana, Vim jung,

Also Area: Mel uncinata, Mel lateritia

(A) Meagre

Soil grey clay (pitted when dry), Seasonally wet (and 5

Euc loe 0.8 kms N BMWR (VSP)

Allocyne huegi 1.3 kms N BMWR (see sheet 1994)

Flora comments

Fauna comments

Adjacent bushland

Block Pinpin/BWR

Note Quadrat 1 on Limestone Mats 0 plants to the Quadrat 2 on Mallee Mats

Vegetation was 1987 photos ONLE boundary in Mary may have margins of limestone

Jo 115

DEP SYSTEM 6 UPDATE SUBMISSION SURVEY SHEET B.J. KEIGHERY 9/95

BUSHLAND AREA E PINJAR on BRAMLEY RD SITES YES/NO

DATE 8/11/95 RECORDERS BK

Observations (edge) transects

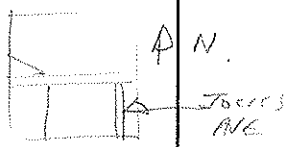
Geographic Location	Latitude 31° 14·24'	S Longitude 115° 43·91'	E ± 1km

Reference Map

Photograph	Photographer's Name	Photo No

Transect of landscape units

dunes
dry/wet flats
sumplands
uplands
type



Soil			Colour
Exposed rock	type	% area	

VEGETATION

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtianna*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B.attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. raphiophylla*	*M. lanceolata*	*M. cuticularis*		
Others	*Calliitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E.foecunda*	*E. latens*

Kim jones Dwarf scrub c over Xanth prei
Dwarf scrub c.

Bank not in photos (VSP)

Roadside : Allocas lat, Exoc obtus, Kun rec,
Mel. lact

Vegetation Condition - Keighery 1994 (Trudgen 1993)

1 = 'Pristine' (Excellent)
2 = Excellent (Very Good)
3 = Very Good (Good) Been cleared, regrowth
4 = Good (Poor)
5 = Degraded (Very Poor)
6 = Completely Degraded

partial clearing
weeds

selective removal of species timber cutting mowing % dieback
fire frequency
'enrichment plantings'
animal impact horse foxes rabbits cats dogs goats pigs overgrazing by native mammals
soil movement mining dumping rubbish dumping roadworks
changes in water regimes flooding drainage watering nutrient influx

Tracks fire breaks walk trails off road vehicle use animal tracks

Service corridors SEC Main Roads Water Authority. Telecom
Other

285

DEP SYSTEM 6 UPDATE SUBMISSION SURVEY SHEET B.J. KEIGHERY 9/95

BUSHLAND AREA COWALLA RD SITES YES/NO

DATE 8/11/95 RECORDERS

Observations (edge) transects

Geographic Location	Latitude 31° 14.889'	S Longitude 115° 37.732'	E

Reference Map The Pinnacles MJ & CB Borwick 0.4 km to S entrance

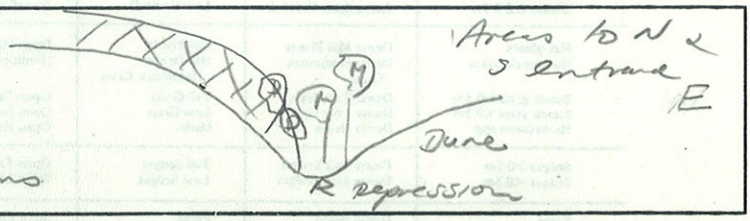
Photograph	Photographer's Name NT	Photo No

Transect of landscape units

W

dunes
dry/wet flats
sumplands
uplands
type

XX Heath
M Marri
D Euc. decipiens



Soil	sandy		Colour	red/orange
Exposed rock	type limestone	% area ??		

VEGETATION

Eucalypts	(E. calophylla)	E. wandoo	E. marginata	E. todtianna	E. rudis	
	(E. decipiens)	E. drummondii	E. haematoxylon	E. lanepoolei	E. gomphocephala	
	E. accedens	E. patens	E. laeliae	E. megacarpa		
Sheoaks	Allocasuarina fraserana		Casuarina obesa			
Banksia	B.attenuata	B. menziesii	B. prionotes	B. illicifolia	B. grandis	B. littoralis
Melaleuca	M. preissii	M. raphiophylla	M. lanceolata	M. cuticularis		
Others	Callitris preissii.					
Mallees	Eucalypts	E. argutifolia	E. petrensis	E. decurva	E. foecunda	E. latens

Mel. hueg / Dry sess Dense Heath A
(across paddock)

Patches Euc. decipiens

Xanth prei, Jack hirsuta, Hak ?trif
(Scattered Marri, Bank grandis) Hard comp,
Ac sal,

Vegetation Condition - Keighery 1994 (Trudgen 1993)
1 = 'Pristine' (Excellent)
2 = Excellent (Very Good)
3 = Very Good (Good)
4 = Good (Poor)
5 = Degraded (Very Poor)
6 = Completely Degraded

?? paddock edge along Rd but looks 1 or 2

partial clearing								
weeds								
selective removal of species		timber cutting		mowing		% dieback		
fire frequency								
'enrichment plantings'								
animal impact	horse	foxes	rabbits	cats	dogs	goats	pigs	overgrazing by native mammals
soil movement	mining		dumping		rubbish dumping			roadworks
changes in water regimes			flooding		drainage		watering	nutrient influx
Tracks	fire breaks		walk trails		off road vehicle use			animal tracks
Service corridors	SEC		Main Roads			Water Authority.		Telecom
Other								

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No boot #2
Date 24/11/95

P10

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From *'Bushland Plant Survey'* written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
✓ Euc rudis			
✓ Mel rhaph			
✓ Cas obesa			
✓ Acacia saligna			
MALLEES			
SHRUBS			
✓ Melaleuca incana			
✓ Viminaria juncea			
✓ Grev obtusiloba = leucadendra			
✓ Allocasuarina humilis / huegelii var hueg.			
✓ Acacia pulchella = Pl		√Bf	
✓ Myoporum sp (swamp)	1A		
✓ Conostylis aculeata	√A		✓
✓ Hakea ? Dead prostrate (ADJ alive)			
✓ Casuarina obesa (shrub)			

SHRUBS (cont.)	No	Fl	ID
GRASSES			
✓ Hemiarthria uncinata	20		✓
✓ * Lolium rigidum			
HERBS			
✓ Senecio aspera	10		
✓ Hakea sub.			
ADJ Open Gravelly			
✓ Apium prost (also in Mel rhaph)			
✓ Atriplex prost			
✓ Cot. coryn.			
✓ Microlaena media.			

HERBS (cont.)	No	Fl	ID
SEDGES			
✓ Cichnia pitosa			
✓ Lepid (sm)			
✓ Schoenus ? coang	20		✓
ADJ			
✓ Baumea juncea			
✓ Samolus junceus			
✓ Sonchus hydro.			
✓ Dampiera alata			
Also open ground			
✓ creek Samolus repens			

Creekline

(B) Euc radiata Forest
over Mel wraypt/Banksia
low forest over
>20% Cahnia
ramosa, Apium prost
patulum
Daviesia arb
Typha orient
(at crossings)
hop? 3 pl. (eaten
by cows in adj area)

(C) Euc decipiens over
very lite Site ϕ2
but very disturb
under-heath -
<150 Some Mel huegs
& living trunk pressi

needs checking in Spring, the E. decipiens site at Deer is more disturbed, may not have been as bad as looked

Note
Wrens with Tim
7.6.15

BUSHLAND PLANT SURVEY RECORDING SHEET 3 - use pencil only

5. SPECIES PRESCENCE

SITE No Boot 03

Date 24/11/9[illegible]

Label each plant with plants number, site code, date and plant's name or working name if required

Record on Sheet

- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

Allogyne huegelii var huegelii (PURPLE)

T	No	Fl	ID
✓ Cas Ob			
MA			
SHRU			
✓ Vim. jun			
✓ Met. vim			
✓ Alogyne (pu			
✓ Hakea pu			
✓ Dodonea a			
✓ Cassytha f			
✓ Dodonea a			
✓ Pimelea ? f			
✓ Grev. obtus			
✓ Mel. talenti			
~~Baeom~~			
✓ Daviesia p			
Eryngium sp MUCHEA			

SHRUBS (cont.)	No	Fl	ID
gianthus tomentosus			
RASSES			
mexima			
* Polypogon mono			
a minor			
S			
annum			
Shuck			
lanceolata			
eryth			
✓ Anag arvensis			
✓ Aster) sub			
☐ Brachycome or cotula (both area)			
✓ Cood. / micrantha			
✓ Eryngium planat sp. MUCHEA purple	USP	✓	BX
✓ Ophtal. vag.			
✓ Juys. arenarius			
✓ Mitra. paradoxa			

HERBS (cont.)	No	Fl	ID
✓ Bill. trix = ϕ1			
✓ Poson yel = ϕ1 = ? Arctotheca			
✓ ☐ Rhiz lettuce = *Lactuca serriola			
SEDGES			
✓ Gahnia trifida			
✓ Isolo. mucronata			
✓ Schoenus ? sp 2			✓
✓ Lepid long			
✓ Baumea juncea			
ADJ			
✓ Hak vana			
✓ Act pyr PADDOCK			
ADJ - clayey by ice			
✓ Mel teet			
✓ Mel ictericia			
✓ Mel huag			
✓ Small Leg sedge ? *Hainardia cylind			
✓ ISO cernua			
✓ Damp alata			
✓ Dicho. gnossii			

*Hainardia cylind. USP ✓ Senecio lautus USP ssp dissectifolius ✓BX

✓ Agrostis avenacea

✓ Plantago sp

✓ Conyza sp. (sterile)

PTO.

PTO.

Area been 'cleared' in the past, at this time

Scattered plantings made
- Euc platy ale
- Euc. gunny - stone ale
- Acacia sp removed

plus — one ord Schinus adj Φ2

Heath

Euc. decip

transitional

Creek

A Scrub 6m o6
Ac sally 10-30% over
30-70% >0.5m } from the transition

over Creek observation 2-4.5m 10-30%

10-30% Acacia VSP >0.5m

Scattered Melaleuca hunteri change Eucalyptus pim VSP Eucalyptus prost.

Flax Lineum

Edges

Weeds wild oats prick weed, small annual grasses within

Φ3

Euc decip

Heath

Heath

Creekline

A

Φ1

Φ2

B

cleared break around edge & adj to inside creekline.

Melaleuca, exp limestone ridges outside adj land

Acacia sally much denser in past dead on ground.

Misc
Hard corp

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Boorine Rd SITE NUMBER Boor 01

DATE TRIP 24-11-95 RECORDERS BJK NCT JS

DATE TRIP _____ RECORDERS _____

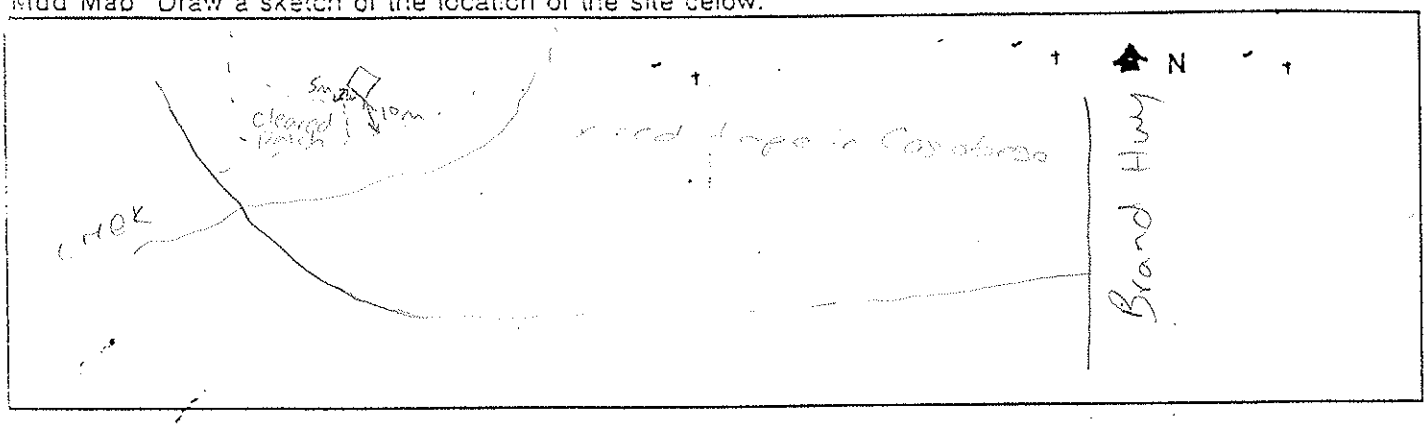
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6009.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



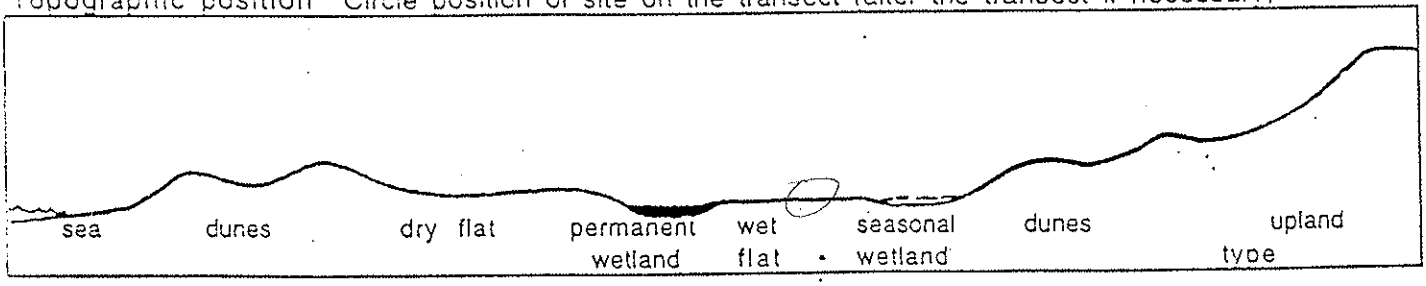
Road Location Boorine Rd

Geographic Location Latitude 31° 15.006' S Longitude 115° 45.004' E Altitude

Reference Map EPE ± 38 m 18 to 28 adj

Photograph Photographer's Name BJK Photo No

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope (flat) gentle steep Aspect N NE E SE S SW W NW

Surface Soil ~~clay~~ loam Colour dark brown

Exposed rock type limestone % surface rocks

Sub-surface Soil Colour

Rock type limestone depth to rock

Drainage well mod (poor) depth water cm Wet all year winter/spring

Litter 30-70 % cover

Depth up to 5 cm

Bare Ground 2-10 %cover

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

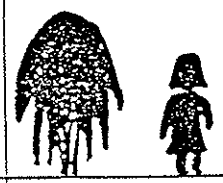
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m
LIFE FORM			open tall woodland B 		30m 10m
COVER CLASS (%)			2 - 10.		
DOMINANT SPECIES			Cas obesa		

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM		Low Scrub A 		Low Heath C 	2m 1m
COVER CLASS (%)		10 - 30		30 - 70	
DOMINANT SPECIES		Kunzea rec Grev oblms = Grevillea sp.		Pimelea ferruginea Acacia pulchella Dodonaea	aspera

	GRASSES	HERBS	SEDGES · over 0.5m	under 0.5m
LIFE FORM	VINES 		Open tall Sedges 	1m
COVER CLASS (%)	2 - 10		10 - 30	
DOMINANT SPECIES	cassytha glabella		Gahnia trifida Lepid tang	

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	✓
3	VERY GOOD	
4	GOOD	
5	DEGRADED	

COMMENTS

has been cleared - all Cas. obesa - young.
virtually no weeds
too late to assess ground herbs completely, some asteraceae

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA Booting Rd SITE NUMBER Booting 02

DATE TRIP 24-11-93 RECORDERS BJK NCT TS

DATE TRIP _____ RECORDERS _____

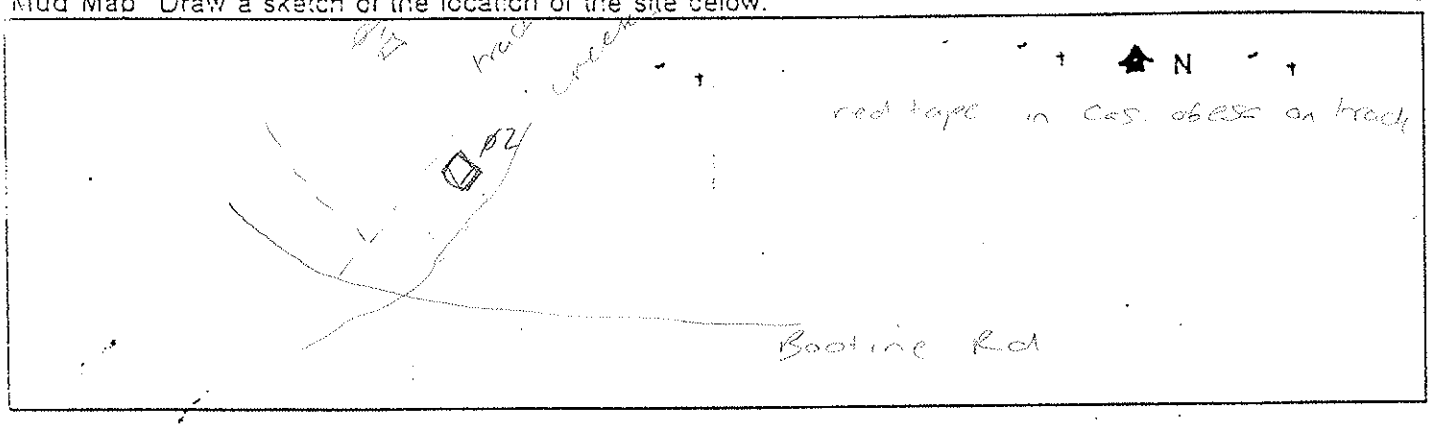
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



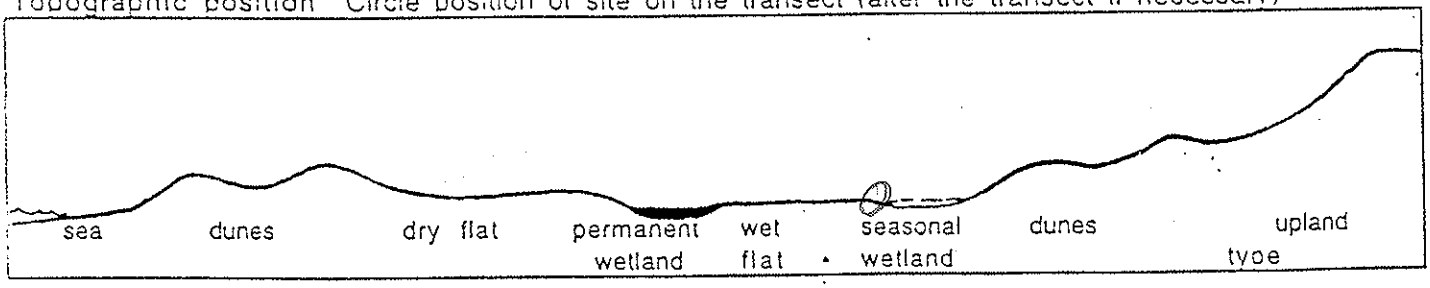
Road Location

Geographic Location Latitude 31°15.071 S Longitude 115°45.035 E Altitude

Reference Map EPE ± 45m4 3L

Photograph Photographer's Name BJK Photo No 5

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat (gentle) steep *Aspect* N NE E (SE) S SW W NW

Surface Soil ~~clay~~ loam *Colour* black

Exposed rock *type* % surface

Sub-surface Soil *Colour*

Rock *type* depth to rock

Drainage well mod (poor) depth water cm *Wet* all year (winter/spring)

Litter	% cover	*Bare Ground* zero	%cover
Depth	cm		

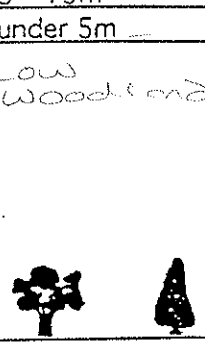
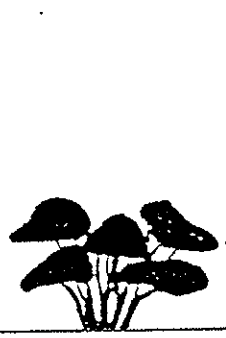
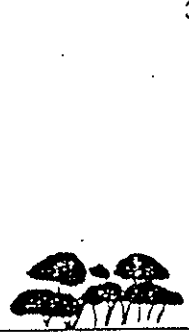
BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

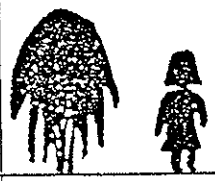
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6009.

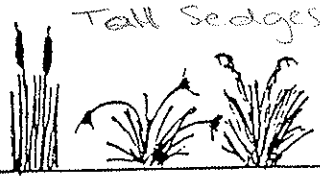
3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 9m
LIFE FORM		Woodland 	Low Woodland 		30m 10m 
COVER CLASS (%)		10-30	10-30		
DOMINANT SPECIES		E. rudis	melrhaph		

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM	Thicket 				2m 1m
COVER CLASS (%)	30-70				
DOMINANT SPECIES	mel incana ~~Casu obtus~~ Jeuca				

	GRASSES	HERBS	SEDGES · over 0.5m	under 0.5m
LIFE FORM	Grass 		Tall Sedges 	1m
COVER CLASS (%)	30-70		30-70	
DOMINANT SPECIES	Hem. ainsw		cahnia trifida	

4. VEGETATION CONDITION

1	'PRISTINE'	
2	EXCELLENT	✓
3	VERY GOOD	
4	GOOD	
5	DEGRADED	

COMMENTS

been partially cleared in past

BUSHLAND PLANT SURVEY RECORDING SHEET 1- use pencil only

BUSHLAND AREA BOOTINE ROAD SITE NUMBER BOOT 93

DATE TRIP 24-11-95 RECORDERS BJK NOTTS

DATE TRIP _____ RECORDERS _____

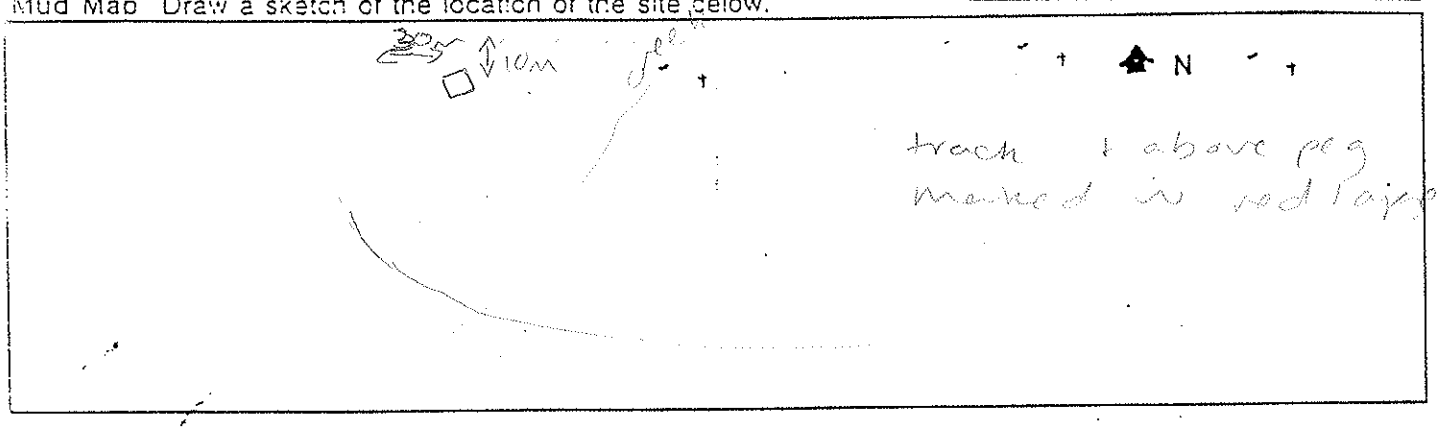
DATE TRIP _____ RECORDERS _____

BOTANIST _____

From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA (Inc.), PO Box 51 Nedlands WA 6008.

1. LOCATION of the QUADRAT

Mud Map Draw a sketch of the location of the site below.



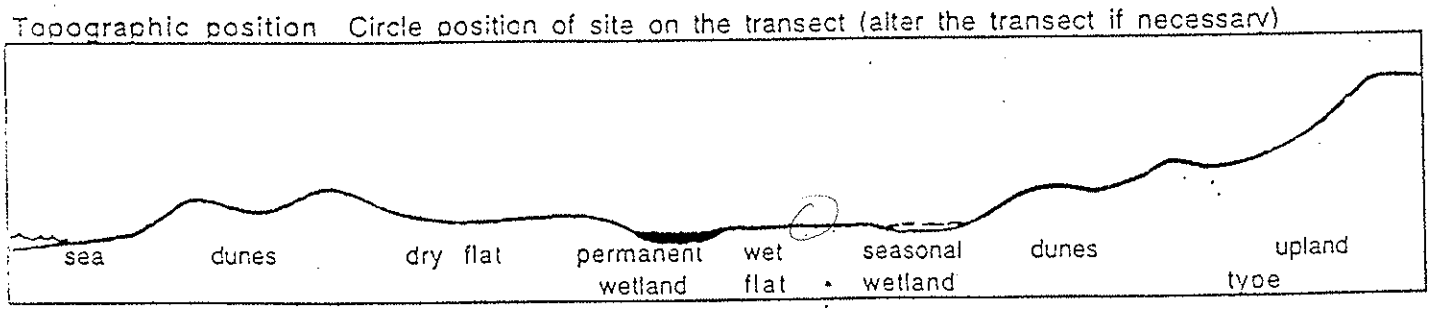
Road Location Bootine Rd

Geographic Location Latitude 31°14.962' S Longitude 115°45.097'E Altitude

Reference Map

Photograph Photographer's Name MJ Photo No 11

Topographic position Circle position of site on the transect (alter the transect if necessary)



2. SITE DATA Circle the correct response.

Slope flat gentle steep *Aspect* N NE E SE S SW W NW

Surface Soil clay loam *Colour* dk brown

Exposed rock *type* limestone rocks % surface 2

Sub-surface Soil *Colour*

Rock *type* depth to rock

Drainage well mod poor depth water cm *Wet* all year winter/spring

Litter 2 - 10 % cover	*Bare Ground* 2 - 10 %cover
Depth 2 cm	

BUSHLAND PLANT SURVEY RECORDING SHEET 2 (Muir)- use pencil only

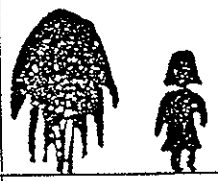
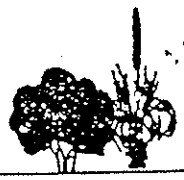
From '*Bushland Plant Survey*' written by B. Keighery (1994) and published by the Wildflower Society of WA Inc., PO Box 64 Nedlands WA 6009.

3. VEGETATION STRUCTURE AND COVER

For each layer record - appropriate life form, cover class (see below),and dominant species in each layer.

