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WESTERN POWER CORPORATION

PROPOSED PINJAR TO CATABY TRANSMISSION LINE

FLORA, VEGETATION AND DIEBACK(*Phytophthora cinnamomi*) SURVEY

December 2000

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EXECUTIVE SUMMARY

Western Power Corporation (Western Power) is planning the construction of a new 132 kilovolt electricity transmission line between Pinjar and Cataby, north and north-west of Perth. Western Power has developed several route options for this new transmission line. The Western Option runs along the eastern side of the Wanneroo-Lancelin Road, passing through State Forest 65. The Central or Common Option runs alongside the existing transmission line, with the Eastern Option running on the eastern side of Brand Highway. The Western Option is the Western Power preferred option and as such the studies detailed in this report concentrate on this alignment. Two areas along the Central Option, Yeal Swamp Nature Reserve and Moore River National Park were also surveyed. This report details the results of mapping of plant communities, surveying for Declared Rare and Priority listed flora and an assessment for the presence of Dieback (*Phytophthora cinnamomi*). All areas surveyed were traversed on foot and by vehicle to allow all species present to be recorded.

The majority of the Western Option lies within the Swan Coastal Plain subregion of the South-West Botanical Province, as defined by Beard. The southern part of the route lies within the Drummond Botanical Subdistrict, characterised by *Banksia* low woodland on leached sands, interspersed by swamps and Tuart, Jarrah and Marri woodlands. The northern part of the route lies within the Irwin Botanical District of the Northern Sandplains Region. This District is characterised by scrub heaths on sandplains.

The survey of the Gingin Stock Route Reserve recorded 109 vascular plant taxa in two plant communities. No Declared Rare flora, as defined by Section 23F of the Wildlife Conservation Act 1950, or Priority listed flora species were recorded in the reserve and none of the taxa recorded were outside their known geographical range. Vegetation in the reserve was in good condition and free of dieback caused by *Phytophthora cinnamomi*. The edges of the reserve had some weed invasion from surrounding agricultural land, which was most severe along the western boundary.

One hundred and fifty five plant taxa in seven plant communities were recorded in State Forest 65 – South in spring 2000. No Declared Rare or Priority listed flora species were recorded in this area and none of the taxa recorded were outside their known geographical range. Overall, the vegetation in State Forest 65 - South was in poor to fair condition. This was due to disturbance from the many access tracks servicing the extensive pine plantations in this State Forest. The area has also been regularly burnt, some areas very recently, which has led to a reduction in the number of plant species expected, and increased weed invasion. No evidence of the presence of *P. cinnamomi* was recorded along the proposed transmission line route during this study.

The survey of State Forest 65 – North recorded 231 plant taxa in 12 plant communities. One Declared Rare taxon, *Anigozanthos humilis* subsp. *chrysanthus*, and one Priority four species, *Georgeantha hexandra*, were recorded. One of the plant communities mapped was a Threatened Ecological Community, as defined by the Department of Conservation and Land Management. This limestone ridge community was recorded in the south-

western section of the State Forest. Overall, the vegetation along the routes surveyed was in very good condition, with weed invasion concentrated along tracks and pasture edges. Some areas also had high weed cover as they had been recently burnt. The plant communities mapped consisted of woodlands, shrublands and heaths, with large areas of limestone recorded.

Along the Western Option there are several areas of remnant vegetation on private property. These vary in size and quality and all were surveyed during this project. Other large areas of native vegetation are also present in the northern section of the proposed route alignment. These areas consist of private property and Vacant Crown Land (VCL), the majority of which is covered by the Tiwest Joint Venture Cooljarloo mining lease. Another area of VCL is located south of private property, bordering the Department of Defence Lancelin Training Area. The majority of remnants on private property were found to be in poor condition as they were unfenced and had been grazed. No Declared Rare flora species were recorded in any of these areas during the survey. Three Priority flora taxa were recorded on VCL. These were the Priority 3 species *Comesperma acerosum* and *Platysace ramosissima*, and the Priority 4 species *Conostephium minus*. A Declared Rare taxon *Anigozanthos viridis* subsp. *terraspectans* is present either side of the route within the Tiwest Joint Venture lease area. These populations are fenced, and will not be impacted on by the transmission line project. *P. cinnamomi* was found in a soil sample collected from the Moore River and the entire river system in this region is likely to be infested.

One hundred and fifty five plant taxa in eight plant communities were recorded in the Yeal Swamp Nature Reserve during this survey. None of these were Declared Rare flora species. One Priority 4 species, *Stachystemon axillaris*, was recorded at one location along the proposed route. Overall, the vegetation south of the Gingin Wanneroo Branch drain was in very good condition. The drain itself was in a generally poor condition due to weed invasion and the impact of *Phytophthora cinnamomi* (dieback). A significant area on the north side of the drain was infested with this pathogen.

The survey of the proposed transmission line through the Moore River National Park recorded 139 vascular plant taxa in 5 plant communities. No Declared Rare flora taxa were recorded during the survey. One plant of a Priority Three species *Stylidium nonscandens*, was recorded at one location. Approximately 5 plants of a possible Priority One species *Stylidium ?carlquistii*, were also recorded although the identification could not be confirmed due to a lack of flowering material. Several other interesting flora species were recorded during the survey. A collection of a possible new subspecies of *Philotheca spicata* was made on the north side of Red Gully Creek. This was named *Philotheca spicata* subsp. Moore River Nat. Pk. for the purposes of this report and a specimen has been retained by the Western Australian Herbarium for further study. Another collection named as Cyperaceae/Liliaceae sp. could not be identified to a family level by staff at the Herbarium and it may therefore be a new species. However, a lack of flowering material prevented any further study of the collected specimen. *Leucopogon* sp. Moore River (M.Hislop 1695) was also recorded. This species has a restricted distribution and has not yet been fully described. A possible range extension was

recorded for *Melaleuca ?subtrigona*. This taxon has not previously been recorded from the coastal plain, being common on the Dandaragan Plateau. Vegetation within the park was in very good condition, with no weed invasion. *P. cinnamomi* was recorded and mapped along Red Gully Creek near the southern boundary of the park.

The conservation significance and representation within the reserve system of all of the plant communities mapped was assessed using available regional studies. Recommendations were also made to reduce the impact of the transmission line on flora and vegetation.

With the exception of Moore River the entire Western Option is free of *P. cinnamomi*. However, both areas surveyed along the Central Option contain areas of vegetation infested with this pathogen.

1 INTRODUCTION

Western Power Corporation (Western Power) is planning the construction of a new 132 kilovolt electricity transmission line between Pinjar and Cataby, north and north-west of Perth. Western Power has developed several route options for this new transmission line. The Western Option runs along the eastern side of the Wanneroo-Lancelin Road, passing through State Forest 65. The Central or Common Option runs alongside the existing transmission line, with the Eastern Option running on the eastern side of Brand Highway. The Western Option is the Western Power preferred option and as such the studies detailed in this report concentrate on this alignment. Two areas along the Central Option, Yeal Swamp Nature Reserve and Moore River National Park were also surveyed.

Western Power has been advised by the Department of Environmental Protection that the proposal will attract a Public Environmental Review. This requires detailed studies to be carried out in all remnant vegetation. These studies must incorporate the mapping of vegetation communities, surveying for Declared Rare and Priority listed flora and an assessment for the presence of Dieback (*Phytophthora cinnamomi*).

2 AIMS

The aim of this project was to obtain information on the plant communities, flora species and *P. cinnamomi* distribution in all remnant vegetation along the proposed alignments. This included State Forests, National Park, Nature Reserves and Vacant Crown Land. All remnant vegetation along the Western Option was surveyed, with only two areas surveyed along the Central Option and no areas on the Eastern Option. Information collected during these surveys will assist decision making with regard to final route alignment, as well as facilitate management of flora, vegetation and *P. cinnamomi* hygiene during both the construction and operational phases of the proposed transmission line. The tasks required to meet this aim were:

- Record all vascular plant species along the proposed route and their conservation status.
- Search for known Declared Rare and Priority flora along the route.
- Map the plant communities encountered and list all plant species present in each community.
- Survey for and map the presence of *Phytophthora cinnamomi* (dieback) along the route, with mapping to include uninterpretable areas.

3 METHODOLOGY

Experienced botanists and dieback interpreters carried out the surveys described in this report between June and November 2000. A 60m wide strip was surveyed along the Western Option, with the exception of the Gingin Stock Route Reserve where the entire width of remnant vegetation was surveyed. In Yeal Swamp Nature Reserve a 70m wide strip on the eastern side of the existing transmission line was surveyed. In the Moore

River National Park, a 70m wide strip on the western side of the existing transmission line was surveyed. The centre line of the Western Option had been marked in the field by surveyors prior to this study.

3.1 Flora and Vegetation

All areas surveyed were traversed by vehicle and on foot to map vegetation boundaries and search for restricted flora species. Detailed site recordings were taken at each community boundary change and at regular intervals along the routes. At each site a standard recording sheet was used to ensure the consistent collection of flora and site data. The data collected is largely consistent with that collected by Gibson *et al.* (1994) as requested by the Department of Conservation and Land Management. Statistical analysis was not used to define plant communities due to the small size of the study area and therefore quantitative plots were not established. At each site the following information was collected within a 10m radius:

- Site location
- Soil type and colour
- Slope (based on 1 to 3 scale used by Gibson *et al.* (1994)
- Vegetation condition (Trudgen 1991)
- Vegetation structure (Muir 1977)
- All vascular plant species present, and the foliage cover of the dominant species.

Where possible the sites were then classified into the community types defined by Gibson *et al.* (1994). This was not carried out for the Moore River National Park section or north of State Forest 65 - North, as these areas are located outside the boundary of the Gibson *et al.* study area (ie. north of Seabird). Where possible, the conservation status of each plant community was determined by reference to available regional studies.

A search of the Department of Conservation and Land Management Rare and Priority flora database was carried out prior to the field-work. This provided a list of all restricted species known to occur in the area. All vegetation within the proposed transmission line corridor was traversed on foot by experienced botanists to search for these species and any others not recorded in the vegetation mapping sites. Where unknown species were encountered specimens were collected for identification at the West Australian Herbarium. The location of all Rare and Priority flora recorded was noted, and the locations of these will be marked in the field prior to any disturbance. With the exception of the Gingin Stock Route Reserve, all surveys were carried out during the spring flowering season to allow identification of all known Declared Rare and Priority Flora. The Gingin Stock Route Reserve was re-visited in spring to confirm the presence or absence of any annual restricted flora species.

Plant species nomenclature used in this report follows Green (1985). All names were checked using the Max Database to ensure they are current. The conservation status of all species collected was checked using the current Department of Conservation and Land Management list (Department of Conservation and Land Management 1999a).

3.2 Phytophthora cinnamomi

All areas surveyed were traversed both in a vehicle and on foot by personnel experienced in the detection and mapping of *Phytophthora cinnamomi*. Samples of soil and vegetation material from dead or dying indicator plant species were collected and analysed for the presence of *P. cinnamomi*. Any obvious disease boundaries along the route were marked in the field using day-glo pink (*P. cinnamomi* infested) or white (uninterpretable) flagging tape. The sampling regime employed during the surveys also included the collection of control samples of soil from locations approximately 20m away from identified infestation boundaries into uninfested vegetation. Following receipt of the sample analysis results and an assessment of the significance and potential for management of each *P. cinnamomi* free area, field boundaries were amended as required.

A *P. cinnamomi* distribution map showing areas of *P. cinnamomi* infestation, areas free of *P. cinnamomi* infestation and areas uninterpretable for the presence of *P. cinnamomi* was then prepared.

3.2.1 Disease Interpretation and Mapping Terminology

P. cinnamomi free (Uninfested areas)
Areas of native vegetation that an accredited interpreter has determined to be free of plant disease symptoms, which would indicate the presence of the pathogen *P. cinnamomi*.

These areas need not be sampled for the presence of *P. cinnamomi*, however if samples are collected, analysis results must not show the presence of *P. cinnamomi*.

P. cinnamomi infested (Infested areas)
Areas of native vegetation that an accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *P. cinnamomi*.

Samples of plant tissue and/or soil should be collected within these areas to confirm the presence of the pathogen. Sample analysis results should provide a recovery of the pathogen from within each area to confirm the interpretation.

Uninterpretable
Areas in which indicator plants are absent or too few to determine the presence or absence of disease caused by *P. cinnamomi*.

Areas that have suffered significant disturbance to reduce the number of indicator plants or mask disease symptoms may be included in this category. Fire is a common factor that will cause normally interpretable areas to become uninterpretable. Cleared land is placed in the uninterpretable category, however these areas will never regain their status as interpretable.

Areas of vegetation that do not include indicator plants such as wetlands and some swamps should be placed in this category unless sampling confirms the presence of *P. cinnamomi*. These areas must then be placed in the infested category.

4 RESULTS

The sections below discuss each distinct area surveyed during this project. The vegetation mapping is illustrated in Figures 1 to 7, with the distribution of *P. cinnamomi* shown in Figures 1a to 7a. The majority of the Western Option lies within the Swan Coastal Plain subregion of the South-West Botanical Province, as defined by Beard (1990). The southern part of the route lies within the Drummond Botanical Subdistrict, characterised by *Banksia* low woodland on leached sands, interspersed by swamps and Tuart, Jarrah and Marri woodlands. The northern part of the route lies within the Irwin Botanical District of the Northern Sandplains Region. This District is characterised by scrub heaths on sandplains.

4.1 Gingin Stock Route Reserve

The proposed Western Option passes through the Gingin Stock Route Reserve. This reserve is situated west of Gingin off Chitna Road and is 5.2 kilometres in length, of which approximately 4.5km will be impacted by the proposed transmission line. There is currently no existing information on flora and vegetation within the reserve, which acts as a corridor between State Forest 65 - South and remnant vegetation north of Chitna Road.

The Gingin Stock Route Reserve is located within the Spearwood Dune geomorphological system as defined by McArthur and Bettenay (1960). A subdivision of these geomorphological systems into units by Churchward and McArthur (1980) places the study area within the Karrakatta geomorphological unit. This unit is defined as an undulating landscape of deep yellow sands over limestone.

The vegetation of the Swan Coastal Plain has been mapped at the complex level by Heddle *et al.* (1980). Vegetation of the Gingin Stock Route Reserve was mapped as Karrakatta Complex – North. This complex is predominantly a low open forest and low woodland of banksia – *Eucalyptus todtiana*, with minor occurrences of *Eucalyptus gomphocephala* (tuart). The common banksia species are *Banksia attenuata* and *Banksia menziesii*, with *Banksia ilicifolia* on the lower slopes. Common shrub species in this complex, as listed by Havel (1968), include *Conospermum triplinervium*, *Hakea trifurcata*, *Mesomelaena stygia*, *Eremaea pauciflora* and *Stirlingia latifolia*.

Flora, vegetation and *P. cinnamomi* presence within the Gingin Stock Route Reserve was surveyed in June 2000. The width of vegetation was found to vary between 50m and approximately 90m depending on the width of firebreaks either side of the vegetation corridor. Overall, the vegetation through the reserve was in very good condition. The number of weed species was low, with those present concentrated on the boundaries of the reserve. Fire history through the reserve varied, with areas of very recent (1-2 years) and recent (<3 years) burns recorded. The majority of the reserve however, does not appear to have been burnt within the last 10 years. Weed species were also more abundant in the recently burnt areas.

4.1.1 Flora

A total of 109 vascular plant taxa belonging to 29 families were recorded in the Gingin Stock Route Reserve in June 2000 (Appendix A1). It is estimated that this is approximately 85% of the flora of the survey area. Further surveying in spring would increase the number of taxa as annual species, particularly orchids, daisies and grasses, would be recorded. Ten of the species recorded were weed species, which have invaded from surrounding pasture and market gardens. The most common plant families recorded were Proteaceae and Myrtaceae.

No Declared Rare flora, as defined by Section 23F of the Wildlife Conservation Act 1950, or Priority listed flora species were recorded in the reserve and none of the taxa recorded were outside their known geographical range.

4.1.2 Vegetation

Two plant communities were recorded and mapped in the Gingin Stock Route Reserve. These are described below, with the location of each shown in Figure 2.

Woodlands

W6: Open Low Woodland of *Banksia menziesii* and *Banksia attenuata* over a tall shrub layer dominated by *Adenanthos cygnorum* over *Hibbertia hypericoides* and *Eremaea pauciflora* on grey sand.