Cover Class	2-10%	10-30%	30 - 70%	over 70%

	TREES			MALLEES	
	over 30m	15 - 30m	5 - 15m under 5m	over 8m	under 8m
LIFE FORM					30m 10m
COVER CLASS (%)					
DOMINANT SPECIES					

	SHRUBS				SHRUBS
	over 2m	2m - 1.5m	1.5 - 1m	1 -0.5m	under 0.5m
LIFE FORM	Scrub 		Low Scrub 		2m 1m
COVER CLASS (%)	10 - 30		10 - 30		
DOMINANT SPECIES	Mel lateriti Grev. obtusa = Pavan Mel viri		Allocasuarina huegelii. var huegelii Adenanthos Banksia sphaerocarpa		

	GRASSES	HERBS	SEDGES	over 0.5m	under 0.5m
LIFE FORM		Very open Herbs	open tall Sedges		1m
COVER CLASS (%)		2-10	10 - 30		
DOMINANT SPECIES		Podocarpa sphaerocarpa Schoenia lance	Gahnia trifida		

4. VEGETATION CONDITION

1 'PRISTINE'	
2 EXCELLENT	✓
3 VERY GOOD	
4 GOOD	
5 DEGRADED	

COMMENTS

lots of seedlings

(285) BOOTINE ROAD

BOOT Ø1 - Ø3

N

Bootine 24/11/95

DEP SYSTEM 6 UPDATE SUBMISSION SURVEY SHEET B.J. KEIGHERY 9/95

BUSHLAND AREA Bootine RD SITES YES/NO

DATE 8/11/95 RECORDERS BJK

Observations edge transects 1

Geographic Location	Latitude	31° 15.16'	S Longitude	115° 44.7'	E

Reference Map

Photograph	Photographer's Name	NT	Photo No

Transect of landscape units

dunes
dry/wet flats
sumplands
uplands
type

Soil	clay loam			Colour	grey
Exposed rock	type	limestone	% area	nodules throughout	

VEGETATION

Eucalypts	*E. calophylla*	*E. wandoo*	*E. marginata*	*E. todtiana*	*E. rudis*	
	E. decipiens	*E. drummondii*	*E. haematoxylon*	*E. lanepoolei*	*E. gomphocephala*	
	E. accedens	*E. patens*	*E. laeliae*	*E. megacarpa*		
Sheoaks	*Allocasuarina fraserana*		*Casuarina obesa*			
Banksia	*B.attenuata*	*B. menziesii*	*B. prionotes*	*B. illicifolia*	*B. grandis*	*B. littoralis*
Melaleuca	*M. preissii*	*M. raphiophylla*	*M. lanceolata*	*M. cuticularis*		
Others	*Callitris preissii.*					
Mallees	Eucalypts	*E. argutifolia*	*E. petrensis*	*E. decurva*	*E. foecunda*	*E. latens*

Patches Ca ob. amongst heath, toto
intact in paddock

Species (mostly roadside) Open shrubland grass
Allo huen (paddock) Re sal Tpod
Vim Tmac, Lepid long Drastic yes. Mel lept.
Hib (VSP) Tmic area, Mel viri, Gahnia
Hard sedge + Mesh spec. Dry lepidosp, Stylob (VSP) Pro
Dod Sapium (VSP), Mel Pateniflora ssp adult

Vegetation Condition - Keighery 1994 (Trudgen 1993)	
1 = 'Pristine' (Excellent)	24/11/95
2 = Excellent (Very Good)	Conditions - see site sheets but
3 = Very Good (Good)	
4 = Good (Poor)	
5 = Degraded (Very Poor)	
6 = Completely Degraded	

partial clearing					
weeds					
selective removal of species		timber cutting	mowing	% dieback	
fire frequency					
'enrichment plantings'					
animal impact	horse foxes	rabbits cats	dogs goats	pigs	overgrazing by native mammals
soil movement	mining	dumping	rubbish dumping		roadworks
changes in water regimes		flooding	drainage	watering	nutrient influx
Tracks	fire breaks	walk trails	off road vehicle use		animal tracks
Service corridors	SEC	Main Roads	Water Authority.		Telecom
Other					

LIFE FORM/HEIGHT CLASS	CANOPY COVER			
	DENSE 70-100%	MID-DENSE 30-70%	SPARSE 10-30%	VERY SPARSE 2-10%
Trees >30m	Dense Tall Forest	Tall Forest	Tall Woodland	Open Tall Woodland
Trees 15-30m	Dense Forest	Forest	Woodland	Open Woodland
Trees 5-15m	Dense Low Forest A	Low Forest A	Low Woodland A	Open Low Woodland A
Trees <5m	Dense Low Forest B	Low Forest B	Low Woodland B	Open Low Woodland B
Mallee tree form	Dense Tree Mallee	Tree Mallee	Open Tree Mallee	Very Open Tree Mallee
Mallee shrub form	Dense Shrub Mallee	Shrub Mallee	Open Shrub Mallee	Very Open Shrub Mallee
Shrubs >2m	Dense Thicket	Thicket	Scrub	Open Scrub
Shrubs 1.5-2.0m	Dense Heath A	Heath A	Low Scrub A	Open Low Scrub A
Shrubs 1.0-1.5m	Dense Heath B	Heath B	Low Scrub B	Open Low Scrub B
Shrubs 0.5-1.0m	Dense Low Heath C	Low Heath C	Dwarf Scrub C	Open Dwarf Scrub C
Shrubs 0.0-0.5m	Dense Low Heath D	Low Heath D	Dwarf Scrub D	Open Dwarf Scrub D
Mat plants	Dense Mat Plants	Mat Plants	Open Mat Plants	Very Open Mat Plants
Hummock Grass	Dense Hummock Grass	Mid-Dense Hummock Grass	Hummock Grass	Open Hummock Grass
Bunch grass >0.5m	Dense Tall Grass	Tall Grass	Open Tall Grass	Very Open Tall Grass
Bunch grass <0.5m	Dense Low Grass	Low Grass	Open Low Grass	Very Open Low Grass
Herbaceous spp.	Dense Herbs	Herbs	Open Herbs	Very Open Herbs
Sedges >0.5m	Dense Tall Sedges	Tall Sedges	Open Tall Sedges	Very Open Tall Sedges
Sedges <0.5m	Dense Low Sedges	Low Sedges	Open Low Sedges	Very Open Low Sedges
Ferns	Dense Ferns	Ferns	Open Ferns	Very Open Ferns
Mosses, liverwort	Dense Mosses	Mosses	Open Mosses	Very Open Mosses

Not line to E Mel $\times$ hyp^2, Baum ante
Euc rudis, Gahn subaen

Boatine 2
Mel weAA some Mallgye Beside road,
no other 'limestone' trees observed,
Associates orange sands

E edge Boatine 1 Mel hueg on
limestone and esp associates Euc rudis

Area for Sale — 31° 15 05' 115° 44 96'
FOR SALE
'Websters' 448 7444 Colin Webster
'King Flora' — Swan Location.

Two lots
Called ——— 3/10 $59,000.
permission to enter
This Section intact ground flora also
Scaev. nobo, Scaev lancaefolia Thys arcu, Pogon stricta
Euc decipiens, Mirbs phaeolas

Sites need to be done!!

Flora comments

Fauna comments

Adjacent bushland

6/5/96 Checked. E = changed entry

BUSHLAND PLANT SURVEY RECORDING SHEET 3 — use pencil only

5. SPECIES PRESCENCE — Label each plant with plants number, site code, date and plant's name or working name if required

SITE No Boot 01
Date 24/11/95

Record on Sheet
- Column 1 plant name
- Column 2 plant number
- Column 3 flowering time- TICK if species flowering
- Column 4 identification check

From '*Bushland Plant Survey*' written by B. Keighery (19940 and published by the Wildflower Society of WA (Inc.), PO Box 64 Nedlands WA 6008.

TREES	No	Fl	ID
Cas obesa (a 2m seedling)			
MALLEES			
SHRUBS			
Mel. huegi			
Acacia baileyana			
Grev obtusi = ? evanescens			
Dodonea aptera ♀	VSP		
Pimelea ferruginea	VSP		
Acacia pulchella	VSP		
Kunzea recurva	VSP		
Dodonea aptera ♂	VSP		
Daviesia physodes			
Eremophila glabra	VSP		
Scaevola globulifera	VSP		
[illegible]	VSP		
Stylobasium australe			
Scaevola lanceolata	VSP		
Dampiera linearis			

SHRUBS (cont.)	No	Fl	ID
GRASSES			
Danthonia occidentalis	VSP		
Ehrh. calycina	VSP		
HERBS			
Phlebocarya ciliata	VSP		
Trachymene glaucifolia			
Opercularia vaginata			
Thysanotus patersonii			
M. brassicoides pandora			
Goodenia micrantha			
Haloragis aculeolata	VSP		
Lasiopetalum stricta			
Hypochaeris glabra = Leontodon saxatilis	VSP	VSP	
Ward. hugelii			
Anag. arvensis			
Hypoxis gallorum	VSP		

HERBS (cont.)	No	Fl	ID
Cent. erythraea			
E Cassytha glabella			✓
E Eryngium sp MUCHEA	VSP		✓ VSP
E Aotus subulata			✓
SEDGES			
Cyperus tenellus			
Lepid. laevigatum			
Schoenus brevifolius			
Schoenus (annual sp indet) = sp 2 'FSKRY'			✓
NOT			
Mel. lasiantha			
Vim. juncea			
Apium annuum			
E Polypogon monospeliensis			
Arctotheca hugelii (dd Fruit)			
Trichocline spathulata			

* = Angianthus tomentosus. ✓✓

CHECK DUPLICATE SHEET

MD

ADJACENT (cont)

Trichlochin

Pogonolepis stricta

Brachycome ?iberidifolia

lock to S
Euc. Loop / Ac salig scattered in
Shrubland / rolled regrowth
Acac colebeya. also some
k - litharks

ls from sands to clay over
stone.
no from Comp. Deg to Very Good
e patch excellent)
bject to
grazing (goats, rabbits, kangaroos)
burning - mulch last year
nt due last 12 mths.
partial clearing along S & W
ndaries

a - Yurine Swamps
lepis oldfield
v. simplex, Triodia uniflora
pis cenua, Viminaria juncea, Myrsio
ctum, Centrolepis muticu,
nas humilis Villarsia capitata
bulonis / native / introduced
enus tennellus, Schoenolaena juncea

Area off Nine Mile Lake Rd. 24/11/95
Alyxia - eaten
Mel. uncinata.
Acacia sp
Acantho candida
Transect north block
Mel huegi
Ac rigst.
Mowi
Back w Yurine
limestone ridge
clay flats Shrubs to herbs - sedge
Patch E. decip.
Dominate Mel. huegi
Mel. thyoides wetlands

Dros. gigantea, Good. pulchella, Act pyr. VSP
Centro aristata, Conyn. micrantha VAR
Siloxerus humifusus, Verti densi
Vim. junci, Phlo marg, Mel. tetrastica
Stylid / dichot, Poiolep.s. gracilis
(swamp), Haem simplex, Pogo. stricta
Flat green Pogonolepis.
*Mowp. simplex, hexyandra
Acacia = Yurine / Swamp.

Beermullah Wd. 23/11/94
Muchea Limestone Spec's
5.4 → 10.4 kms

Moore River Ext beginns 13.1 km W Brand Hwy
Lys ~~citrata~~ elegans
(Beaufortia ? purpurea)
0.6 x 0.3 km N
Beermullah Rd

13.1
10.6 J.B

Muchea
? Allocas, Euc decipiens
Mel thyph, teretifolia, uncinata
Act. pyr., Allogyne, Mel huegs
Chamae. uncinatum, Grev
Vim juncea, Ac. saligna
2.7 kms W Brand Hwy
to 7.7 kms

24/11/95

Boothie Road
3.2 kms N Brand Hwy
1st Mel huegs clump adj to
Amphib. swamp Mel thyph creekline
0.55 kms W Brand Hwy
Orig. patch on roadside VSP
Bush Woodland beside damp patch

MUCHEA LIMESTONES
Suggested name of area (1996)

Some Other Commonly used Names:
Part Submission 285, Bootine Road

Area (ha):
cadastral boundary - 80.2, 50% bushland (aerial photo), no remnant vegetation mapped (GIS), approx. 75% area described

Local Authorities (Suburb)
Shire of Gingin

Zoning (MRS & town planning)
rural

Ownership categories: Street name, Lot number
Kimberley Lance Hill and Beryl Christine Hill
C/O PO Bullsbrook Tel 571 1792
NO CONTACT

Reserve Status
NA

LANDFORM AND SOIL
Landscape features: low limestone ridge, vegetated wetland
Geomorphology and soils
Pinjarra Plain
Guildford formation (Qpa)

REGIONAL VEGETATION AND FLORA
Vegetation Complex
Plateaus
Pinjarra Plain
Mungala Complex

Floristic Community Types: not sampled types inferred
Supergroup 2 - Seasonal Wetlands
*7 Herb rich saline shrublands in clay pans
*18 Shrublands on calcareous silts
*S7 Northern woodlands to forests over tall sedgelands alongside permanent wetlands

REGIONAL WETLANDS
No wetlands mapped
Wetland Types: floodplain, palusplain, river, creek, artificial channel
Consanguineous suite
Bassendean - Pinjarra transition OR Bassendean with fluvial features
Beermullah (B/P.1)
Wetland Management Objective: Conservation, Resource Enhancement, Multiple Use
Lake EPP: none identified

THREATENED COMMUNITIES
Critically Endangered (Muchea Limestones) - Vulnerable (floristic community type 8& 18)

AREA DESCRIPTION
Vegetation and Flora
Structural units: limited survey from outside fenceline
Eucalyptus decipiens Woodland, *Casuarina obesa* Woodland, *Melaleuca rhaphiophylla* Low Forest, *Actinostrobus pyrimidalis*, *Grevillea evanescens* and *Calothamnus quadrifidus* Tall Open Scrub, *Melaleuca huegelii* Tall Shrubland, *Viminaria juncea* Tall Shrubland, mixed Open Low Heath, *Senecio lautus* subsp. *dessectifolius* Herbland, mixed Herbland, *Gahnia trifida* Sedgeland, exotic Grassland
Remnant Vegetation (canopy only): 25 % of area shrubs/trees over pasture
Vegetation Condition: 50% Very Good to Good with 50 % Degraded to Completely Degraded
Total Flora: not known
DRF/Priority - GIS: 4 ID 6164
DRF/Priority and significant flora from survey - *Grevillea evanescens* (1), *Haloragis aculeolata* (2)
Muchea limestone taxa: *Alyogyne huegelii* var. *huegelii* MS, *Eryngium* sp. Muchea, *Hibbertia spicata* subsp. *spicata*, *Senecio lautus* subsp. *dessectifolius*, *Calothamnus quadrifidu*, *Eucalyptus decipiens*, *Melaleuca huegelii*

Fauna
Mammals: not surveyed
Linkage: bushland linkage to south - east to CALM purchased land and vegetated creekline to the south

Special Attributes:
Adjacent to best known area of vegetation on Muchea Limestones which has previously been purchased by CALM. Over much of the area there is a good cover of the tree, shrub and herb flora on the clay/limestone flats believed to be chracteristic of this community. Area grazed by cows and kangaroos but floristically the area is intact. With reduced grazing and weed control the area has the potential to regenerate to very good condition. Being adjacent to the small purchased block this would also buffer influences on the smaller area as well as

including elements of the Muchea limestone communities not present in the CALM land (*Actinostrobus pyrimidalis*, *Grevillea evanescens* and *Calothamnus quadrifidus* Tall Open Scrub and *Casuarina obesa* Woodland over mixed Herbland) and add significantly to areas of other communities.

INTERNATIONAL AND NATIONAL SIGNIFICANCE

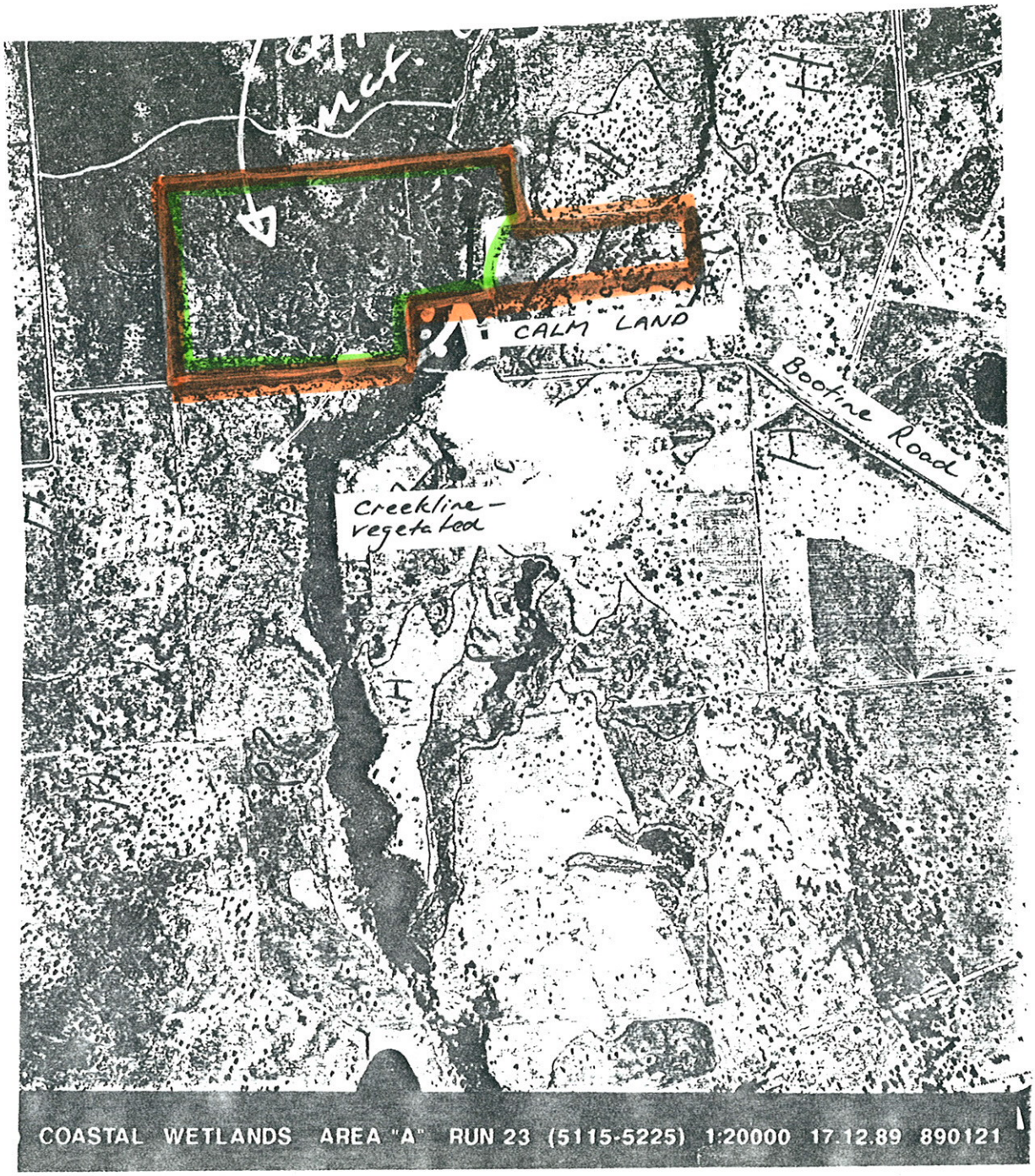
Not listed

CONSERVATION RECOMMENDATIONS

Criteria met for inclusion: Representation of ecological communities, Diversity, Rarity, Maintaining ecological systems or natural processes, Scientific or evolutionary importance, General criteria for the protection of wetland, streamline and estuarine fringing and coastal vegetation.
Constraints: Private land

MUCHEA LIMESTONES

Orange - Cadastral boundary
Green - Area described
Blue - CALM purchased land



Department of Environmental Protection System 6 Update: Site Based Flora Muchea Limestone Sites
(Muchea Limestone Sites, Vines01-01, Much01-05, Yuri01-05, Beer01-02, Boot01-03, B.J. Keighery, 7/12/95)

Anthericaceae

Borya scirpoidea
Caesia micrantha
Caesia parviflora
Corynotheca micrantha
Laxmannia sessiliflora subsp. australis
Sowerbaea laxiflora
Thysanotus arbuscula
Thysanotus arenarius
Thysanotus manglesianus
Thysanotus patersonii
Thysanotus sparteus
Thysanotus thyrsoideus
Tricoryne elatior

Apiaceae

Daucus glochidiatus
Eryngium pinnatifidum subsp. palustre MS
Eryngium sp. scps
Homalosciadium homalocarpum
Hydrocotyle callicarpa
Hydrocotyle pilifera var. pilifera
Hydrocotyle rugulosa
Trachymene pilosa
Xanthosia huegelii

Asteraceae

* Arctotheca calendula
* Aster subulatus
Asteridea pulverulenta
Blennospora drummondii
Brachyscome iberidifolia
* Conyza sp. scps
Cotula coronopifolia
* Dittrichia graveolens
Hyalosperma cotula
* Hypochaeris glabra
Lagenifera huegelii
Millotia tenuifolia
Olearia picridifolia
* Osteospermum clandestinum
Podolepis gracilis
Podotheca chrysantha
Podotheca gnaphalioides
Pogonolepis stricta
Quinetia urvillei
Siloxerus humifusus
* Sonchus oleraceus
* Urospermum picroides

* Ursinia anthemoides
Waitzia suaveolens

Brassicaceae

* Cardamine hirsuta

Callitrichaceae

* Callitriche stagnalis

Campanulaceae

* Wahlenbergia capensis
Wahlenbergia preissii

Caryophyllaceae

* Petrorhagia velutina
* Silene gallica
* Spergula arvensis

Casuarinaceae

Allocasuarina fraseriana
Allocasuarina humilis

Centrolepidaceae

Centrolepis aristata
Centrolepis drummondiana
Centrolepis mutica

Colchicaceae

Burchardia bairdiae
Burchardia umbellata
Wurmbea sp. scps

Crassulaceae

Crassula colorata
* Crassula natans

Cyperaceae

Baumea juncea
Cyathochaeta avenacea
Cyathochaeta sp. mound
* Cyperus tenellus
Gahnia trifida
Isolepis marginata
Lepidosperma angustatum
Lepidosperma longitudinale
Lepidosperma scabrum
Lepidosperma tenue
Mesomelaena pseudostygia

Mesomelaena tetragona
Schoenus clandestinus
Schoenus curvifolius
Schoenus latitans
Schoenus rigens
Schoenus sp. scps
Schoenus tenellus
Tetraria octandra

Dasypogonaceae

Calectasia cyanea
Lomandra caespitosa
Lomandra hermaphrodita
Lomandra preissii
Lomandra sericea
Lomandra suaveolens

Dilleniaceae

Hibbertia acerosa
Hibbertia aurea
Hibbertia huegelii
Hibbertia hypericoides
Hibbertia racemosa
Hibbertia stellaris

Droseraceae

Drosera erythrorhiza
Drosera glanduligera
Drosera macrantha "scp" scps (BJK&NG 228)
Drosera menziesii subsp. menziesii
Drosera menziesii subsp. penicillaris
Drosera neesii
Drosera pallida
Drosera sp. scps
Drosera stolonifera subsp. stolonifera

Epacridaceae

Astroloma pallidum
Astroloma xerophyllum
Conostephium pendulum
Leucopogon australis
Leucopogon kingianus
Leucopogon propinquus

Euphorbiaceae

Phyllanthus calycinus
Poranthera microphylla

Gentianaceae

* Centaurium erythraea
* Cicendia filiformis

Goodeniaceae

Anthotium junciforme
Dampiera alata
Dampiera linearis
Dampiera trigona
Goodenia micrantha
Goodenia pulchella
Scaevola phlebopetala

Haemodoraceae

Anigozanthos humilis
Anigozanthos manglesii
Anigozanthos pulcherrimus
Anigozanthos viridis
Conostylis aculeata
Conostylis candicans
Conostylis festucacea subsp. festucacea
Conostylis juncea
Conostylis setigera
Haemodorum laxum
Haemodorum sparsiflorum
Haemodorum spicatum
Phlebocarya ciliata
Tribonanthes australis
Tribonanthes violacea

Haloragaceae

Gonocarpus pithyoides
Haloragis tenuifolia

Iridaceae

* Gladiolus caryophyllaceus
* Gladiolus sp. scps
* Homeria flaccida
Patersonia occidentalis
* Romulea rosea

Juncaceae

* Juncus capitatus

Juncaginaceae

Triglochin centrocarpum

Lamiaceae

Hemiandra pungens

Lauraceae

Cassytha flava

Cassytha glabella
Cassytha pubescens
Cassytha racemosa
Cassytha sp. "furry, sessile fls" Fish-3 scps

Lentibulariaceae

Utricularia violacea

Lobeliaceae

Lobelia tenuior
* Monopsis debilis

Loganiaceae

Mitrasacme paradoxa

Loranthaceae

Nuytsia floribunda

Menyanthaceae

Villarsia albiflora
Villarsia capitata

Mimosaceae

Acacia celastrifolia
Acacia huegelii
Acacia pulchella
Acacia saligna

Molluginaceae

Macarthuria apetala

Myrtaceae

Agonis linearifolia
Astartea aff. fascicularis "Brixton" MET
Astartea aff. fascicularis sthcst
Baeckea robusta
Calothamnus sanguineus
Calothamnus sp. scps
Calytrix angulata
Calytrix strigosa
Chamelaucium uncinatum
Darwinia sp. Muchea
Eremaea pauciflora
Eucalyptus calophylla
Eucalyptus decipiens
Eucalyptus rudis
Eucalyptus todtiana
Kunzea littericola "white" scps
Kunzea recurva

Melaleuca huegelii
Melaleuca incana
Melaleuca lateritia
Melaleuca rhaphiophylla
Melaleuca sp. B FPR (BJK&NG 054)
Melaleuca sp. scps
Melaleuca viminea
Regelia ciliata
Scholtzia involucrata
Verticordia densiflora
Verticordia lindleyi subsp. lindleyi scps map

Orchidaceae

Acianthus sp. scps
Caladenia ferruginea
Caladenia filamentosa
Caladenia flava
Caladenia longicauda
Caladenia marginata
Caladenia paludosa Hopper & AP Brown scps
Caladenia sp. scps
Leporella fimbriata
Microtis media
Microtis sp. scps
Prasophyllum sp. APB (Forrestfield) scps
Thelymitra sp. scps

Papilionaceae

Aotus gracillima
Bossiaea eriocarpa
Daviesia divaricata
Daviesia physodes
Gompholobium aristatum
Gompholobium tomentosum
Hardenbergia comptoniana
Hovea trisperma var. trisperma
Isotropis cuneifolia
Isotropis cuneiformis subsp. "glabra" scps map
Jacksonia furcellata
Jacksonia sternbergiana
Kennedia prostrata
* Lotus angustissimus
* Medicago polymorpha
* Melilotus indicus
Mirbelia spinosa
Nemcia capitata
* Trifolium campestre
* Trifolium dubium

Phormiaceae

Dianella revoluta

Poaceae

Agrostis avenacea
* Aira caryophyllea
* Aira praecox
Amphipogon turbinatus
* Avena barbata
* Briza maxima
* Briza minor
* Bromus diandrus
Cynodon dactylon
Danthonia occidentalis
Danthonia sp. scps
* Ehrharta calycina
* Ehrharta longiflora
Eragrostis elongata
* Lolium rigidum
Microlaena stipoides
Neurachne alopecuroidea
* Phalaris sp. scps
* Polypogon monspeliensis
Polypogon tenellus
Stipa campylachne
Stipa compressa
Stipa flavescens
Stipa sp. scps
Stipa tenuifolia
Stipa trichophylla
* Vulpia bromoides
* Vulpia myuros
* Vulpia sp. scps

Polygalaceae

Comesperma virgatum

Polygonaceae

* Rumex sp. scsp

Portulacaceae

Calandrinia granulifera
Calandrinia liniflora

Primulaceae

* Anagallis arvensis
* Anagallis arvensis var. arvensis FPR

Proteaceae

Banksia attenuata
Banksia littoralis
Banksia menziesii
Banksia prionotes
Banksia telmatiaea

Dryandra nivea
Dryandra sessilis
Grevillea curviloba subsp. incurva
Grevillea obtusifolia
Grevillea vestita
Hakea costata
Hakea prostrata
Hakea trifurcata
Hakea varia
Petrophile brevifolia
Petrophile linearis
Petrophile macrostachya
Stirlingia latifolia
Synaphea spinulosa

Ranunculaceae

Clematis pubescens

Restionaceae

Alexgeorgea nitens
Hypolaena exsulca
Lepidobolus preissianus
Leptocarpus roycei MS
Loxocarya fasciculata
Loxocarya flexuosa
Lyginia barbata
Restio sinosus scps ms

Rhamnaceae

Cryptandra sp. scps

Rubiaceae

* Galium sp. scps
Opercularia vaginata

Santalaceae

Exocarpos sparteus

Sapindaceae

Diplopeltis huegelii

Scrophulariaceae

* Bellardia trixago
* Dischisma capitatum
Gratiola peruviana
* Parentucellia viscosa

Stackhousiaceae

Stackhousia monogyna

Stylidiaceae

Levenhookia stipitata
Stylidium brunonianum
Stylidium calcaratum
Stylidium dichotomum
Stylidium divaricatum
Stylidium junceum
Stylidium longitubum
Stylidium macrocarpum
Stylidium piliferum
Stylidium repens
Stylidium roseo-alatum
Stylidium utricularioides

Violaceae

Hybanthus calycinus

Xanthorrhoeaceae

Xanthorrhoea preissii

Zamiaceae

Macrozamia riedlei

5012 WA 2820(C) COASTAL WETLANDS AREA "A" RUN 24 (5001-5113) 1:20000 17.12.89 890121

Department of Environmental Protection

Head Office:
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141 St Georges Terrace
Perth, Western Australia 6000
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Waste Management Division:
Ground Floor, 32 St Georges Terrace
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Tel (09) 222 0422 Fax (09) 222 0455
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Perth, Western Australia 6832

Regional Offices:
Bunbury • Karratha • Kalgoorlie • Kwinana

David Hodby Nominees Pty Ltd
81 Smyth Rd
NEDLANDS WA 6009

Your Ref
Our Ref 67/91
Enquiries N Thorning

Dear ~~Sir~~/David Madam

SYSTEM SIX UPDATE PROGRAMME - FLORA SURVEY INFORMATION

Thank you for providing permission for our botanical team to survey the bushland on your property. As arranged between Mrs Hodby and Miss Natalie Thorning of this Department, the bushland on Lot 2115 Airfield Rd was visited on 3 November 1995.

The botanical survey provides us with information on the natural plant communities found in the area, and their condition. This information is needed to assist the Department of Environmental Protection in its programme to update the conservation recommendations for System 6 and the coastal plain portion of System 1. The main objective of the programme is to ensure that the proposed conservation estate is representative of the ecological communities extant in the region.

As part of this programme the Department has advertised for the public to submit areas of bushland that they consider to be of regional significance. Our botanical team is surveying these submitted areas as well as those it considers may be important based on other factors such as their location and soil type etc. The botanical survey provides us with information on the natural plant communities found in the area, and their condition. Please note that the area is one of many sites that we have surveyed. The fact that we visited and surveyed the site does not indicate that it will necessarily be included in the updated System Six Recommendations.

The update programme has employed the botanical survey methodology used in Gibson et al. (1994), 'A Floristic Survey of the Southern Swan Coastal Plain', to provide the main information base upon which to review the adequacy of the existing System recommendations and to assess other bushland areas.

One survey site was located on the property and wooden survey pegs were left in each corner of the 10 metres by 10 metres square survey site. We may wish to revisit this site at a later date, if so, we will contact you prior to our visit. A general description of the vegetation and an assessment of its condition was also completed.

CUSTOMER FOCUS

The information collected during the visits will be used to assess the relative conservation values of the bushland areas. The final selections for inclusion in the updated System Six Recommendations will be the best possible examples of bushland containing plant community types that are either unrepresented or poorly represented in the current and proposed conservation system.

If you are interested in the information we have collected, the location of the survey sites or any other additional information on the System Six Update Programme please don't hesitate to contact Miss Natalie Thorning (222 7051) or Mr Kevin McAlpine (222 7055).

Once again, thank you very much for your support for this programme.

Yours sincerely

Colin Sanders
DIRECTOR
POLICY AND STRATEGIC STUDIES

4 December 1995

Department of Environmental Protection

Head Office:
8th Floor, Westralia Square
141 St Georges Terrace
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Waste Management Division:
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or PO Box Y3030, East, St Georges Terrace
Perth, Western Australia 6832

Regional Offices:
Bunbury • Karratha • Kalgoorlie • Kwinana

Mr & Mrs Kolb
59 North Beach Rd
NORTH BEACH WA 6020

Your Ref
Our Ref 67/91
Enquiries N Thorning.

Dear Mr & Mrs Kolb

SYSTEM SIX UPDATE PROGRAMME - FLORA SURVEY INFORMATION

Thank you for providing permission for our botanical team to survey the bushland on your property. As arranged between Mrs Ray Kolb and Miss Natalie Thorning of this Department, the bushland on Lots 2358 and 1718 Bootine Rd was visited on 24 November 1995.

The botanical survey provides us with information on the natural plant communities found in the area, and their condition. This information is needed to assist the Department of Environmental Protection in its programme to update the conservation recommendations for System 6 and the coastal plain portion of System 1. The main objective of the programme is to ensure that the proposed conservation estate is representative of the ecological communities extant in the region.

As indicated in my earlier letter seeking approval to survey your vegetation, the fact that we visited and surveyed the site does not indicate that it will necessarily be included in the updated System Six Recommendations.

Three survey sites were located on the property and metal fence droppers were left in each corner of the 10 metres by 10 metres square survey sites. We may wish to revisit these sites at a later date, if so, we will contact you prior to our visit. A general description of the vegetation and an assessment of its condition was also completed.

The information collected during the visits will be used to assess the relative conservation values of the bushland areas. The final selections for inclusion in the updated System Six Recommendations will be the best possible examples of bushland containing plant community types that are either unrepresented or poorly represented in the current and proposed conservation system.

CUSTOMER FOCUS

If you are interested in the information we have collected, the location of the survey sites or any other additional information on the System Six Update Programme please don't hesitate to contact Miss Natalie Thorning (222 7051) or Mr Kevin McAlpine (222 7055).

Once again, thank you very much for your support for this programme.

Yours sincerely

Colin Sanders
DIRECTOR
POLICY AND STRATEGIC STUDIES

27 December 1995

Record of Telephone Call

Call from	Call to	Folio No.
Dept DEP	**Dept**	**File No.**

Subject	Date	Time
SYSTEM 6 UPDATE - FLORA SURVEY	/ /	

Details

CA 2062 Beermullah West Road

Mahamed Yasmin KHAN

84 Monmouth St, Mt Lawley.

unable to find telephone no. letter sent 20/11

Action taken/Recommendation(s) (where applicable)

Approval (if required)

Department of Environmental Protection
Westralia Square, 8th Floor, 141 St Georges Terrace, Perth WA 6000

Department of Environmental Protection

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Perth, Western Australia 6832

Regional Offices:
Bunbury • Karratha • Kalgoorlie • Kwinana

Mr SA & Ms JA McVee
C/o Post Office
GINGIN WA 6503

Your Ref
Our Ref 67/91
Enquiries N Thorning.

Dear Mr & Mrs McVee

SYSTEM SIX UPDATE PROGRAMME - FLORA SURVEY INFORMATION

Thank you for providing permission for our botanical team to survey the bushland on your property. As arranged between Mr Sethal McVee and Miss Natalie Thorning of this Department, the bushland on Lot 1711 Beermullah West Road was visited on 24 November 1995.

The botanical survey provides us with information on the natural plant communities found in the area, and their condition. This information is needed to assist the Department of Environmental Protection in its programme to update the conservation recommendations for System 6 and the coastal plain portion of System 1. The main objective of the programme is to ensure that the proposed conservation estate is representative of the ecological communities extant in the region.

As indicated in my earlier letter seeking approval to survey your vegetation, the fact that we visited and surveyed the site does not indicate that it will necessarily be included in the updated System Six Recommendations.

Two survey sites were located on the property and wooden survey pegs were left in each corner of the 10 metres by 10 metres square survey sites. We may wish to revisit these sites at a later date, if so, we will contact you prior to our visit. A general description of the vegetation and an assessment of its condition was also completed.

The information collected during the visits will be used to assess the relative conservation values of the bushland areas. The final selections for inclusion in the updated System Six Recommendations will be the best possible examples of bushland containing plant community types that are either unrepresented or poorly represented in the current and proposed conservation system.

If you are interested in the information we have collected, the location of the survey sites or any other additional information on the System Six Update Programme please don't hesitate to contact Miss Natalie Thorning (222 7051) or Mr Kevin McAlpine (222 7055).

Once again, thank you very much for your support for this programme.

Yours sincerely

Colin Sanders
DIRECTOR
POLICY AND STRATEGIC STUDIES

27 December 1995

Record of Telephone Call

Call from	Call to	Folio No.
NATALIE THORNING	Sethal McVee	
Dept: DEP	Dept:	File No. 12-1

Subject	Date	Time
SYSTEM 6 UPDATE - FLORA SURVEY	20 / 1 / 95	12.15 pm

Details

CC 1711 Beermullah West Road

Sethal Arthur & Janet Ann McVee

c/o PO Cungin

ph: 576 2086 (Mooliabeenee)

~~575 4042~~ (Beermullah)

OK to visit & put sites.

Was not comfortable about Govt & shires telling him what to do with his land.

Has purposefully kept bush on his block to keep a balance.

Action taken/Recommendation(s) (where applicable)

Approval (if required)

Department of Environmental Protection
Westralia Square, 8th Floor, 141 St Georges Terrace, Perth WA 6000

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Perth, Western Australia 6832

Regional Offices:
Bunbury • Karratha • Kalgoorlie • Kwinana

Mr MV Khan
84 Monmouth St
MOUNT LAWLEY WA 6050

Your Ref
Our Ref 67/91
Enquiries N Thorning

Dear Mr Khan

SYSTEM SIX UPDATE PROGRAMME - FLORA SURVEY INFORMATION

Having been unable to contact you by telephone, I am writing to outline the details of the above survey and to confirm our request for permission to access to lot 2062 Beermullah West Rd, which I believe is in your ownership.

As you may be aware, the Department of Environmental Protection is coordinating a programme to update the conservation recommendations for System 6 and the coastal plain portion of System 1. The main objective of the programme is to ensure that the proposed conservation estate is representative of the ecological comunities remaining in the region.

As part of this programme the Department has advertised for the public to submit areas of bushland that they consider to be of regional significance. Our botanical team is surveying these submitted areas as well as those it considers may be important based on other factors such as their location and soil type etc. The botanical survey provides us with information on the natural plant communities found in the area, and their condition. Please note that we need to visit a great many sites to develop a detailed understanding of the distribution of the various plant communities. The fact that we are seeking to visit and survey the area does not indicate that it will necessarily be included in the updated System Six Recommendations.

The update programme has employed the botanical survey methodology used in Gibson et al. (1994), 'A Floristic Survey of the Southern Swan Coastal Plain', to provide the main information base upon which to review the adequacy of the existing System recommendations and to assess other bushland areas.

Survey sites are located after visiting the bushland areas. Each survey site is 10 metres by 10 metres square and, if you are agreeable, is marked by four steel posts which remain in place so that the site may be resampled at least once. Sites on CALM lands will remain as monitoring sites and you may wish to retain the sites on your lands for the same purpose. Our sampling is non-destructive and small samples of plants are only collected when we are unsure of the plants identity.

CUSTOMER FOCUS

The information collected during the visits will be used to assess the relative conservation values of the bushland areas. The final selections for inclusion in the updated System Six Recommendations will be the best possible examples of bushland containing plant community types that are either unrepresented or poorly represented in the current and proposed conservation system.

It would be appreciated if you could reply as soon as possible since our field programme is concentrated around the spring flowering season. For further information please don't hesitate to contact Miss Natalie Thorning (222 7051) or Mr Kevin McAlpine (222 7055).

Thank you for your support.

Yours sincerely

Colin Sanders
DIRECTOR
POLICY AND STRATEGIC STUDIES

20 November 1995

Species List Muchea Limestones

Amaranthaceae	
Ptilotus manglesii	PTIMAN
Anthericaceae	
Corynotheca micrantha	CORMIC
Dichopogon preissii	DICPRE
Sowerbaea laxiflora	SOWLAX
Thysanotus arenarius	THYARE
Thysanotus manglesianus/patersonii complex	THYSPMP
Thysanotus multiflorus	THYMUL
Thysanotus thyrsoideus	THYTHY
Tricoryne elatior	TRIELA
Apiaceae	
Apium annuum	APIANN
Apium prostratum	APIPRO
Centella cordifolia	CENCOR
Daucus glochidiatus	DAUGLO
Eryngium pinnatifidum subsp. purple	
Hydrocotyle hispidula	HYDHIS
Schoenolaena juncea	SCHJUN
Trachymene pilosa	TRAPIL
Asteraceae	
*Arctotheca calendula	ARCCAL
*Aster subulatus	ASTSUB
Brachyscome ?bellidioides	BRABEL
Cotula coronopifolia	COTCOR
*Dittrichia graveolens	DITGRA
Gnephosis sp	GNEANG
*Hypochaeris glabra	HYPGLAbr
Lagenifera huegelii	LAGHUE
*Leontodon saxatilis	LEOSAX
Pithocarpa pulchella	PITPUL
Podolepis gracilis (Swamp form GJK 13126)	PODGRASW
Pogonolepis strictus	
Pogonolepis 'flat green'	
Senecio lautus subsp. dissectifolius	SENLAUDI
Siloxerus humifusus	SILHUM

	*Sonchus asper				SONASP
	Sonchus hydrophilus				SONHYD
	*Sonchus oleraceus				SONOLE
	Trichocline sp. (GJK 6382-glabrous)	1	eE		TRISP
Casuarinaceae					
	Allocasuarina lehmanniana				
	Casuarina obesa				CASOBE
Centrolepidaceae					
	Centrolepis aristata				CENARI
	Centrolepis mutica				CENMUT
Chenopodiaceae					
	*Atriplex prostrata				ATRPRO
Colchicaceae					
	Burchardia multiflora				BURMUL
	Wurmbea ?monantha (Vines)				WURMON
Convolvulaceae					
	Wilsonia humilis				WILHUM
Crassulaceae					
*	Crassula natans				CRANAT
Cupressaceae					
	Actinostrobus pyramidalis				ACTPYR
Cyperaceae					
	Baumea juncea				BAUJUN
	Gahnia trifida				GAHTRI
	Isolepis cernua				ISOCER
	Isolepis oldfieldiana				ISOOLD
	Lepidosperma angustatum				LEPANG
	Lepidosperma longitudinale				LEPLON
	Schoenus nanus				SCHNAN
	Schoenus sp. 2 (GJK 5739)				SCHOSP2
Dasypogonaceae					
	Acanthocarpus canaliculatus		S	Anstey Rd	ACACAN
Dilleniaceae					
	Hibbertia racemosa				HIBRAC
	Hibbertia spicata subsp. leptotheca	3	S	Yalgorup	HIBSPILE
Droseraceae					

	Drosera gigantea subsp. gigantea						DROGIG
	Drosera menziesii subsp. menziesii						DROMENME
Epacridaceae							
	Leucopogon parviflorus						LEUPAR
Euphorbiaceae							
	Phyllanthus calycinus (Vines)						PHYCAL
Goodeniaceae							
	Dampiera alata						DAMALA
	Goodenia micrantha						GOOMIC
	Goodenia pulchella						GOOPUL
	Lechenaultia linarioides (Banksia adj)				S	Coogee	LECLIN
	Scaevola anchusifolia						SCAANC
	Scaevola lanceolata						SCALAN
Haemodoraceae							
	Conostylis candicans (Muchea)						CONCAN
	Haemodorum simplex						HAESIM
	Haemodorum sparsiflorum						HAESPA
	Tribonanthes uniflora						TRIUNI
Haloragaceae							
	Haloragis aculeolata	2					HALACU
	Myriophyllum echinatum	1	2	eE			MYRECH
Iridaceae							
*	Romulea rosea						ROMROS
*	Romulea rosea subsp. rosea						ROMROSRO
Juncaceae							
*	Juncus bufonius						JUNBUF
	Juncus bufonius						JUNBUF
Juncaginaceae							
	Triglochin mucronatum						TRIMUC
Lauraceae							
	Cassytha flava						CASFLA
	Cassytha glabella						CASGLA
	Cassytha racemosa						CASRAC
Linaceae							
	Linum marginale						LINMAR
Lobeliaceae							

Species List Muchea Limestones

	Isotoma hypocrateriformis			ISOHYP
*	Monopsis debilis			MONDEB
Loganiaceae				
	Mitrasacme paradoxa			MITPAR
Loranthaceae				
	Nuytsia floribunda			NUYFLO
Malvaceae				
	Allogyne huegelii var.			
Menyanthaceae				
	Villarsia capitata			VILCAP
Mimosaceae				
	Acacia pulchella var. glaberrima			ACAPULGL
	Acacia rostellifera			ACAROS
	Acacia saligna			ACASAL
	Acacia sp			
Myoporaceae				
	Myoporum caprarioides			MYOCAP
Myrtaceae				
	Baeckea robusta	S	North Beach	BAEROB
	Calothamnus quadrifidus			CALQUA
	Eucalyptus calophylla			EUCCAL
	Eucalyptus decipiens			EUCDEC
	Eucalyptus rudis			EUCRUD
	Kunzea recurva			KUNREC
	Melaleuca sp			MELACE
	Melaleuca bracteosa			MELBRA
	Melaleuca huegelii			MELHUE
	Melaleuca incana			
	Melaleuca lateriflora var. acutifolia			MELLATAC
	Melaleuca lateritia			MELLAT
	Melaleuca rhaphiophylla			MELRHA
	Melaleuc teretifolia			
	Melaleuca uncinata			MELUNC
	Melaleuca viminea			MELVIM
	Regelia ciliata			REGCIL
	Verticordia densiflora			VERDEN

Species List Muchea Limestones

Orchidaceae		
	Microtis media	MICMED
Papilionaceae		
	Daviesia physodes	DAVPHY
	Hardenbergia comptoniana	HARCOM
	Kennedia prostrata	KENPRO
*	Lotus angustissimus	LOTANG
	Viminaria juncea	VIMJUN
Philydraceae		
	Philydrella sp	PHIDRU
Phormiaceae		
	Dianella revoluta	DIAREV
Pittosporaceae		
	Sollya heterophylla	SOLHET
Plantaginaceae		
*	Plantago lanceolata	PLALAN
Poaceae		
	Agrostis avenacea	AGRAVE
*	Aira caryophyllea	AIRCAR
	Amphibromus neesii	AMPNEE
*	Briza maxima	BRIMAX
*	Briza minor	BRIMIN
	Danthonia sp	DANACE
*	Ehrharta calycina	EHRCAL
*	Ehrharta longiflora	
	Hemiarthria unsinata	
*	Lolium rigidum	LOLRIG
	Microlaena stipoides	MICSTI
	Neurachne alopecuroidea	NEUALO
	Poa poiformis/porphyroclados	POASP
	Stipa ?flavescens	STIFLA
*	Vulpia bromoides	VULBRO
*	Vulpia myuros	VULMYU
Polygalaceae		
	Comesperma integerrimum	COMINT
	Comesperma virgatum	COMVIR

Species List Muchea Limestones

Primulaceae					
*	Anagallis arvensis				ANAARV
	Samolus junceus				SAMJUN
	Samolus repens				SAMREP
Proteaceae					
	Banksia littoralis				BANLIT
	Dryandra nivea				DRYNIV
	Grevillea evanescens	1			
	Hakea prostrata				HAKPRO
	Hakea varia				
Restionaceae					
	Leptocarpus ?coangustatus				LEPCOA
Rubiaceae					
	Opercularia vaginata				OPEVAG
Sapindaceae					
	Diplopeltis huegelii				
Santalaceae					
	Exocarpos sparteus				EXOSPA
	Dodonaea aptera				DODAPT
Scrophulariaceae					
	Gratiola peruviana				GRAPER
Solanaceae					
	Anthocercis ilicifolia (Vines)		S	Mandurah	ANTILI
Stylidiaceae					
	Stylidium dichotomum				STYDIC
Surianaceae					
	Stylobasium australe				
Thymelaeaceae					
	Pimelea ferruginea				PIMFER
Xanthorrhoeaceae					
	Xanthorrhoea preissii				XANPRE

Source TEC Branch Val English

Field Survey of Extant Areas of Muchea Limestone and Northern Ironstone, Gingin Area

Site Description	Latitude	Longitude
Corner ?Gingin Brook Rd and Brand Hwy - *Grevillea ?vestita*	-31° 20.045'	115° 51.98'
Patch of Northern Ironstone, south of Gingin Brook Rd on verge adjacent property; *Grevillea obtusifolia* and *Burchardia bardii*	-31° 18.86'	115° 46.94'
Beattie Rd Muchea limestone remnant	-31° 18.32'	115° 45.52'
The Pinnacles Property ?Tamalla Limestone	-31° 14.98'	115° 37.65'
Muchea Limestone/Northern Ironstone road verge 200m ?west of junction of Beermullah Rd and Pinpin Rd; *Grevillea obtusifolia, Thysanotus arenarius, Eucalyptus calophylla, Acacia saligna*	-31° 14.033'	115° 42.287'
Pinpin Rd verge. Remnants of Muchea limestone; *Melaleuca teretifolia*; *Melaleuca lateritia* hybrid. *Pimelia imbricata, Xanthorrhoea preissii*	-31° 12.418'	115° 41.946'
Beermullah West Rd, 0.8km east of Pinpin Rd on south side; private property and road verge; Muchea Limestone; *Xanthorrhoea preissii, Grevillea obtusifolia, Viminaria juncea, Dianella revoluta, Tricoryne elatior, Melaleuca teretifolia, Allocasuarina lehmanii*	-31° 14.24'	115° 43.91'
On Bootine Rd ~ 500m east of Jocks Rd. Private property on north side; Muchea limestone; *Casuarina obesa, Alogyne huegelii, Grevillea obtusifolia, Xanthorrhoea preissii, Hibbertia spicata* subsp. ?	-31° 15.14'	115° 44.70'
Bootine Rd property for sale (Kolbs); *Eucalyptus decipies, Grevillea obtusifolia*	-31° 15.05'	115° 44.96'
Property south west of Lat Long given; off Nine Mile Swamp Rd, on Road reserve between farms heading west; *Eucalyptus decipiens, Baeckea, Casuarina obesa, Acacia saligna.* Area rolled but regenerating	-31° 13.71'	115° 46.44'

FLORISTIC COMMUNITY TYPES ON THE PINJARRA PLAIN
(after Gibson *et al.* 1994 and DEP 1996).

Seasonal Wetlands

2	Southern wet shrublands	50.3
5	Mixed shrub damplands	38.4
7	Herb rich saline shrublands in clay pans	44.8
8	Herb rich shrublands in clay pans	50.8
9	Dense shrublands on clay flats	34.8
10a	Shrublands on dry clay flats	45.9
10b	Shrublands on southern ironstones	53.3
11	Wet forests and woodlands	28.0
13	Deeper wetlands on heavy soils	16.9
15	Forests and woodlands of deep seasonal wetlands	16.8
18	Shrublands on calcareous silts	36.6
S2	Northern Pericalymma ellipticum dense low shrublands	17.7
S5	*Acacia saligna* wetlands	23.3
S6	Northern dense low shrublands	35.4
S7	Northern woodlands to forests over tall sedgelands alongside permanent wetlands	17.7

Uplands

1a	*E. haematoxylon* - *E. marginata* woodlands on Whicher foothills	66.2
3a	*E. calophylla* - *Kingia australis* woodlands on heavy soils	58.2
3b	*E. calophylla* - *E. marginata* woodlands on sandy clay soils	57.3
3c	*E. calophylla* - *Xanthorrhoea preissii* woodlands and shrublands	47.7
20a	*B. attenuata* woodlands over species rich dense shrublands	64.5
20b	Eastern *Banksia attenuata* and/or *E. marginata* woodlands	59.7
20c	Eastern shrublands and woodlands	60.4
21c	Low lying *Banksia attenuata* woodlands or shrublands	38.5
25	Southern *Eucalyptus gomphocephala* - *Agonis flexuosa* woodlands	48.1
28	Spearwood *B. attenuata* or *B. attenuata* - *Eucalyptus* woodlands	55.1

TYPICAL FLORISTIC COMMUNITY TYPES ON THE PINJARRA PLAIN
(after Gibson *et al.* 1994 and DEP 1996).

Seasonal Wetlands

2	Southern wet shrublands	50.3
5	Mixed shrub damplands	38.4
7	Herb rich saline shrublands in clay pans	44.8
8	Herb rich shrublands in clay pans	50.8
9	Dense shrublands on clay flats	34.8
10a	Shrublands on dry clay flats	45.9
10b	Shrublands on southern ironstones	53.3
18	Shrublands on calcareous silts	36.6
S5	*Acacia saligna* wetlands	23.3

Semi - permanent Wetlands

13	Deeper wetlands on heavy soils	16.9
15	Forests and woodlands of deep seasonal wetlands	16.8
S7	Northern woodlands to forests over tall sedgelands alongside permanent wetlands	17.7

Uplands

20a	*B. attenuata* woodlands over species rich dense shrublands	64.5
20b	Eastern *Banksia attenuata* and/or *E. marginata* woodlands	59.7
20c	Eastern shrublands and woodlands	60.4
25	Southern *Eucalyptus gomphocephala - Agonis flexuosa* woodlands	48.1
28	Spearwood *B. attenuata* or *B. attenuata - Eucalyptus* woodlands	55.1

VEGETATION AND SIGNIFICANT FLORA OF BUSHPLAN SITE 23 (MUCHEA LIMESTONE)

THE VINES

Prepared for

Mike Bishaw
Bowman Bishaw Gorham,
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Prepared by

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14 June 1999

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	LOCATION	1
1.2	OBJECTIVES	1
2.0	METHODS	1
3.0	RESULTS AND DISCUSSION	2
3.1	VEGETATION	2
3.2	SIGNIFICANT FLORA	5
4.0	LIMITATIONS	6
4.1	PLANT COMMUNITIES	6
4.2	SIGNIFICANT FLORA	6
5.0	REFERENCES	7

VEGETATION AND SIGNIFICANT FLORA OF BUSHPLAN SITE 23 (MUCHEA LIMESTONE)

THE VINES

1.0 INTRODUCTION

This report describes vegetation in Bushplan Site 23, Cardinal Drive Bushland, Ellenbrook (Department of Environmental Protection 1998 Part B, pp. 155-156) and searches for rare flora there.

The searches and vegetation survey were requested by Mike Bishaw, of Bowman Bishaw Gorham, around 19 March 1999.

1.1 LOCATION

The location of the survey area is shown in Map 1, which is also the vegetation map. It is in The Vines and is north of Bordeaux Lane, west of Vines Avenue and southwest of Cardinal Drive. It comprises approximately 80 ha of vegetated and cleared land.

1.2 OBJECTIVES

The principal requirements of the vegetation survey are to:

- to determine the condition of the vegetation of the Bushplan site, and
- to assess how well it is represented, if at all, in Bushplan Site 300, particularly the eastern wetlands 'Sawpit' reserve between Bushplan Site 23 and Maralla Road.

2.0 METHODS

The field work part of the project was done on Wednesday, 24 March 1999, when transects were driven along most of the tracks in the Bushplan site and next to it and walked into vegetation that had no tracks in it. Four transects were driven across and along the 'Sawpit' reserve. Notes on vegetation types, condition and principal species were made, plants were collected and photographs were taken along the transects.

Vegetation boundaries were marked onto 1:20 000 scale Metro Regional Area aerial photography flown in January 1998 before, during and after the field trip. The aerial photographs were stereoscopically viewed with magnifying lenses. Subsequently, boundaries and symbols representing vegetation units were drawn onto transparent film overlying one of the photographs. The film map was photocopied and enlarged to 1:10 000.

3.0 RESULTS AND DISCUSSION

3.1 VEGETATION

Map 1 shows the vegetation of the Bushplan site at scales of 1:20 000 and 1:10 000. The following 11 vegetation units are indicated on the map and are described and discussed in this section, and condition ratings for them are given. Locations where photographs were taken are shown on Map 3.

The 11 vegetation units and their map symbols are:

- B Banksia Low Woodland
- A *Acacia saligna* Open to Closed Tall Scrub
- Mv *Melaleuca viminea* Open to Closed Tall Scrub
- MvA *Melaleuca viminea – Acacia saligna* Open to Closed Tall Scrub
- CMvA *Melaleuca viminea – Acacia saligna* Open to Closed Tall Scrub over *Calothamnus lateralis* Closed Heath
- Er *Eucalyptus rudis* Open to Closed Forest
- Mp *Melaleuca preissiana* Low Closed to Open Forest
- Mr *Melaleuca rhaphiophylla* Low Closed Forest
- EcMh *Eucalyptus (Corymbia) calophylla* Open Forest over *Melaleuca huegelii* Mixed Tall Open Scrub and *Banksia littoralis* Low Open Forest
- W *Phytolacca-Conyza-Chenopodium-Lepidium-Juncus* Closed Tall [1-2 m] Herbland
- Cl Cleared

These vegetation units are described below and discussed in terms of:

(1) photographs and notes,
(2) condition,
(3) location in Bushplan site,
(4) similarity to the vegetation units of Griffin (Weston *et al.* 1993),
(5) representation in the Bushplan Site 300 part of the Griffin study area and
(6) probable Floristic Community Type counterpart.

The descriptions use the several strata system of structural units or plant communities used by Muir (1977) and modified by Keighery (1994) for *Perth's Bushplan* (Department of Environmental Protection 1998, Part A, Table 11, p. 37). A copy of the *Perth's Bushplan* table accompanies this report.

Assessments of condition of the plant communities are shown on Map 2, which is a transparency that overlies Map 1. The scale used for the assessments is the six-point scale developed by Trudgen (1991) and Keighery (1994) and used in *Perth's Bushplan* (Western Australian Planning Commission 1998, p. 53). The six steps in the scale are: 1 Pristine, 2 Excellent, 3 Very Good, 4 Good, 5 Degraded and 6 Completely Degraded.

A photocopy of the scale from *Perth's Bushplan*, with the six numbers added to it, accompanies this report. The photocopy gives definitions of the steps in the scale.

In general, the condition of the uncleared vegetation in Bushplan Site 23 was assessed as Excellent.

It should be noted, however, that it is, at this time of the year, impossible to accurately assess the nature and condition of the herbaceous plant ground layer.

Banksia Low Woodland (B)

(1) ASW99.III.3-5, 6.
(2) Condition 2 (1-3); there appears to be a patchy occurrence of dieback disease.
(3) Raised sandy sites in the centre and in the eastern corner.
(4) Probably A1.
(5) A3 is poorly represented in the eastern, Sawpit part and is well-represented in the western, Lexia part.
(6) Comprises one or more of the six Floristic Community Type *Banksia* woodlands listed by Keighery (1997a) for the Ellenbrook area.

***Acacia saligna* Open to Closed Tall Scrub** (A)

(1) ASW99.III.3-2. The recently burnt area between the cleared bands has much *Anthocercis littorea*; there is less in the long unburnt stands east of the cleared bands.
(2) Overstorey Condition – 2 (-3); understorey is mainly herbaceous plants and unassessable.
(3) Low flats and drainage areas in the western part of the Bushplan site, on reddish loamy soils with limestone.
(4) Possibly identical with J.
(5) No representation of J.
(6) The Floristic Community Type counterpart is probably S5 of Keighery (1997a).