W6 was recorded in the northern portion of the reserve and included recently burnt areas. Other common species included *Stirlingia latifolia*, *Petrophile linearis*, *Alexgeorgea nitens*, *Patersonia occidentalis*, *Xanthorrhoea preissii* and *Lyginia barbata*.

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*. *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

W16 was mapped in the southern half of the reserve, in upper slope areas. Other common species included *Xanthorrhoea preissii*, *Patersonia occidentalis*, *Conostephium pendulum* and *Alexgeorgea nitens*.

4.1.3 *P. cinnamomi* Distribution

The vegetation of the Gingin Stock Route Reserve was in very good condition at the time of the assessment, with no obvious symptoms of *P. cinnamomi* presence observed. Several recently dead specimens of *Banksia* species and *Xanthorrhoea preissii* were sampled to determine whether spot infestations were present, and numerous old deaths of *Banksia* species were observed throughout the reserve. Sampling conditions were almost ideal during the assessment as surface soils were moist and ambient temperatures were moderate.

Ten samples of vegetation and/or soil were collected from suspect individuals or areas containing vegetation that had died in previous seasons. Sample results are presented in

Table 1. The majority of dying vegetation sampled contained no lesions in root or root collar phloem, and live borer grubs or borer cavities were present in many.

Table 1: Sample Analysis Results

Sample Number	Sample Type	Species Sampled	Result
GG1	Soil		No *Phytophthora*
GG2	Soil		No *Phytophthora*
GG3a	Root Collar	*Adenanthos cygnorum*	No *Phytophthora*
GG3b	Soil		No *Phytophthora*
GG4	Soil		No *Phytophthora*
GG5	Soil	*Banksia menziesii*	No *Phytophthora*
GG6	Soil		No *Phytophthora*
GG7a	Soil		No *Phytophthora*
GG7b	Root Collar	*Banksia attenuata*	No *Phytophthora*
GG8	Soil	*Xanthorrhoea preissii*	No *Phytophthora*
GG9	Soil		No *Phytophthora*
GG10	Soil and Root Collar	*Xanthorrhoea preissii*	No *Phytophthora*

The locations of sample collections are shown in Figure 2a.

The reserve was found to be *P. cinnamomi* free (Uninfested), with no obvious symptoms of disease found and no *P. cinnamomi* recovered from samples. Figure 2a presents the results of the survey.

4.1.4 Hygiene

The Gingin Stock Route Reserve is a narrow, linear strip of vegetation bordered on the west, north and east sides by private property, and by State Forest 65 to the south. The reserve is fenced from the private property for the majority of it's boundary and cleared fire breaks are maintained between the reserve and neighbouring properties. Where the reserve was bordered by native vegetation, no symptoms of *P. cinnamomi* presence were observed in the adjoining vegetation. Though the reserve is less than 100m in width, it's *P. cinnamomi* free status, fenced boundary, and regional significance as a vegetation corridor, warrant it should be viewed as Protectable with respect to Disease Hygiene. As it is not known whether *P. cinnamomi* is present in the adjacent cleared areas, a full landscape unit approach to hygiene for the reserve is not possible and a linear approach must be taken during future access. A separate hygiene map should be prepared prior to any construction operations in this area.

4.2 State Forest 65 – South

Part of the proposed Western Option passes through the southern half of State Forest 65, also known as the Moore River State Forest. This area is situated inland from Yanchep and Two Rocks, on the eastern side of the Wanneroo-Lancelin Road. The vegetation

consists of a mosaic of pine plantations and discrete blocks of native vegetation. The location of the areas of native vegetation is shown on Figures 1 and 2.

The southern section of the route alignment in State Forest 65 – South is located within the Bassendean unit of the Bassendean geomorphological system as defined by McArthur and Bettenay (1960) and Churchward and McArthur (1980). This unit is defined as sand plains with low dunes and occasional swamps on predominantly grey sands. North of Two Rocks, the route passes into the Spearwood Dune geomorphological system as defined by McArthur and Bettenay (1960). A subdivision of these geomorphological systems into units by Churchward and McArthur (1980) places the study area within the Karrakatta geomorphological unit. This unit is defined as an undulating landscape of deep yellow sands over limestone.

The vegetation of the Swan Coastal Plain has been mapped at the complex level by Heddle *et al.* (1980). Vegetation of State Forest 65 – South was mapped as Karrakatta Complex – North. This complex is predominantly a low open forest and low woodland of banksia – *Eucalyptus todtiana*, with minor occurrences of *Eucalyptus gomphocephala* (tuart). The common banksia species are *Banksia attenuata* and *Banksia menziesii*, with *Banksia ilicifolia* on the lower slopes. Common shrub species in this complex, as listed by Havel (1968), include *Conospermum triplinervium*, *Hakea trifurcata*, *Mesomelaena stygia*, *Eremaea pauciflora* and *Stirlingia latifolia*.

Flora, vegetation and *P. cinnamomi* presence within State Forest 65 - South was surveyed in late September 2000. The condition of the native vegetation varied from block to block, with some areas heavily infested with weeds and recently burnt. Several areas appeared to have been very regularly burnt, resulting in a loss of diversity and increase in weed cover. This was particularly evident in the blocks closer to the Wanneroo-Lancelin Road.

4.2.1 Flora

A total of 155 vascular plant taxa belonging to 44 families were recorded in State Forest 65 - South in September 2000 (Appendix A2). The spring timing of this survey allowed for many annual species to be recorded. Sixteen of the species recorded were weed species. This is a relatively high number for the total area surveyed, and is a result of disturbance associated with the extensive pine plantations in the area. The most common plant families recorded were Proteaceae, Myrtaceae and Papilionaceae.

No Declared Rare flora or Priority listed flora species were recorded in State Forest 65 – South. None of the taxa recorded were outside their known geographical range although the *Allocasuarina fraseriana* recorded is at the northern limit of its range.

4.2.2 Vegetation

A total of seven plant communities were described and mapped along the proposed transmission line route in this area. These consisted of woodlands and heaths, as described below and illustrated in Figures 1 and 2.

Overall, the vegetation in State Forest 65 - South was not in as good a condition as seen in other areas mapped for this project. This was due to disturbance from the many access tracks servicing the extensive pine plantations in this State Forest. The area has also been regularly burnt, some areas very recently, which has led to a reduction in the number of plant species expected.

Woodlands

W1: Open Tall Woodland of *Melaleuca preissiana, Eucalyptus rudis and Banksia littoralis* over *Kunzea ericifolia* and *Adenanthos cygnorum* on grey sand in low-lying areas.

Plant community W1 was recorded in a drainage line near the southern end of the survey area. The vegetation had been disturbed by heavy machinery, with a resulting low number of species recorded (15).

W9: Low Woodland of *Allocasuarina fraseriana, Banksia attenuata* and *Eucalyptus todtiana* over open low shrubs on yellow sand.

Plant community W9 was mapped in one small section of the route alignment. A total of 47 plant species were recorded in this community, with common understorey species including *Stirlingia latifolia* and *Xanthorrhoea preissii*. The amount of bare ground present was high, which is a common occurrence under she-oaks (*A. fraseriana*).

W10: Low Woodland of *Banksia attenuata, Banksia menziesii* and *Allocasuarina fraseriana* over *Hibbertia hypericoides, Xanthorrhoea preissii* and *Adenanthos cygnorum* on yellow sand.

W10 was mapped at two locations in the northern part of the State Forest, with a total of 44 species recorded. Other common species included *Conospermum canaliculatum* and *Thryptomene prolifera.*

W14: Low Woodland of *Banksia attenuata, Banksia menziesii* and *Eucalyptus todtiana* over *Xanthorrhoea preissii, Calytrix ?fraseri, Thryptomene prolifera* and *Stirlingia latifolia* on yellow sand in low-lying areas.

A total of 48 vascular plant species were recorded in plant community W14 in State Forest 65 – South. This plant community was also mapped in State Forest 65 – North and was recorded in several low-lying areas. Other common species included *Nuytsia floribunda* and *Persoonia comata.*

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides, Eremaea pauciflora, Leucopogon polymorphus, Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

Plant community W16 was common throughout State Forest 65 (North and South) and the Gingin Stock Route Reserve. A total of 94 plant taxa were recorded within this

community in State Forest 65 – South, with it covering an extensive area in the northern section of the route alignment. Other common species included *Allocasuarina fraseriana*, *Eremaea asterocarpa*, *Xanthorrhoea preissii*, and *Calytrix flavescens*.

W21: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia grandis* over *Hibbertia hypericoides*, *Xanthorrhoea preissii*, *Conospermum canaliculatum* and *Stirlingia latifolia* on yellow sand over limestone.

Woodland W21 occurs where limestone, normally at depth within the Karrakatta complex, comes closer to the surface, with very occasional surface outcropping present. Species diversity was relatively high, with 72 plant taxa recorded. Other common species present were *Acacia lasiocarpa*, *Petrophile macrostachya* and *Jacksonia hakeoides*.

Heaths

H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessilis*, *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* and, *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

Community H1 was recorded in both State Forest 65 – South and State Forest 65 – North and occurs where soils become very shallow with much limestone at the surface. The blocks covered by this community in State Forest 65 – South had been recently burnt, with a resulting low diversity and high weed cover. Only 27 plant taxa were recorded.

4.2.3 *P. cinnamomi* Distribution

No evidence of the presence of *P. cinnamomi* was recorded in State Forest 65 – South along the proposed transmission line routes during this study and therefore no samples were collected. A large proportion of the area was either uninterpretable due to a lack of indicator species (pine plantation), or difficult to interpret accurately due to fires in recent years. The burnt areas were still interpretable as the tree layer was relatively intact. Figures 1a and 2a present the results of the survey.

The remnant vegetation within the survey area was composed mainly of *Banksia* woodland communities, however limestone substrates were observed regularly and the major management roads within the area were constructed of limestone. This indicates that the area is probably less vulnerable to the invasion and proliferation of *P. cinnamomi*.

4.2.4 Hygiene

A hygiene plan should be prepared prior to construction activities in this area. The presence of limestone based access roads and limestone influenced soils greatly reduces the risk of *P. cinnamomi* establishing in the area as the result of an accidental introduction, however hygiene measures to protect the susceptible vegetation present should be employed.

4.3 State Forest 65 – North

State Forest 65 – North is located north of the Moore River, inland from Seabird. There are currently two proposed alternatives for the Western Route Option within this area, the eastern corridor and the western corridor, both of which were surveyed in detail. The eastern corridor follows Pickpocket Road and McCormicks Road for the majority of its length, while the western corridor is located between 300 and 900m east of Brockway Road, which is the western boundary of the State Forest. Both corridors total approximately 32.5km in length, with the eastern corridor the longer of the two. State Forest 65 – North is surrounded by grazing land and pivot irrigation agricultural systems, with some housing to the west of the western boundary.

State Forest 65 - North is located within the Spearwood Dune geomorphological system as defined by McArthur and Bettenay (1960). A subdivision of these geomorphological systems into units by Churchward and McArthur (1980) places the study area within both the Cottesloe and Karrakatta geomorphological units. The Cottesloe unit, covering the south-western half of the forest is defined as a low hilly landscape with shallow sands over much exposed limestone. The Karrakatta unit, covering the eastern section of the State Forest, is described as an undulating landscape of deep yellow sands over limestone.

In State Forest 65 – North the boundaries of the Heddle *et al.* (1980) vegetation complexes correspond with the geomorphological units mapped by Churchward and McArthur (1980). Vegetation of the south-western section of the State Forest was mapped as Cottesloe Complex – North. Closed heaths on limestone outcroppings, with a mixture of banksia woodlands and low forests on deeper sands, dominate this complex. Common species associated with the limestone outcrops include *Melaleuca huegelii*, *Trymalium ledifolium*, *Grevillea preissii*, *Jacksonia hakeoides* and *Conospermum canaliculatum* (Havel 1968).

Vegetation of the eastern section of the State Forest was mapped as Karrakatta Complex – North. This complex is predominantly a low open forest and low woodland of banksia – *Eucalyptus todtiana*, with minor occurrences of *Eucalyptus gomphocephala* (tuart). The common banksia species are *Banksia attenuata* and *Banksia menziesii*, with *Banksia ilicifolia* on the lower slopes. Common shrub species in this complex, as listed by Havel (1968), include *Conospermum triplinervium*, *Hakea trifurcata*, *Mesomelaena stygia*, *Eremaea pauciflora* and *Stirlingia latifolia*.

Flora, vegetation and *P. cinnamomi* presence within State Forest 65 - North was surveyed in September 2000. Overall, the vegetation within the area was in good condition, the only exception being recently burnt areas which had high weed invasion. This was particularly evident in burnt limestone heath areas.

4.3.1 Flora

A total of 231 vascular plant taxa belonging to 54 families were recorded in State Forest 65 - North in September 2000 (Appendix A3). The spring timing of this survey allowed for many annual species to be recorded, with high overall species richness due to the wide variety of soil types and habitats encountered. Twenty-two of the taxa recorded were weed species, which had invaded along tracks and into burnt areas from surrounding cleared land. The most common plant families recorded were Proteaceae, Myrtaceae, Papilionaceae and Cyperaceae.

One Declared Rare flora species, *Anigozanthos humilis* subsp. *chrysanthus*, was recorded on the McCormicks Road section of the eastern corridor (Figure 2). Three plants of this species were recorded on the flagged centreline.

One Priority 4 species, *Georgeantha hexandra* ms, was recorded on the western corridor. Approximately 5 plants were located along an un-named track near the northern end of this option (Figure 3). This is a significant range extension for this taxon, which has not previously been recorded south of Jurien.

4.3.2 Vegetation

A total of twelve plant communities were described and mapped along both options within State Forest 65 - North. These consisted of woodlands, shrublands and heaths, which are described below and illustrated in Figures 2 and 3. Overall, the vegetation along the routes surveyed was in very good condition, with weed invasion concentrated along tracks and pasture edges. Some areas also had high weed cover as they had been recently burnt.

Woodlands

W6: Open Low Woodland of *Banksia menziesii* and *Banksia attenuata* over a tall shrub layer dominated by *Adenanthos cygnorum* over *Hibbertia hypericoides* and *Eremaea pauciflora* on grey sand.

A total of 91 vascular plant species were recorded in plant community W6, which was recorded at the southern end of the two corridors. Other common species included *Stirlingia latifolia*, *Acacia pulchella* var. *glaberrima* and *Gompholobium tomentosum*.

W11: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed shrubs dominated by *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Eremaea pauciflora*, *Stirlingia latifolia* and *Mesomelaena pseudostygia* on yellow sand.

Plant community W11 was mapped along the eastern corridor, with a large proportion of its area burnt within the last 3 years. Fifty-one plant taxa were recorded in this community which was similar in composition to W16. It was mapped as a separate unit as the recent fire had changed the abundance of many of the dominant species.

W12: Low Woodland of *Eucalyptus todtiana, Banksia attenuata* and *Banksia grandis* over *Jacksonia sternbergiana, Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

Forty-three plant taxa were recorded in plant community W12 during this survey. This community was mapped on the western corridor at only one location. It differed from surrounding woodlands in the dominance of tall shrubs such as *Jacksonia sternbergiana* and *Hakea prostrata.*

W13: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia sternbergiana, Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

Plant community W13 was also only recorded along one section of the western corridor. It differed from W12 in the absence of *Eucalyptus todtiana* and *Banksia grandis* in the tree layer, and the absence of *Eremaea pauciflora* in the shrub layer. A total of 58 plant species were recorded.

W14: Low Woodland of *Banksia attenuata, Banksia menziesii* and *Eucalyptus todtiana* over *Xanthorrhoea preissii, Calytrix ?fraseri, Thryptomene prolifera* and *Stirlingia latifolia* on yellow sand in low-lying areas.

Plant community W14 was recorded in low-lying areas along the eastern corridor. The density of *Calytrix ?fraseri* varied between sites, with higher cover recorded in disturbed areas, such as the edges of tracks. One hundred and one plant taxa were recorded in this community. Other common species included *Eremaea pauciflora, Mesomelaena pseudostygia* and *Schoenus brevisetis.*

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides, Eremaea pauciflora, Leucopogon polymorphus, Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

Plant community W16 was the second most common community mapped along the eastern corridor, and was also recorded in several other areas. It was characterised by a very low, diverse shrub layer, with 95 plant taxa recorded. Other common species included *Hibbertia subvaginata, Xanthorrhoea preissii* and *Stirlingia latifolia,* with the dominant species varying depending on fire history.

W17: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Hibbertia hypericoides, Hakea costata, Hakea trifurcata* and *Mesomelaena pseudostygia* on yellow sand.