***Melaleuca viminea* Open to Closed Tall Scrub** (Mv)

(1) ASW99.III.3-22.
(2) Overstorey Condition – 2 (-3); understorey is mainly herbaceous plants and unassessable.
(3) Most of the low flat and drainage area in the northern part of the Bushplan site, on sandy loamy soils with limestone
(4) No Griffin counterpart, although Griffin had three sites with *Melaleuca viminea* in them.
(5) The species, but not the community, is apparently represented in Bushplan Site 300, in Griffin Sites 2, 13 and 37.
(6) The Floristic Community Type counterpart of this Muchea Limestone community is probably Type 18, Shrublands on Calcareous Silts.

Melaleuca viminea – Acacia saligna **Open to Closed Tall Scrub** (MvA)

(1) ASW99.III.3-7, 8, 9, 10. This is a mixture and combination of the *Melaleuca viminea* and *Acacia saligna* Open to Closed Tall Scrubs. It is also the habitat and locality where there are several populations of the Declared Rare Flora *Grevillea curviloba* subsp. *curviloba*.
(2) Overstorey Condition – 2 (-3); understorey is mainly herbaceous plants and unassessable.
(3) Most of the low flat and drainage area in the southeastern part of the Bushplan site, on sandy loamy soils with limestone
(4) No Griffin counterpart.
(5) No representation.
(6) This is probably a form of Floristic Community Type 18, Shrublands on Calcareous Silts.

Melaleuca viminea – Acacia saligna **Open to Closed Tall Scrub over *Calothamnus lateralis* Closed Heath** (CMvA)

(1) ASW99.III.3-19. This is a mixture and combination of the *Melaleuca viminea* and *Acacia saligna* Open to Closed Tall Scrubs with a dense understorey dominated by *Calothamnus lateralis*, a shrub recorded during the Griffin study but not recorded in any of his plots.
(2) Condition – 1-2.
(3) A small drainage area in the northeastern part of the Bushplan site mostly between the drain and Cardinal Drive, on loamy soils with limestone
(4) No Griffin counterpart.
(5) No representation.
(7) This is probably a form of Floristic Community Type 18, Shrublands on Calcareous Silts.

Eucalyptus rudis – Melaleuca preissiana **Open to Closed Forest** (Er)

(1) ASW99.III.3-23. This forest has varying proportions of *Eucalyptus rudis* and *Melaleuca preissiana* as dominants, with *Banksia littoralis, Xanthorrhoea preissii* and *Melaleuca rhaphiophylla* prominent in the understorey.
(2) Condition – 1-2. This vegetation in the Bushplan site is regenerating after fire.
(3) A north-south band depression or drainage line in the western part of the Bushplan site.
(4) Probably the same as two Griffin units, depending on which species is dominant: E3 and H.
(5) There are a few small representations of both E3 and H in the Sawpit part of Bushland Site 300 and a few of E3 in the Lexia part.
(6) This is probably a form of Floristic Community Type 11, 13 or 14.

Melaleuca preissiana – Eucalyptus calophylla **[Low] Closed to Open Forest** (Mp)

(1) ASW99.III.3-20. This community is a diverse and varying mixture of *Melaleuca preissiana, Eucalyptus calophylla, Banksia attenuata, Banksia menziesii, Allocasuarina fraseriana, Banksia littoralis* and *Acacia saligna*. There is also a small grove of *?Melaleuca preissiana* north of this stand, in the middle of the flat.
(2) Condition 2 (-1).
(3) North of centre of Bushplan site on middle to lower slope of sandridge.
(4) Possibly C1.
(5) This may be the same unit as Griffin shows as being well-represented in a part of Bushplan Site 300 north of this site.
(6) This is probably Floristic Community Type 4 or allied to it.

Melaleuca rhaphiophylla **Low Closed Forest** (Mr)

(1) ASW99.III.3-0, 1. The understorey is mainly of small herbaceous plants which are not identifiable at this time of year.
(2) Overstorey Condition – 2; understorey is mainly herbaceous plants and not assessable.
(3) Depression in southern part of Bushplan site between cleared bands.
(4) Probably I.
(5) Two small representations of Griffin's I are in the Lexia part of Bushplan Site 300.
(6) This is a representation of Floristic Community Type 11.

Eucalyptus (*Corymbia*) *calophylla* **Open Forest over** *Melaleuca huegelii* **Mixed Tall Open Scrub and** *Banksia littoralis* **Low Open Forest** (EcMh)

(1) ASW99.III.3-11, 16, 17, 18. A Marri-Blackboy plant community that is unusual in being on a hill and, at the same time, having a low tree / tall shrub stratum of *Banksia littoralis, Hakea prostrata* and *Melaleuca huegelii*. At least one population of the Declared Rare Flora *Grevillea curviloba* subsp. *curviloba* is at the edge of this community.
(2) Condition 2 (-1).
(3) On raised limestone and calcareous soil in southeastern quadrant at southern base of central, *Banksia*-covered sandridge.
(4) No Griffin counterpart.
(5) No representation and apparently does not occur elsewhere.
(6) .There appears to be no Floristic Community Type counterpart of this plant community.

Phytolacca-Conyza-Chenopodium-Lepidium-Juncus **Closed Tall [1-2 m] Herbland** (W)

(1) ASW99.III.3-21. This is a small, very dense community of weeds fed by an outpouring of wastewater.
(2) Condition – 6.
(3) A gentle slope or depression near the centre of the Bushplan site, at the edge of the sand ridge.
(4) No Griffin counterpart.
(5) No representation and I have not seen it apparently does not occur elsewhere.
(6) This is probably a variation of Floristic Community Type 6 S15, Weed group.

Cleared (Cl)

(1) ASW99.III.3-10, 11, 16. Most of the clearing in Bushplan Site 23 is roads, tracks, the water tower, a drain and, in the western part of the site, two parallel cleared bands. Because native vegetation, in which *Anthocercis littoralis* is prominent, is regenerating in parts of the cleared bands they might warrant a condition rating of 5 instead 6.

3.2 SIGNIFICANT FLORA

One Declared Rare Flora (DRF) subspecies, *Grevillea curviloba* subsp. *curviloba*, was found during the survey. It was found at two locations, both of which are already known and marked. The forms of the plants and the habitats at each location differed markedly from each other.

One location is in the northeastern part of Bushplan Site 23, north of Bordeaux Lane, west of the drain and south of the central sand ridge. The location has loamy or silty soils with limestone and is marked with yellow flagged star pickets. There are several small populations of spreading to erect plants to over 1 m high (Photos ASW99.III.3-11, 12, 13).

The second location is north of Bushplan Site 23 (Photo ASW99.III.3-24) at GPS coordinates 31^44'52"S by 115^59'41.5"E (04 770 by 87 113). It has one small population of very prostrate plants on white sandy soil.

Perth's Bushplan (Department of Environmental Protection 1998 Part B, pp. 155-156) refers to four species, in addition to the *Grevillea*, typical on limestone that are in Bushplan Site 23. All four are common on calcareous coastal sands and rock but are believed to be absent or rare on non-calcareous soils on the eastern side of the Coastal Plain.

Two of these species are herbaceous plants not likely to be found at this time of year, but the other two are large shrubs, both of which were found during the survey. These two shrubs are *Melaleuca huegelii* (Photos ASW99.III.3-14, 15) and *Anthocercis littorea*. Both *Melaleuca huegelii* and *Anthocercis littorea* are listed by Weston *et al.* (1993) as having been found during their Ellenbrook study, but no location is indicated, and neither species is on the report's Appendix Four spreadsheet of species recorded in Griffin's plots. It is possible they were found either in what is now Bushplan Site 23 or on limestone soils immediately north of BS 23, possibly in vegetation that has been cleared recently.

4.0 LIMITATIONS

4.1 PLANT COMMUNITIES

A plant community does not, unlike an individual plant, have a discrete boundary or limit; it is often a section of a continuum more or less arbitrarily defined by the presence of a suite of dominant or characteristic species, which, however, vary in their relative proportions through a stand.

These suites of species sometimes show up on aerial photographs as distinctive patterns, but the patterns are confused or altered, on the ground as well as on the photographs, by various factors, especially fire and post-fire succession and regeneration. The alterations include structure and species composition and may persist for several years.

Consequently, and especially when one distinctive structural vegetation type is divided into plant communities defined by species which are different from each other although they may appear similar, experts are likely to differ in their mapping and classification of stands. But the experts may be equally correct.

Some of the apparent vegetation differences in the survey area are due to parts having been burnt less than one year prior to the survey, and others having been burnt five years or so ago.

4.2 SIGNIFICANT FLORA

March, when this survey was undertaken, is a time when a very small percentage of flora, including rare flora, is in flower. However, even when the greatest number of species is in flower, no single rare flora survey can be expected to exclude the possibility that there are, in the area surveyed, species of rare flora which were not found during the survey. This is partly because some species flower during one season while others flower at other times of the year.

Furthermore, some species do not flower every year, and some species are not identifiable, or even visible, except for short periods before, during and after flowering, such as most orchids.

In addition, there may be rare or otherwise significant species that have not previously been recorded anywhere near the area.

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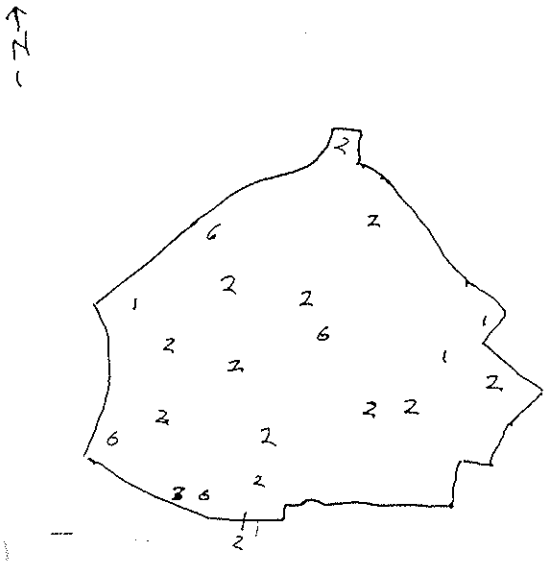
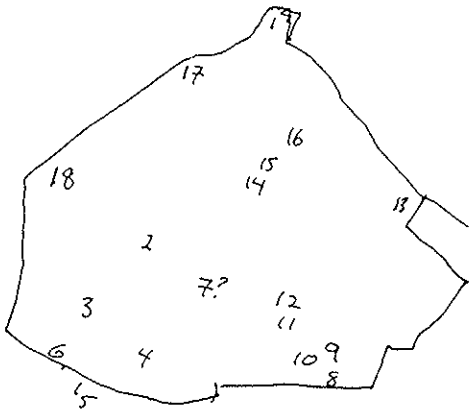
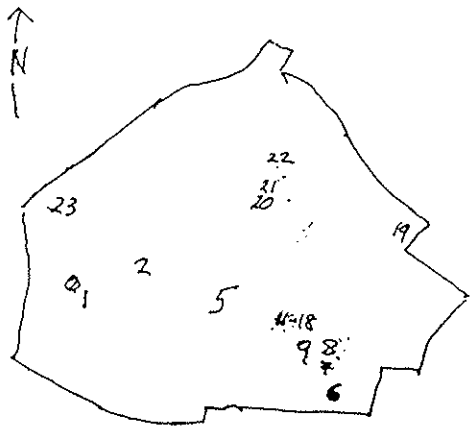
MAP 2
CONDITION
BUSHPLAN SITE 23



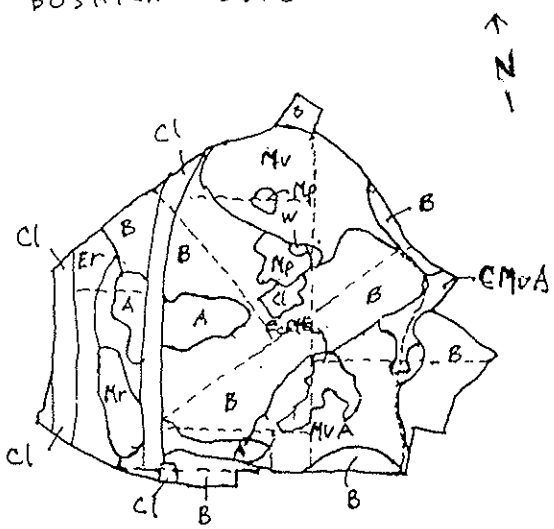
197
SITE LOCATIONS
BS 23



MAP 3
PHOTO LOCATIONS
BUSHPLAN SITE 23



MAP 1
VEGETATION
BUSHPLAN SITE 23



MAP 1

VEGETATION

BUSHPLAN SITE 23

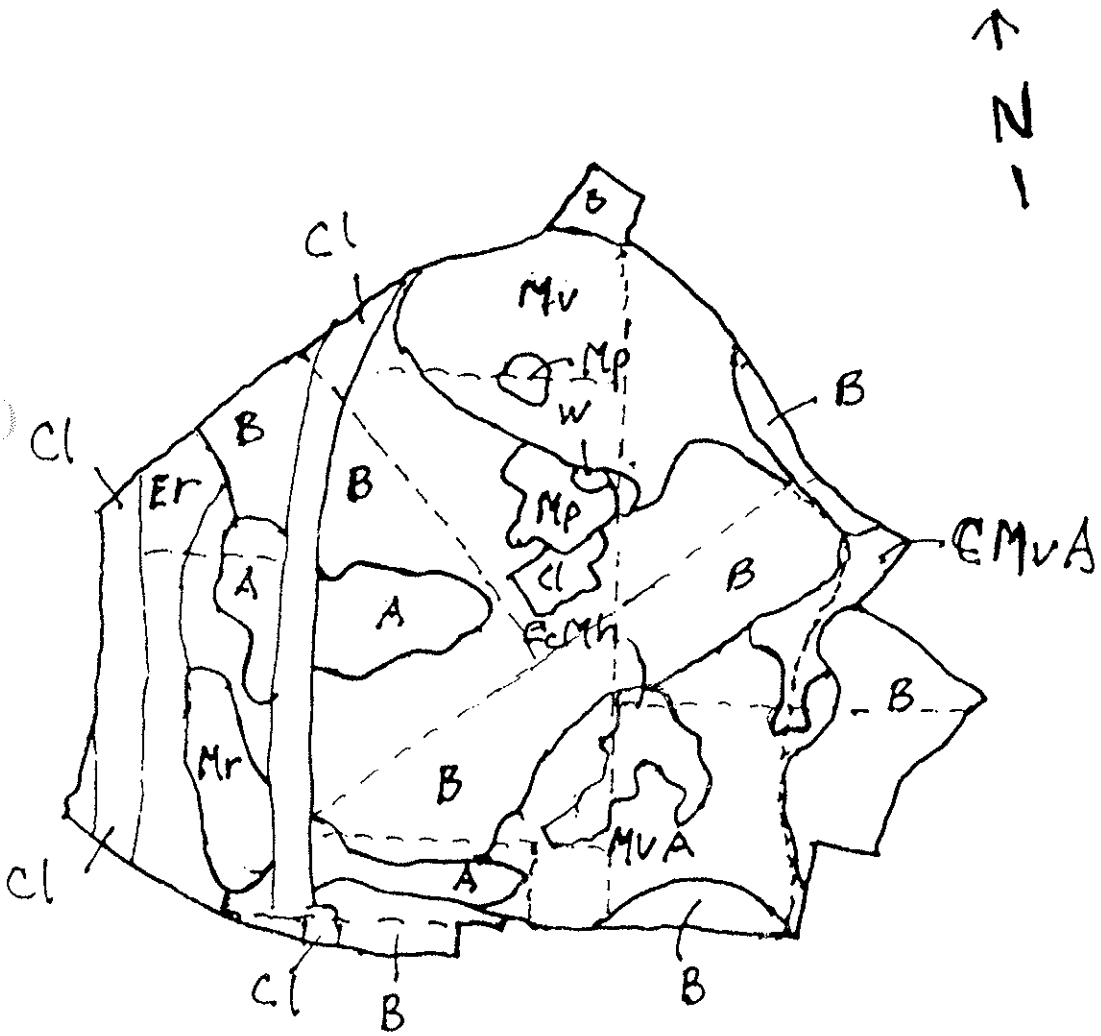
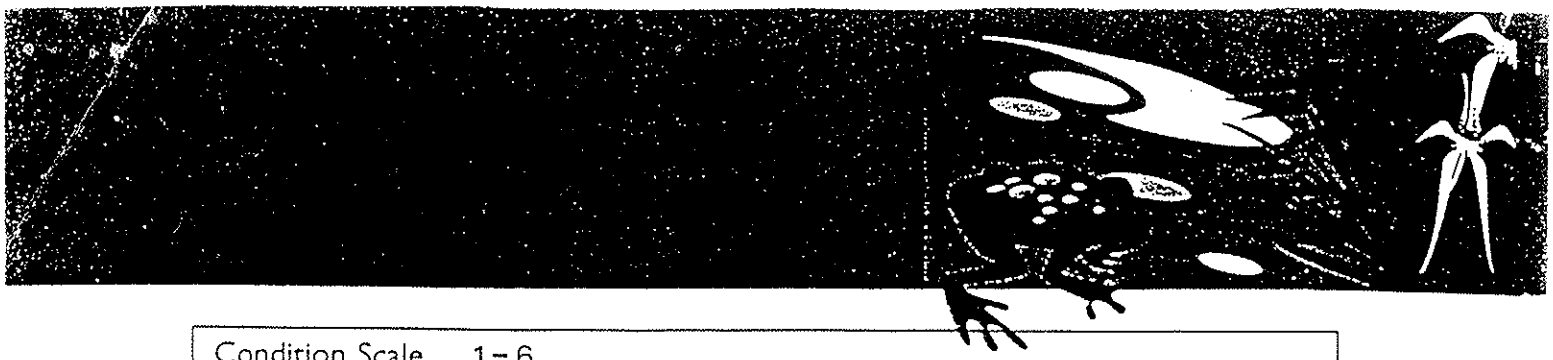


Table 11: Vegetation Structural Classes (Keighery, BJ, 1994 (Adapted from Muir, 1977, and Aplin, 1979))

Life Form/ Height Class	Canopy Cover (percentage)			
	100 – 70%	70 – 30%	30 – 10%	10 – 2%
Trees over 30m Trees 10 – 30m Trees under 10m	Tall Closed Forest Closed Forest Low Closed Forest	Tall Open Forest Open Forest Low Open Forest	Tall Woodland Woodland Low Woodland	Tall Open Woodland Open Woodland Low Open Woodland
Tree Mallee Shrub Mallee	Closed Tree Mallee Closed Shrub Mallee	Tree Mallee Shrub Mallee	Open Tree Mallee Open Shrub Mallee	Very Open Tree Mallee Very Open Shrub Mallee
Shrubs over 2m Shrubs 1 – 2m Shrubs under 1m	Closed Tall Scrub Closed Heath Closed Low Heath	Tall Open Scrub Open Heath Open Low Heath	Tall Shrubland Shrubland Low Shrubland	Tall Open Shrubland Open Shrubland Low Open Shrubland
Grasses	Closed Grassland	Grassland	Open Grassland	Very Open Grassland
Herbs	Closed Herbland	Herbland	Open Herbland	Very Open Herbland
Sedges	Closed Sedgeland	Sedgeland	Open Sedgeland	Very Open Sedgeland



Condition Scale 1 – 6
1Pristine Pristine or nearly so, no obvious signs of disturbance
2Excellent Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.
3Very Good Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
4Good Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
5Degraded Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
6Completely Degraded The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora composing weed or crop species with isolated native trees or shrubs.

Sent to ANCA 14/12/95 (to support recognition of the Muchea Limestone Community & possible purchase lands. Priority area is Boothine Rd. bjk.

MUCHEA LIMESTONES - FLORISTICS

REPORT FOR ANCA NATIONAL RESERVES NETWORK

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INTRODUCTION

The Muchea Limestones were first commented on by James Drummond, a colonial botanist, in a letter to Joseph Hooker (the Director of Kew) dated 15th January 1847. Current plant names are indicated in brackets.

" I visited Gingin a farm of Mr. W.L. Brockman's situated on a fine and ever running stream of purest water, a tributary of the Moore River. On the road to it I found an interesting species of *Genetyllis* (*Darwinia* sp "Muchea") with very small heath like leaves but with large heads of drooping flowers surrounded by ciliated bracts, an earnest or more important discovery twice made in this fine genus of Myrtaceae. I also found in the same locality an interesting plant belonging to the Scrophulariaceae (probably *Grattiola peruviana*) and a very distinct and showy species of *Grevillea* with linear leaves and scarlet flowers growing 12 or 15 feet high (*Grevillea evanescens - described* in 1994). On reaching the brook on which Mr. Brockman's farm is situated, I was delighted to find it in many places almost filled with a remarkable fern - a rare order in this part of New Holland. It resembled a good deal *Aspidium felixmas* (*Cyclosorus interruptus*, a normally tropical fern) but is a larger plant, bearing fructifications on the margins of the fronds. The stems creep mostly on the dead wood which is covered with the water of the brook. Mr. Brockman's farm consists mostly of remarkable hills of secondary limestone covered to a depth of several feet with rich black soil. Barley produces heavy crops on this soil, but for several years the wheat has suffered apparently from the ravages of fungus.

A Malvaceous plant, new to me, was abundantly in flower (probably *Alogyne huegelii*). These remarkable limestone hills abut on the common ironstone formation of the Darling Range."

Thus only 18 years after European settlement the uniqueness of this formation was recognised, but it was already being cleared for agriculture.

EXTENT OF THE FORMATION

McArthur and Bettenay (1960) in their landmark treatment of soils of the Swan Coastal Plain note

" Along the eastern section of the plain are sporadic deposits of limestone. These consist of soft porous, poorly bedded, clayey material often with a thin crust of travetine on the surface. The deposits occur as slight mounds a few feet above the surrounding country and are strongly suggestive of spring activity. The mounds may be seen from Muchea to Benger along a line parallel to the Darling Scarp and probably indicate the position of a fracture associated with the Darling Fault".(page 9)

These eastern side of the Plain limestone deposits or Muchea Limestones are mapped as discrete units in the Urban and Environmental Geology Map Series (Anon, 1976, a and b, 1977, 1978, Gozzard, 1982, a & b, 1983, a & b, 1986 and Jordan, 1986, a & b) occurring from north west of Gingin to north east of Forrestdale Lake. The greatest concentration of Muchea Limestone occurs to the north west of Gingin. The most westerly deposits occur along the Gingin Brook, a series of limestone mines indicating their presence.

Discrete units of Muchea Limestone are not mapped by Churchward and McArthur (1980) but the descriptions of the Yanga, Mungala and Bootine landform and soil units refer to the presence of marl (Muchea Limestone). The Mungala unit is predominantly 'plains dominated by shallow black clays on marl' and the area mapped under this unit has the greatest development of limestone (Map 1). Throughout this area today Muchea Limestone can be seen exposed in the cleared paddocks and is especially obvious in occasional limestone ridges and as large excavated boulders alongside drains and waterholes. Further south the surface expressions of the Limestones are progressively smaller in area and the deposits more isolated.

Vegetated areas of Muchea Limestone have been located from north of Gingin (31° 14' S and 115° 46' E) to the Passmore Street in the Gosnells area (System 6 Update, Department of Environmental Protection). While all of these occurrences are in the general area of mapped Muchea Limestones not all of them have been mapped.

All of the areas located are small in extent which is characteristic of vegetation remaining on the eastern side of the Plain (Keighery and Trudgen 1992, Gibson *et al.* 1994). It is estimated that 97% of the eastern side of the Swan Coastal Plain has been cleared (Department of Conservation and Land Management 1990). Drummond's 1847 letter comments on the early clearing for agriculture and many areas have been mined. No vegetated occurrences or obvious limestone areas have been located south of Gosnells. It is possible that all accessible deposits have been mined.

FLORISTICS AND STRUCTURE OF THE FORMATION

METHODS

This report is based on floristic and descriptive studies undertaken for the System Six Update (Department of Environmental Protection 1995), information gathered during the floristic survey of the Southern Swan Coastal Plain (Gibson *et al.* 1994) and species lists compiled for reserves under the National Reserves Network program (G.J. Keighery 1995).

Floristic sites have been placed in four locations on Beermullah West Road, Bootine Road, the Muchea townsite reserve and the Vines Estate in Guildford (Map 1). The occurrences of Muchea Limestone in Yurine Swamp Nature Reserve were too disrupted by mining to be used for site based studies. Site descriptions have been made on remnants along roads in the Gingin to Muchea area.

Additional flora data is derived from species lists for Yurine Swamp Nature Reserve (G.J. Keighery 1995), the Muchea townsite (B.J. Keighery 1995) and the locality in the Gosnells area (Trudgen and Keighery 1995, page 207 and 215).

STRUCTURAL VEGETATION FORMATIONS PRESENT

The vegetation of the Muchea Limestones does not appear to have been mapped previously as a distinctive vegetation unit on the large scale vegetation maps of the Swan Coastal Plain (Speck 1952 and 1958, Beard 1979a and b, Heddle *et al* 1980).

Speck (1952 and 1958) does not appear to have mapped this vegetation type. This possibly occurred as his 1952 study ended near Muchea, south of the most developed areas of Muchea

Limestone, detailed landform and soils maps were not yet available and because access to the poorly drained wet plains would have been difficult before the formation of all weather roads.

Beard (1979a and b) and Heddle *et al* (1980) map all known occurrences within broader units Beard (1979a and b)maps the occurrences as woodlands or wetland mosaic. Heddle *et al* (1980) maps them as part of the Bootine, Mungala, Yanga and Southern River Complexes. This is not surprizing as structural formations on the eastern side of the Coastal Plain vary greatly over very short distances, depending on the relief, type of soil, underlying soils and the degree of inundation (Keighery and Keighery 1991, Keighery and Trudgen 1992, Gibson *et .al.* 1994 and Trudgen and Keighery 1995).

The small Yurine Swamp Nature Reserve (Map 1) can be used to demonstrate this variation.. It is mapped either as wetland mosaic (Beard 1979a) or Bootine complex (Heddle *et al.* 1980), and is entirely within the Bootine soil unit of Churchward and McArthur (1983), but it contains at least seven distinct vegetation communities: the deep orange sand dunes which cover the limestone are clothed with *Banksia* woodland over heath, downslope a Marri (*Eucalyptus calophylla*) woodland occurs, this merges downslope to the remnants of a *Casuarina obesa* woodland over heath (this has been severely disturbed by mining for marl, the Muchea Limestone), *Melaleuca preissiana* low woodland, *Melaleuca rhaphiophylla* woodland around the lake, *Eucalyptus rudis* woodland, low heath on a clay flat, a lake with a western yellow sand dunes lunette with *Banksia prionotes* open woodland over *Chamelaucium uncinatum* . Most of these communities are affected by the presence of underlying limestone at various depths.

A series of structural formations are associated with the Muchea Limestones. These formations appear to be related to the depth and type of soil overlying the limestone and the degree of inundation.

The major structural formations on the best developed areas of Muchea Limestone are:
On rises with outcropping limestone:
Eucalyptus decipiens mallee over heath often dominated by *Melaleuca huegelii*
Melaleuca huegelii heath or shrubland over *Grevillea evansecens* and *Xanthorrhoea preissii*
On the wet flats:
Scattered *Casuarina obesa* over *Melaleuca lateriflora, Grevillea evansecens* and *Melaleuca viminea* shrubland and Herbs
Melaleuca huegelii, *Grevillea evansecens* and *Melaleuca* species shrubland and Herbs
Casuarina obesa open woodland over *Poa* grassland and Herbs
Creekline:
Eucalyptus rudis open forest over *Melaleuca rhaphiophylla* open low forest over shrubland over tall sedgeland and grassland.
Areas: Bootine Road, Beermullah West Road.

Where the limestone appears to be at greater depth, is more remote or the limestone area is geographically isolated from other limestone areas:
On sand dunes (often yellow or orange):
Banksia woodlands over heath
Acacia saligna shrubland over Herbs
Eucalyptus decipiens mallee
On damper sands over limestone:
Open Marri woodland over mixed shrublands usually containing *Melaleuca huegelii, Acacia saligna, Grevillea curviloba* and *Regelia ciliata.*
Areas: Yurine Swamp Nature Reserve , Bambun Road, Muchea, Vines and Gosnells

FLORISTICS

Species richness per 100 sq. metres varies from:

- 31 species on the drier rise to 40-58 on the wet flats in the Bootine and Beermullah West Road areas
- 31-41 species in the *Acacia* shrublands at Bambun and the Vines
- 47 - 57 species in the Marri woodlands from
- 74 species in the *Banksia* woodland at Yurine Swamp

Most sites have been only been sampled once.

Currently 160 taxa have been recorded from the 5 quadrats at the private land on Beermullah West and Bootine road, and 153 taxa from 4 quadrats at Muchea. This suggests that the vegetation formations characteristic of the Muchea Limestones have species richness more like the western Spearwood dunes (30-60 species per 100 square metres) than the uplands and clay wetlands of the eastern side of the Swan Coastal Plain (60-80 species per 100 square metres). However the combination of Muchea Limestones, clay based wetlands and *Banksia* woodlands greatly elevates local floral diversity as illustrated at Yurine Swamp with 299 taxa of vascular plant recorded from it.

HIGH FIDELITY PLANT SPECIES DEFINING THE MUCHEA LIMESTONES

There are 29 vascular plant species that are regularly associated with the occurrence of Muchea Limestones. These comprise one tree, two mallees, eighteen shrubs, six herbs and two grasses.

TREES
Casuarina obesa

MALLEES
Eucalyptus decipiens
Eucalyptus foecunda

SHRUBS
Acacia sp indet
Allocasuarina lehmaniana
Alogyne huegelii var *huegelii*
Baeckea robusta
Comesperma integerrimum
Darwinia sp "Muchea"
Diplopeltis huegelii
Dodonaea aptera
Exocarpus sparteus
Grevillea curviloba ssp. *curviloba*
Grevillea curviloba ssp. *incurva*
Grevillea evanescens
Hibbertia spicata ssp. *leptotheca*
Lechenaultia linearioides
Melaleuca acerosa
Melaleuca huegelii
Pimelea ferruginea
Stylobasium australe

HERBS
Apium annuum
Conostylis candicans
Halorhagis aculeolata
Senecio lautus ssp. *dissectifolius*
Thysanotus arenarius
Wilsonia humilis

GRASSES

Stipa flavescens
Poa s ? *porphyroclados*

Many of these taxa normally occur close to the coast on Tamala limestones, indeed most (*Allocasuarina lehmaniana, Baeckea robusta, Comesperma integerrimum, Dodonaea aptera, Eucalyptus decipiens, Eucalyptus foecunda, Exocarpus sparteus, Hibbertia spicata* ssp. *leptotheca, Lechenaultia linearioides, Melaleuca acerosa, Melaleuca huegelii* and *Pimelea ferruginea*) are listed as only occurring close to or on the the coast in the Flora of the Perth Region (Marchant *et al* , 1987). In several others (*Conostylis candicans, Halorhagis aculeolata* and *Alogyne huegelii*) there were scattered old collections, but their occurrence on this soil type was not documented (Keighery, 1990). It appears that several taxa (*Grevillea curviloba* ssp. *curviloba, Grevillea curviloba* ssp. *incurva*, and *Grevillea evanescens*) may be entirely or almost restricted to the Muchea Limestones.

Most of these taxa are endemic to the Swan Coastal Plain (Keighery, 1990), none are declared rare flora, but several are on CALM's priority list (CALM, 1995). The *Grevillea* taxa are all priority 1 and require urgent survey to determine if they should be declared rare.

It would seem likely that these species were able to colonise the Muchea Limestones by following the limestone cliffs found outcropping for considerable distances inland along the Moore (System six Update data), Swan (Keighery and Keighery, 1996) and possibly the Murray rivers (System six Update data).

CONCLUSIONS

The Muchea Limestones are a naturally uncommon geomorphic element of the Swan Coastal Plain. They have been poorly studied because of their size, access and absence from public lands. Occurrences are now critically rare because of destruction due to clearing for agriculture and mining. All known vegetated occurrences are on freehold land.

The best vegetated remnants in the most developed areas of the Muchea Limestones contain rises clothed with *Melaleuca huegelii* dominated shrubland or *Eucalyptus decipiens* mallee with adjacent wetlands dominated by *Casuarina obesa* woodland and/or mixed *Melaleuca* shrublands.

A series of vascular plants normally found on Tamala limestones close to the coast characterises these vegetation types. The species richness of these areas is also most similar to near coastal heathland communities.

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Preliminary list for Muchea Limestone Area (sites plus records from memory GJK 14/95)

Amaranthaceae	
Ptilotus manglesii	PTIMAN
Anthericaceae	
Corynotheca micrantha	CORMIC
Dichopogon preissii	DICPRE
Sowerbaea laxiflora	SOWLAX
Thysanotus arenarius	THYARE
Thysanotus manglesianus/patersonii complex	THYSPMP
Thysanotus multiflorus	THYMUL
Thysanotus thyrsoideus	THYTHY
Tricoryne elatior	TRIELA
Apiaceae	
Apium annuum	APIANN
Apium prostratum	APIPRO
Centella cordifolia	CENCOR
Daucus glochidiatus	DAUGLO
Eryngium pinnatifidum subsp. purple	
Hydrocotyle hispidula	HYDHIS
Schoenolaena juncea	SCHJUN
Trachymene pilosa	TRAPIL
Asteraceae	
Arctotheca sp (yellow) *~~Arctotheca~~ calendula	ARCCAL
*Aster subulatus	ASTSUB
Brachyscome ?bellidioides	BRABEL
Cotula coronopifolia	COTCOR
*Dittrichia graveolens	DITGRA
~~Gnephosis sp~~	GNEANG
*Hypochaeris glabra	HYPGLAbr
Lagenifera huegelii	LAGHUE
*Leontodon saxatilis	LEOSAX
~~Pithocarpa pulchella~~	PITPUL
Podolepis gracilis (Swamp form GJK 13126)	PODGRASW
Pogonolepis strictus	
Pogonolepis 'flat green'	
Senecio lautus subsp. dissectifolius	SENLAUDI
Siloxerus humifusus	SILHUM

Senecio lautus subsp. dissectifolius				SENLAUDI
Siloxerus humifusus				SILHUM
*Sonchus asper				SONASP
Sonchus hydrophilus				SONHYD
*Sonchus oleraceus				SONOLE
~~Trichocline sp.~~ (GJK 6382-glabrous)	1	eE		TRISP
Casuarinaceae				
Allocasuarina lehmanniana				
Casuarina obesa				CASOBE
Centrolepidaceae				
Centrolepis aristata				CENARI
Centrolepis mutica				CENMUT
Chenopodiaceae				
*Atriplex prostrata				ATRPRO
Colchicaceae				
Burchardia multiflora				BURMUL
Wurmbea ?monantha (Vines)				WURMON
Convolvulaceae				
Wilsonia humilis				WILHUM
Crassulaceae				
* Crassula natans				CRANAT
Cupressaceae				
Actinostrobus pyramidalis				ACTPYR
Cyperaceae Baumea articulata				
Baumea juncea				BAUJUN
Gahnia trifida				GAHTRI
Isolepis cernua				ISOCER
Isolepis oldfieldiana				ISOOLD
Lepidosperma angustatum lepid ? effusum				LEPANG
Lepidosperma longitudinale				LEPLON
Schoenus nanus humilis				SCHNAN
S. lenticellus. Schoenus sp. 2 (GJK 5739)				SCHOSP2
Dasypogonaceae				
Acanthocarpus canaliculatus			S Anstey Rd	ACACAN
Dilleniaceae				
Hibbertia racemosa				HIBRAC

	Linum marginale (Boot)			LINMAR
Lobeliaceae				
	Isotoma hypocrateriformis			ISOHYP
*	Monopsis debilis			MONDEB
Loganiaceae				
	Mitrasacme paradoxa			MITPAR
~~Loranthaceae~~				
	~~Nuytsia~~ floribunda			NUYFLO
Malvaceae				
	Allogyne huegelii var. huej			
Menyanthaceae				
	Villarsia capitata			VILCAP
Mimosaceae				
	Acacia pulchella var. glaberrima			ACAPULGL
	Acacia rostellifera			ACAROS
	Acacia saligna			ACASAL
	Acacia sp			
Myoporaceae				
	Myoporum caprarioides			MYOCAP
Myrtaceae				
	Baeckea robusta (BANK ADJ)	S	North Beach	BAEROB
	Calothamnus quadrifidus (roadside)			CALQUA
	Eucalyptus calophylla			EUCCAL
	Eucalyptus decipiens			EUCDEC
	Eucalyptus rudis			EUCRUD
	Kunzea recurva			KUNREC
	Melaleuca sp (yellow, roadside)			MELACE
	Melaleuca bracteosa			MELBRA
	Melaleuca huegelii			MELHUE
	Melaleuca incana			
	Melaleuca lateriflora var. acutifolia			MELLATAC
	Melaleuca lateritia			MELLAT
	Melaleuca rhaphiophylla			MELRHA
	Melaleuc teretifolia			
	Melaleuca uncinata			MELUNC
	Melaleuca viminea			MELVIM

	Hibbertia spicata subsp. leptotheca	3			S	Yalgorup	HIBSPILE
Droseraceae	(adj Boot Jarrah)						
	Drosera gigantea subsp. gigantea						DROGIG
	Drosera menziesii subsp. menziesii						DROMENME
~~Epacridaceae~~							
??	~~Leucopogon parviflorus~~						LEUPAR
Euphorbiaceae							
?	Phyllanthus calycinus (Vines)						PHYCAL
Goodeniaceae							
	Dampiera alata						DAMALA
	Goodenia micrantha						GOOMIC
	Goodenia pulchella						GOOPUL
	Lechenaultia linarioides (Banksia adj)				S	Coogee	LECLIN
	Scaevola anchusifolia						SCAANC
	Scaevola lanceolata						SCALAN
Haemodoraceae							
	Conostylis candicans (Muchea)						CONCAN
	Haemodorum simplex						HAESIM
	~~Haemodorum sparsiflorum~~						HAESPA
	Tribonanthes uniflora						TRIUNI
Haloragaceae							
	Haloragis aculeolata (Boot)	2					HALACU
	Myriophyllum echinatum	1	2	eE			MYRECH
Iridaceae							
*	Romulea rosea						ROMROS
*	Romulea rosea subsp. rosea						ROMROSRO
Juncaceae							
*	Juncus bufonius						JUNBUF
	Juncus bufonius						JUNBUF
Juncaginaceae							
	Triglochin mucronatum						TRIMUC
Lauraceae							
	Cassytha flava						CASFLA
	Cassytha glabella						CASGLA
	Cassytha racemosa						CASRAC
Linaceae							

	Regelia ciliata	REGCIL
	Verticordia densiflora	VERDEN
Orchidaceae		
	Microtis media	MICMED
Papilionaceae		
	Daviesia physodes	DAVPHY
	Hardenbergia comptoniana	HARCOM
	Kennedia prostrata	KENPRO
*	Lotus angustissimus	LOTANG
	Viminaria juncea	VIMJUN
Philydraceae		
	Philydrella sp	PHIDRU
Phormiaceae		
	Dianella revoluta	DIAREV
~~Pittosporaceae~~		
	~~Sollya heterophylla~~	SOLHET
Plantaginaceae		
*	Plantago lanceolata	PLALAN
Poaceae		
	Agrostis avenacea	AGRAVE
*	Aira caryophyllea	AIRCAR
	Amphibromus neesii	AMPNEE
*	Briza maxima	BRIMAX
*	Briza minor	BRIMIN
	Danthonia sp	DANACE
*	Ehrharta calycina	EHRCAL
*	Ehrharta longiflora	
	Hemiarthria unsinata	
*	Lolium rigidum	LOLRIG
	Microlaena stipoides	MICSTI
	Neurachne alopecuroidea	NEUALO
	Poa poiformis/porphyroclados	POASP
	Stipa ?flavescens	STIFLA
*	Vulpia bromoides	VULBRO
*	Vulpia myuros	VULMYU
Polygalaceae		

Stipa trichophylla (HACKEA)

	Comesperma integerrimum				COMINT
	Comesperma virgatum				COMVIR
Primulaceae					
*	Anagallis arvensis				ANAARV
	Samolus junceus				SAMJUN
	Samolus repens				SAMREP
Proteaceae					
	Banksia littoralis				BANLIT
	Dryandra nivea				DRYNIV
	Grevillea evanescens	1			
	Hakea prostrata				HAKPRO
	Hakea varia				
Restionaceae					
	Leptocarpus ?coangustatus				LEPCOA
	Lepyrodia sp.	Rhamnaceae			
Rubiaceae					
	Opercularia vaginata	Cryptandra			OPEVAG
Sapindaceae					
	Diplopeltis huegelii				
Santalaceae					
	Exocarpos sparteus				EXOSPA
	Dodonaea aptera				DODAPT
Scrophulariaceae					
	Gratiola peruviana				GRAPER
Solanaceae					
	Anthocercis ilicifolia	(Vines)	S	Mandurah	ANTILI
Stylidiaceae					
	Stylidium dichotomum				STYDIC
Surianaceae					
	Stylobasium australe				
Thymelaeaceae					
	Pimelea ferruginea				PIMFER
Xanthorrhoeaceae					
	Xanthorrhoea preissii				XANPRE

Article

A plant community mystery solved - Location of a "Presumed Destroyed Community Type"

Two plant communities, Muchea Limestones and *Casuarina obesa* Woodlands were described as being "presumed destroyed community" types in the most recent regional survey of plant communities on the Swan Coastal Plain. While the Survey found areas of *Casuarina obesa* Woodlands without appreciable understorey no areas of Muchea Limestone were found. The regional study, "A Floristic Survey of the Southern Swan Coastal Plain" by N. Gibson, B. Keighery, G.Keighery, A. Burbidge and M. Lyons 1994, carried out by the the Department of Conservation and Land Management, the Conservation Council with funding from the Australian Heritage Commission and CALM is the basis for the System 6 Update work on the Swan Coastal Plain. As a consequence one of the tasks for the System 6 Update was to see if any intact areas of Muchea Limestones could be found.

The Muchea Limestones are discussed by McArthur and Bettenay in their landmark treatment of the soils of the Swan Coastal Plain and mapped along the eastern side of the Plain on environmental geology maps from south of the Moore River National Park to Harvey. But, the only known reference to the vegetation of these soils is in an obscure letter by the first botanical collector in the state, James Drummond, in 1847 about the plants growing on these easte ~ soils with outcropping limestone.

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

As a consequence in 1995 the System 6 survey team and Val English from the CALM's Threatened Species and Communities Unit spent a day systematically observing areas of remnant vegetation from roads between Ellenbrook bushland and the Moore River National Park in the vicinity of areas of mapped limestone. A series of areas supporting the species recognised in 1994 and other typical limestone species were found on the roadsides and adjacent private land. One of these small patches even looked to be intact.

While we felt fairly confident that we had found our mysterious Muchea Limest[illegible]s further work was needed to be done from within the remnants to describe them. With permission from the landholders another days survey work was done by the System 6 team on several of these patches. This work identified a suite of communities associated with these soils and a suite of characteristic species. Some examples of these species are the three mentioned above and Fremantle Mallee (*Eucalyptus foecunda*), Lilac Hibiscus (*Alyogyne huegelii* var *huegelii*), *Diplopeltis huegelii*, Coast Hop Bush (*Dodonaea aptera*), *Hibbertia spicata* ssp. *leptotheca*, Coastal Honey Myrtle (*Melaleuca acerosa*) and Coast Spear Grass (*Stipa flavescens*). Two highly restricted taxa not found on the western limestones*Grevillea curviloba* ssp. *incurva* and *Grevillea evanescens* were found in these northern Muchea Limestones. Also *Haloragis aculeolata* which is only currently known form one other limestone and clay area in the Yalgorup National Park was found.

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

With this more detailed knowledge of the floristics of the Muchea Limestones the areas to the south could be integrated into a synopsis of the plant communities of these soils prepared for the Australian Nature Conservation Authority Reserves Network by G. Keighery and B.

Keighery. The Muchea Limestones were described in this report from Gosnells to south of the Moore River National Park. Unfortunately a lot of the areas, including the System 6 areas where these communities were identified, are severely impacted by mining, clearing and/or grazing.

With the Muchea Limestones defined and located the CALM Threatened Communities Unit was able to classify these communities as critically endangered and begin investigating the possibility of purchasing the best currently known remnant of the Muchea Limestones. CALM and ANCA have since jointly arranged the purchase of this best known remnant. A very satisfactory outcome to a plant community detective story.

A plant community thought to have been lost to early agricultural clearing of the eastern side of the Swan Coastal Plain has been located during floristic survey for the System 6 Update.

This plant community found on Muchea Limestones was considered to be 'presumed destroyed' in the 1994 report "A Floristic Survey of the Southern Swan Coastal Plain" by N. Gibson and others, being used as the basis for the System 6 Update work on the Swan Coastal Plain.

The only known reference to the plants of the Muchea Limestone community was found in an obscure letter by James Drummond - the first botanical collector in the state - describing the plants in 1847.

Survey work for the System 6 Update in 1994 gave some hints as to what would be expected on the Muchea Limestones when a series of coastal limestone species, including Chenile Honey Myrtle and Limestone Marlock, were found between Muchea and Moore River National Park.

As a result of these findings, in 1995 the System 6 survey team and Val English from CALM's Threatened Species and Communities Unit spent a day systematically observing areas of remnant vegetation from roads between Ellenbrook bushland and the Moore River National Park in areas of mapped limestone.

A series of areas supporting typical limestone species were found on the roadsides and adjacent private land. Further survey on some of these patches by the System 6 Update team, supported by Greg Keighery from CALM who is working on species conservation on the Plain, identified a suite of communities associated with the soils and as well as three highly restricted Grevilleas not found on the western limestones.

Unfortunately a lot of the areas where the Muchea Limestone communities were identified, are severely impacted by mining, clearing and grazing.

With the Muchea Limestones defined and located the CALM Threatened Species and Communities Unit was able to classify these communities as critically endangered and buy the best known remnant of the community.

More information on these communities is found in an unpublished report by Greg Keighery and Bronwen Keighery avaiable from CALM (Wildlife Library) and Department of Environmental Protection.

A Preliminary Assessment of the Flora and Vegetation of Carousel Swamp, Cannington

B Keighery and B Hyder-Griffiths
Department of Environment May 2004

No map included (2018)

Synopsis of the Values of Carousel Swamp
The characteristics and values of the native vegetation present in Carousel Swamp (see attached map) are outlined below. This assessment is limited by the timing of the field inspections by the authors. However all the information available on the area (in particular the information from CALM) indicates that further survey will further raise the values of the area.

Wetlands
Areas 1 and 3 - 9 are wetlands. A small area in the NW corner of Area 2 supports upland vegetation, the remainder being wetland. Areas 4 -5, 6a and 7 support the highest quality vegetation, which appears to vary from Excellent to Good Condition with some areas of severe localised disturbance. The NW corner of Area 6 (6b) has been partially filled and is predominantly weed invaded. Areas 1 - 3 and 9 and 8 have been disturbed by recent (last few weeks in Area 8 and possibly Area 3 and 2) and longer-term clearance (Area 2 and 1). The filling has followed a similar pattern. However it appears that in most of the cleared and/or filled areas the original soil structure is intact which indicates that vegetation can regrow and/or revegtation has the highest chance of success.

The vegetation of the wetlands is:
- highly variable, forming a mosaic of units (see Appendix 1) not known elsewhere on the Swan Coastal Plain in the PMR;
- representative of wetlands on heavy soils within the Guildford Vegetation Complex on the eastern side of the Swan Coastal Plain;
- associated with Muchea limestone soils (recent excavation holes in Areas 5/6 are a mixture of brown sandy clays and limestone nodules) and patches of ironstone (Area 1);
- representative of floristic community type 7 (at the least, supporting the findings by CALM that the floristic community types most likely to be present in the area are floristic community types 7, 8 or 9; see Appendix 2: CALM Threatened Species and Communities Unit communications with Western Power and City of Canning).

The ecological communities of Muchea limestones (listed under the Commonwealth EPBC Act), ironstones and floristic community types 7, 8 or 9 are threatened ecological communities (TEC). A spring survey is required to better determine the variety of floristic community types present in the area.

Early winter is not the time to determine the flora of such an area but existing data and recent observations have established that the wetlands contain a diverse flora, including a series of significant flora species (see Appendix 1), including:
- the as Declared Rare Flora (DRF) emergent aquatic species *Eleocharis keigheryi* (at present this plant is aestivating and material will need to be collected in spring, to confirm the identification however the appearance and habitat of the *Eleocharis* is typical of *E. keigheryi*);
- *Eremophila glabra* subsp. *chlorella* , a highly restricted species known from a few disjunct populations on the Swan Coastal Plain, which should be considered for listing as DRF;
- the priority species, *Baeckea tenuifolia*; and
- at least nine aquatic species (an unusual diversity of such species).

Uplands
The small portion of upland in Area 2 is a remnant of Marri dominated vegetation from floristic community type 3, all subsets of this group are TEC's.

Bush Forever
The Guildford Vegetation Complex has approximately 6% of its original area remaining vegetated in the Perth Metropolitan Region and only 3% is proposed to be protected in Bush Forever Sites in *Bush Forever* (Table 4 Volume 1 *Bush Forever*). While not a Bush Forever Site

the naturally vegetated area of Carousel Swamp is expected to be protected in any development under the following policy measure in Bush Forever (Volume 1, page xiv):
"There will be a general presumption against clearing of bushland containing threatened ecological communities or representation of vegetation complexes of which less than 10per cent currently remains on the Swan Coastal Plain portion of the Perth metropolitan Region."

Appendix 1: Preliminary Flora and Vegetation Description

Information from a series of sources was used to compile the list of vegetation units and flora. Melissa Hoskings and Val English may have collected further information not included in this synopsis.

- Collections by CALM - B.J. Lepschi, R.J. Cranfield & L.W. Sage (3 October 1996, collated from Florabase WA Herbarium)
- Melissa Hoskings and Val English WA Threatened Species and Communities Unit (04 2004, transects of the area)
- Bronwen Keighery and Bridget Hyder-Griffiths DoE (04/05.2004, edge inspection, transects)

Vegetation Units

- Open swamp heathland. dominated by *Melaleuca lateritia* and *M. rhaphiophylla*
- *Viminaria juncea* shrubland
- *Melaleuca rhaphiophylla*/*M. viminea* shrubland
- *Viminaria juncea*/*Melaleuca rhaphiophylla*/*M. viminea* shrubland
- *Casuarina obesa* Woodland
- Aquatic Herbland/Grassland: a series of aquatic species (shaded) are listed for the area, indicating presence of aquatic communities.

Flora

Over eighty native plants are listed for the Carousel Wetland. Of these over 20 are indicative of clay based wetlands on the eastern side of the Swan Coastal Plain and nine are aquatics and emergent aquatics indicating that water is present in the wetlands for several months in winter/spring.

Key
Underlined = typical of the clay wetlands on the eastern side of the Swan Coastal Plain
Shaded = aquatics and emergent aquatics (plants that grow and flower in water).

Anthericaceae
Sowerbaea laxiflora
Thysanotus tenellus Endl.

Apiaceae
Schoenolaena juncea

Asteraceae
Cotula coronopifolia L.
* *Hypochaeris glabra* L.

Dasypogonaceae
Acanthocarpus canaliculatus A.S.George

Brassicaceae
* *Heliophila pusilla* L.f.

Boryaceae
Borya sphaerocephala R.Br.

Callitrichaceae
**Callitriche stagnalis* Scop.

Casuarinaceae
Casuarina obesa (largest known and significant area of this species in an intact community in the PMR and south of the Swan)

Centrolepidaceae
Centrolepis aristata (R.Br.)Roem.& Schult.

Colchicaceae
Burchardia congesta
Burchardia multiflora

Crassulaceae
**Crassula natans* Thunb. var. *minus* (Eckl.& Zeyh.)G.D.Rowley

Cyperaceae
Bolboschoenus caldwellii (V.J.Cook
Chorizandra enodis Nees
Cyathochaeta avenacea
Eleocharis keigheryi
* *Cyperus tenellus* L.f.
Gahnia trifida
Isolepis cernua var. *setiformis* (Benth.)Muasya
Isolepis cyperoides R.Br.
Lepidosperma longitudinale Labill.
Lepidosperma squamatum
Mesomelaena tetragona (R.Br.)Benth.
Schoenus plumosus Rye
Schoenus ?tenellus
Trithuria sp

Dasypogonaceae
Dasypogon bromeliifolius

Droseraceae
Drosera glanduligera Lehm.
Drosera heterophylla Lindl.
Drosera menziesii DC. subsp. *menziesii*
Drosera ramellosa Lehm.

Euphorbiaceae
* *Euphorbia terracina* L.

Gentianaceae
* *Cicendia filiformis* (L.)Delarbre

Goodeniaceae
Dampiera linearis R.Br.
Scaevola lanceolata Benth.

Haemodoraceae
Tribonanthes sp
Haloragaceae
Myriophyllum crispatum Orchard

Hydrocharitaceae
Ottelia ovalifolia (R.Br.)Rich.

Hypoxidaceae
Hypoxis occidentalis Benth.

Iridaceae
* *Hesperantha falcata* (L.f.)Ker Gawl.
Patersonia occidentalis R.Br.
Patersonia aff. *occidentalis*

* *Sparaxis bulbifera* (L.)Ker Gawl.

Juncaceae
#Juncus bufonius
Juncus capitatus Weigel
Juncus holoschoenus

Juncaginaceae
Triglochin linearis Endl.
Triglochin mucronata R.Br.
Triglochin muelleri Buchenau

Lauraceae
Cassytha racemosa Nees

Lentibulariaceae
Utricularia multifida R.Br.

Lobeliaceae
* *Monopsis debilis* (L.f.)C.Presl

Loranthaceae
Amyema linophylla (Fenzl)Tiegh. subsp. *linophylla*
(parasite of Sheoak)

Malvaceae
Lawrencia squamata Miq.

Menyanthaceae
Villarsia albiflora F.Muell.

Myoporaceae
Eremophila glabra (R.Br.)Ostenf. subsp. *chlorella* (Gand.)Chinnock ms

Myrtaceae
Baeckea tenuifolia
Hypocalymma angustifolium (Endl.)Schauer
Melaleuca lateritia A.Dietr.
Melaleuca rhaphiophylla
Melaleuca viminea
Pericalymma ellipticum (Endl.)Schauer var. *floridum* (Schauer)Cranfield
Verticordia densiflora
Verticordia huegelii Endl. var. *huegelii*

Orchidaceae
Diuris laxiflora Lindl.
Microtis media R.Br. subsp. *media*
Thelymitra aff. *pauciflora*

Papilionaceae
#Dillwynia sp.
Eutaxia virgata Benth.
* *Vicia sativa* L.
Viminaria juncea

Philydraceae

Philydrella drummondii L.G.Adams
Philydrella pygmaea (R.Br.)Caruel subsp. *pygmaea*

Poaceae
Agrostis sp
Amphibromus nervosus (Hook.f.)Baill.
Austrodanthonia sp
* *Avena barbata* Link
* *Hyparrhenia hirta* (L.)Stapf
Neurachne alopecuroidea R.Br.
* *Lolium temulentum* L. forma *temulentum*

Polygonaceae
**Rumex crispus* L.

Proteaceae
#*Hakea prostrata*
#*Hakea sulcata*
Grevillea bipinnatifida

Restionaceae
Baumea juncea
Chaetanthus aristatus
Meeboldina coangustata (Nees)B.G.Briggs & L.A.S.Johnson
Meeboldina scariosa (R.Br.)B.G.Briggs & L.A.S.Johnson

Potamogetonaceae
Ruppia maritima L.

Scrophulariaceae
* *Parentucellia viscosa* (L.)Caruel

Thymelaeaceae
Pimelea imbricata R.Br. var. *major* (Meisn.)Rye

Xanthorrhoeaceae
#*Xanthorrhoea ?preissii*

Zannichelliaceae
Lepilaena australis Harv.

Appendix 2

Lisa Edwards
Environmental Officer
Business Services Group
Shared Services Provider
Western Power, 363-365 Wellington Street, Perth, WA, 6000, Australia

phone: (08) 9326 6904 | **fax:** (08) 9326 6280 | **email:** lisa.edwards@westernpower.com.au

"Hoskins, Melissa"
<melissah@calm.wa.gov.au>

16/04/2004 10:56

To: "Lisa Edwards (E-mail)" <lisa.edwards@westernpower.com.au>
cc:
Subject: Cannington site

Hi Lisa

RE: Vegetation located behind the Western Power substation site in Cannington

In a recent inspection of the above site, an officer from the Department of Conservation and Land Management's Western Australia Threatened Species and Communities Unit (WATSCU) identified the vegetation as likely to be a threatened ecological community (TEC). The community is most likely one of the following four clay pan community types: type 7 - 'Herb rich saline shrublands in clay pans'; type 8 - 'Herb rich shrublands in clay pans'; type 9 - 'Dense shrublands on clay flats'; or type 10a - 'Shrublands on dry clay flats'. However, detailed plot-based survey in spring, when the full suite of species is present, and floristic analysis would be required to confirm the presence of one of the above community types.

Floristic community types 7, 8 and 9 are listed in Western Australia as 'Vulnerable', and community type 10a is listed as 'Endangered'. These listings are endorsed by the WA Minister for the Environment. The significance of these community types is recognised by planning and regulatory departments in WA.

The Western Australian Threatened Species and Communities Unit (WATSCU) places a high priority on the conservation of threatened communities and is highly supportive of their protection. WATSCU is very willing to provide advice on the management of the likely threatened community at the site.

Regards

Melissa

Melissa Hoskins
WA Threatened Species and Communities Unit
Dept. of Conservation and Land Management
Phone 9405-5170, Fax 9306-1066
email melissah@calm.wa.gov.au

E –mail letter: City of Canning

From: Hoskins, Melissa [mailto:melissah@calm.wa.gov.au]
Sent: Friday, 16 April 2004 10:50 AM
To: Toni Burbidge
Subject: Cannington site

Hi Toni

RE: Vegetation located behind the Western Power substation site in Cannington

In a recent inspection of the above site, an officer from the Department of Conservation and Land Management's Western Australia Threatened Species and Communities Unit (WATSCU) identified the vegetation as likely to be a threatened ecological community (TEC). The community is most likely one of the following four clay pan community types: type 7 - 'Herb rich saline shrublands in clay pans'; type 8 - 'Herb rich shrublands in clay pans'; type 9 - 'Dense shrublands on clay flats'; or type 10a - 'Shrublands on dry clay flats'. However, detailed plot-based survey in spring, when the full suite of species is present, and floristic analysis would be required to confirm the presence of one of the above community types.