Plant community W17 was recorded along the western corridor, and although no limestone was visible at the surface, the species composition indicated limestone was closer to the surface than in the previously described woodland communities. A total of 68 vascular plant taxa were recorded, with other common species including *Stirlingia*

latifolia, *Eremaea pauciflora*, *Jacksonia hakeoides*, *Leucopogon polymorphus* and *Conospermum canaliculatum*.

W20: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia hakeoides*, *Melaleuca systena*, *Acacia lasiocarpa*, *Calothamnus quadrifidus* and *Conospermum canaliculatum* on yellow sand with occasional limestone outcropping.

Woodland W20 was recorded along both corridors in areas where soils were shallow. Species richness was very high, with 108 taxa recorded. Much of the area mapped on the eastern corridor had been burnt in the past three to four years. The amount of surface limestone varied between sites, although some was always present.

Shrublands

S1: Shrubland of *Melaleuca systena* and *Melaleuca huegelii* subsp. *huegelii* on limestone ridges.

Shrubland S1 was only recorded in two locations along the western corridor. It occurred on the highest points in the landscape, where the limestone outcropping was very heavy. A high proportion of bare ground was present which annual weed species and native herbs had invaded. Fifty-nine plant taxa were recorded.

S2: Shrubland of *Dryandra sessilis*, *Melaleuca systena*, *Baeckea ?robusta* and *Diplolaena angustifolia* on yellow sand with limestone outcropping.

Plant community S2 was recorded immediately downslope of S1 and was also characterised by heavy limestone outcropping. The cover of annual species was not as high as in plant community S1. A total of 38 taxa were recorded, many of which were unique to this community.

Heaths

H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessilis*, *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* and *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

Plant community H1 was the most common heath mapped along both corridors. Its condition and species composition varied markedly due to fire history. A total of 78 plant species were recorded, with other common species including *Desmocladus* spp., *Conostylis candicans*, *Hakea trifurcata*, *Banksia leptophylla* and *Acacia lasiocarpa*.

H2: Dense Heath dominated by *Jacksonia hakeoides* on yellow sand.

Plant community H2 was recorded on the western corridor. Plant density and cover was much higher than H1, with lower species richness (51 taxa). No limestone was visible at the surface. Other common species included *Acacia sessilis*, *Melaleuca systena*, *Conospermum canaliculatum*, *Hibbertia hypericoides* and *Xanthorrhoea preissii*.

4.3.3 *P. cinnamomi* Distribution

No symptoms of *P. cinnamomi* infestation were observed along the proposed transmission line routes in State Forest 65 - North. Diseased vegetation was identified however at two locations away from the proposed routes, indicating a history of introduction and the presence of suitable conditions for the establishment and proliferation of the pathogen. The most significant infestation located was situated at the south-eastern end of McCormick's Road in a shallow swale/drainage line that feeds into the Moore River system on Karrakatta soils.

Sampling conditions were almost ideal during the assessment as surface soils were moist and ambient temperatures were moderate. Seven samples of vegetation and/or soil were collected from recently dead or dying plants or soil in areas containing dead or dying vegetation. Sample results are presented in Table 2.

Table 2: Sample Analysis Results

Sample Number	Sample Type	Species Sampled	Result
SF1	Soil and root collar	*Banksia menziesii.*	No *Phytophthora*
SF2	Soil		No *Phytophthora*
SF3	Soil and root collar	*Banksia attenuata*	No *Phytophthora*
SF4	Soil and root collar	*Banksia attenuata*	No *Phytophthora*
SF5	Soil		No *Phytophthora*
SF6	Soil and root collar	*Banksia attenuata*	No *Phytophthora*
SF7	Soil		No *Phytophthora*

The locations of sample collections are shown on Figures 2a and 3a.

The western corridor option shown on the Figures traverses areas of limestone influence and outcrops. Whereas these areas are generally accepted as being non vulnerable to *P. cinnamomi*, and the small patches of outcrop often contained few recognised indicator species, the areas were interpreted with care as the potential for local perching of water was recognised and *P. cinnamomi* was known from the area.

4.3.4 Hygiene

State Forest 65 - North contains many existing access tracks created for the management of the vegetation. The eastern corridor option follows two of these tracks closely, one of which passes through an infestation of *P. cinnamomi* to the east of the proposed route. The interpretation identified that the vegetation along this corridor option was uninfested and of good quality, and furthermore is separated from the infestation to the east by a dune and considerable distance of track that appeared to be rarely travelled. This option

should be managed as a protectable unit in the preparation of any subsequent hygiene plans for construction and operation of the transmission line.

The vegetation of the western corridor option was interpreted as uninfested, however this option contains no pre-existing access tracks. Should this option be pursued hygiene management should focus on the traditional road construction topics of soil movement and importation of materials. This route option should be managed as a protectable unit in the preparation of any subsequent hygiene plans for construction and operation of the transmission line.

4.4 Other Remnant Vegetation and Vacant Crown Land

Along the Western Option there are several areas of remnant vegetation on private property. These vary in size and quality and all were surveyed during this project. Other large areas of native vegetation are also present in the northern section of the proposed route alignment. These areas consist of private property and Vacant Crown Land (VCL), the majority of which is covered by the Tiwest Joint Venture Cooljarloo mining lease. Another area of VCL is located south of private property, bordering the Department of Defence Lancelin Training Area. These areas are located along the entire route option and are discussed in detail below. The plant species recorded within the plant communities mapped are listed in Appendix A4.

4.4.1 Remnants on Private Property between the Gingin Stock Route Reserve and State Forest 65 - North

The Western Option passes through several small areas mapped as remnant vegetation by Agriculture WA, between the northern end of the Gingin Stock Route Reserve and the southern end of State Forest 65 - North. These areas were surveyed in spring 2000, with the vegetation mapped on Figure 2. At the northern end of the Reserve the transmission line route passes close to Chitna Road, through an old borrow area (D2). Some attempt has been made to rehabilitate this borrow pit but only some trees seedlings have survived. The route then passes into an area mapped as S4, a tall shrubland dominated by *Hakea trifucata*. This area was in very poor condition, with a high weed cover and only 12 native species recorded. The route then passed back into plant community W6, as mapped within the Gingin Stock Route Reserve. The southern several hundred metres of this remnant was in good condition, but degenerated closer to Gingin Brook Road. The remaining area south of the road was mapped as W6d, defined as areas originally community W6 but disturbed by clearing, grazing or burning and in very poor condition.

North of Chitna Road was a mosaic of completely cleared areas and mapping unit W6d, until the proposed route crosses the Moore River. Two options are being considered by Western Power in this area. Both initially cross the river west of Junction Bridge. The westerly option heads directly north from this point, while the easterly option heads east, re-crosses the river and then runs north on the eastern bank, before again crossing onto the western bank and heading towards State Forest 65 - North. All areas along the river were mapped for both options. Vegetation along the Moore River was mapped as F4, a Dense Forest of *Eucalyptus rudis*, *Melaleuca rhaphiophylla* and *Banksia prionotes* over weed species. The vegetation was in very poor condition as it is unfenced and actively

grazed by cattle. Very few understorey species were present, with a total of only six native species recorded in this community.

Between the Moore River and State Forest 65 - North, the route passes through areas mapped as remnant vegetation from aerial photography. Site inspections found these to be areas of remnant trees, such as *Corymbia calophylla*, *Banksia* spp. and *Nuytsia floribunda*, over pasture. The understorey layer had been completely removed.

4.4.2 Remnants on Private Property between State Forest 65 - North and Sappers Road

Only one very small remnant was located on this stretch of the proposed route (Figure 3). This remnant was unfenced and had been historically grazed. It was mapped as D3, defined as *Banksia* Woodlands in which the understorey has been modified to the extent that they cannot be adequately described. This remnant was dominated by *Banksia attenuata* and *Banksia menziesii*, with occasional *Eucalyptus todtiana*, *Nuytsia floribunda* and *Corymbia calophylla*. Remaining understorey species included *Mesomelaena pseudostygia*, *Hibbertia hypericoides*, *Hakea prostrata*, *Alexgeorgea nitens*, *Desmocladus fasciculatus*, *Macrozamia riedlei* and *Xanthorrhoea preissii*.

It should be noted that the entire length of the Garbanup Road reserve is vegetated, which is not shown on the Agriculture WA remnant vegetation maps. The proposed alignment does not impact on this vegetation as the transmission line will be located entirely on cleared private property on the eastern side of the road reserve.

4.4.3 Remnants on Private Property between Sappers Road and Dingo Road

The largest, most significant remnant on private property is located immediately north of Sappers Road. The vegetation on this and adjacent properties is mapped on Figure 4. Two plant communities were mapped along this 3.8km section of vegetation on the property as well as the Sappers Road reserve. None of the vascular plant species recorded were Rare, Priority or other species of interest.

W18: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over low shrubs dominated by *Eremaea pauciflora*, *Stirlingia latifolia*, *Xanthorrhoea preissii* and *Conospermum canaliculatum* on yellow sand.

This was the dominant plant community mapped in this remnant, with a total of 88 vascular plant taxa recorded. The vegetation in this community was in very good condition, with only a few weed species recorded along the edge of an existing track inside the property boundary. Fire history within the property varied, which has resulted in slight changes in vegetation composition, with *Hibbertia hypericoides* more abundant in more recently burnt areas.

W19: Open Low Woodland of *Banksia ilicifolia* over low shrubs dominated by *Xanthorrhoea preissii* on yellow sand in low-lying areas.

This plant community was mapped in a low-lying area near the southern boundary of the remnant. It was also in very good condition, although the open nature of the understorey

layer has allowed weeds to invade further from the track edge. A total of 32 plant taxa were recorded, with common species including *Schoenus brevisetis*, *Acacia pulchella* var. *glaberrima* and *Conospermum canaliculatum* subsp. *canaliculatum*.

Vegetation on the property adjacent to this remnant (on the eastern side) was also mapped, to provide Western Power with information in the event of a change in route alignment. The vegetation on this property was also mapped as W18, with the exception of a small section mapped as W18d, which had been cleared in the past. The vegetation on this property continued further than shown on Figure 4 but could not be mapped due to lack of access.

A small remnant further north was also surveyed and mapped (Figure 4), with the plant community recorded as W16, a community present in several other areas. The vegetation within this area was in good condition, although weeds have invaded the edges. A total of 62 plant taxa were recorded during the survey of this remnant.

4.4.4 Remnants on Private Property between Dingo Road and Mimegarra Road

Extensive areas between these two roads have been mapped as remnant vegetation by various sources. A field inspection of the route alignment in these areas found the majority to be a dense *Banksia* Woodland over a very disturbed understorey, too modified by fire, clearing or grazing to be described and mapped (Figures 4 and 5). The only area of vegetation in moderate condition was a very small area of Shrubland mapped immediately south of Dingo Road. This area was mapped at S1/H1.

S1/H1: Shrubland of *Hakea trifurcata*, *Melaleuca systena*, *Dryandra sessilis*, *Calothamnus quadrifidus* and *Melaleuca huegelii* subsp. *huegelii* on yellow sand with limestone outcropping.

This plant community was only mapped in one small pocket on the south side of Dingo Road. It was in fair condition, with some weed invasion from the road and adjoining grazing properties. It was named S1/H1 as it contained many of the dominants from both of these previously described plant communities. Thirty-three plant taxa were recorded from this community during the survey.

All of the areas north of Dingo Road were in very poor condition, with the understorey layer varying between scattered shrubs and weeds and no native shrubs. None of the remnants were fully fenced from adjacent grazing land and as such had been disturbed over a period of time. Appendix A4 lists the shrub species recorded in all areas mapped as D3.

4.4.5 Remnants on Private Property and Vacant Crown Land between the Tiwest Joint Venture Lease and Properties adjacent to Mimegarra Road

This section of the proposed route alignment consists of a 6.7km long section of VCL adjacent to the Department of Defence Lancelin Training Area, as well as some scattered remnants on private property. The plant communities recorded in these areas are mapped on Figure 5. Overall, the majority of vegetation within the VCL was in very good

condition, with the condition of remnants on private property varying between moderate and poor.

No Declared Rare flora species were recorded during the survey in November 2000. Three Priority flora taxa were recorded. These were the Priority 3 species *Comesperma acerosum* and *Platysace ramosissima*, and the Priority 4 species *Conostephium minus*. *Comesperma acerosum* and *Platysace ramosissima* have both been recorded from several locations within the adjoining Department of Defence Lancelin Training Area (ecologia 2000). Another species, *Thysanotus multiflorus* was recorded on the Carpenter property, north of the VCL. This represents a small range extension for this species, which has not previously been recorded as far north. The location of these four species is shown on Figure 5.

All remnants on private property in this section were mapped as disturbed communities. The plant communities mapped within the VCL are described below.

Forests

F5: Low Forest of *Eucalyptus decipiens*, *Melaleuca preissiana* and *Banksia* spp. over tall shrubs on grey sand.

Plant community F5 was mapped along three low-lying areas within the VCL. It was generally only present in a narrow band, with the *Eucalyptus decipiens* dominant on the outside edges. The diversity of these areas was low, with a total of 33 plant taxa recorded. The shrub layer was dominated by *Kunzea ericifolia* and *Adenanthos cygnorum*.

F6: Dense Low Forest of *Eucalyptus rudis*, *Melaleuca preissiana*, *Melaleuca rhaphiophylla* and *Banksia prionotes* on brown sand.

Dense Low Forest F6 was only recorded at one location within the VCL and was in a poor condition when compared to other plant communities within the area. Only 19 plant taxa were recorded, six of which were weed species. Very few shrub species were recorded, with the understorey layer dominated by herbs.

Woodlands

W5: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed low shrubs dominated by *Eremaea pauciflora* on grey sand.

Plant community W5 was the dominant community mapped within the VCL, and was also mapped within the Moore River National Park. It is a very uniform community both in species composition and height, with a total of 68 plant taxa recorded during this survey.

W5b: Low Woodland of similar understorey species composition to W5, but dominated by *Banksia prionotes*. These areas appeared to have been disturbed.

Woodland W5b was recorded along a property boundary near the southern end of the VCL. It appeared to have been disturbed as the shrub layer was very open and species richness was low (30 taxa recorded). The shrub layer in areas mapped as W5b was dominated by *Kunzea ericifolia*, which is often recorded at high density in disturbed areas.

Shrublands

S5: Dense Shrubland of *Leptospermum erubescens*, *Calothamnus sanguineus* and *Banksia telmatiaea*, with occasional emergent *Banksia littoralis* and *Melaleuca rhaphiophylla*, on grey sandy-loam.

Plant community S5 was recorded in a narrow band at one location near the northern boundary of the VCL. The shrub layer in this community was very dense, except in areas where some surface water was present. Twenty vascular plant species were recorded in this community during the field-work in November 2000.

Heaths

H4: Dense Heath of mixed low shrubs on grey sandy-clay.

The community mapped as H4 was the most diverse community recorded in the VCL, with 80 plant taxa recorded in a relatively small area. It bordered Shrubland S5 on both sides and was dominated by proteaceous and myrtaceous shrubs over sedges such as *Mesomelaena pseudostygia*.

H5: Low Heath dominated by *Xanthorrhoea preissii* and *Melaleuca ?trichophylla* on grey sand.

Plant community H5 was only present in one small area, with a resulting low number of species recorded (33). Other common understorey species included *Alexgeorgea nitens*, *Dasypogon obliquifolius*, *Caustis dioica* and *Dryandra lindleyana*.

4.4.6 The Tiwest Joint Venture Lease

Flora, vegetation and *Phytophthora cinnamomi* distribution within the Tiwest Joint Venture lease area has been extensively surveyed by various consultants for Tiwest. This information has been provided to Western Power and is given in Figure 5. The flora and vegetation on the lease was surveyed by Mattiske Consulting Pty Ltd (1997). Since this survey, extensive areas at the northern end of the proposed transmission line have been cleared for mining. Surveys by Mattiske Consulting Pty Ltd (1997, 1998) and Landcare Services Pty Ltd (1998) recorded one Declared Rare Flora taxon, *Anigozanthos viridis* subsp. *terraspectans*, and one Priority 4 species, *Conostephium minus*, within the vicinity of the proposed transmission line route. Two populations of *Anigozanthos viridis* subsp. *terraspectans* are located to the east and west of the proposed transmission line. These populations have been fenced by Tiwest Joint Venture and will not be disturbed by construction and maintenance of the transmission line. *Conostephium minus* was

recorded at four locations within the vicinity of the route alignment. Plants are only likely to be disturbed at one of these locations.