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Regards

Melissa

Melissa Hoskins
WA Threatened Species and Communities Unit
Dept. of Conservation and Land Management
Phone 9405-5170, Fax 9306-1066
email melissah@calm.wa.gov.au

DRAFT MEMORANDUM
Terrestrial Ecosystem Branch
DEPARTMENT OF ENVIRONMENT

ATTENTION:	Rachel Mercy
FROM:	Bronwen Keighery
DATE:	31st January 2005
SUBJECT:	Carousel Swamp and maintenance of Western Power Poles

On 25th January 2005 I spent approx two hours walking the Carousel Swamp area with Western Power Environmental Officers (Cliff Morris and Lisa) and an Engineer (Sean) and CALM WATSCU Officer (Melissa Hoskings).

The Western Power officers outlined maintenance procedures and discussed proposed maintenance (eg pole replacement and supporting structures) and additional (eg new pole/s for an additional line) works on power lines in the area. Maps were viewed on site showing aspects of the works and existing poles but these were not supplied (no apparent detail of proposed works). The works discussed varied from short term maintenance to long term use of the substation and associated lines, both existing and proposed.

It was evident form the observations on site that some of the proposed works could be confined to the existing tracks with little native vegetation there were areas where the proposed construction works and/or the poles and associated infrastructure (cables and in several cases new poles) would impact on relatively undisturbed areas of TEC.

It was agreed that the site meeting was for information and discussion only, giving some direction in what could trigger formal assessment and/or referral to the Commonwealth. Some general and more specific issues were raised and discussed. These include those outlined below.

- The need for clear descriptions and maps of proposed works (including associated impacts) to be submitted to DoE to consider proposals.
- Western Power's recognition of the TEC in the area and the need to manage the area to protect the TEC through documentation of the area's values and management needs (currently being addressed through a contract with Greg Woodman).
- The difficulty of dealing with numerous individual proposals for management of the infrastructure in the area, without management plans for both natural values and infrastructure.
- The need for a natural area management plan which, among other issues needs to address the closure of tracks (and rehabilitation) and hydrology of the area (especially in relation to perching of water in response to impeding layers, including clay, limestone and ironstone observed on site).
- The need for an infrastructure management plan (including possible expansion) which, among other issues, needs to address ongoing maintenance needs, the number of lines etc and recognise the values of the native vegetation.
- The need for natural area management plan and infrastructure management plan to be complimentary.
- Impacts of hole drilling on surface (vegetation) and sub-surface hydrology.

Adjacent
Boot #1

Casuarina obesa
over Boothia
Road

BJK

(285) BOOTØ3
Bootine Road
Bushland, Shire
of Gingin
24-11-95

(285) BOOTØ3
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) BOOTØ3
Bootine Road
Bushland, Shire of
Gingin
24-11-95

Bootine Road Bushland - from the western gate 24-11-95

Remnant vegetation in the western block adjacent to Bootine Road Bushland 24-11-95

Bootine Road fire-break opposite Bootine Road Bushland, showing limestone. 24-11-95

(285) BOOTØ2
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) BOOTØ2
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) BOOTØ3
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) Adjacent BOOT Ø1
Bootine Road Bushland,
Shire of Gingin
24-11-95

285) BOOT Ø2
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) BOOT Ø2
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) BOOTØ1
Bootine Road
Bushland, Shire
of Gingin
24-11-95

(285) BOOTØ1
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) BOOTØ1
Bootine Road
Bushland, Shire
of Gingin
24-11-95

(285) Adjacent BOOTØ1
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOTØ1
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOTØ1
Bootine Road
Bushland, Shire of
Gingin
24-11-95

(285) Adjacent BOOT01
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOT01
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOT01
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOTØ1
Bootine Road Bushland
Shire of Gingin
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(285) Adjacent BOOTØ1
Bootine Road Bushland,
Shire of Gingin
24-11-95

(285) Adjacent BOOTØ1
Bootine Road Bushland
Shire of Gingin
24-11-95

(295) BEER01
Lot 1711 Beermullah Road, Shire of Gingin
24-11-95

(285) BEER02
Lot 1711 Beermullah Road, Shire of Gingin
24-11-95

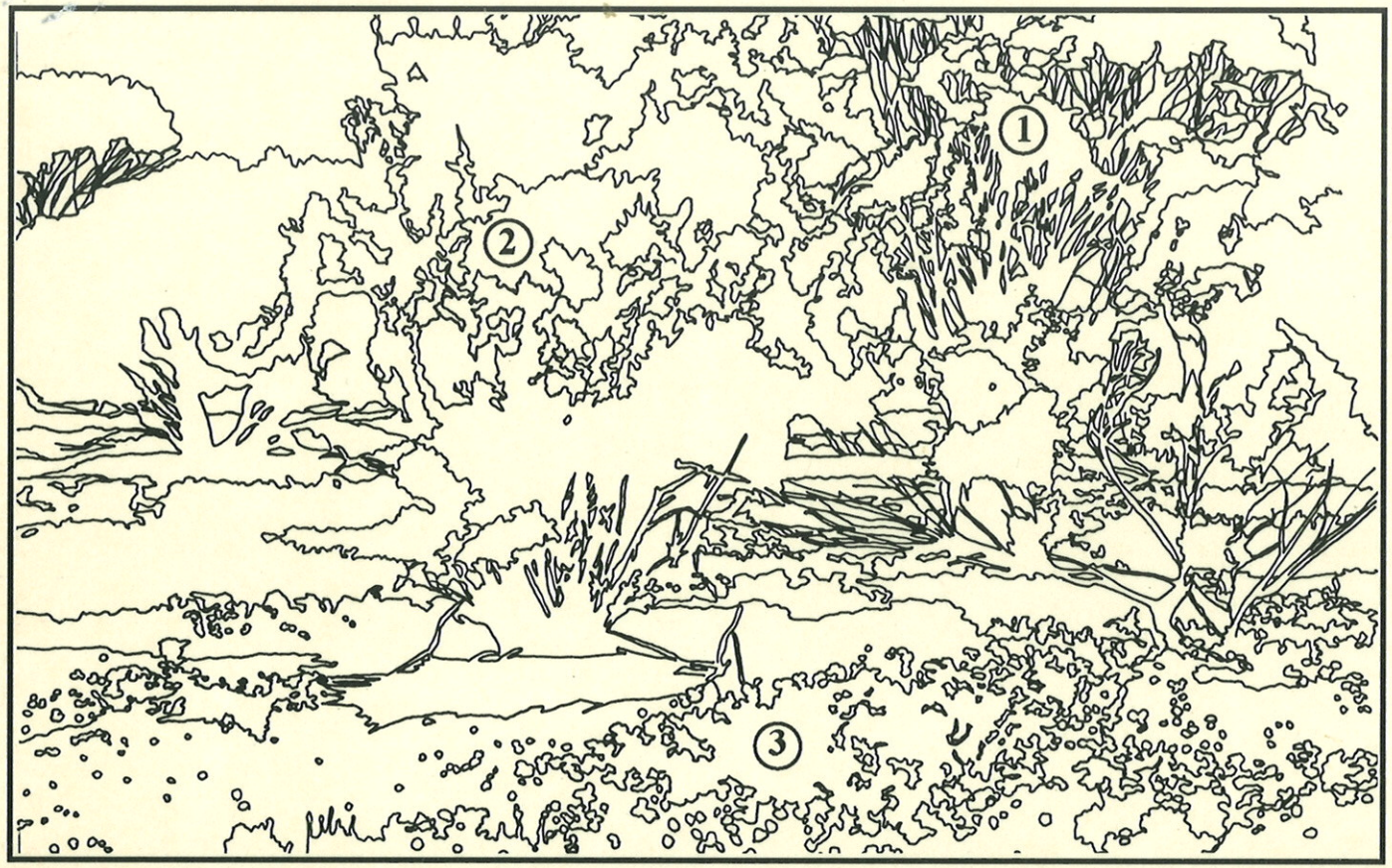
(285) BEER02
Lot 1711 Beermullah Rd, Shire of Gingin
24-11-95

Nuytsia floribunda in muchea limestone area
24-11-95

15. PINJARRA PLAIN SHRUBLAND

Pinjarra Plain Spring 1992 Photo: G J Keighery

15 PLANT COMMUNITIES OF WESTERN AUSTRALIA
PINJARRA PLAIN SHRUBLAND



Focus Points for Discussion

- Colours and shapes
- Vegetation layers
- Diversity and interaction of plants
- Links of vegetation to climate
- Links of vegetation to soil type
- Plant density
- Range of habitats
- Special features

Compare and contrast this plant community with other ones in Western Australia. Include your local natural environment too!

Plant communities can be rare and endangered just like individual plants and animals.

The Pinjarra plain near Perth was the site of early agricultural development. Today most of the original plant communities of those soils have been cleared.

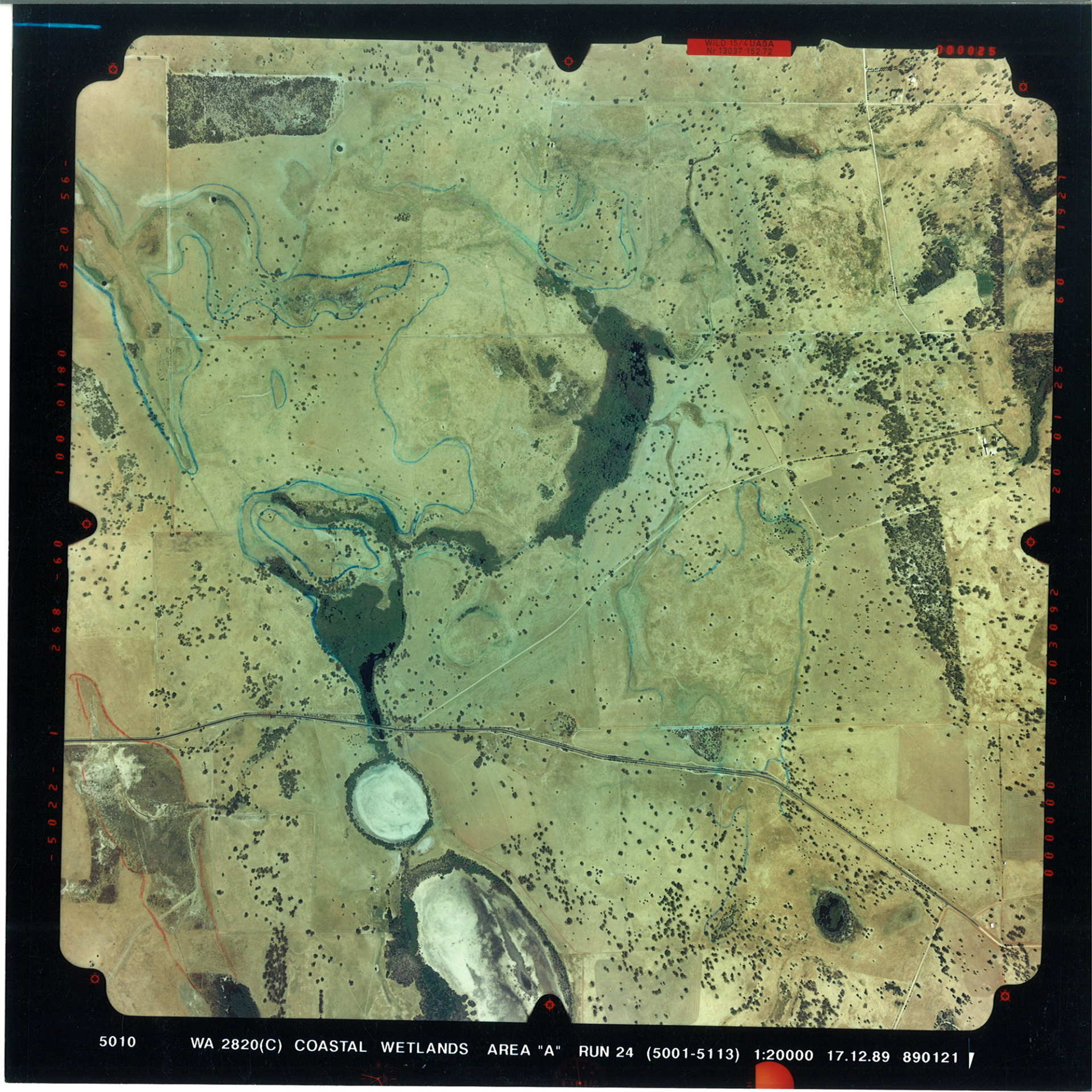
These soils are low-lying and very wet in winter. As the soils dry out in spring some of these open shrublands become carpeted with pink everlastings.

It is now rare to see these carpets of everlastings which used to grow extensively close to Perth.

LEGEND

1. **Mohan**
   Melaleuca viminea
   mel-a-loo-ka vim-in-ee-a
2. **Kunzea (white flowers)**
   Kunzea recurva
   kun-zee-a re-cur-va
3. **Pink Everlastings**
   Rhodanthe manglesii
   roe-dan-thee man-glee-see-eye

Greening Western Australia
BHP
Conservation and Land Management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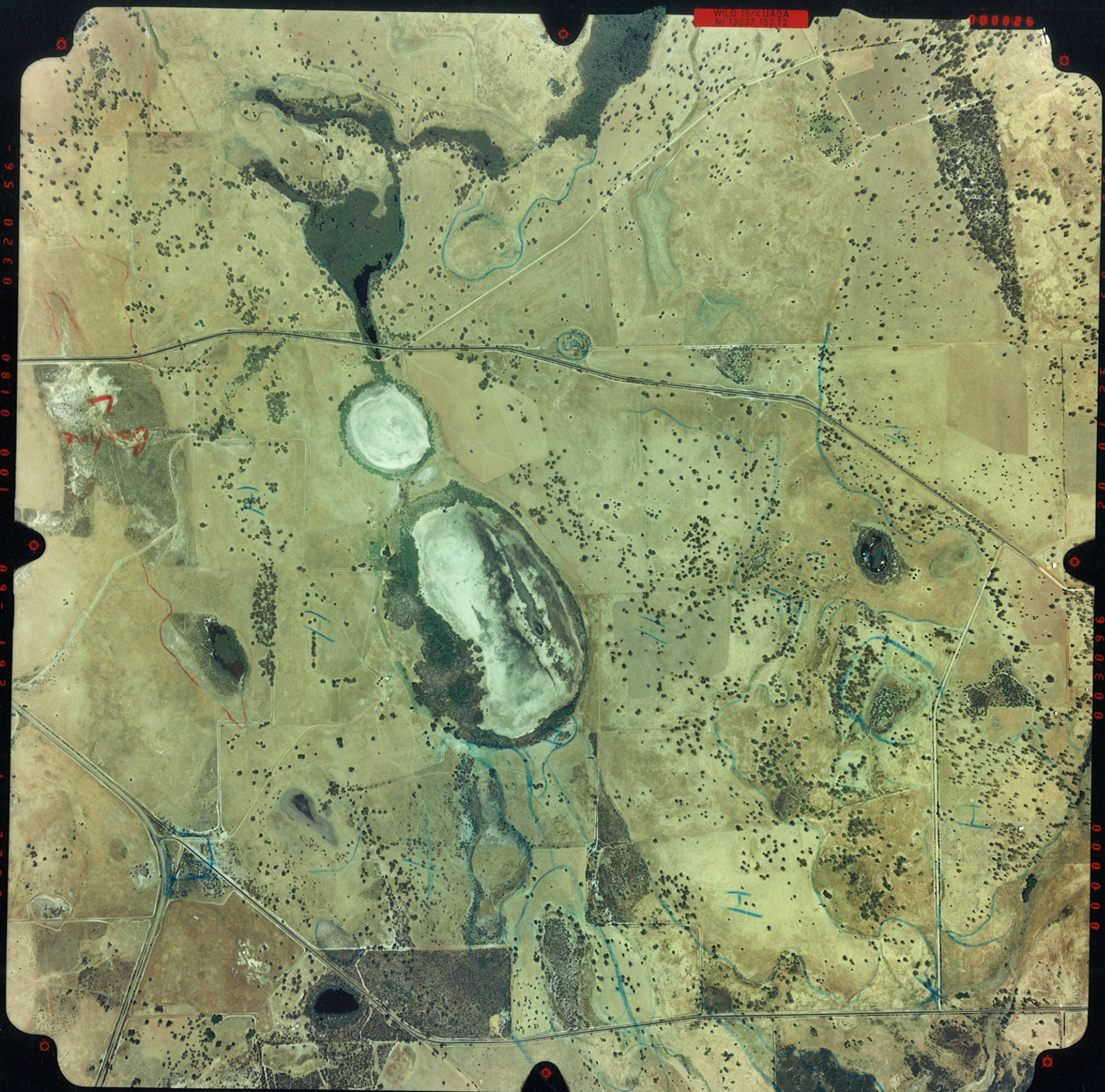

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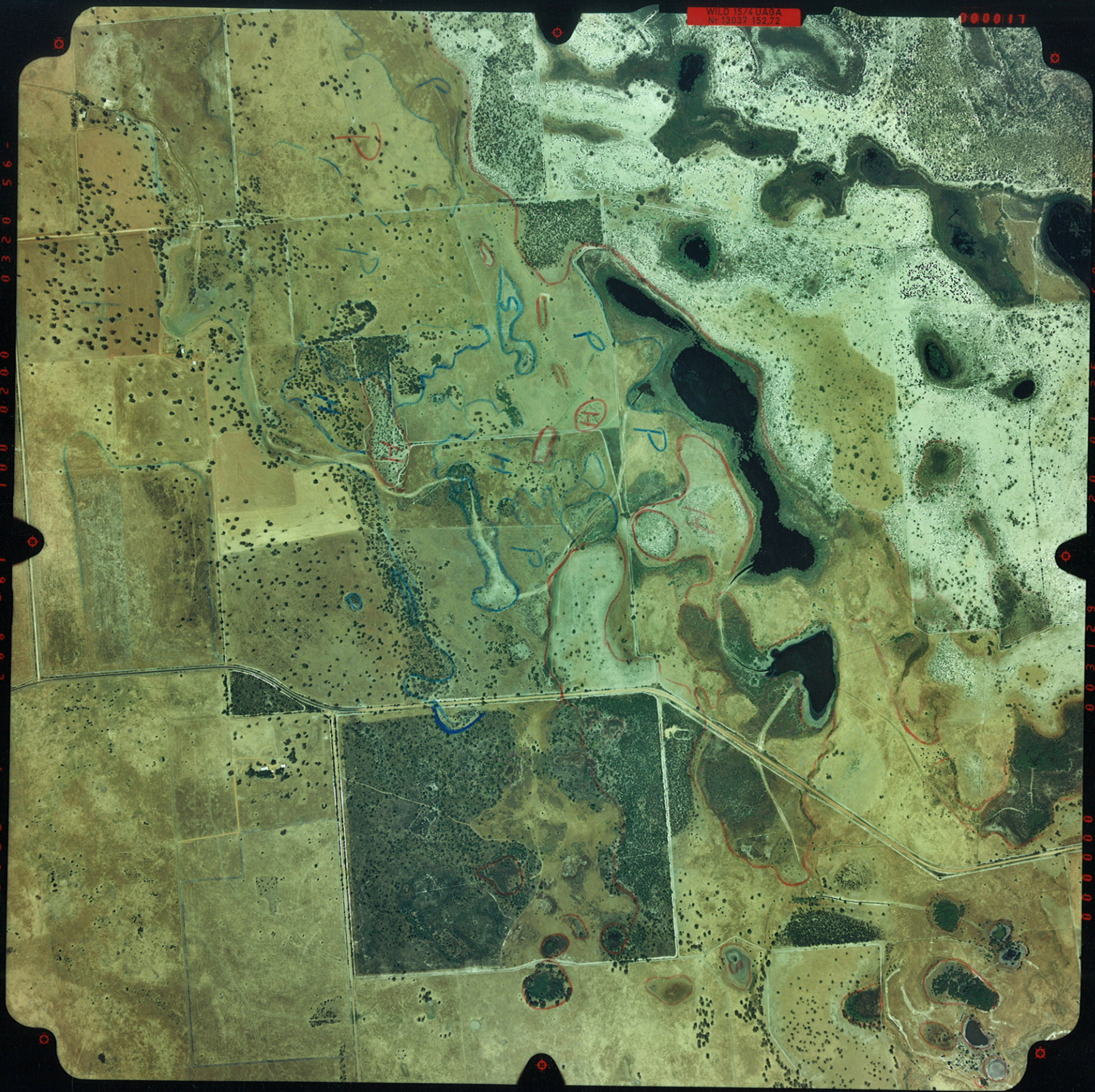

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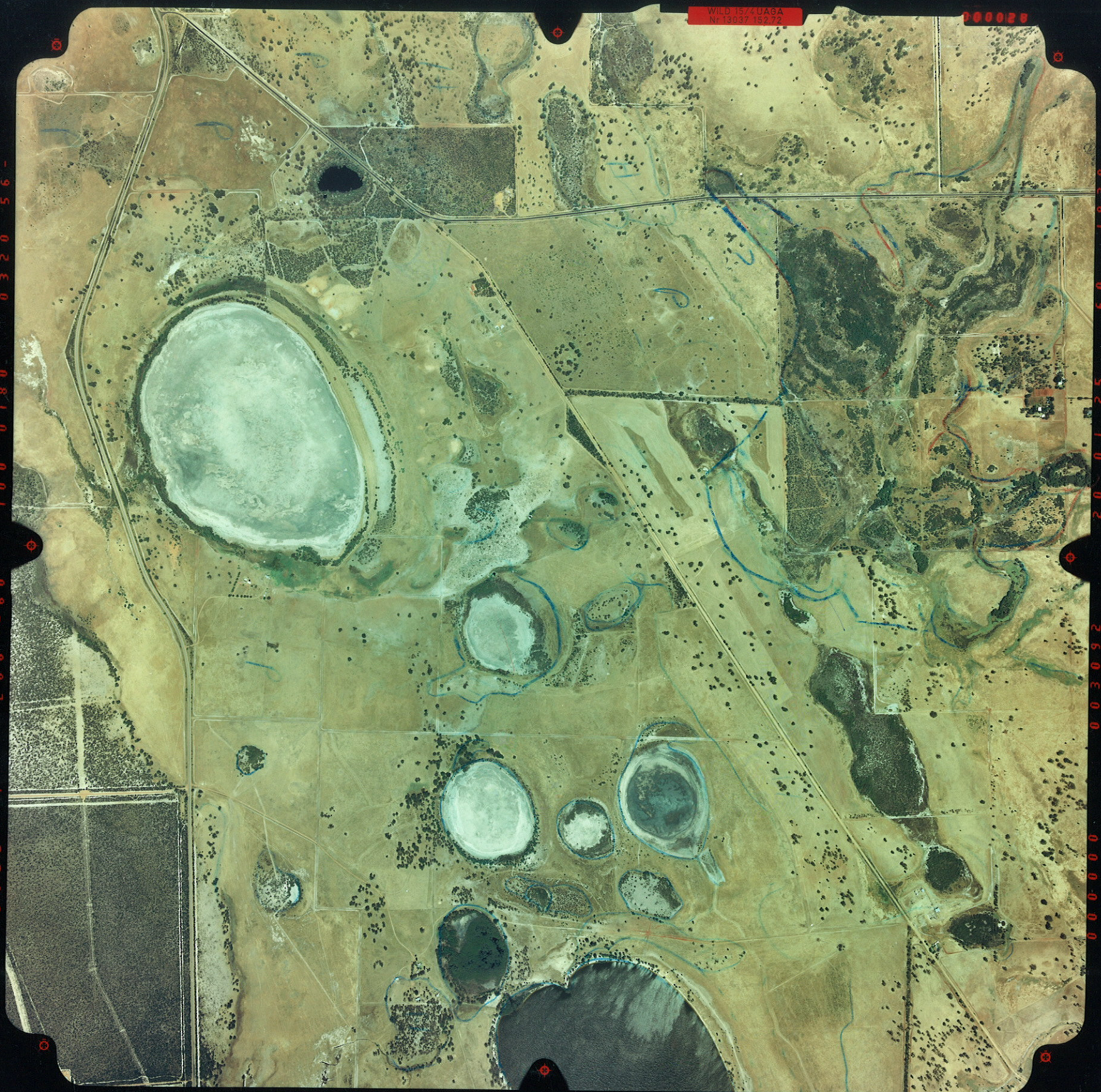
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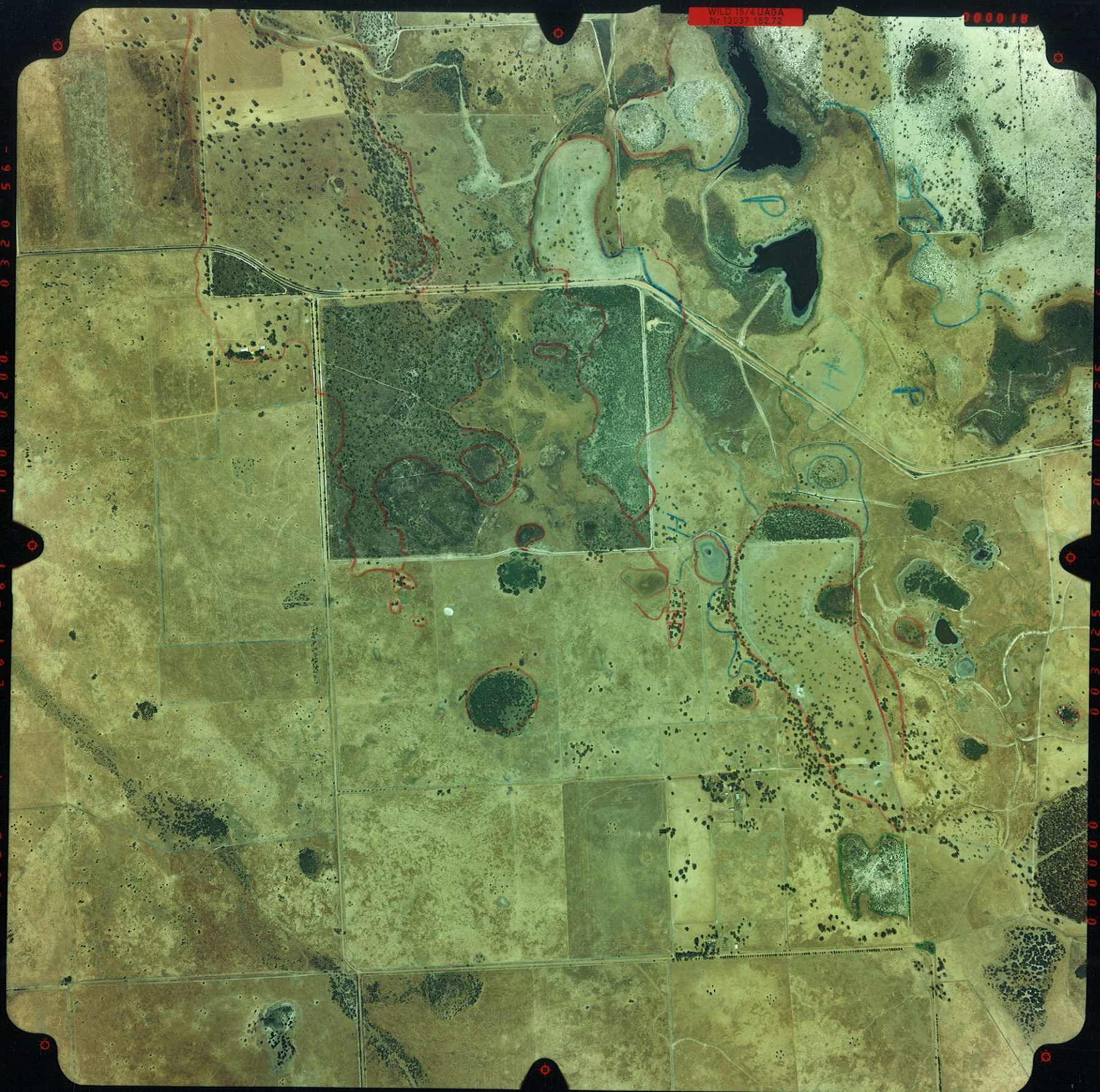