A total of seven plant communities were described and mapped along the proposed route (Mattiske Consulting Pty Ltd 1997). These are described below.

Woodlands

1a.1: Open Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow-brown sand.

and

1a.2: Woodland of *Banksia prionotes* and *Eucalyptus todtiana* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow sand.

These plant communities were mapped at several locations along the route and are widespread throughout the Tiwest lease areas. Plant community 1a.1 is dominant in dune areas, with plant community 1a.2 only recorded on dune crests.

1b: Woodland of *Eucalyptus todtiana, Banksia menziesii* and *Banksia attenuata* over mixed Proteaceous and Myrtaceous shrubs on lower slopes on grey sand.

Plant community 1b was the dominant community mapped by Mattiske Consulting (1997) in the Tiwest Joint Venture southern lease area. It is present at several locations along the proposed transmission line, with dominant understorey species including *Adenanthos cygnorum* and *Eremaea pauciflora*. This community was also mapped to the north of the Cataby sub-station (Mattiske Consulting Pty Ltd 1996).

1e: Woodland of *Banksia attenuata, Banksia menziesii* and *Nuytsia floribunda* over *Banksia telmatiaea, Beaufortia squarrosa* and *Adenanthos cygnorum* on lower slopes on grey-brown sand.

Plant community 1e was mapped in a very small section at the southern end of the proposed route. This community is similar to 1a.1 but is lower in the landscape and therefore dominated by species common to damper soils. It is well represented locally in the north-western section of the Tiwest lease area (Mattiske Consulting Pty Ltd 1997).

1f: Woodland of *Melaleuca preissiana, Banksia attenuata, Banksia menziesii* and *Eucalyptus todtiana* over *Adenanthos cygnorum, Eremaea pauciflora and Calytrix fraseri* over *Dasypogon obliquifolius*, on mid to lower slopes on grey-brown sand.

This community was mapped in the northern section of the proposed route alignment. It is similar in composition to 1b, but its position lower in the landscape is reflected by the presence of species such as *Melaleuca preissiana* which preferentially grow in damper soils.

Heaths on sand

3a: Heath of occasional *Nuytsia floribunda, Banksia* spp. and *Eucalyptus todtiana* over *Beaufortia elegans, Petrophile macrostachya* and *Allocasuarina* spp. on grey sand.

Plant community 3a was the most widespread community mapped along the proposed transmission line, and was common throughout the Tiwest lease area (Mattiske Consulting Pty Ltd 1997). Other common understorey species present within this community were *Hakea costata* and *Mesomelaena pseudostygia.*

3k: Low heath dominated by *Banksia telmatiaea,* with occasional *emergent Nuytsia floribunda* and *Eucalyptus todtiana,* on brown sandy-loam.

This plant community was mapped in a very small area at the southern boundary of the Tiwest lease and is the preferred habitat of the Declared Rare flora taxon *Anigozanthos viridis* subsp. *terraspectans.*

4.4.7 Distribution of *P. cinnamomi*

The majority of the areas surveyed on private property or VCL were found to be free of disease, with only two samples collected during the field survey. The result of analysis of these is given in Table 3.

Table 3: Sample Analysis Results

Sample Number	Sample Type	Species Sampled	Result
R1	Soil and root	*Banksia prionotes*	*Phytophthora cinnamomi*
R2	Soil and root	*Banksia prionotes*	No *Phytophthora*

Sample R1 was taken from a dead tree beside the Moore River and sample R2 was taken from the remnant vegetation north of Sappers Road.

The Moore River and its fringing soils should be regarded as infested due to the recovery of *P. cinnamomi* from its verge at R1, and also because of the infestations located within its catchment at Yeal Swamp Nature Reserve. Some sections were mapped as uninterpretable due to severe disturbance associated with agriculture. Any hygiene plan developed for construction of the proposed transmission line should address the quality of the remnant vegetation patches and the status of adjacent properties with respect to tenure, vegetation condition and disease status.

The Tiwest Joint Venture Lease area is uninfested and has been classified as a "Protectable Area" under the revised CALM Policy Statement Number 3 (Department of Conservation and Land Management 1999b). The entire lease has been fenced and hygiene measures are employed to prevent the introduction of *P. cinnamomi.* Western Power will be required to conduct all construction and maintenance operations within the Tiwest lease in accordance with the site hygiene procedures (Tiwest Joint Venture 2000).

4.5 Yeal Swamp Nature Reserve

The Central and Eastern Options pass through a 13.4km section of the Yeal Swamp Nature Reserve. The new transmission line would be positioned on the eastern side of

the existing pylons. The reserve is located on the eastern side of the Wanneroo-Lancelin Road inland from Two Rocks. It borders State Forest 65 – South on its western side.

Yeal Swamp Nature Reserve is located within the Bassendean unit of the Bassendean geomorphological system as defined by McArthur and Bettenay (1960) and Churchward and McArthur (1980). This unit is defined as sand plains with low dunes and occasional swamps on predominantly grey sands. It also contains small pockets of complex dunes.

Vegetation of the southern half of Yeal Swamp Nature Reserve was mapped as Karrakatta Complex – North by Heddle *et al.* (1980). This complex is predominantly a low open forest and low woodland of banksia – *Eucalyptus todtiana*, with minor occurrences of *Eucalyptus gomphocephala* (tuart). The common banksia species are *Banksia attenuata* and *Banksia menziesii*, with *Banksia ilicifolia* on the lower slopes. Common shrub species in this complex, as listed by Havel (1968), include *Conospermum triplinervium*, *Hakea trifurcata*, *Mesomelaena stygia*, *Eremaea pauciflora* and *Stirlingia latifolia*.

Vegetation of the northern half of the reserve has been mapped as Bassendean Complex – North. This complex consists of a range of vegetation from low forests and woodlands of banksia – *Eucalyptus todtiana*, to low woodlands of *Melaleuca preissiana* and sedgelands on moister sites.

Flora, vegetation and *P. cinnamomi* presence within Yeal Swamp Nature Reserve was surveyed in late September 2000. Overall, the vegetation within the reserve south of the Gingin Wanneroo Branch Drain in very good condition. North of the drain there was evidence of plant disease, with many dead trees present. Weed species were also more abundant along the drain. The majority of the reserve did not appear to have been burnt within the last 10 years.

4.5.1 Flora

A total of 155 vascular plant taxa belonging to 40 families were recorded on the Yeal Swamp Nature Reserve section of the proposed transmission line (Appendix A5). Nine of these were weed species. The most common plant families recorded were Myrtaceae, Papilionaceae and Proteaceae.

No Declared Rare flora species were recorded during the survey. One Priority 4 species, *Stachystemon axillaris*, was recorded approximately 6.5km north of the southern reserve boundary. Only 1 plant was noted during the survey. *Schoenus* affin. *laevigatus* was also recorded. If the identification could be confirmed when this species was flowering it would represent a significant range extension for this taxon, which is common to the far south of the state, with only one previous recording from the Perth metropolitan area. The locations of all restricted and unusual flora species are shown on Figure 6.

4.5.2 Vegetation

A total of eight plant communities and one disturbance community were described and mapped along the existing transmission line in the Nature Reserve. These consisted of forests, woodlands and shrublands, the locations of which are illustrated in Figure 6. Many of the plant communities mapped were not recorded in other areas of vegetation along the proposed route alignment. This was due to the influence of the grey Bassendean sands.

Overall, the vegetation south of the drain was in very good condition. The Gingin Wanneroo Branch Drain was in a generally poor condition due to weed invasion and the impact of *Phytophthora cinnamomi* (dieback). A significant area on the north side of the drain was infested with dieback, with the area mapped as D1 so heavily impacted as to be impossible to map as a plant community.

Forests

F1: Dense Forest of *Eucalyptus rudis*, *Melaleuca* spp., and *Corymbia calophylla* over *Kunzea ericifolia* and mixed herbs and sedges on brown sandy-loam.

Plant community F1 was mapped along the banks of the Gingin Wanneroo Branch Drain, in a very narrow strip. The vegetation was in only moderate condition due to heavy weed infestation. The drain flows into the Nature Reserve from pasture areas, a source of weed seeds, which catch and germinate along the banks. Only 30 plant species were recorded in this community.

F3: Low Forest of *Banksia* spp. and *Melaleuca preissiana over Hibbertia subvaginata*, *Melaleuca* sp., *Beaufortia elegans* and *Calytrix angulata* on grey sand in low-lying areas.

This vegetation type was recorded in several narrow bands along the existing transmission line, bordering swamps and drainage lines. A total of 48 plant species were recorded in this community, dominated by myrtaceous and proteaceous species over sedges.

Woodlands

W2: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* over a very low shrub layer dominated by *Melaleuca* sp., *Stirlingia latifolia* and *Thryptomene prolifera* on grey sand.

This low *Banksia* woodland community was predominantly recorded in the southern section of the reserve, part of which had been recently burnt. A total of 82 vascular plant taxa were recorded within W2 during this survey, with other common species including *Schoenus brevisetis*, *Conostylis* spp., and *Conospermum* spp.

W3: Low Woodland of *Banksia attenuata, Banksia menziesii* and *Banksia ilicifolia* over *Eremaea pauciflora, Xanthorrhoea preissii, Phlebocarya ciliata* and *Verticordia nitens* on grey sand.

Plant community W3 was scattered along the entire length of the existing transmission line, although the widest sections were mapped at the southern end of the reserve. It was similar to W2 but contained a higher cover of moist soil indicators such *as Banksia ilicifolia* and *Xanthorrhoea preissii* (Heddle 1980). Ninety-four plant taxa were recorded in this community.

W4: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over shrubs dominated by *Eremaea pauciflora* and *Beaufortia elegans* on grey sand.

Plant community W4 was the dominant woodland mapped in the northern section of the reserve. It had a relatively low species richness (41) compared to the other woodland communities due to the high density of the shrub layer.

W7: Low Woodland of *Banksia attenuata, Melaleuca preissiana* and *Banksia menziesii* over *Xanthorrhoea preissii, Hypocalymma angustifolium, Adenanthos cygnorum* and *Verticordia nitens* on grey sand in low-lying areas.

Plant community W7 was mapped in three narrow bands in very shallow depressions and was characterised by the presence of moist soil indicator species such *as Melaleuca preissiana* and *Hypocalymma angustifolium.* Forty-four plant species were recorded in this community.

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides, Eremaea pauciflora, Leucopogon polymorphus, Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

Plant community W16 has been mapped in many of the areas surveyed for the proposed route alignment and was recorded in two small areas in the Nature Reserve. A detailed species list for this community within the reserve was not produced, as extensive searching found it to contain no species which had not been previously recorded for W16 in other areas.

Shrublands

S3: Shrubland of *Regelia ciliata* and *Pericalymma spongiocaule*, with occasional emergent *Melaleuca preissiana* and *Banksia littoralis*, on grey sand.

One area of S3 was mapped in a wet depression near the northern boundary of the reserve. The shrub layer was very dense, resulting in a low species richness (22 species recorded). Other species recorded included *Schoenus* affin. *laevigatus, Xanthorrhoea preissii, Euchilopsis linearis* and *Hypocalymma angustifolium.*

4.5.3 *P. cinnamomi* Distribution

A single large infestation of *P. cinnamomi* was identified during interpretation of the proposed transmission line corridor through the Yeal Swamp Nature Reserve. This was located adjacent to the Yeal Lake and Gingin Wanneroo Branch Drain. This infestation appeared to have been present for many years and it was not clear whether it was introduced from the drainage system or from the construction of the existing transmission line. The infestation had caused a very high impact on the vegetation, removing all *Banksia* species, and radically modifying the remaining understorey vegetation. A brief inspection of other areas associated with the drainage system downstream of the transmission line indicated that infestations were well established and widespread in association with the water flows. Infestations had also spread upslope from the drainage lines and had been transported by vehicles and machinery where tracks crossed the drainage lines.

Sampling conditions were almost ideal during the assessment as surface soils were moist and ambient temperatures were moderate. Seven samples of vegetation and/or soil were collected from suspect individuals or areas containing dead or dying vegetation. Sample results are presented in Table 4.

Table 4: Sample Analysis Results

Sample Number	Sample Type	Species Sampled	Result
Y1	Soil		No *Phytophthora*
Y2	Soil		*Phytophthora cinnamomi*
Y3	Soil and root collar	*Xanthorrhoea preissii*	*Phytophthora cinnamomi*
Y4	Soil		No *Phytophthora*
Y5	Soil		No *Phytophthora*
Y6	Soil, root collar and roots	*Banksia attenuata*	*Phytophthora cinnamomi*
Y7	Soil and root collar	*Banksia attenuata*	*Phytophthora cinnamomi*

The locations of sample collections, as well as the distribution of *P. cinnamomi* infested areas, are shown on Figure 6a.

Samples numbers Y1, Y4 and Y5 were all control samples collected from either healthy vegetation away from the disease boundary, or from healthy vegetation located in pockets within the infested area. The high recovery of *P. cinnamomi* from samples indicates that inoculum levels within the infested area are high and the risk of moving the pathogen during operations is also therefore high.

4.5.4 Hygiene

As with the other portions of the proposed transmission line, a hygiene plan would be required prior to construction through the Yeal Swamp Nature Reserve. The vast

majority of the vegetation of the Reserve appears healthy and uninfested, therefore a linear approach to hygiene would be required in order to adequately control the risk of spread of *P. cinnamomi* on vehicles and machinery to other areas within the Reserve.

4.6 Moore River National Park

The Central Option for the new transmission line passes through an 8.6km section of the Moore River National Park near the Brand Highway. The new transmission line would be constructed on the western side of the existing pylons.

The Moore River National Park is located within the Ridge Hill Shelf geomorphological system as defined by McArthur and Bettenay (1960). A subdivision of these geomorphological systems into units by Churchward and McArthur (1980) places the study area within the Coonambidgee geomorphological unit. This unit is a transition unit between the deep sands of the Bassendean dunes and the Regan Scarp area of the Dandaragan Plateau. It is gently sloping and dominated by light grey sand. The southern end of the proposed transmission line passes near the boundary of the Regan Scarp unit, dominated by yellow or grey sands with some gravel. At several points at the northern end of the National Park the transmission line passes on the edge of the Bassendean unit, a system of complex dunes and occasional swamps. Several soil and landform types therefore influence vegetation along the proposed transmission line.

The vegetation of the Swan Coastal Plain has been mapped at the complex level by Heddle *et al.* (1980). Vegetation of the Moore River National Park route option was predominantly mapped as Coonambidgee Complex consisting of vegetation ranging from a low open forest and low woodland of *Eucalyptus todtiana – Banksia attenuata – Banksia menziesii – Banksia ilicifolia*, to an open woodland of *Corymbia calophylla* – banksia on the moister soils. The transmission route also passes along the eastern edge of the Bassendean Complex – North, with the presence of low woodlands of *Melaleuca* spp. and sedgelands on moister sites. The Regan Complex influences vegetation on the southern edge of the National Park due to the presence of some gravel in the soil.

No detailed vegetation studies or management plans have been produced for the Moore River National Park, which is situated south of the Moore River, approximately 90km north of Perth. It is described in the System 6 report as containing a wide range of vegetation, with the most common, a low woodland of banksia, *Eucalyptus todtiana* and *Nuytsia floribunda* on pale grey sands (Department of Conservation and Environment 1980).

Flora, vegetation and *P. cinnamomi* presence within the Moore River National Park was surveyed in July 2000. Overall, the vegetation along the transmission line was in very good condition. No weed species were recorded, indicating a low level of use of the existing access track. Fire history along the route varied, with areas of very recent (1-2 years) and recent (<3 years) burns recorded. The majority of the route however, does not appear to have been burnt within the last 10 years.

4.6.1 Flora

A total of 139 vascular plant taxa belonging to 29 families were recorded on the Moore River National Park section of the proposed transmission line in July 2000 (Appendix A6). It is estimated that this is approximately 85% of the flora of the survey area. Further surveying in spring would increase the number of taxa as annual species, particularly orchids, daisies and grasses, would be recorded. Some of the collected species could also not be identified due to a lack of flowering material. None of the species recorded were weed species. The most common plant families recorded were Proteaceae and Myrtaceae.

No Declared Rare flora taxa were recorded during the survey. One plant of a Priority Three species *Stylidium nonscandens*, was recorded at one location. Approximately 5 plants of a possible Priority One species *Stylidium ?carlquistii*, were also recorded although the identification could not be confirmed due to a lack of flowering material.

Several other interesting flora species were recorded during the survey. A collection of a possible new subspecies of *Philotheca spicata* was made on the north side of Red Gully Creek. This was named *Philotheca spicata* subsp. Moore River Nat. Pk. for the purposes of this report and a specimen has been retained by the Western Australian Herbarium for further study. Another collection named as Cyperaceae/Liliaceae sp. could not be identified to a family level by staff at the Herbarium and it may therefore be a new species. However, a lack of flowering material prevented any further study of the collected specimen. *Leucopogon* sp. Moore River (M.Hislop 1695) was also recorded. This species has a restricted distribution and has not yet been fully described. A possible range extension was recorded for *Melaleuca ?subtrigona*. This taxon has not previously been recorded from the coastal plain, being common on the Dandaragan Plateau. It may be present in the survey area due to the influence of the Regan Scarp geomorphological unit. The locations of all restricted and unusual flora species are shown on Figure 7.

4.6.2 Vegetation

Five plant communities were recorded and mapped along the proposed transmission line within the Moore River National Park. These are described below, with the location of each shown in Figure 7.

Forests

F2: Dense Low Forest of *Melaleuca rhaphiophylla* and *Corymbia calophylla* over *Astartea* sp., *Hypocalymma angustifolium* and sedges on brown clay.

Plant community F2 was recorded along the banks of Red Gully Creek, which intersects the existing transmission line approximately 1km north of the southern boundary of the National Park. The creek was flowing at the time of survey. Diversity was low in this community due to both its narrow, linear nature as well as the very dense tall shrub layer.

Woodlands

W5: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed low shrubs dominated by *Eremaea pauciflora* on grey sand.

Plant community W5 was the most common woodland mapped along the transmission line. It occurred predominantly on mid to upper slope areas, interspersed with plant community W8 on the lower slope sections. It was also the most species rich community, with 101 plant taxa recorded. Common understorey species included *Lyginia barbata*, *Stirlingia latifolia*, *Andersonia heterophylla* and *Astroloma xerophyllum*.

W8: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii over Banksia laricina* and *Verticordia nitens* on grey-brown sand.

Plant community W8 was the dominant woodland community mapped on lower slope areas. Vegetation within this community was very dense and always dominated by *Banksia laricina* and *Verticordia nitens*. The low shrub and herb species recorded were generally present in low numbers due to the dense taller shrub layer, with epacrids and sedges most common.

W15: Low Woodland of *Banksia attenuata*, with occasional *Banksia menziesii* and *Eucalyptus todtiana*, over mixed tall shrubs dominated by *Petrophile recurva*, *Eremaea pauciflora* and *Adenanthos cygnorum* on yellow sand.

Plant community W15 was recorded in several narrow strips north of Red Gully Creek. It was characterised by the presence of bright yellow sand at the surface, an influence of the nearby Regan Scarp. This community was always dominated by *Petrophile recurva*, a species not recorded on the surrounding grey sands. Other common species were *Mesomelaena pseudostygia*, *Hibbertia acerosa*, *Hakea psilorrhyncha* and *Stirlingia latifolia*.

Heaths

H3: Dense Low Heath of *Pericalymma spongiocaule*, *Andersonia lehmanniana*, *Euchilopsis linearis* and *Xanthorrhoea preissii* on grey clay.

Plant community H3 was recorded in the swamp areas on clay in the northern section of the National Park. Occasional emergent trees were recorded, including *Melaleuca preissiana*, *Nuytsia floribunda* and *Banksia* spp. The understorey stratum was very dense, with surface water present in some areas. Other common species included *Dryandra nivea* subsp. *nivea*, *Beaufortia squarrosa* and *Hypocalymma angustifolium*.

4.6.3 *P. cinnamomi* Distribution

The vegetation of the Moore River National Park was in very good condition at the time of the assessment, with the only obvious symptoms of *P. cinnamomi* presence observed around Red Gully Creek. Several scattered dead specimens of *Banksia* species and *Xanthorrhoea preissii* were sampled to determine whether spot infestations were present, particularly along the access track and within the swamp in the northern section of the park. The swamp had previously been thought to be infested, by the Department of

Conservation and Land Management, due to the presence of scattered deaths around the swamp edges. The Department of Conservation and Land Management interpreters had not collected samples for verification of *P. cinnamomi* presence (S. King *pers. comm.*).

Sampling conditions were almost ideal during the assessment as surface soils were moist and ambient temperatures were moderate. Seven samples of vegetation and/or soil were collected from suspect individuals or areas containing dead or dying vegetation. Sample results are presented in Table 5.

Table 5: Sample Analysis Results

Sample Number	Sample Type	Species Sampled	Result
M1	Soil and root collar	*Banksia laricina.*	*Phytophthora citricola*
M2	Soil and root collar	*Banksia menziesii*	*Phytophthora cinnamomi*
M3	Soil		No *Phytophthora*
M4	Soil	*Banksia attenuata*	*Phytophthora citricola*
M5	Soil	*Banksia ilicifolia*	No *Phytophthora*
M6	Soil and root collar	*Banksia attenuata*	*Phytophthora citricola*
M7	Soil and roots	*Xanthorrhoea preissii*	No *Phytophthora*

The locations of sample collections, as well as the distribution of *P. cinnamomi*, are shown in Figure 7a.

Disease expression in the Red Gully Creek consisted of a progression of vegetation death, with the oldest deaths observed closest to the creek and a line of fresh deaths between 20m and 30m upslope of the creek. Disease expression was most obvious in *Banksia* species, particularly *B. ilicifolia* and *B. attenuata*, however specimens of *Xanthorrhoea preissii*, *Dryandra lindleyana* and *Daviesia* species were also affected. Root collar lesions were observed on *Banksia* species in Red Gully. Disease impact within the creek gully was high with a nearly total loss of overstorey and a significant modification of the understorey vegetation. The disease front had reached the crest of the gully in many places.

Phytophthora citricola was recovered in samples collected from isolated plant deaths along the existing transmission line access track, as well as from dead plants in the swamp at the northern end of the Park. This pathogen is not considered to be capable of producing high impact disease epidemic in native vegetation in Western Australia and only the occasional plant appeared to be affected in the Park.

A couple of small infestations that were not sampled were also identified along the southern border of the National Park in proximity to the existing transmission line. These infestations were most probably introduced during either clearing of the fire break around the Park or during subsequent uncontrolled access along the fire break.

During alterations to the field lines it was observed that an unidentified party had removed all flagging from an area within the Moore River National Park along the central option. Department of Conservation and Land Management Track Hygiene Markers were then installed along the transmission line access track at Red Gully Creek to notify users of the hygiene status of the area. The track markers were also removed.

4.6.4 Hygiene

A full landscape assessment for hygiene planning purposes was not conducted during this survey, however the vegetation of the National Park appeared to be in very good condition and a linear approach to hygiene must be taken during future access. A separate hygiene plan should be prepared prior to any construction operations in this area.

4.7 Regional Significance and Conservation Status of Plant Communities

The regional significance and conservation status of the plant communities mapped during this project was determined by reference to available regional studies. No one regional study covers the entire length of the proposed alignments, with adequate discussion of the conservation status of vegetation types. South of Seabird, the conservation status of the plant communities was determined by reference to Gibson *et al.* (1994). This definitive study of the southern Swan Coastal Plain describes floristic communities within the region and their distribution. Where possible, the plant communities mapped during this project were matched to floristic communities described by Gibson *et al.* (1994). This was difficult in some cases as the Swan Coastal Plain study was carried out over several seasons, rather than one sampling occasion as for this project. In addition numerous changes in species nomenclature have occurred since the report was produced in 1994, leading to difficulties in determining the current names of key indicator species in the Gibson *et al.* report. Where the communities along the route could be matched to these floristic communities, each was assigned a conservation code as defined below.

Table 5: Definition of Community Conservation Status as used by Gibson *et al.* (1994)

Conservation Status	Definition
Presumed destroyed	A community that is totally destroyed or so extensively modified that it is unlikely to re-establish ecosystem processes in the foreseeable future
Critical	A community with most or all of its known occurrences facing severe modification or destruction in the immediate future
Endangered	A community in danger of severe modification or destruction throughout its range, if causal factors continue operating
Vulnerable	A community likely to move into the endangered category in the near future if the causal factors continue operating
Susceptible	A community of concern because there is evidence that it can be modified or destroyed by human activities, or would be vulnerable to new threatening processes
Low risk	A community that does not qualify for one of the above categories
Insufficiently known	A community for which there is inadequate data to assign to one of the above categories

Determining the regional significance of the plant communities mapped north of Seabird was more difficult as no single study is currently available that details the conservation status of plant communities in this region. The West Midlands Study will allow this in the future but is currently incomplete and could not be used for this report. In addition, the available studies all discuss vegetation at different levels of detail, making specific comparisons to plant communities mapped along the proposed transmission line not possible in all cases. Regional studies referenced for the route north of Seabird included Griffin and Keighery (1989), Crook *et al.* (1984), Halpern Glick Maunsell (2000) and ecologia (2000). Griffin (1994) describes in detail the floristics of the Perth to Geraldton region. However, it does not discuss the representation of these floristic groups within the reserve system, or the area (hectares) covered by each group within the region. Therefore it could not be used to discuss the conservation significance of the plant communities mapped along the proposed transmission line route.

Each plant community was also cross-referenced against the Department of Conservation and Land Management Threatened Ecological Communities list (English and Blyth 1997), as well as Keighery and Keighery (1992).

4.7.1 Plant Communities South of Seabird

The area south of Seabird covered Yeal Swamp Nature Reserve, State Forest 65 - South, the Gingin Stock Route Reserve, the majority of State Forest 65 - North and any remnants in between. Within these areas, the plant communities mapped were matched to floristic communities described by Gibson *et al.* (1994). In many cases, several plant

communities were included in one floristic community due to the broader scale of the Gibson *et al.* (1994) study.

Plant communities F1 and W1 are both components of floristic community 14, deeper wetlands on sandy soils. This community is described in Gibson *et al.* as not being represented in the reserve system and a conservation status was not assigned, as it is insufficiently known. However, the current survey mapped this floristic community within the Yeal Swamp Nature Reserve, although it only occurred in a narrow strip along the Drain and was in a poor condition in parts.

Plant communities W7 and S3 are both components of floristic community 21c, low lying *Banksia attenuata* woodlands or shrublands. This community is well reserved but susceptible to human activities. Plant communities F3 and W3 are both components of floristic community 22, *Banksia ilicifolia* woodlands, as defined by Gibson *et al.* (1994). This floristic community is poorly reserved and susceptible to human activities. Plant communities W2 and W4 are components of floristic community type 23b, northern *Banksia attenuata – B menziesii* woodlands. This community is unreserved other than the areas mapped during this project, and is susceptible to human activities.

Heath communities H1 and H2 are components of floristic community 24, northern Spearwood shrublands and woodlands. This floristic community type is well reserved but has been identified as susceptible to human activity. The shrubland mapped as S1 is floristic community 26a as described by Gibson *et al* (1994). This community is unreserved and susceptible to human activities. The Department of Conservation and Land Management also list it as a Threatened Ecological Community. It was recorded at two locations on the Western option within State Forest 65 - North, one of which is the highest point within the State Forest. Shrubland S2 was mapped adjacent to S1 within State Forest 65 – North and corresponds to community 26b, woodlands and mallees on limestone, described by Gibson *et al.* (1994). This community is well reserved and at low risk from human activities.

Woodlands W6, W9, W10, W11, W12, W13, W14, W16 and W17 all appear to be components of community type 28, Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands. This community type is widespread north of Perth; it is well represented within the reserve system, and therefore has a low risk conservation status.

Several plant communities south of Seabird could not be assigned to a floristic community type. These were F4, W20 and W21. Plant community F4, vegetation along the Moore River, was in a very degraded condition with no native understorey remaining. This prevented it being correlated to a floristic community. The degraded condition of the vegetation in this area reduces its conservation significance, although the Moore River may act as a corridor. The woodlands on limestone mapped as W20 and W21 did not appear to fit into any of the floristic communities. They were most similar to 26b but do not appear to be described in the Gibson *et al.* (1994) study. These areas were mapped at the northern limit of the southern swan coastal plain study and therefore may have not been included in any survey sites. The woodlands on limestone are very well represented in areas of State Forest 65 – North that will not be disturbed during this project, however,

their representation within other areas is unknown. A summary of the conservation status of the plant communities mapped south of Seabird is given in Table 6 below.

Table 6: Conservation Status of Plant Communities south of Seabird (from the floristic community types of Gibson *et al.* (1994)

Plant Community	Floristic Community Type	Reservation Status	Conservation Status
F1	14	Unreserved	Insufficiently known
F3	22	Poorly reserved	Susceptible
F4	unknown		
W1	14	Unreserved	Insufficiently known
W2	23b	Unreserved	Susceptible
W3	22	Poorly reserved	Susceptible
W4	23b	Unreserved	Susceptible
W6	28	Well reserved	Low risk
W7	21c	Well reserved	Susceptible
W9	28	Well reserved	Low risk
W10	28	Well reserved	Low risk
W11	28	Well reserved	Low risk
W12	28	Well reserved	Low risk
W13	28	Well reserved	Low risk
W14	28	Well reserved	Low risk
W16	28	Well reserved	Low risk
W17	28	Well reserved	Low risk
W20	unknown		
W21	unknown		
S1	26a	Unreserved	Susceptible
S2	26b	Well reserved	Low risk
S3	21c	Well reserved	Susceptible
H1	24	Well reserved	Susceptible
H2	24	Well reserved	Susceptible

None of the communities mapped are listed as potentially rare by Keighery and Keighery (1992).

4.7.2 Plant Communities North of Seabird

Areas surveyed north of Seabird consisted of native vegetation remnants on private property, Vacant Crown Land and the Moore River National Park.

North of the Moore River, an attempt has been made to define floristic bioregions as part of the West Midlands project (Griffin 1998). The Western route option passes through the Spearwood and Bassendean bioregions, with the Cataby substation near the boundary of the Yerramullah bioregion. The Spearwood bioregion is well represented in the conservation estate though the southern portion is less represented. The Bassendean bioregion contains much uncleared land but is poorly represented in the conservation

estate. Table 7 below gives an analysis of the proportion of these bioregions remaining uncleared, and represented in conservation reserves. This was taken from Griffin (1998).

Table 7: Proportion of Bioregion and Soil-landscape systems Vegetated and in Conservation Reserves

Interim bioregion	Soil-landscape system	Proportion Vegetated	Proportion NPNCA
Spearwood	Spearwood	0.64	0.16
	Tamala	0.92	0.66
Bassendean	Bassendean	0.70	0.09

Fifteen plant communities were mapped along the Western Option north of State Forest 65 – North, and within Moore River National Park. These consisted of Forests, Woodlands, Shrublands and Heaths.

All of the plant communities mapped within the Moore River National Park are present in other undisturbed areas of the park, although this is only based on observation at the time of field-work as no vegetation maps of the park are available. Management plans for nearby nature reserves have been prepared which discuss vegetation on a broad scale (Crook *et al.* 1984). The woodland communities on grey sand mapped in the National Park (W5 and W8) are also present in the Namming Nature Reserve, just north of Regans Ford and an unnamed nature reserve (23934) to the east of Namming Nature Reserve. These reserves are also described as containing heath areas, although not enough detail is given to determine their similarity to H3. The above reserves also contain creeks edged by Forests, although again descriptions are not adequate to determine similarity to F2.

Due to this lack of detailed information it is difficult to determine the regional significance of the plant communities mapped in the National Park during this survey. However, it is likely that all are well represented within other areas of the National Park or nearby Nature Reserves. The only community that may not be is W15. Flora species within this Woodland on yellow sand are influenced by the Regan Scarp geomorphological unit (Churchward and McArthur 1980), which does not appear to be well represented within the reserve system. Griffin and Keighery (1989) also state that the Wet Heaths (H3) and *Banksia* Woodlands (W5 and W8) of the Moore River – Namming floristic area are well represented within the reserve system.

The remaining plant communities were mapped within private property or on Vacant Crown Land south of the Tiwest Joint Venture lease area. Forests F5 and F6 were mapped in drainage lines and depressions on Vacant Crown Land. Plant community F5 was also mapped by Halpern Glick Maunsell (2000), on Vacant Crown Land in several areas to the east and west of the proposed transmission line. *Eucalyptus decipiens* is common near Jurien and north-west of Eneabba, with restricted distribution within the vicinity of the transmission line (Brooker and Kleinig 1990). Its distribution within the reserve system is unknown, and it is likely to be poorly conserved. A small pocket has been mapped within the Southern Beekeepers Reserve (Burbidge and Boscacci 1989), although the composition of the understorey in this area would be different to that

mapped along the transmission line route. The *Eucalyptus rudis* Woodland of F6 is locally and regionally restricted due to its narrow linear nature. Woodlands of these types in drainage lines and swamps have been recorded in Reserve #27993 (Halpern Glick Maunsell (2000), and Reserve #27216 and Wongonderrah Nature Reserve (Crook *et al.* 1984).