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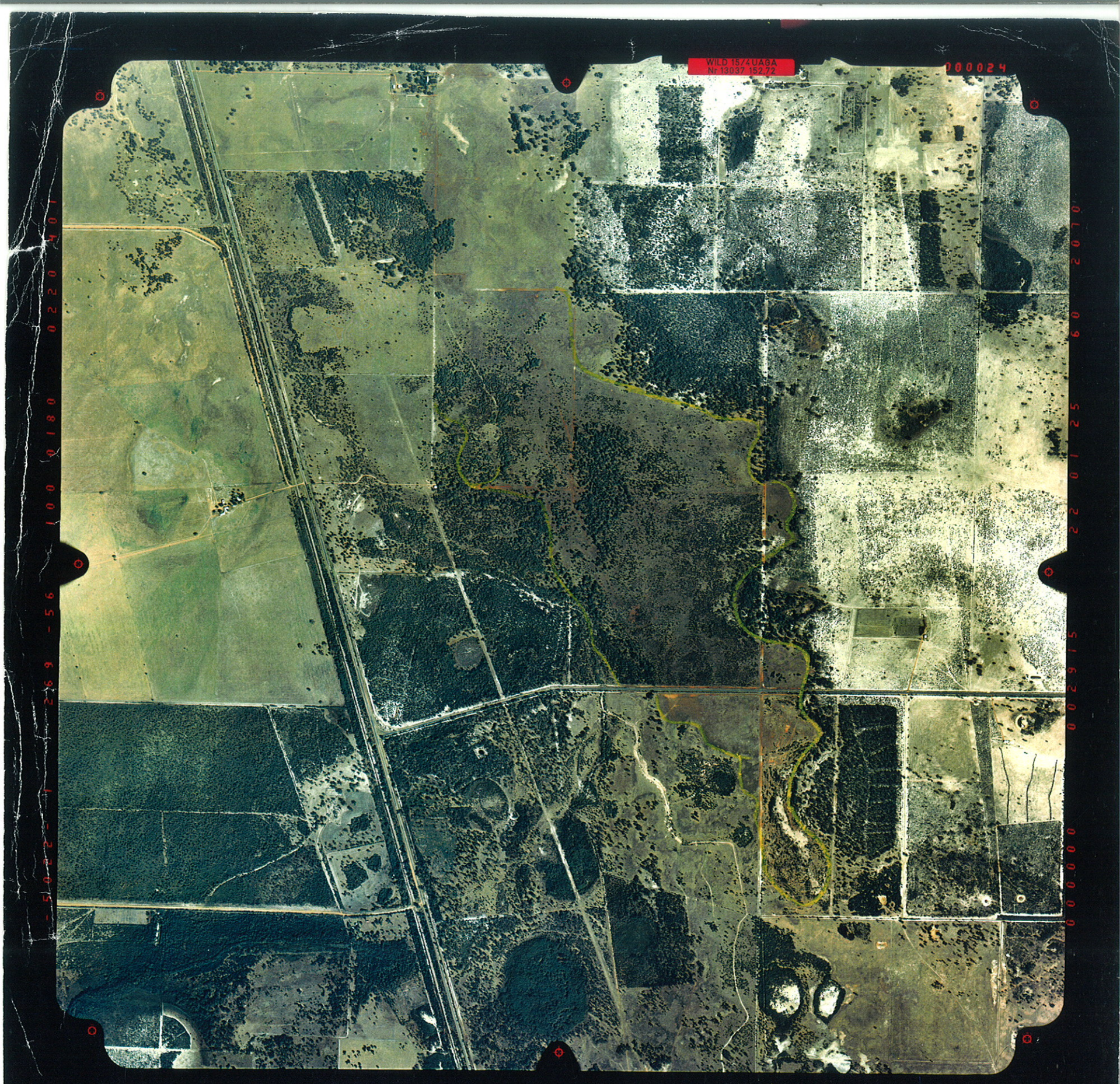

5018 WA 2708 (C) GINGIN GROUNDWATER RUN 25 (5001-5070) 1:20000 15.3.89 880140

WILD 1574UAGA
Nr 13037 152.72
Muchea Nature Reserve
5063 WA 2706 (C) GINGIN GROUNDWATER RUN 27 (5001-5072) 1:20000 12.3.89 880140

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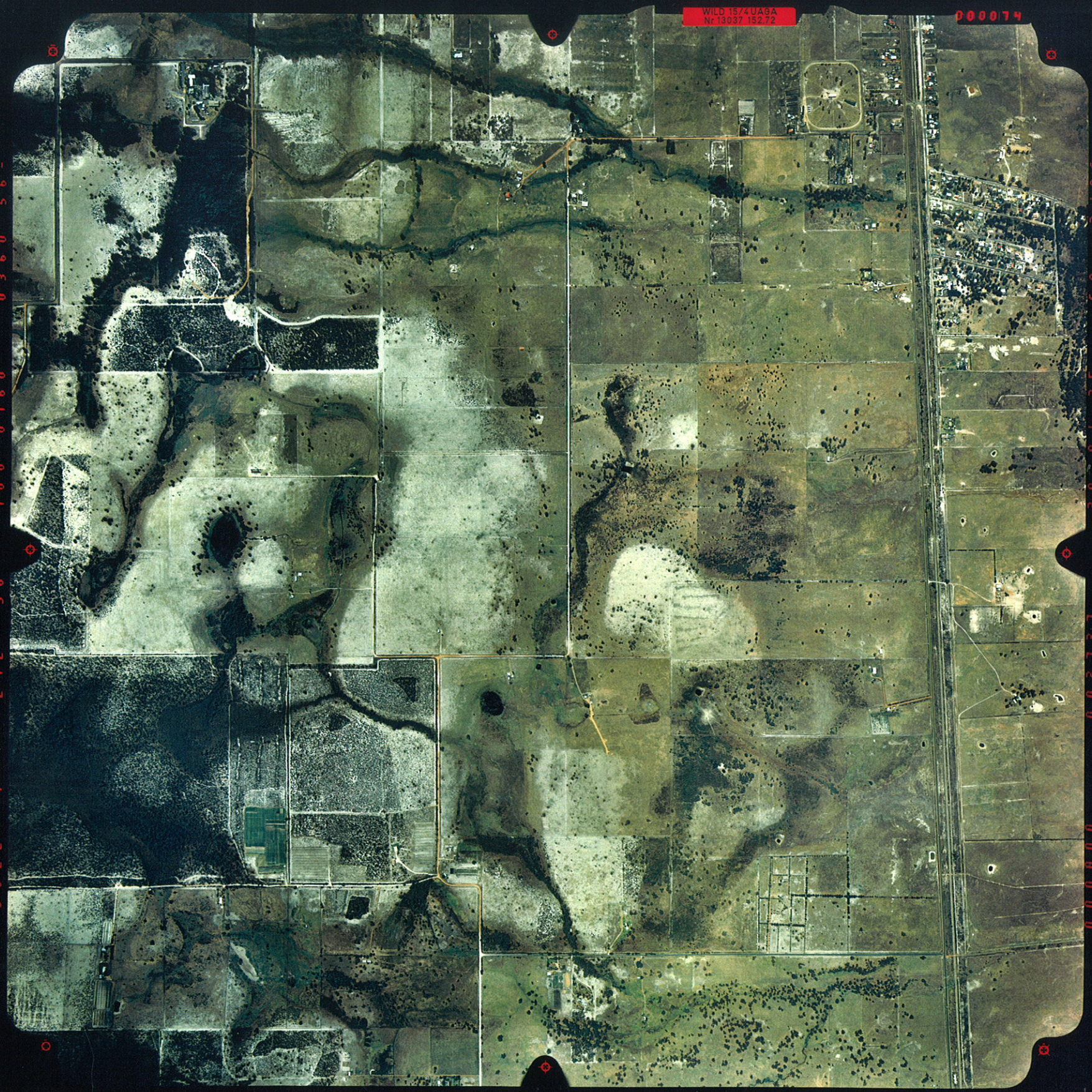
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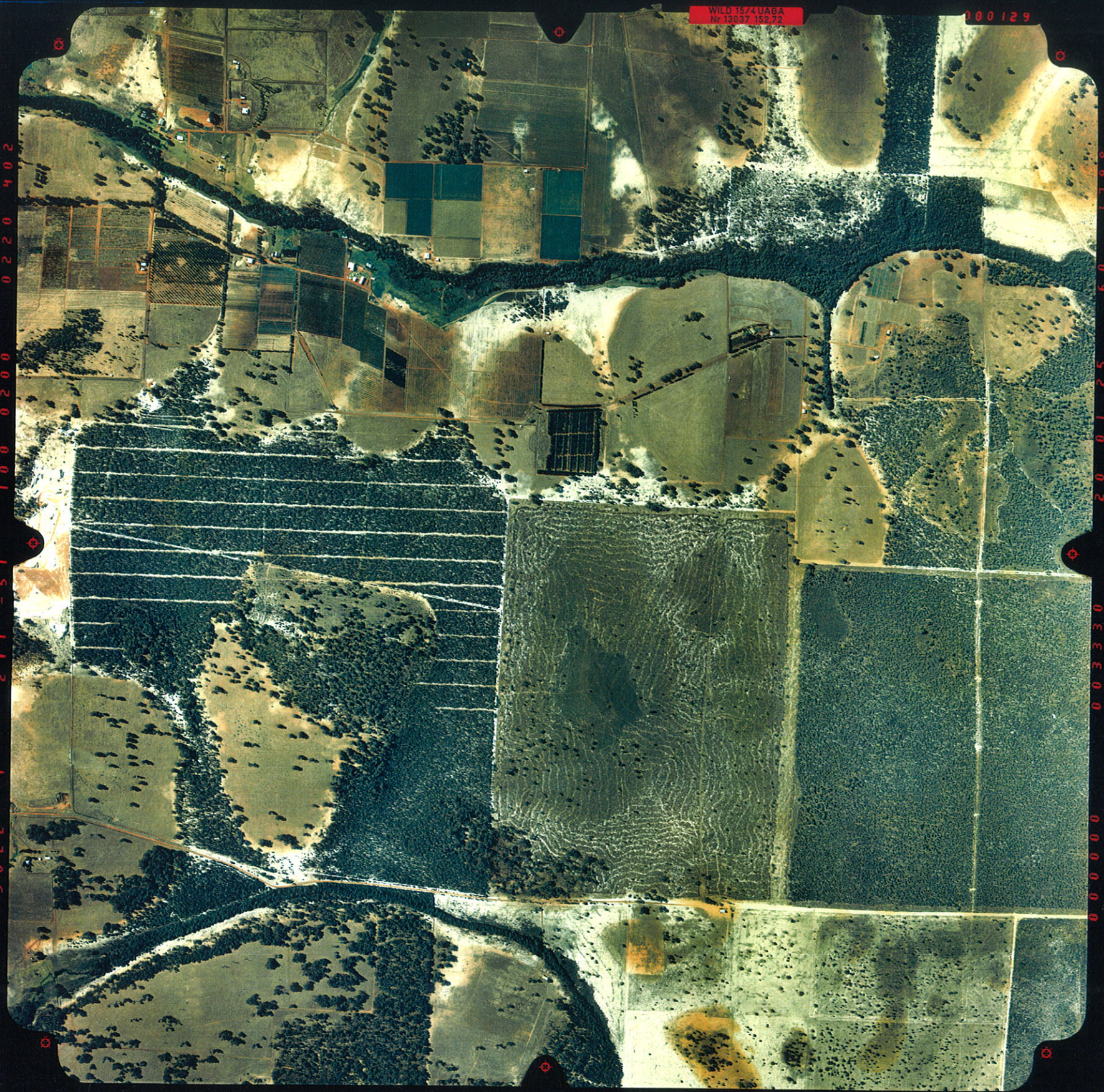

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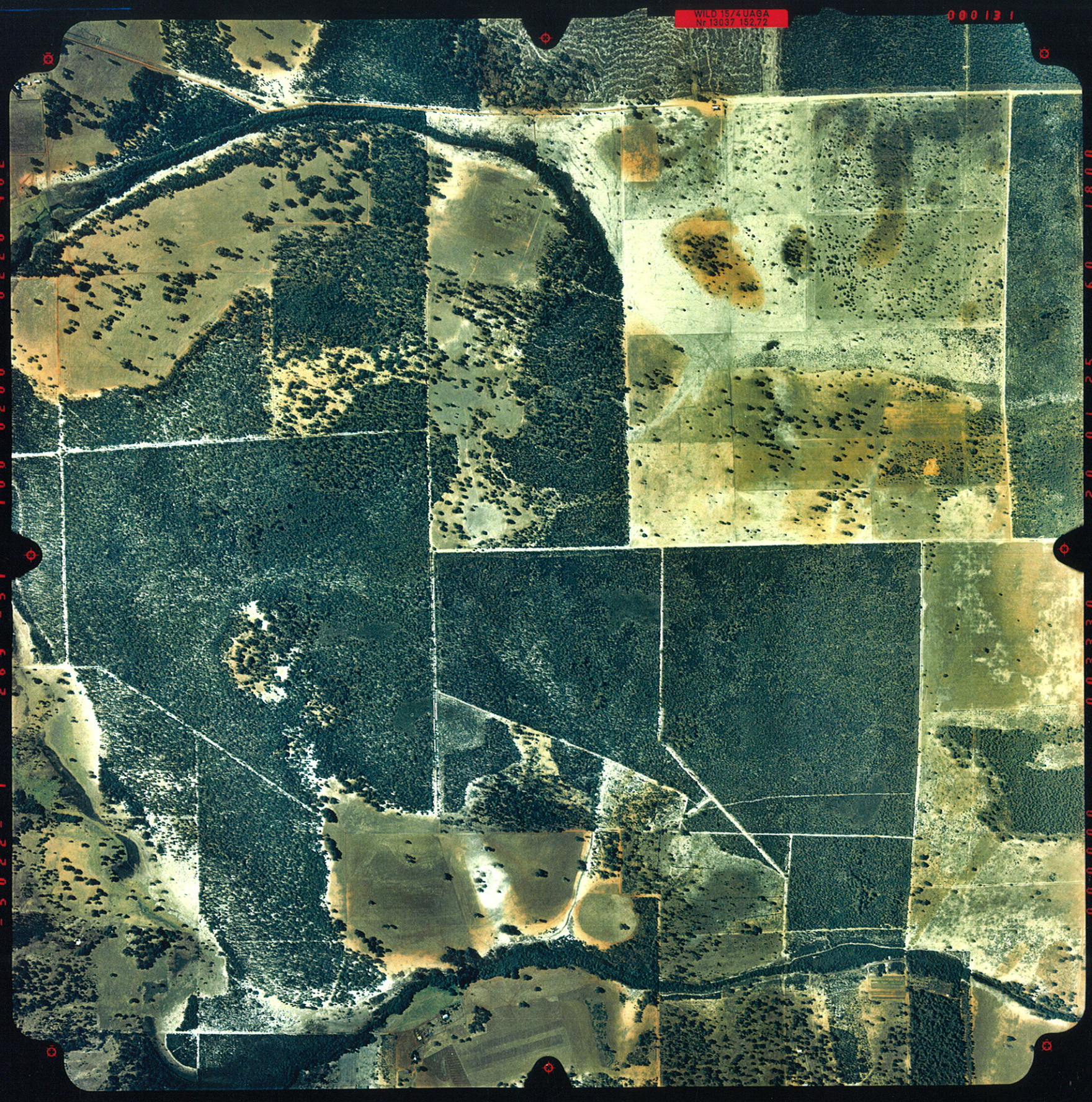

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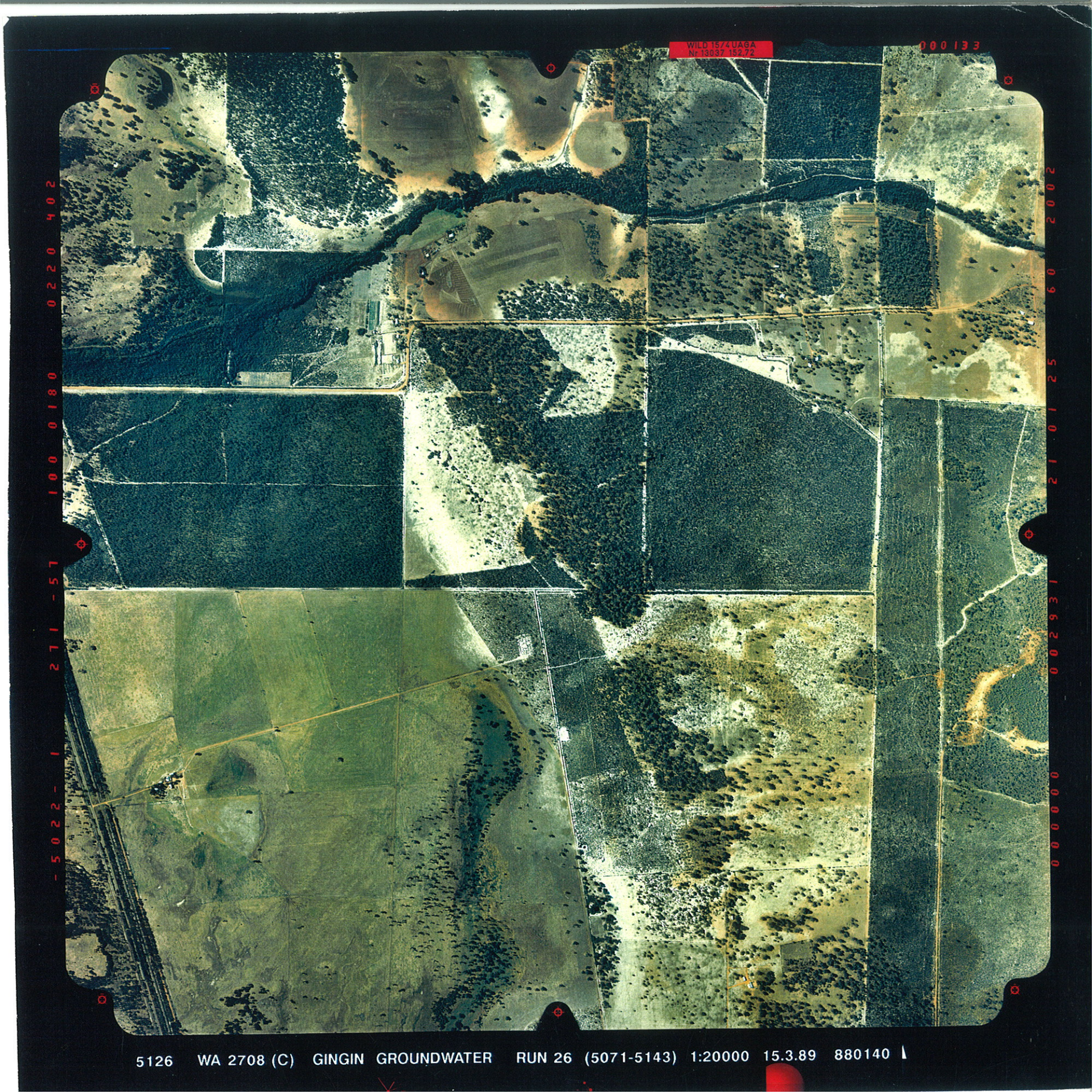
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5216 WA 3166(C) METRO REGIONAL AREA & EXT. RUN 15 (5215-5307) 1:20000 11-DEC-92 920676

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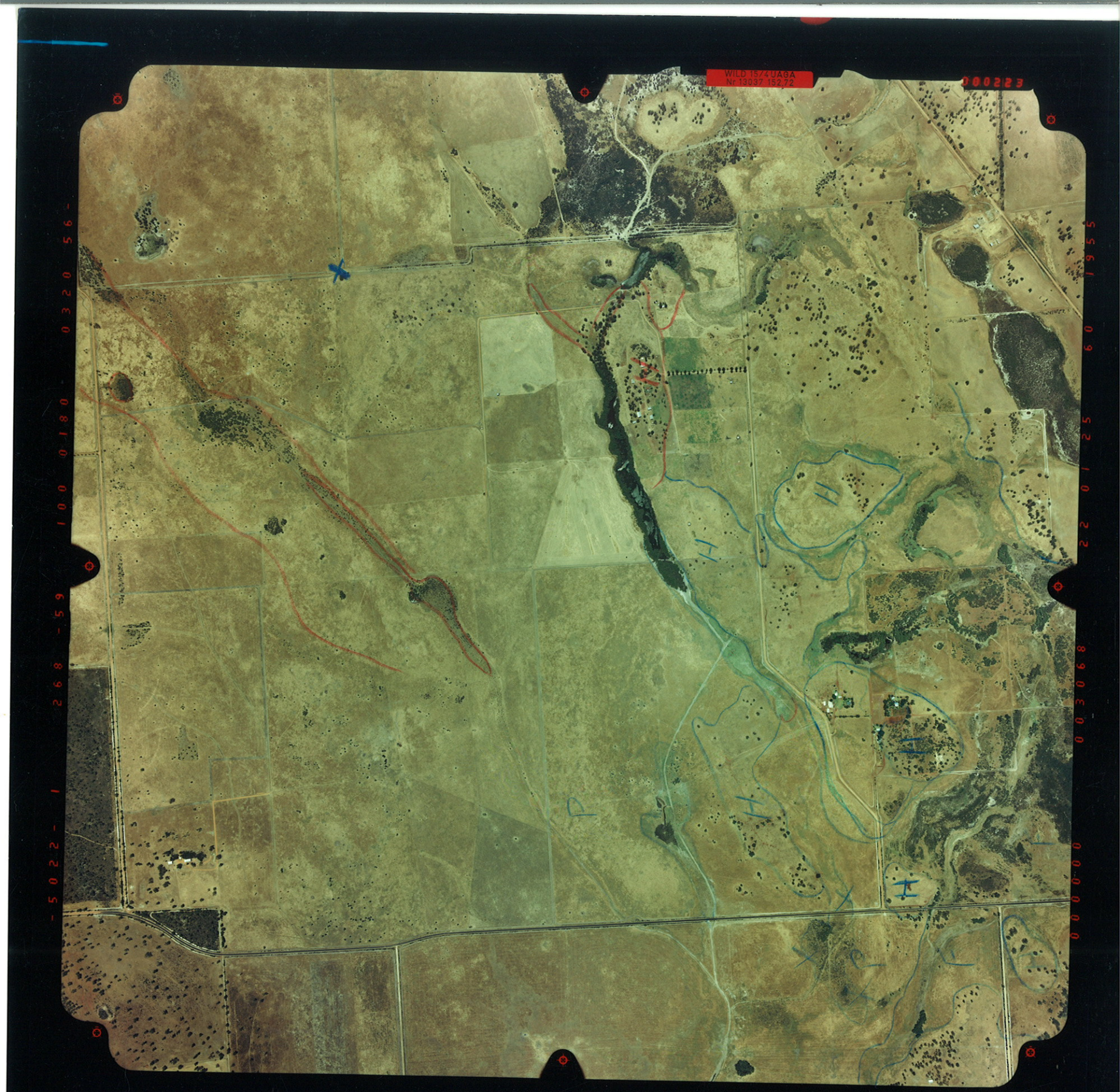
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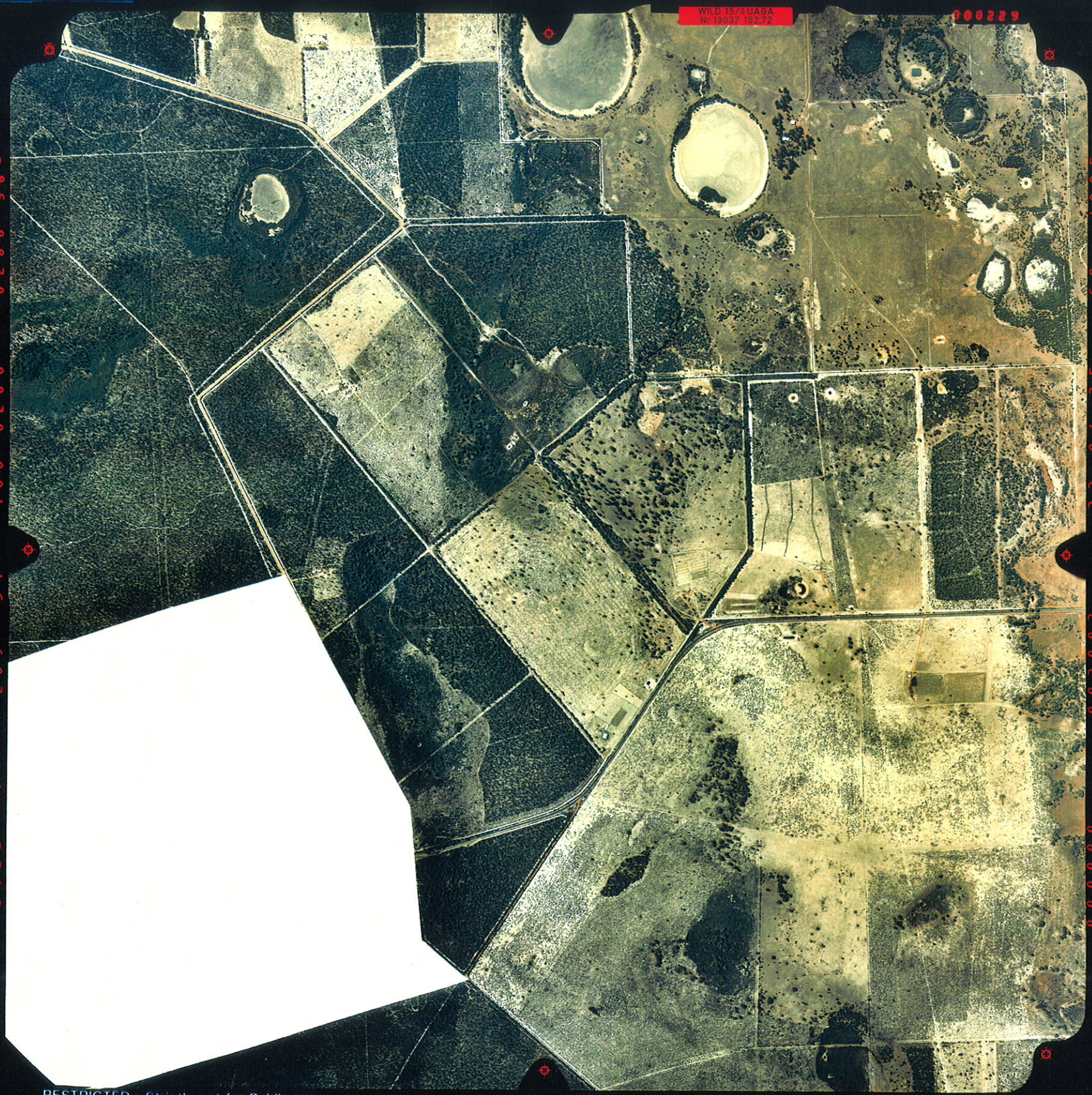

RESTRICTED - Strictly not for Public use

5221 WA 2709 (C) GINGIN GROUNDWATER RUN 24 (5166-5224) 1:20000 15.3.89 880140

VASCULAR PLANT SPECIES OF CANNINGTON SUBSTATION, 2004

FAMILY		SPECIES	STATUS
TYPHACEAE	*	*Typha orientalis*	
APONOGETONACEAE		*Aponogeton hexatepalus*	P4
JUNCAGINACEAE		*Triglochin linearis*	
		Triglochin mucronata	
POACEAE	*	*Arundo donax*	
		Austrodanthonia setacea	
	*	*Avena barbata*	
	*	*Brachypodium distachyon*	
	*	*Briza maxima*	
	*	*Briza minor*	
	*	*Cynodon dactylon*	
	*	*Ehrharta calycina*	
	*	*Ehrharta longiflora*	
	*	*Eragrostis curvula*	
	*	*Hyparrhenia hirta*	
		Lachnagrostis filiformis	
	*	*Lolium rigidum*	
	*	*Melinus repens*	
		Neurachne alopecuroidea	
	*	*Paspalum dilitatum*	
	*	*Paspalum distichum*	
	*	*Pennisetum clandestinum*	
	*	*Polypogon monspeliensis*	
	*	*Polypogon tenellus*	
	*	*Stenotaphrum secundatum*	
	*	*Tribolium uniole*	
	*	*Triticum aestivum*	
CYPERACEAE		*Baumea juncea*	
		Bolboschoenus caldwellii	
		Chorizandra enodis	
		Cyathochaeta avenacea	
	*	*Cyperus tenellus*	
		Eleocharis	
		Isolepis cernua	
		Lepidosperma costale	
		Lepidosperma longitudinale	
		Mesomelaena pseudostygia	
		Mesomelaena tetragona	
		Schoenus capillifolius	P2
		Schoenus plumosus	
		Schoenus subfascicularis	
		Schoenus variicellae	
ARECACEAE	*	*Washingtonia filifera*	
ARACAEAE	*	*Zantadeschia aethiopica*	
RESTIONACEAE		*Chaetanthus aristatus*	
		Lepyrodia glauca	
		Meeboldina cana	
		Meeboldina coangustata	
CENTROLEPIDACEAE		*Centrolepis aristata*	
PHILYDRACEAE		*Philydrella pygmaea* ssp. *pygmaea*	
JUNCACEAE	*	*Juncus bufonius*	
	*	*Juncus capitatus*	