Three additional *Banksia* Woodland communities, W5b, W18 and W19 were also mapped in the remnants north of the Moore River. The conservation status and regional representation of these is difficult to determine as the available regional studies generally map these areas at a vegetation association, rather than a plant community, level. Halpern Glick Maunsell (2000) mapped the vegetation in the area as '*Banksia* woodland over heath' and described this association as being very widespread in the region. It has also been mapped extensively in the Department of Defence training area west of the proposed transmission line (ecologia 2000). *Banksia* woodland is also present within the majority of nature reserves in the area, although the composition of the understorey layer can vary significantly between locations (Griffin and Keighery 1989). All of the *Banksia* woodland communities mapped along the proposed route are present in extensive areas along the route that will not be disturbed during construction and maintenance of the transmission line.

Several shrublands and wet heaths were also mapped. S4 and S1/H1, both associated with limestone were only present in very small pockets and were in poor condition. As a result, their significance is low, with similar vegetation in good condition present in nearby reserves (Halpern Glick Maunsell 2000). Heaths on grey sand are poorly represented in the reserve system within the Moore River – Namming area, but very well represented within Badgingarra National Park and Mullering and Wongonderrah Reserves (Griffin and Keighery 1989). Shrubland S5 is a component of Wet Heath Super Group III as described by Griffin and Keighery (1989). These wet heaths are widespread in the Moore River National Park and Namming Nature Reserve.

Mattiske Consulting Pty Ltd (1997) discussed the conservation significance of the plant communities in the Tiwest lease area. This report states that all are well represented locally and regionally within the reserve system.

5 DISCUSSION

5.1 Flora and Vegetation

The proposed transmission line passes through a wide variety of plant communities in varying condition. Previous to this survey, few studies had been carried out in many of the remnants included in this study. The area north of the Moore River is known to be an important area with regard to species diversity and high number of species endemic to the region. However, of the 259 taxa known to be regional endemics, only 12% to 14% occur in the areas through which the transmission line will pass (Griffin *et al.* 1990).

The areas surveyed during this project included vegetation of varying quality and diversity. Generally, it was found that areas on private property were in poor condition, while the large areas of State Forest surveyed were in very good condition. The proposed Western Option passes through the Gingin Stock Route Reserve, State Forest 65 North and South, and areas of vegetation on Vacant Crown Land and Private Property.

The survey of the Gingin Stock Route Reserve found that the vegetation was in good condition although there was extensive weed invasion in some areas from the farmland on both edges of the reserve. This weed invasion was particularly high in several pockets that had been recently burnt, and was also greater on the western side of the reserve where significant areas had been cleared. The vegetation was uniform in composition along the reserve, with only two plant communities mapped. No Declared Rare or Priority flora or other species of significance were recorded during the survey, and none of the plant communities mapped are threatened or restricted. The stock route acts as a vegetation corridor in an otherwise cleared area and is likely to be used by fauna. Any clearing required for the transmission line should be designed to prevent the reserve being completely cleared at any point.

State Forest 65 – South was a mosaic of remnant vegetation and pine plantations. The blocks of vegetation in the southern section of the State Forest were in poor to fair condition, with high levels of weed invasion and evidence of frequent burning. There are a large number of roads in the area, some of which are used regularly. These roads have allowed weed species to spread into all of the blocks of vegetation surveyed, although this spread was most evident on limestone areas and in drainage lines. Activities associated with construction and maintenance of the transmission line will not have any significant impact on these blocks of vegetation as all are already impacted on by existing activities. The northern portion of State Forest 65 – South consists of a large block of vegetation in very good condition. With the exception of recently burnt areas, weed invasion was low and very few existing tracks are present. The plant communities in this area contained a high number of species although none of these were restricted or significant. None of the plant communities mapped are listed as threatened, although the conservation significance of three of these is unknown.

State Forest 65 – North was the largest block of vegetation surveyed along the Western Option. It was generally in a very good condition, with weed invasion restricted to the boundaries, track edges and some recently burnt areas. The block contains a relatively small number of existing tracks, which has assisted in maintaining the condition of the area. The vegetation within the block had a high diversity and variable composition due to the wide range of soil types encountered. One Declared Rare flora species and one Priority 4 species were recorded, increasing the conservation significance of the area. In addition, one of the plant communities mapped (26a) is a Threatened Ecological Community, as defined by the Department of Conservation and Land Management. All of the plant communities mapped along the eastern of the two corridors within this area are represented elsewhere in the State Forest. On the western of the two corridors, the limestone communities 26a and 26b do not appear to be represented elsewhere in the State Forest.

As a result of the presence of restricted flora and plant communities, State Forest 65 – North is a significant area and measures should be taken to minimise disturbance associated with the proposed transmission line. The eastern of the two proposed corridors should be used for the transmission line. This will avoid impacts on the threatened community mapped along the western route, which occurs on the top of a limestone ridge, the highest point in the block. Construction of a transmission line along this route will adversely impact on this community and cause very high visual impact. The eastern option also follows existing tracks, which will reduce the amount of clearing required. Use of the western route will require clearing of a new permanent track, allowing uncontrolled access into areas currently protected from weed invasion and other adverse human impacts. Tower and track placement along the eastern option should be designed to avoid clearing of the Declared Rare species recorded along this route.

Several remnants on private property and VCL were also surveyed during this project. The majority of remnants on private property were unfenced and in poor condition from grazing and other farming activities. Weed invasion was high in these areas, resulting in a low species richness. A large remnant north of Sappers Road was in very good condition however, and the transmission line should avoid this area wherever possible. Vegetation in the block of VCL south of the Tiwest Joint Venture Lease area was also in very good condition, with three Priority species recorded along the proposed transmission line route. A wide firebreak exists along or close to the proposed route and this should be used during construction wherever possible.

The Tiwest Joint Venture lease area contains vegetation largely typical of the Kwongan vegetation of the region (Mattiske Consulting Pty Ltd 1997). The area is currently actively mined and therefore activities associated with the transmission line will not have any impacts on vegetation that are not pre-existing. The presence of a Declared Rare flora taxon close to the proposed route should be taken into account when planning vehicle access to the tower construction sites.

Yeal Swamp and the Moore River National Park contain plant communities not recorded in other areas due to the different soil types present. These areas also both contained

significant flora species, including a possible new taxon. It is recommended that the new transmission line not be constructed through either of these conservation areas.

5.2 Weeds

A total of thirty two weed species were recorded in the vegetation surveyed along the proposed transmission line routes. None of these were Declared Weeds, as listed by Agriculture Western Australia. The majority of weed species, most of which are common and non-aggressive, were recorded in unfenced remnants on private property and along existing tracks and firebreaks. Within the Gingin Stock Route Reserve and State Forest 65 (South and North) weeds had also invaded into recently burnt areas, as burning creates open ground into which weed spores can germinate. The limestone communities mapped (S1, S2, S4, S1/H1) appear to be the most susceptible to weed invasion as all of these areas contained some annual weeds. The high cover of bare ground around limestone outcropping in these communities provides suitable habitat for weed spores.

The northern end of State Forest 65 – South, State Forest 65 – North and the VCL towards the northern end of the Western Option all contained large blocks of vegetation relatively unaffected by weeds. Hygiene measures should be put in place to ensure weeds are not spread into these areas during construction and maintenance activities. These should include ensuring all vehicles are clean prior to entering vegetated areas, and not allowing any soil movement between blocks of vegetation and agricultural areas.

5.3 Dieback caused by *P. cinnamomi*

P. cinnamomi was identified in the proposed transmission line corridor along the Western Route option at the Moore River. This infestation was identified by sampling a dead *Banksia prionotes* located approximately 20m from the waters edge. No other visible symptoms of disease were evident due to the lack of susceptible species within this very degraded area. This route contained several large areas of high quality native vegetation separated by disturbances such as roads and agricultural properties. The western route option contained areas of vegetation that occurred on Spearwood dune system soils and limestone outcrops. These sites typically are less vulnerable to the effects of *P. cinnamomi* than sites in the Bassendean system due to soil pH.

The central route option was located entirely within the Bassendean system and is characterised by grey leached sands and extensive wetland systems associated with regional drainage systems from the Regan Scarp. Only two sections of significant remnant vegetation were assessed for this route option, these being the Yeal Swamp Nature Reserve and the Moore River National Park. Both of these areas contained *P. cinnamomi* infestations associated with drainage systems. The disease impact in the identified infestations was very high as a result of the site moisture regime, the soil properties (Bassendean Dune Complex – leached grey sands) and the high density of susceptible species in the vegetation. This route option was located immediately beside the existing Pinjar to Cataby Transmission line, which has been used extensively for access through these areas, however it appeared that the disease was initially introduced to the corridor via the drainage systems. Disease spread along the existing access track

from the infested areas was minimal and appeared to be primarily due to passive spread via root contact.

The Western route option, though containing a *P. cinnamomi* infestation at the Moore River at present, appears to be less vulnerable to the effects of *P. cinnamomi* than the central route option. The soil types and generally drier conditions along the western route option would provide a lower risk environment with respect to establishment of the pathogen following an accidental introduction.

There have been relatively few surveys for the presence of *P. cinnamomi* in this mid-west region of WA to provide a wider context for discussion of the results of this survey. Regional surveys along roads in the Northern Sandplains area north of the Moore River conducted by Hart, Simpson and Associates for the Northern Sandplains Dieback Working Party in the early 1990s showed that *P. cinnamomi* infestations were rare in the region. The other *Phytophthora* species such as *P. citricola* and *P. megasperma* were more common, especially associated with wet areas such as drains, but did not produce symptoms of epidemic similar to *P. cinnamomi*. These other pathogens were generally found associated with minor spot infestations that killed small patches of *Banksia* in some years (Hart, Simpson and Associates 1992).

The potential impacts of introducing *P. cinnamomi* to the proposed transmission line routes will vary depending on the location and site characteristics of the introduction. The Western Route option, being located primarily on Spearwood Dune system has well drained soils with limestone a common feature as a basement material or present at the surface. The risk of *P. cinnamomi* establishing disease foci along this route option is lower than for the Central route option. Risk increases with moisture status of the soils and is greatest in low wet areas such as swamps, drains and creeks (Hill *et al.* 1994).

The potential impact on the vegetation along the routes should *P. cinnamomi* be introduced could be extreme, especially in the lower, moist portions of the routes. Infested areas in Bassendean Dune *Banksia* Woodlands tend to have a high impact with extreme modification of both the overstorey and understorey (Hill *et al.* 1994) as seen in both the Yeal Swamp Nature Reserve and Moore River National Park sections surveyed for this report.

A single large infestation was observed away from the Western route option within State Forest 65 - North during the survey. This infestation was relatively young, but very active with many species observed to be dying throughout the infested area. This tends to indicate that, once established *P. cinnamomi* has the potential to severely affect the *Banksia* Woodland communities on the Spearwood Dune system.

5.4 Potential Impacts of the Project

The proposed transmission line has the potential to adversely impact flora and vegetation along the routes. These impacts are:

1. Clearing of plant communities and fauna habitat – The placement of each tower, as well as the construction of permanent tracks will require clearing of vegetation in many of the plant communities mapped.
2. Loss of significant flora species – Placement of the towers and access tracks may require clearing of Priority and other significant flora species.
3. Conservation values of Nature Reserves and National Park – If the Central Option is chosen, vegetation clearing will be required in several nature reserves and the Moore River National Park. This will impact on the integrity of these conservation areas.
4. Increased access – The creation of vehicle access into previously isolated areas will allow entry into these areas by non-Western Power personnel. This may increase the spread of weeds and plant disease and increase the risk of fire.
5. Risk of fire – Construction activities have the potential to cause fires in the densely vegetated areas.
6. Introduction and spread of weeds and plant diseases – Construction and maintenance activities, as well as use of new tracks by members of the public has the potential to spread weeds and plant disease (particularly dieback caused by *P. cinnamomi*) into previously unaffected areas. This risk is higher in areas where *P. cinnamomi* is already present.
7. Indirect impacts – Construction of the transmission line may have temporary indirect impacts on flora, vegetation and fauna. These include generation of dust and noise.

6 RECOMMENDATIONS

The following recommendations are made based on the results of the flora, vegetation and dieback survey.

6.1 Flora and Vegetation

1. Vegetation clearing should be minimised wherever possible, with existing tracks and cleared land used for construction if available.
2. The placement of towers and tracks should be designed to minimise clearing of significant flora species.
3. On selection and approval of the final alignment, the location of all Declared Rare and Priority flora should be marked in the field to assist in their protection.
4. The new transmission line should follow the Western Option to prevent clearing in the Moore River National Park and the Yeal Swamp Nature Reserves, both of which contain several significant flora species.
5. All precautions should be taken to prevent accidental fires. These include the use of diesel rather than petrol vehicles and the provision of a fire tender during hot conditions.
6. All vehicles commencing work on the project should be certified weed free (ie. clean and free of any dirt that could carry weed spores and seeds).

7. There should be no soil movement between agricultural areas and areas of native vegetation to prevent the spread of weeds and plant disease.
8. The transmission line should follow the western edge of the Gingin Stock Route Reserve as this side is the most disturbed.
9. The eastern of the two options in State Forest 65 – North should be used for construction of the transmission line. This will reduce the amount of vegetation clearing required and prevent disturbance to the Threatened Ecological Community located on the western route.
10. If the western route is used it should be diverted around the eastern side of the limestone ridge contained the Threatened Ecological Community.
11. The location of the *Anigozanthos humilis* subsp. *chrysanthus* population on the eastern route in State Forest 65 – North should be temporarily fenced during construction to prevent accidental disturbance.
12. Construction through the VCL south of the Tiwest lease area should utilise all available tracks and fire-breaks to minimise clearing as the vegetation in this area is in very good condition.

6.2 Dieback caused by *P. cinnamomi*

1. A hygiene plan should be prepared for the final route option that takes into account land tenure, vegetation condition and identified access routes.
2. The hygiene plan should be submitted to CALM for review and approval prior to commencement of construction operations.
3. Construction and where practicable, maintenance and ground inspection activities be conducted under dry soil conditions.
4. All activities within the Tiwest Joint Venture lease area should be carried out in accordance with the company's existing Dieback Management Plan.
5. All water supplied for dust suppression and/or fire fighting should be dosed with Sodium hypochlorite to prevent the accidental introduction of *P. cinnamomi*.

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APPENDIX A1: VASCULAR PLANT SPECIES RECORDED WITHIN THE GINGIN STOCK ROUTE RESERVE

Family	Species	W6	W16
Zamiaceae	*Macrozamia riedlei*	+	+
Poaceae	*Amphipogon debilis*	+	+
	* *Briza minor*	+	
	* *Ehrharta calycina*	+	
	Neurachne alopecuroidea		
Cyperaceae	*Caustis dioica*		+
	Lepidosperma pubisquameum	+	
	Mesomelaena pseudostygia	+	+
	Schoenus brevisetis		+
	Schoenus clandestinus	+	+
	Schoenus curvifolius	+	+
	Schoenus pleiostemoneus	+	
Restionaceae	*Alexgeorgea nitens*	+	
	Chordifex sinuosus ms	+	
	Desmocladus flexuosus	+	
	Hypolaena exsulca	+	
	Lyginia barbata	+	+
	Lyginia imberbis	+	
	Restionaceae sp. (DW 1-22)	+	
Dasypogonaceae	*Calectasia cyanea*	+	+
	Lomandra preissii	+	
	Lomandra hermaphrodita	+	+
Xanthorrhoeaceae	*Xanthorrhoea preissii*	+	+
Anthericaceae	*Corynotheca micrantha*	+	
	Laxmannia ramosa subsp. *ramosa*	+	
Colchicaceae	*Burchardia umbellata*	+	+
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*	+	+
	Anigozanthos sp.	+	
	Conostylis ?angustifolia	+	
	Conostylis teretifolia subsp. *planescens*	+	
	Haemodorum sp.	+	+
	Phlebocarya ciliata	+	+

APPENDIX A1: VASCULAR PLANT SPECIES RECORDED WITHIN THE GINGIN STOCK ROUTE RESERVE

Family	Species	W6	W16
Iridaceae	* *Gladiolus caryophyllaceus*	+	+
	Patersonia occidentalis	+	
Orchidaceae	*Orchidaceae* sp.	+	
	Pterostylis sp.		+
Casuarinaceae	*Allocasuarina humilis*	+	
Proteaceae	*Adenanthos cygnorum*	+	
	Banksia attenuata	+	+
	Banksia ilicifolia	+	
	Banksia menziesii	+	+
	Conospermum canaliculatum subsp. *canaliculatum*	+	
	Dryandra lindleyana	+	
	Hakea prostrata		+
	Hakea ruscifolia	+	
	Hakea trifurcata		+
	Persoonia comata	+	
	Petrophile brevifolia	+	+
	Petrophile linearis	+	+
	Petrophile macrostachya	+	+
	Stirlingia latifolia	+	+
	Synaphea spinulosa	+	
Loranthaceae	*Nuytsia floribunda*	+	
Aizoaceae	* *Carpobrotus* sp.	+	
Molluginaceae	*Macarthuria australis*	+	
Droseraceae	*Drosera erythrorhiza*	+	+
	Drosera pallida	+	+
	Drosera platystigma	+	
Mimosaceae	*Acacia huegelii*	+	
	Acacia pulchella var. *glaberrima*	+	

APPENDIX A1: VASCULAR PLANT SPECIES RECORDED WITHIN THE GINGIN STOCK ROUTE RESERVE

Family	Species	W6	W16
Papilionaceae	*Bossiaea eriocarpa*	+	+
	Daviesia decurrens		+
	Daviesia divaricata subsp. *divaricata*		+
	Daviesia nudiflora subsp. *hirtella*	+	
	Gompholobium tomentosum	+	+
	Hovea trisperma	+	+
	Jacksonia furcellata		+
	Jacksonia sternbergiana	+	
	* *Lupinus* sp.		+
	Nemcia capitata	+	
Geraniaceae	* *Pelargonium capitatum*	+	
Dilleniaceae	*Hibbertia huegelii*	+	
	Hibbertia hypericoides	+	+
	Hibbertia subvaginata	+	
Thymelaceae	*Pimelea* sp. (DW 1-7)	+	+
Myrtaceae	*Calothamnus sanguineus*	+	+
	Calytrix flavescens	+	+
	Calytrix fraseri	+	
	Calytrix sp. (GW 1-15)	+	
	Calytrix sp. (Op20)		+
	Eremaea asterocarpa subsp. *asterocarpa*	+	+
	Eremaea pauciflora	+	+
	Eucalyptus todtiana	+	+
	Hypocalymma xanthopetalum		+
	Kunzea ericifolia		+
	Leptospermum spinescens	+	
	Melaleuca nesophila		+
	Melaleuca sp. (scabra group)		+
	Melaleuca trichophylla	+	
	Scholtzia sp. (DW 1-14)	+	+
	Verticordia nitens	+	
Apiaceae	*Xanthosia huegelii* subsp. *huegelii* ms	+	

APPENDIX A1: VASCULAR PLANT SPECIES RECORDED WITHIN THE GINGIN STOCK ROUTE RESERVE

Family	Species	W6	W16
Epacridaceae	*Astroloma pallidum*		+
	Conostephium preissii	+	+
	Leucopogon conostephioides	+	
	Leucopogon polymorphus		+
	Leucopogon ?propinquus		+
	Lysinema ciliatum	+	
Solanaceae	* *Solanum nigrum*	+	
Goodeniaceae	*Dampiera linearis*	+	+
	Lechenaultia biloba	+	
	Scaevola canescens	+	+
	Scaevola repens var. *repens*	+	
Stylidiaceae	*Stylidium piliferum*	+	+
	Stylidium repens	+	+
Asteraceae	* *Arctotheca calendula*		+
	* *Hypochaeris glabra*	+	
	Lagenophora huegelii	+	
	* *Ursinia anthemoides*		+

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Zamiaceae	*Macrozamia riedlei*		+		+	+	+	+
Pinaceae	* *Pinus* sp.							+
Poaceae	* *Aira caryophyllea*					+		
	Austrostipa sp.			+				
	* *Briza minor*		+				+	
Cyperaceae	*Caustis dioica*					+		
	Lepidosperma pubisquameum					+		
	Lepidosperma sp.	+						
	Mesomelaena pseudostygia			+	+	+		
	Schoenus clandestinus			+	+	+		
	Schoenus curvifolius					+		
Restionaceae	*Alexgeorgea nitens*				+			
	Hypolaena exsulca				+			
	Lepidobolus preissianus subsp. *preissianus*			+				
Dasypogonaceae	*Calectasia cyanea*					+		
	Lomandra hermaphrodita					+		
Xanthorrhoeaceae	*Xanthorrhoea preissii*		+	+	+	+	+	+

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Anthericaceae	*Agrostocrinum scabrum*						+	
	Laxmannia sessiliflora						+	
	Sowerbaea laxiflora		+	+			+	
	Thysanotus asper						+	
	Thysanotus manglesianus		+				+	
Asphodelaceae	* *Asphodelus fistulosus*						+	
	* *Trachyandra divaricata*					+		
Colchicaceae	*Burchardia umbellata*		+	+		+	+	
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*		+			+	+	+
	Anigozanthos manglesii					+	+	
	Conostylis aculeata	+	+			+		
	Conostylis candicans							+
	Conostylis teretifolia subsp. *teretifolia*		+	+	+	+		
	Haemodorum sp.			+	+	+		
Iridaceae	* *Gladiolus caryophyllaceus*	+		+	+	+	+	+
	Patersonia occidentalis					+	+	
Orchidaceae	*Caladenia flava* subsp. *flava*	+	+				+	
	Caladenia sp.			+		+		
	Elythranthera brunonis					+	+	
	Pyrorchis nigricans				+		+	

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Casuarinaceae	*Allocasuarina fraseriana*		+	+		+		
	Allocasuarina humilis				+		+	
Proteaceae	*Adenanthos cygnorum*	+		+	+	+		
	Banksia attenuata		+	+	+	+	+	
	Banksia grandis		+				+	
	Banksia ilicifolia				+			
	Banksia littoralis	+						
	Banksia menziesii		+	+	+	+	+	
	Banksia prionotes		+					
	Calothamnus quadrifidus							+
	Calothamnus sanguineus				+	+		
	Conospermum acerosum subsp. *acerosum*					+		
	Conospermum canaliculatum subsp. *canaliculatum*			+			+	+
	Conospermum incurvum				+	+		
	Conospermum stoechadis subsp. *stoechadis*					+		
	Dryandra lindleyana		+		+	+	+	+
	Dryandra sessilis						+	+
	Grevillea preissii subsp. *preissii*							+
	Hakea costata					+		
	Hakea prostrata		+	+			+	+
	Hakea ruscifolia		+			+	+	
	Persoonia comata	+	+	+	+	+	+	
	Petrophile linearis	+	+	+	+	+	+	+
	Petrophile macrostachya				+	+	+	
	Petrophile seminuda					+		

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Proteaceae	*Petrophile serruriae*			+				
(Continued)	*Stirlingia latifolia*		+	+	+	+	+	
	Synaphea spinulosa				+	+		
Loranthaceae	*Nuytsia floribunda*		+	+	+	+	+	
Gyrostemonaceae	*Gyrostemon subnudus*							+
Aizoaceae	*Carpobrotus virescens*						+	
Portulaceae	*Calandrinia liniflora*			+				
Caryophyllaceae	* *Petrorhagia velutina*		+				+	
Lauraceae	*Cassytha* sp.					+		
Brassicaceae	* *Brassica* sp.					+		
	* *Heliophila pusilla*		+			+	+	+
Droseraceae	*Drosera erythrorhiza*				+	+	+	
	Drosera menziesii subsp. *penicillaris*					+		+
	Drosera sp. (climbing)			+		+	+	
Crassulaceae	*Crassula colorata*						+	+

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Mimosaceae	*Acacia barbinervis* subsp. *borealis*					+		
	Acacia lasiocarpa						+	+
	Acacia pulchella var. *glaberrima*			+			+	
	Acacia saligna			+	+		+	+
	Acacia stenoptera				+	+		
Papilionaceae	*Bossiaea eriocarpa*					+		+
	Daviesia divaricata subsp. *divaricata*					+	+	
	Daviesia nudiflora subsp. *hirtella*				+	+		
	Daviesia podophylla		+			+		
	Gompholobium scabrum	+				+		
	Gompholobium tomentosum		+	+		+		
	Hardenbergia comptoniana		+					
	Hovea pungens		+			+		
	Jacksonia floribunda					+		
	Jacksonia furcellata		+		+		+	
	Jacksonia hakeoides			+		+	+	+
	Jacksonia sternbergiana		+	+	+	+	+	
	Kennedia prostrata		+				+	
	Sphaerolobium macranthum						+	
Geraniaceae	* *Pelargonium capitatum*			+				
Rutaceae	*Boronia ramosa* subsp. *anethifolia*					+		
	Philotheca spicata					+	+	

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Euphorbiaceae	*Phyllanthus calycinus*			+			+	
Stackhousiaceae	*Tripterococcus brunonis*		+				+	
Rhamnaceae	*Cryptandra pungens*	+						
Dilleniaceae	*Hibbertia huegelii*		+	+	+	+	+	
	Hibbertia hypericoides		+	+		+	+	+
	Hibbertia racemosa		+	+	+	+	+	
	Hibbertia subvaginata					+		
Thymelaeaceae	*Pimelea floribunda*	+						
	Pimelea sulphurea					+		
Myrtaceae	*Calytrix flavescens*					+		
	Calytrix fraseri		+	+	+	+		
	Calytrix sapphirina							+
	Eremaea asterocarpa var. *asterocarpa*					+		
	Eremaea pauciflora				+	+	+	
	Eucalyptus rudis	+						
	Eucalyptus todtiana		+		+	+	+	
	Hypocalymma xanthopetalum		+			+		
	Kunzea ericifolia	+		+	+	+	+	
	Leptospermum spinescens		+			+	+	
	Melaleuca preissiana	+						
	Melaleuca sp.					+	+	

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Myrtaceae	*Melaleuca systena* ms							+
(Continued)	*Regelia inops*				+			
	Scholtzia involucrata			+		+		
	Thryptomene prolifera				+		+	
	Verticordia nitens	+			+			
Haloragaceae	*Gonocarpus pithyoides*					+		
Apiaceae	*Daucus glochidiatus*			+	+	+		
	Xanthosia huegelii subsp. *huegelii* ms					+	+	+
Epacridaceae	*Astroloma pallidum*					+		
	Conostephium pendulum					+		
	Conostephium preissii					+		
	Leucopogon polymorphus					+		
	Leucopogon ?propinquus		+	+	+		+	
	Leucopogon sprengelioides					+		
	Lysinema ciliatum					+		
Primulaceae	* *Anagallis arvensis*		+				+	
Loganiaceae	*Mitrasacme paradoxa*				+			
Chloanthaceae	*Pityrodia bartlingii*					+		
Scrophulariaceae	* *Verbascum virgatum*						+	

APPENDIX A2: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - SOUTH

Family	Species	W1	W9	W10	W14	W16	W21	H1
Goodeniaceae	*Dampiera linearis*					+		
	Lechenaultia floribunda				+	+	+	
	Lechenaultia linarioides		+					+
	Scaevola repens var. *repens*				+	+		
Stylidiaceae	*Stylidium brunonianum* subsp. *brunonianum*		+	+	+	+	+	
	Stylidium calcaratum			+		+	+	
	Stylidium diuroides subsp. *diuroides*					+		
	Stylidium piliferum		+			+	+	
	Stylidium repens					+	+	
Asteraceae	* *Arctotheca calendula*						+	
	Brachyscome ?glandulosa			+	+			
	* *Hypochaeris glabra*		+	+	+		+	+
	Olearia axillaris						+	
	Podotheca angustifolia		+			+	+	
	* *Sonchus oleraceus*						+	
	* *Ursinia anthemoides*		+	+	+	+	+	

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Zamiaceae	*Macrozamia riedlei*			+		+	+	+	+			+	+
Pinaceae	* *Pinus* sp.						+						
Poaceae	* *Aira caryophyllea*								+		+		
	Amphipogon striatus								+				
	Austrostipa flavescens									+			
	* *Briza minor*	+		+				+	+	+	+		
	* Poaceae sp.	+				+						+	
Cyperaceae	*Caustis dioica*							+					
	* *Isolepis marginata*					+	+						
	Lepidosperma pubisquameum					+							
	Lepidosperma sp.					+							
	Lepidosperma squamatum								+				+
	Lepidosperma tenue	+											
	Mesomelaena pseudostygia	+	+	+	+	+	+	+	+			+	+
	Schoenus brevisetis					+	+	+					
	Schoenus clandestinus	+			+	+	+	+	+			+	
	Schoenus curvifolius	+			+	+							
	Schoenus grandiflorus								+				
	Schoenus pleiostemoneus					+							
	Tetraria capillaris		+										
	Tetraria octandra						+						
Restionaceae	*Alexgeorgea nitens*					+	+		+			+	+
	Desmocladus asper									+			
	Desmocladus fasciculatus	+								+		+	
	Desmocladus flexuosus	+	+			+		+	+		+	+	+
	Hypolaena exsulca	+	+			+	+		+				

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Restionaceae	*Lepidobolus preissianus* subsp. *preissianus*	+					+	+	+			+	
(Continued)	*Lyginia barbata*	+	+			+	+	+	+	+		+	
Ecdeiocolaeceae	*Georgeantha hexandra* ms (P4)								+				
Dasypogonaceae	*Acanthocarpus preissii*								+				
	Calectasia cyanea	+			+	+	+						
	Lomandra hermaphrodita	+	+	+		+	+	+				+	
	Lomandra preissii					+	+			+			
Xanthorrhoeaceae	*Xanthorrhoea preissii*	+	+	+	+	+	+	+	+	+		+	+
Phormiaceae	*Dianella revoluta* var. *divaricata*							+		+			
	Stypandra glauca												+
Anthericaceae	*Agrostocrinum scabrum*						+			+		+	+
	Arnocrinum preissii					+	+					+	
	Chamaescilla corymbosa					+			+				
	Corynotheca micrantha			+			+		+			+	+
	Laxmannia sessiliflora							+	+				
	Sowerbaea laxiflora		+		+		+	+				+	+
	Thysanotus asper								+	+			
	Thysanotus manglesianus					+	+	+	+			+	
Colchicaceae	*Burchardia umbellata*	+	+	+	+	+	+		+	+			

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Haemodoraceae	*Anigozanthos humilis* subsp. *chrysanthus* (R)		+										
	Anigozanthos humilis subsp. *humilis*		+		+	+	+	+	+			+	
	Anigozanthos manglesii	+	+				+		+	+		+	
	Conostylis aculeata subsp. *aculeata*	+											
	Conostylis candicans	+	+	+	+	+	+	+	+	+		+	+
	Conostylis setigera subsp. *setigera*	+					+						
	Conostylis teretifolia subsp. *teretifolia*	+	+		+	+	+	+	+			+	
	Haemodorum sp.	+	+	+	+	+	+	+					
	Haemodorum spicatum	+					+						
Iridaceae	* *Gladiolus caryophyllaceus*								+				
	* *Homeria flaccida*											+	
	Patersonia occidentalis	+	+	+		+	+						
	* *Romulea rosea*								+				
Orchidaceae	*Caladenia flava* subsp. *flava*	+	+	+	+	+		+	+	+		+	+
	Caladenia georgei						+				+		
	Caladenia latifolia									+	+		
	Caladenia sp.	+				+	+						
	Cyanicula sp.	+											
	Diuris corymbosa											+	
	Elythranthera brunonis	+		+	+			+	+			+	
	Pterostylis ?sanguinea					+							
	Pterostylis ?vittata	+											
	Pyrorchis nigricans				+	+						+	
Casuarinaceae	*Allocasuarina humilis*	+					+	+	+			+	