VASCULAR PLANT SPECIES OF CANNINGTON SUBSTATION, 2004

FAMILY		SPECIES	STATUS
ASPARAGACEAE	*	*Asparagus asparagoides*	
	*	*Asparagus officinalis*	
DASYPOGONACEAE		*Lomandra caespitosa*	
		Acanthocarpus preissii	
XANTHORRHOEACEAE		*Xanthorrhoea preissii*	
ANTHERICACEAE		*Agrostrocrinum scabrum*	
		?*Dichopogon capillipes*	
		Thysanotus manglesianus	
		Thysanotus tenellus	
		Thysanotus sp.	
		Thysanotus sp. (climber)	
ALLIACEAE	*	*Agapanthus praecox*	
COLCHICACEAE		*Burchardia multiflora*	
		Wurmbaea dioica subsp. *alba*	
HYPOXIDACEAE		*Hypoxis occidentalis* var. *occidentalis*	
HAEMODORACEAE		*Haemodorum ?discolor*	
		Haemodorum paniculatum	
		Tribonanthes australis	
	*	*Narcissus* sp.	
IRIDACEAE	*	*Freesia* sp.	
	*	*Gladiolus* sp.	
	*	*Hesperantha falcata*	
	*	*Moraea flaccida*	
		Patersonia occidentalis	
	*	*Romula rosea*	
	*	*Sparaxis bulbifera*	
	*	*Watsonia meriana*	
	*	*Watsonia meriana* var. *bulbilifera*	
	*	*Watsonia meriana* var. *meriana*	
	*	*Watsonia versfeldii*	
ORCHIDACEAE		*Diuris laxiflora*	
		Prasophyllum ?*regium*	
CASUARINACEAE		*Casuarina obesa*	
SALICACEAE	*	*Populus nigra* var. *italica*	
PROTEACEAE		*Adenanthos cygnorum*	
		Dryandra lindleyana	
		Grevillea bipinnatifida	
		Hakea erinacea	
		Hakea prostrata	
		Hakea sulcata	
		Hakea varia	
LORANTHACEAE		*Amyema linophylla* subsp. *linophylla*	
POLYGONACEAE	*	*Rumex crispus*	
	*	*Rumex* sp.	
LAURACEAE		*Cassytha racemosa*	
FUMARIACEAE	*	*Fumaria capreolata*	
	*	*Fumaria muralis*	
BRASSICACEAE	*	*Brassica tournefortii*	
	*	*Raphanus raphanistrum*	
DROSERACEAE		*Drosera bulbosa* ?subsp. *bulbosa*	
		Drosera glanduligera	
		Drosera heterophylla	

VASCULAR PLANT SPECIES OF CANNINGTON SUBSTATION, 2004

FAMILY		SPECIES	STATUS
		Drosera menziesii	
MIMOSACEAE	*	*Acacia longifolia*	
		Acacia saligna	
PAPILIONACEAE		*Eutaxia virgata*	
		Jacksonia sternbergiana	
	*	*Lotus subbiflorus*	
	*	*Lupinus* spp.	
	*	*Trifolium campestre*	
	*	*Trifolium dubium*	
	*	*Trifolium* sp.	
	*	*Vicia hirsuta*	
	*	*Vicia sativa*	
		Viminaria juncea	
GERANIACEAE	*	*Erodium moschatum* or *E. botrys*	
	*	*Pelargonium capitatum*	
OXALIDACEAE	*	*Oxalis glabra*	
	*	*Oxalis pes-caprae*	
	*	*Oxalis purpurea*	
POLYGALACEAE		*Comesperma virgatum*	
EUPHORBIACEAE	*	*Euphorbia terracina*	
	*	*Ricinus communis*	
MALVACEAE		*Lawrencia squamata*	
THYMELEACEAE		*Pimelea imbricata* var. *major*	
		Pimelea imbricata var. *piligera*	
		?*Pimelea* sp.	
LYTHRACEAE	*	*Lythrum hyssopifolia*	
MYRTACEAE		*Astartea affinis* ms	
		Eucalyptus camaldulensis	
		Hypocalymma angustifolium	
	*	*Melaleuca armillaris*	
		Melaleuca lateritia	
		Melaleuca ?*lateritia*	
	*	*Melaleuca nesophila*	
		Melaleuca preissiana	
		Melaleuca rhaphiophylla	
		Melaleuca ?*rhaphiophylla*	
		Pericalymma ellipticum var. floridum	
		Verticordia densiflora	
		Verticordia densiflora var. *densiflora*	
		Verticordia huegelii var. *huegelii*	
		Verticordia plumosa ?var. *brachyphylla*	
		Myriophyllum crispatum	
APIACEAE	*	*Foeniculum vulgare*	
		Schoenolaena juncea	
PRIMULACEAE	*	*Anagallis arvensis*	
GENTANIACEAE	*	*Cicendia filiformis*	
MENYANTHACEAE		*Villarsia albiflora*	
		Villarsia submersa	
CONVOLVULACEAE	*	*Ipomoea indica*	
BORAGINACEAE	*	*Echium plantagineum*	
LAMIACEAE	*	*Stachys arvensis*	
	*	?*Stachys arvensis*	

VASCULAR PLANT SPECIES OF CANNINGTON SUBSTATION, 2004

FAMILY		SPECIES	STATUS
SOLANACEAE	*	*Solanum nigrum*	
SCROPHULARIACEAE	*	*Parentucellia latifolia*	
	*	*Parentucellia viscosa*	
OROBANCHACEAE	*	*Orobanche minor*	
LENTIBULARIACEAE	*	*Utricularia multifida*	
MYOPORACEAE		*Eremophila* ?*glabra*	
PLANTAGINACEAE	*	*Plantago lanceolata*	
RUBIACEAE		*Opercularia vaginata*	
GOODENIACEAE		*Goodenia pulchella* subsp. Coastal Plain A (M. Hislop 634)	
		Scaevola lanceolata	
STYLIDIACEAE		*Stylidium divaricatum*	
		Stylidium ?*roseo-alatum*	
ASTERACEAE	*	*Cirsium vulgare*	
	*	*Conyza* ?*parva*	
	*	*Conyza* sp.	
		Cotula coronopifolia	
		Hyalosperma cotula	
	*	*Hypochaeris glabra*	
		Senecio pinnatifolius	
	*	*Senecio vulgaris*	
	*	*Sonchus oleraceus*	
	*	*Sonchus* sp.	
	*	*Taraxacum officinale*	

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
*	*Acacia longifolia*	*												
	Acacia saligna	*			*	*				*				
	Acanthocarpus preissii					*		*	*					
	Adenanthos cygnorum					*								
*	*Agapanthus praecox*						*							
	Agrostrocrinum scabrum										*			*
	Amyema linophylla subsp. *linophylla*									*				
*	*Anagallis arvensis*									*	*			
	Aponogeton hexatepalus										*			
*	*Arundo donax*	*					*						*	*
*	*Asparagus asparagoides*				*		*			*				
*	*Asparagus officinalis*										*			
	Astartea affinis ms										*	*	*	*
	Austrodanthonia setacea									*				
*	*Avena barbata*									*	*			
	Baumea juncea			*		*								
	Bolboschoenus caldwellii	*		*						*				
*	*Brachypodium distachyon*										*			
*	*Brassica tournefortii*							*						*
*	*Briza maxima*								*	*	*			
*	*Briza minor*								*	*	*			*
	Burchardia multiflora								*	*	*			*
	Cassytha racemosa			*		*					*		*	
	Casuarina obesa	*							*	*	*			
	Centrolepis aristata								*	*	*			
	Chaetanthus aristatus		*			*		*		*	*	*	*	
	Chorizandra enodis								*		*		*	
*	*Cicendia filiformis*								*	*	*			
*	*Cirsium vulgare*	*												
	Comesperma virgatum										*			
*	*Conyza ?parva*				*									
*	*Conyza* sp.		*											
	Cotula coronopifolia		*		*					*				

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
	Cyathochaeta avenacea						*		*	*	*			*
*	*Cynodon dactylon*	*	*		*	*	*	*	*	*	*	*	*	*
*	*Cyperus tenellus*								*		*			
	?Dichopogon capillipes												*	
	Diuris laxiflora								*		*			
	Drosera bulbosa ?subsp. *bulbosa*									*	*			
	Drosera glanduligera								*					
	Drosera heterophylla							*	*	*				*
	Drosera menziesii								*	*	*			
	Dryandra lindleyana					*								
*	*Echium plantagineum*									*				
*	*Ehrharta calycina*									*		*		
*	*Ehrharta longiflora*									*				
	Eleocharis										*			
*	*Eragrostis curvula*	*			*	*			*					
	Eremophila ?glabra										*			
*	*Erodium moschatum* or *E. botrys*				*									
*	*Eucalyptus camaldulensis*									*				
*	*Euphorbia terracina*	*									*			
	Eutaxia virgata									*	*			
*	*Foeniculum vulgare*										*			
*	*Freesia* sp.									*				
*	*Fumaria capreolata*		*						*					*
*	*Fumaria muralis*			*										
*	*Gladiolus* sp.	*									*			
	Goodenia pulchella sp. Coastal Plain A (M. Hislop 634)										*			*
	Grevillea bipinnatifida					*								
	Haemodorum ?discolor						*		*	*	*	*		*
	Haemodorum paniculatum								*	*	*			*
	Hakea erinacea											*		
	Hakea prostrata					*			*					
	Hakea sulcata							*						
	Hakea varia					*		*			*	*		

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
*	*Hesperantha falcata*			*					*	*	*			*
	Hyalosperma cotula										*			*
*	*Hyparrhenia hirta*	*				*			*	*	*	*		
	Hypocalymma angustifolium										*			
*	*Hypochaeris glabra*										*			
	Hypoxis occidentalis var. *occidentalis*								*					
*	*Ipomoea indica*				*									
	Isolepis cernua								*	*				
	Jacksonia sternbergiana				*									
*	*Juncus bufonius*								*					
*	*Juncus capitatus*									*	*			
	Lachnagrostis filiformis								*		*			
	Lawrencia squamata		*											
	Lepidosperma costale								*		*	*		*
	Lepidosperma longitudinale										*			
	Lepyrodia glauca										*			
*	*Lolium rigidum*									*	*			
	Lomandra caespitosa								*	*				
*	*Lotus subbiflorus*								*	*	*			
*	*Lupinus* spp.						*				*			
*	*Lythrum hyssopifolia*									*	*			
	Meeboldina cana										*			*
	Meeboldina coangustata			*					*					
*	*Melaleuca armillaris*	*												
	Melaleuca lateritia			*			*	*			*	*		*
	Melaleuca ?lateritia		*											
*	*Melaleuca nesophila*	*												
	Melaleuca preissiana		*					*	*		*			
	Melaleuca rhaphiophylla								*					
	Melaleuca ?rhaphiophylla			*									*	
*	*Melinus repens*						*							
	Mesomelaena pseudostygia					*								
	Mesomelaena tetragona										*			

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
*	*Moraea flaccida*				*						*			
	Myriophyllum crispatum									*				
*	*Narcissus* sp.						*							
	Neurachne alopecuroidea									*				
	Opercularia vaginata										*			
*	*Orobanche minor*								*					
*	*Oxalis glabra*						*							
*	*Oxalis pes-caprae*	*		*	*		*	*						*
*	*Oxalis purpurea*						*							
*	*Parentucellia latifolia*								*		*			
*	*Parentucellia viscosa*								*	*	*			
*	*Paspalum dilitatum*										*			*
*	*Paspalum distichum*													*
	Patersonia occidentalis						*		*	*	*			*
*	*Pelargonium capitatum*	*												
*	*Pennisetum clandestinum*	*			*		*			*		*		
	Pericalymma ellipticum var. *floridum*									*				
	Philydrella pygmaea subsp. *pygmaea*								*					
	Pimelea imbricata var. *major*									*	*			
	Pimelea imbricata var. *piligera*								*		*			
	?*Pimelea* sp.								*					
*	*Plantago lanceolata*		*											
*	*Polypogon monspeliensis*								*		*			
*	*Polypogon tenellus*								*		*			
*	*Populus nigra* var. *italica*				*									
	Prasophyllum ?*regium*										*			
*	*Raphanus raphanistrum*							*						
*	*Ricinus communis*		*		*									*
*	*Romula rosea*	*					*	*	*	*	*			
*	*Rumex crispus*										*			
*	*Rumex* sp.	*		*			*							
	Scaevola lanceolata										*			
	Schoenolaena juncea										*			

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
	Schoenus capillifolius										*			
	Schoenus plumosus								*	*	*			
	Schoenus subfascicularis							*	*					
	Schoenus variicellae								*	*				
	Senecio pinnatifolius				*						*			
*	*Senecio vulgaris*				*									
*	*Solanum nigrum*	*		*										
*	*Sonchus oleraceus*										*			*
*	*Sonchus* sp.	*												
*	*Sparaxis bulbifera*								*					
*	*Stachys arvensis*										*			
*	?*Stachys arvensis*						*							
*	*Stenotaphrum secundatum*				*									
	Stylidium divaricatum								*	*	*			*
	Stylidium ?roseo-alatum										*			
*	*Taraxacum officinale*				*									
	Thysanotus manglesianus										*			
	Thysanotus tenellus								*					
	Thysanotus sp.										*			
	Thysanotus sp. (climber)										*			
*	*Tribolium uniole*													
	Tribonanthes australis								*		*			
*	*Trifolium campestre*										*			
*	*Trifolium dubium*				*									
*	*Trifolium* sp.		*											
	Triglochin linearis		*	*							*		*	
	Triglochin mucronata		*											
*	*Triticum aestivum*								*					
*	*Typha orientalis*	*		*										
*	*Utricularia multifida*										*			
	Verticordia densiflora							*	*	*	*	*		
	Verticordia densiflora var. *densiflora*									*	*			
	Verticordia huegelii var. *huegelii*								*					

VASCULAR PLANT SPECIES WITHIN PLANT COMMUNITIES

		1	2	3	4	5	6	7	8	9	10	11	12	13
	Verticordia plumosa ?var. *brachyphylla*					*								
*	*Vicia hirsuta*	*										*		
*	*Vicia sativa*	*			*		*						*	
	Villarsia albiflora									*				
	Villarsia submersa												*	
	Viminaria juncea						*		*	*	*	*	*	*
*	*Washingtonia filifera*						*							
*	*Watsonia meriana*	*		*		*	*	*	*		*	*	*	*
*	*Watsonia meriana* var. *bulbilifera*			*	*									
*	*Watsonia meriana* var. *meriana*				*									
*	*Watsonia versfeldii*										*			
	Wurmbaea dioica subsp. *alba*								*					
	Xanthorrhoea preissii					*	*		*			*		*
*	*Zantadeschia aethiopica*			*	*						*			

PLOT	DATE	GPS E	GPS N	SOIL	DESCRIPTION
1	18/08/2004	400274	6457180	Brown clay with some sand	Low heath to 0.5m, very wet and low, Watsonia nearby
2	18/08/2004	400195	6457116	clay	Low heath in wetland, under water, near substation, SE peg marked, some limestone at surface near here, some stress in Mels
3	18/08/2004	400256	6457155	brown clay with occasional expose	Casuarina obesa woodland, partially inundated, ?fire >3 yrs
4	18/08/2004	400295	6456917	clay	Same comm. As plot 2, underwater, less stress in mels than plot 2, jarrah pegs left in corners, under powerline

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
1	Melaleuca rhaphiophylla	1	3	1	3	1	3	
1	Patersonia occidentalis	0.3	30	0.4	30	0.4	30	
1	Haemodorum paniculatum	0.3	2	0.4	3	0.4	3	recollect in Nov- (Wpcann 154)
1	Cyathochaeta avenacea	0.5	20	0.5	20	0.5	20	
1	Verticordia densiflora	0.5	15	0.5	15	0.5	15	
1	Drosera heterophylla	0.1	0.5					
1	Chorizandra enodis	0.5	6	0.5	6	0.5	6	
1	Pimelea imbricata var. piligera	0.3	1	0.3	1	0.8	1	
1	Stylidium divaricatum	0.15	0.1	0.2	0.1	0.2	0.5	
1	Lomandra caespitosa	0.3	0.2	0.3	0.5	0.3	0.5	
1	*Hesperantha falcata	0.15	0.5	0.15	0.5	0.15	0.5	dried in Nov
1	Acanthocarpus preissii	0.3						
1	Centrolepis aristata	0.05	10	0.05	30	0.05	25	
1	*Lotus subbiflorus	0.01	0.01	0.01	0.01	0.01	0.01	
1	*Parentucellia viscosa	0.01	0.01	0.3	0.5	0.3	0.5	S & W boundary-dried in Nov
1	*Triticum aestivum	0.25	0.01	0.5	0.01			S boundary
1	*Orobanche minor	0.15	0.01					dead
1	Drosera glanduligera	0.01	0.01	0.01	0.01			
1	Diuris laxiflora			0.4	0.01			
1	Drosera menziesii			0.4	0.2			
1	Verticordia huegelii var. huegelii			0.4	2	0.4	2	
1	Hypoxis occidentalis var. occidentalis	0.05	0.2	0.2	0.01	0.2	0.01	dried in Nov
1	Philydrella pygmaea ssp. pygmaea			0.07	0.01	0.07	0.01	dried in Nov
1	Cicendia filiformis			0.07	0.02	0.07	0.02	dried in Nov
1	Thysanotus tenellus			0.2	0.01	0.2	0.01	dried in Nov
1	*Briza maxima			0.2	0.2	0.2	0.1	
1	*Briza minor			0.1	0.2	0.1	0.1	
1	Schoenus variicellae			0.1	0.1	0.1	0.2	dried in Nov
1	*Cyperus tenellus			0.05	0.01	0.05	0.01	dried in Nov
1	Isolepis cernua			0.05	0.01	0.05	0.01	dried in Nov
1	*Romulea rosea			0.2	0.01			
1	Schoenus plumosus			0.15	1	0.15	0.08	dried in Nov
1	Lachnagrostis filiformis			0.05	0.02	0.05	0.05	
1	*Juncus bufonis			0.02	0.01			
1	Burchardia multiflora			0.3	0.01			

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
1	Polypogon tenellus					0.15	0.08	dried in Nov
1	*Parentucellia latifolia					0.2	0.5	
1	*Polypogon monspeliensis					0.25	0.02	

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
2	Opercularia vaginata	0.2	3	0.2	3	0.2	4	
2	*Hyparrhenia hirta	1.5	1	1.5	1	1.5	1	
2	Chorizandra enodis	0.5	7	0.5	8	0.5	8	
2	Melaleuca lateritia	1	20	1	20	1	20	& seedlings
2	Tribonanthes australis	0.15	0.01					
2	Triglochin linearis	0.2	0.3	0.2	0.3	0.2	0.05	
2	*Lotus subbiflorus	0.02	0.5	0.02	0.8	0.02	1.5	
2	Meeboldina cana	0.4	20	0.4	20	0.4	20	
2	Thysanotus sp. (climber)		0.01					
2	Schoenolaena juncea			0.3	0.05	0.5	0.03	
2	Lepidosperma costale	0.5	2.5	0.5	2.5	0.5	2.5	
2	Burchardia multiflora	0.4	0.2	0.4	0.2	0.4	0.2	
2	Haemodorum paniculatum	0.3	0.2			0.3	0.1	
2	Astartea affinis ms	1	2	1	2	1	2	
2	Stylidium divaricatum	0.1	0.1	0.2	0.1	0.2	0.3	
2	*Anagallis arvensis	0.01	0.1	0.01	0.01	0.05	0.05	
2	*Romulea rosea	0.15	1	0.3	1	0.15	0.5	dried in Nov
2	*Hesperantha falcata	0.1	0.1	0.1	0.1	0.1	0.3	dried in Nov
2	Sonchus oleraceus	0.1	0.01	0.1	0.01	0.1	0.01	
2	Weedy grasses	0.15	1	0.15	3			collected in Nov (listed below)
2	*Briza maxima					0.2	0.01	
2	*Polypogon monspeliensis					0.3	0.1	
2	Lachnagrostis filiformis					0.4	1	
2	*Lolium rigidum					0.5	0.3	
2	*Briza minor					0.4	0.05	
2	Polypogon tenellus					0.25	0.1	
2	*Brachypodium distachyon					0.2	1	
2	Centrolepis aristata	0.05	0.1	0.05	0.1	0.05	0.2	
2	Pimelea imbricata var. major	0.5	0.3	0.5	0.3	0.5	0.3	
2	Schoenus plumosus			0.07	5	0.07	2	dried in Nov
2	*Watsonia versfeldii			0.3	0.02	0.3	0.02	
2	*Avena barbata			0.6	0.02	0.6	0.02	dried in Nov
2	*Trifolium campestre			0.1	0.01	0.1	0.01	
2	*Parentucellia viscosa					0.3	0.1	
2	*Parentucellia latifolia					0.05	4	

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
2	*Lythrum hyssopifolia					0.2	0.1	
2	Goodenia pulchella ssp. Coastal Plain A (M. Hislop 634)					0.4	1	
2	Juncus capitatus					0.15	0.2	
	*Cyperus tenellus					0.05	0.5	
Plot still under water in September. Mel lat seedlings here-look different to adults ie. Longer reddish leaves.								
No water in the plot by November.								
3	Casuarina obesa	4	40	4	40	4	40	
3	Cyathochaeta avenacea	0.5	15	0.5	15	0.5	15	
3	Patersonia occidentalis	0.4	4	0.4	4	0.4	4	
3	*Romulea rosea	0.2	6	0.2	6			
3	*Cynodon dactylon	0.15	10	0.15	10	0.15	12	
3	*Briza maxima	0.15	1.5	0.4	2	0.4	1	
3	*Hesperantha falcata	0.15	3	0.25	0.05	0.15	0.05	
3	*Lolium rigidum	0.15	0.01	0.15	0.01	0.15	1	
3	*Pennisetum clandestinum	0.2	3	0.2	3	0.2	3	
3	Burchardia multiflora	0.1	0.01	0.2	0.02			
3	Austrodanthonia setacea	0.2	0.01	0.3	0.01	0.4	0.01	
3	Drosera menziesii	0.1	0.1	0.3	0.01			
3	Drosera heterophylla	0.01	0.01	0.01	0.01			
3	Verticordia densiflora var. densiflora	0.4	1.5	0.4	1.5	0.4	1.5	
3	Haemodorum paniculatum	0.2	0.01	0.4	0.01	0.4	0.01	
3	Lomandra caespitosa	0.3	0.1	0.3	0.1	0.3	0.1	
3	Pericalymma ellipticum var. floridum	0.4	0.2	0.4	0.2	0.4	0.2	
3	Neurachne alopecuroidea	0.1	0.02	0.2	0.02	0.3	0.02	
3	*Asparagus asparagoides	0.02	0.01	0.02	0.01	0.02	0.01	
3	*Lotus subbiflorus	0.01	0.01	0.1	0.01	0.1	0.01	
3	*Echium plantagineum	0.01	0.01	0.01	0.01	0.3	0.01	
3	Centrolepis aristata	0.05	0.05	0.05	3	0.05	2	dried in Nov
3	Chaetanthus aristatus	0.3	0.05	0.3	0.05	0.3	0.05	
3	Stylidium divaricatum	0.2	0.1	0.2	0.1	0.2	0.1	
3	*Anagallis arvensis	0.02	0.01			0.02	0.01	
3	*Briza minor			0.2	5	0.2	3	dried in Nov

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
3	Schoenus variicellae			0.1	0.2	0.1	0.1	dried in Nov
3	Schoenus plumosus			0.15	0.5	0.15	0.3	dried in Nov
3	*Juncus capitatus			0.07	0.05	0.07	0.05	dried in Nov
3	Isolepis cernua			0.06	0.5	0.06	0.2	dried in Nov
3	*Ehrharta longiflora			0.3	0.01			
3	*Avena barbata			0.5	0.1	0.08	0.1	
3	Drosera bulbosa ?ssp. bulbosa			0.01	0.01			
3	Pimelea imbricata var. major			0.3	0.05	0.3	0.05	
3	*Parentucellia viscosa			0.1	0.03	0.1	0.02	dried in Nov
3	*Cicendia filiformis			0.05	0.01			
3	*Lythrum hyssopifolia					0.1	0.01	

WESTERN POWER CANNINGTON SUBSTATION 10M X 10M PLOTS

PLOT	SPECIES	HT AUG	COV AUG	HT SEP	COV SEP	HT NOV	COV NOV	COMMENTS
4	Astartea affinis ms	1.2	5	1.2	5	1	5	
4	Meeboldina cana	0.6	12	0.6	18	0.6	20	
4	Melaleuca lateritia	1.2	23	1.2	23	1.2	25	
4	Eutaxia virgata	1	0.3	1	0.3	1	0.3	
4	Schoenolaena juncea	0.2	1	0.5	2	0.8	2	
4	Cassytha racemosa		1		2.5		4	
4	Triglochin linearis	0.3	0.5	0.3	0.5	0.3	0.01	dried in Nov
4	Chorizandra enodis	0.6	0.5	0.6	1	0.6	1	
4	*Hesperantha falcata	0.2	0.05	0.2	0.05	0.2	0.01	
4	Goodenia pulchella ssp. Coastal Plain	0.3	0.01	0.3	0.01	0.5	0.04	
4	Stylidium divaricatum	0.15	0.1	0.15	0.5	0.15	2	
4	*Gladiolus sp.	0.2	0.01	0.2	0.01	0.2	0.01	dried in Nov
4	Schoenus capillifolius	0.1	0.5	0.07	1	0.01	1	dried in Nov
4	Burchardia multiflora	0.4	0.2			0.4	0.05	
4	*Watsonia meriana	1	0.1	1	1	1	0.1	
4	Aponogeton hexatepalus	0.2	0.05	0.25	0.05			P4
4	Cyathochaeta avenacea	0.3	0.05			0.15	0.05	
4	Urtricularia multifida			0.15	0.05			
4	*Cicendia filiformis			0.06	0.01	0.06	0.02	dead
4	Thysanotus manglesianus						1	
4	*Parentucellia latifolia					0.07	5	
4	Hyalosperma cotula					0.1	2	
4	Lachnagrostis filiformis					0.3	0.3	
	*Hypochaeris glabra					0.1	0.01	
	Haemodorum paniculatum					0.2	0.05	
	Stylidium ?roseo-alatum					0.01	0.01	
	Prasophyllum ?regium					0.06	0.01	
	*Juncus capitatus					0.01	0.01	
	*Cyperus tenellus					0.01	0.05	
Water has receded from eastern side of the plot in September								

AREA	LOCATION	DESCRIPTION
1	Near tax carpark	Infested by weeds, dominated by a mixture of weeds including couch, includes drainage area dominated by Typha orientalis
2	just north of bridgework	Swampy area, dominated by couch, with some other species on slightly higher ground including Cotula
3	just south of bridgework; eastern boundary of power station	Area underwater, dominated by Typha
4	just south of bridgework	Area dominated by weeds, has small grove of poplars on south-eastern corner
5	just south of bridgework	Very weedy but some native shrubs still in area
6	to west of area 3	very degraded, has had garden refuse also dumped into it, crapola
7	small area within 6	wetland, surrounded by natives and weeds on edges
8	private property area	Sedgeland dominated by patersonia occidentalis, gahnia, verticordias under water
9	private property area	surrounds area 8, dominated by Casuarina obesa
10	area to west	wetland heath area
11	west and east of telecomm tower	very weedy area with some heath
10d	on southern boundary	has same main species as 10, but is very weedy
12	in centre of area	degraded heath with viminaria juncea, inundated
13	southern section	completely dominated by watsonia - was cleared 2 weeks later

1	Highly degraded area with artificial drainage area, dominated by weed species including *Typha orientalis* , *Cynodon dactylon* and *Pennisetum clandestinum* , with occasional native species including Bolboschoenus caldwellii
2	Highly degraded area dominated by weed species including *Cynodon dactylon* , with native species including *Chaetanthus aristatus* and *Cotula coronopifolia*
3	Highly degraded area inundated in Spring dominated by *Typha orientalis* and *Watsonia meriana* , with *Chaetanthus aristatus*
4	Highly degraded area dominated by weed species such as *Watsonia meriana* , with *Poplus nigrica* var. *italica*
5	Degraded area dominated by *Watsonia meriana* with native species such as *Jacksonia sternbergiana* , *Hakea prostrata* , *Hakea varia* , *Acanthocarpus preissii* , *Xanthorrhoea preissii* and *Mesomelanea pseudostygia*
6	Highly degraded area dominated by a mixture of weed species including *Watsonia meriana* , *Cynodon dactylon* and *Pennisetum clandestinum*
7	Degraded wetland area, inundated in Spring, surrounded by mixed species including *Watsonia meriana* , *Verticordia densiflora* , *Hakea sulcata* , *Melaleuca lateritia* and *Schoenus subfascicularis*
8	Heath inundated in Spring, dominated by *Verticordia densiflora* , *Patersonia occidentalis* , *Cyathochaeta avenacea* and *Centrolepis aristata*
9	Low Woodland of *Casuarina obesa* over disturbed understorey of *Cyathochaeta avenacea* , *Cynodon dactylon* and *Patersonia occidentalis*

	10	Heath inundated in Spring, dominated by *Melaleuca lateritia* over mixed species including *Meeboldina cana* , *Chorizandra enodis* and *Astartea affinis* ms
10d		Highly degraded plant community 10
	11	Highly degraded area dominated by *Cynodon dactylon* and *Watsonia meriana* , with occasional native species including *Melaleuca lateritia* and *Astartea affinis* ms
	12	Highly degraded area inundated in Spring dominated by *Viminaria juncea* , with *Watsonia meriana* var. *meriana* , *Cynodon dactylon* and *Melaleuca lateritia*
	13	Highly degraded area dominated by *Watsonia meriana* with occasional native species including *Xanthorrhoea preissii*