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Proteaceae	*Adenanthos cygnorum*	+				+							
	Banksia attenuata	+	+	+	+	+	+	+	+			+	
	Banksia grandis			+	+								+
	Banksia leptophylla											+	
	Banksia menziesii	+	+		+	+	+	+	+				
	Calothamnus quadrifidus	+					+	+	+	+		+	+
	Calothamnus sanguineus	+	+		+		+	+					+
	Conospermum canaliculatum subsp. *canaliculatum*	+				+	+	+	+			+	+
	Dryandra lindleyana	+	+	+	+	+	+	+	+	+	+	+	+
	Dryandra sessilis					+		+	+	+	+	+	+
	Grevillea preissii subsp. *preissii*									+	+	+	
	Hakea costata	+	+	+	+	+	+	+	+			+	+
	Hakea lissocarpha									+			
	Hakea prostrata	+		+				+	+			+	
	Hakea ruscifolia	+		+	+	+	+	+	+				
	Hakea trifurcata	+				+		+	+	+		+	+
	Hakea undulata	+					+						
	Hakea varia												+
	Persoonia comata	+				+	+	+	+				
	Petrophile linearis	+	+		+	+	+	+					
	Petrophile macrostachya		+	+	+	+	+	+	+			+	+
	Petrophile serruriae			+	+	+				+			
	Stirlingia latifolia	+	+	+	+	+	+	+	+				
	Synaphea spinulosa	+	+	+	+	+	+	+	+			+	+
Loranthaceae	*Amyema* sp.								+				
	Nuytsia floribunda	+	+			+	+	+	+			+	
Chenopodiaceae	*Rhagodia baccata* subsp. *baccata*										+		

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Amaranthaceae	*Ptilotus manglesii*				+								
Gyrostemonaceae	*Gyrostemon subnudus*								+				
Aizoaceae	* *Carpobrotus* sp.						+					+	
Molluginaceae	*Macarthuria australis*	+											
Portulacaceae	*Calandrinia corrigioloides*					+							
Caryophyllaceae	* *Cerastium glomeratum*										+		
	* *Petrorhagia velutina*										+		
Lauraceae	*Cassytha* sp.	+						+	+	+	+		
Brassicaceae	* *Heliophila pusilla*			+		+			+	+	+	+	+
Droseraceae	*Drosera erythrorhiza*	+	+	+	+	+	+	+	+				+
	Drosera menziesii subsp. *penicillaris*	+			+	+	+	+	+			+	
	Drosera pallida	+	+				+	+	+	+		+	+
	Drosera platystigma	+				+							
Crassulaceae	*Crassula colorata*					+	+						
	* *Crassula glomerata*										+		

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Mimosaceae	*Acacia huegelii*				+								
	Acacia lasiocarpa							+	+	+	+	+	+
	Acacia pulchella var. *glaberrima*	+		+	+	+	+	+		+			
	Acacia saligna				+								
	Acacia sessilis	+						+	+				+
	Acacia stenoptera		+			+	+						
Caesalpiniaceae	*Labichea lanceolata* subsp. *lanceolata*							+					
Papilionaceae	*Bossiaea eriocarpa*	+	+	+	+	+	+	+	+	+		+	+
	Daviesia divaricata subsp. *divaricata*						+	+	+				
	Daviesia incrassata subsp. *incrassata*	+											
	Daviesia nudiflora subsp. *hirtella*	+				+	+						
	Gompholobium aristatum								+				
	Gompholobium knightianum	+					+						
	Gompholobium tomentosum	+		+	+	+				+	+		+
	Hardenbergia comptoniana									+			
	Hovea pungens				+					+			
	Hovea trisperma	+	+			+	+						
	Isotropis cuneifolia				+		+		+	+		+	
	Jacksonia furcellata	+			+	+							
	Jacksonia hakeoides							+	+			+	+
	Jacksonia sternbergiana	+		+	+	+	+		+			+	+
	Kennedia prostrata						+		+	+			
	Mirbelia trichocalyx							+	+	+		+	
	Nemcia reticulata						+		+				
	Templetonia retusa									+	+		
	* *Trifolium* sp.										+		+

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Geraniaceae	* *Erodium botrys*								+				
	* *Pelargonium capitatum*											+	
Rutaceae	*Diplolaena angustifolia*										+		
	Philotheca spicata	+	+		+		+						
Polygalaceae	*Comesperma calymega*								+				
	Comesperma integerrimum										+		
Euphorbiaceae	*Beyeria cinerea*										+		
	Phyllanthus calycinus					+			+	+	+		+
Stackhousiaceae	*Stackhousia monogyna*					+		+		+		+	+
	Tripterococcus brunonis	+							+				
Sapindaceae	*Dodonaea aptera*									+			
Rhamnaceae	*Cryptandra pungens*					+							
	Stenanthemum notiale subsp. *chamelum*								+				
	Trymalium ledifolium			+						+	+		+
Dilleniaceae	*Hibbertia huegelii*	+	+		+	+	+	+	+			+	
	Hibbertia hypericoides	+	+	+	+		+	+	+	+	+	+	+
	Hibbertia racemosa			+	+	+		+		+		+	
	Hibbertia subvaginata	+				+	+						
Violaceae	*Hybanthus calycinus*		+	+	+		+		+	+		+	+

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Thymelaceae	*Pimelea calcicola*									+			
	Pimelea ferruginea									+			
	Pimelea leucantha					+							
	Pimelea sulphurea	+	+		+	+	+						
Myrtaceae	*Baeckea ?robusta*									+	+		+
	Calytrix flavescens	+	+		+	+	+						
	Calytrix fraseri					+							
	Calytrix ?fraseri					+	+						
	Calytrix strigosa									+			
	Corymbia calophylla				+								
	Eremaea asterocarpa	+	+	+	+	+	+		+				
	Eremaea pauciflora	+	+	+		+	+	+	+			+	
	Eucalyptus decipiens					+			+			+	
	Eucalyptus foecunda									+			
	Eucalyptus gomphocephala				+							+	
	Eucalyptus todtiana	+		+		+	+	+	+			+	+
	Kunzea ericifolia	+	+			+	+						
	Leptospermum spinescens	+	+		+	+	+	+	+				
	Melaleuca ?trichophylla	+				+							
	Melaleuca huegelii subsp. *huegelii*									+	+		
	Melaleuca systena ms				+	+		+	+	+	+	+	+
	Scholtzia ?involucrata						+						
	Scholtzia ciliata								+			+	
	Thryptomene prolifera	+			+	+	+						
	Verticordia nitens					+							
Haloragaceae	*Glischrocaryon aureum*	+	+						+				
	Gonocarpus pithyoides					+	+						

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Apiaceae	*Daucus glochidiatus*										+		
	Trachymene ?pilosa					+							
	Xanthosia huegelii subsp. *huegelii* ms	+	+	+		+	+	+	+	+		+	
Epacridaceae	*Astroloma macrocalyx*					+							
	Astroloma pallidum								+				
	Conostephium pendulum					+	+						
	Conostephium preissii	+		+	+			+	+			+	
	Leucopogon conostephioides	+					+					+	
	Leucopogon oxycedrus								+				
	Leucopogon parviflorus			+	+					+	+		
	Leucopogon polymorphus	+	+	+		+	+	+	+			+	
	Leucopogon propinquus	+							+				+
	Leucopogon racemulosus					+							
	Leucopogon sp. Yanchep (M. Hislop 1986)			+	+			+	+			+	+
	Lysinema ciliatum	+				+							
Primulaceae	* *Anagallis arvensis*					+			+	+	+	+	+
Loganiaceae	*Mitrasacme paradoxa*	+				+							
Lamiaceae	*Hemiandra glabra*							+	+			+	+
Solanaceae	*Anthocercis ilicifolia* subsp. *ilicifolia*								+				
Scrophulariaceae	* *Parentucellia latifolia*										+		
Rubiaceae	*Opercularia vaginata*					+			+	+			

APPENDIX A3: VASCULAR PLANT SPECIES RECORDED WITHIN STATE FOREST 65 - NORTH

Family	Species	W6	W11	W12	W13	W14	W16	W17	W20	S1	S2	H1	H2
Goodeniaceae	*Dampiera linearis*					+							
	Lechenaultia floribunda								+				
	Lechenaultia linarioides								+	+		+	+
	Scaevola canescens								+				
	Scaevola repens var. *repens*		+				+		+				
	Scaevola thesioides subsp. *thesioides*									+			
Stylidiaceae	*Stylidium brunonianum* subsp. *brunonianum*	+	+		+		+		+			+	
	Stylidium calcaratum	+						+	+			+	
	Stylidium crossocephalum	+											
	Stylidium cygnorum								+				
	Stylidium diuroides subsp. *diuroides*	+	+			+	+	+	+				
	Stylidium piliferum	+	+		+	+	+						
	Stylidium repens		+			+	+					+	
	Stylidium ?striatum					+			+				
Asteraceae	* *Arctotheca calendula*								+	+			
	Brachyscome ?glandulosa						+			+		+	+
	* *Hypochaeris glabra*	+		+	+	+	+	+	+	+	+	+	+
	Lagenophora huegelii						+					+	
	Millotia tenuifolia var. *tenuifolia*		+				+						
	Olearia rudis								+				+
	Podolepis lessonii			+							+		+
	Podotheca angustifolia								+		+	+	+
	Quinetia urvillei						+				+		
	Rhodanthe citrina						+					+	
	Rhodanthe citrina (pink form)					+							
	* *Sonchus oleraceus*									+	+		+
	* *Ursinia anthemoides*	+		+	+	+	+	+	+	+	+	+	

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Dennstaedtiaceae	*Pteridium esculentum*	+												
Zamiaceae	*Macrozamia riedlei*				+	+	+					+		
Poaceae	* *Aira caryophyllea*			+	+		+							
	Amphipogon turbinatus				+		+						+	+
	Austrodanthonia acerosa						+	+					+	
	Austrostipa flavescens					+	+						+	
	* *Briza maxima*			+	+			+				+		
	* *Ehrharta calycina*							+				+		
	Neurachne alopecuroidea												+	
Cyperaceae	*Caustis dioica*						+	+					+	+
	Lepidosperma longitudinale										+			
	Lepidosperma pubisquameum							+						
	Lepidosperma squamatum			+	+								+	
	Mesomelaena pseudostygia						+	+	+	+			+	+
	Mesomelaena tetragona												+	
	Schoenus brevisetis		+	+				+	+				+	
	Schoenus clandestinus						+	+					+	+
	Schoenus curvifolius												+	
	Schoenus grandiflorus												+	
	Schoenus rigens												+	+

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Restionaceae	*Alexgeorgea nitens*				+	+	+	+						+
	Chordifex sinuosus												+	
	Desmocladus fasciculatus						+		+			+		
	Desmocladus flexuosus							+				+		
	Hypolaena exsulca		+				+	+	+					
	Lepidobolus preissianus subsp. *preissianus*						+	+				+	+	
	Lyginia barbata							+	+			+	+	+
Juncaceae	*Juncus pallidus*	+												
Dasypogonaceae	*Calectasia cyanea*						+							
	Dasypogon obliquifolius				+								+	+
	Lomandra hermaphrodita		+		+			+						
	Lomandra preissii							+	+					
Xanthorrhoeaceae	*Xanthorrhoea preissii*				+		+	+	+		+	+	+	+
Anthericaceae	*Corynotheca micrantha*						+		+	+				
	Sowerbaea laxiflora									+				
	Thysanotus asper						+	+						
	Thysanotus multiflorus				+									
	Thysanotus triandrus												+	
	Tricoryne elatior		+		+			+		+				

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Colchicaceae	*Burchardia umbellata*				+		+	+						
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*					+	+	+	+				+	
	Anigozanthos pulcherrimus												+	
	Conostylis aculeata			+				+					+	+
	Conostylis candicans			+			+	+		+		+		
	Conostylis juncea				+	+							+	
	Conostylis setigera subsp. *setigera*							+						
	Conostylis teretifolia subsp. *planescens*		+										+	
	Conostylis teretifolia subsp. *teretifolia*						+							
	Haemodorum discolor							+						
	Haemodorum spicatum				+		+	+						
	Phlebocarya ciliata		+									+		
Iridaceae	*Patersonia occidentalis*				+	+	+	+	+				+	+
Orchidaceae	*Pterostylis* sp.		+											
Casuarinaceae	*Allocasuarina humilis*		+			+		+			+		+	+
	Allocasuarina microstachya												+	
Proteaceae	*Adenanthos cygnorum*		+		+			+					+	
	Banksia attenuata		+		+	+	+	+					+	
	Banksia ilicifolia				+			+	+					

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Proteaceae	*Banksia littoralis*										+			
(Continued)	*Banksia menziesii*		+		+	+	+	+						
	Banksia prionotes	+	+	+	+	+	+	+		+		+		
	Banksia telmatiaea		+								+		+	
	Conospermum acerosum subsp. *acerosum*							+						
	Conospermum canaliculatum subsp. *canaliculatum*						+	+	+		+		+	+
	Conospermum triplinervium				+									
	Dryandra lindleyana						+	+					+	+
	Dryandra sessilis											+		
	Hakea candolleana												+	
	Hakea costata						+	+				+	+	
	Hakea prostrata					+	+		+	+		+		
	Hakea ruscifolia						+	+	+				+	
	Hakea trifurcata						+			+		+	+	+
	Hakea varia										+			
	Persoonia comata		+				+	+					+	
	Petrophile brevifolia						+						+	+
	Petrophile linearis		+		+		+	+	+				+	
	Petrophile macrostachya						+		+					
	Petrophile serruriae						+							
	Stirlingia latifolia				+		+	+	+				+	
	Synaphea spinulosa				+			+					+	+
Loranthaceae	*Nuytsia floribunda*				+	+	+	+			+	+	+	

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Amaranthaceae	*Ptilotus manglesii*									+			+	
	Ptilotus stirlingii				+									
Molluginaceae	*Macarthuria australis*								+					
Portulacaceae	*Calandrinia liniflora*				+									
Caryophyllaceae	* *Petrorhagia velutina*			+										
Lauraceae	*Cassytha aurea* var. *hirta*				+		+	+					+	
Brassicaceae	* *Heliophila pusilla*				+									
Droseraceae	*Drosera eneabba*				+									
	Drosera gigantea													+
	Drosera sp. (climbing)				+			+					+	
Mimosaceae	*Acacia blakelyi*					+								
	Acacia lasiocarpa											+		
	Acacia pulchella var. *glaberrima*		+		+	+	+	+	+				+	
	Acacia rostellifera											+		
	Acacia saligna		+								+			
	Acacia sessilis							+						
	Acacia stenoptera				+			+						+

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Papilionaceae	*Bossiaea eriocarpa*		+	+	+	+	+	+						
	Daviesia divaricata subsp. *divaricata*					+		+						
	Daviesia incrassata subsp. *incrassata*							+					+	+
	Daviesia nudiflora subsp. *hirtella*						+	+						
	Gompholobium pungens						+							
	Gompholobium tomentosum		+		+			+					+	
	Hardenbergia comptoniana											+		
	Hovea pungens					+		+					+	
	Hovea trisperma				+									
	Jacksonia floribunda				+		+	+						
	Jacksonia furcellata		+	+		+								
	Jacksonia hakeoides						+			+				
	Jacksonia nutans												+	+
	Jacksonia sternbergiana	+			+	+	+	+				+		
	* *Lupinus* sp.											+		
	Nemcia reticulata												+	
Rutaceae	*Philotheca spicata*				+			+						
Polygalaceae	*Comesperma acerosum* (P3)												+	
	Comesperma calymega							+						
Stackhousiaceae	*Stackhousia monogyna*				+			+					+	

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Rhamnaceae	*Cryptandra arbutiflora* var. *intermedia*						+		+					
	Stenanthemum notiale									+				
Dilleniaceae	*Hibbertia acerosa*		+		+			+					+	+
	Hibbertia huegelii				+	+	+	+					+	+
	Hibbertia hypericoides					+	+	+	+			+		
	Hibbertia racemosa						+							
	Hibbertia stellaris										+		+	
	Hibbertia subvaginata		+		+			+						
Violaceae	*Hybanthus calycinus*								+					
Thymelaceae	*Pimelea imbricata* var. *piligera*												+	
	Pimelea leucantha							+						
	Pimelea sulphurea				+				+					
Myrtaceae	*Beaufortia squarrosa*										+			
	Calothamnus quadrifidus						+					+		
	Calothamnus sanguineus						+	+			+	+	+	+
	Calytrix angulata													+
	Calytrix flavescens				+			+	+			+	+	
	Eremaea asterocarpa				+			+						
	Eremaea pauciflora		+		+	+	+	+	+				+	
	Eucalyptus decipiens		+											

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Myrtaceae	*Eucalyptus rudis*	+		+										
(Continued)	*Eucalyptus todtiana*				+	+	+	+				+	+	
	Hypocalymma xanthopetalum				+	+	+	+					+	
	Kunzea ericifolia		+	+	+	+		+					+	
	Leptospermum erubescens										+		+	
	Leptospermum spinescens						+	+						
	Melaleuca ciliosa						+	+						
	Melaleuca huegelii subsp. *huegelii*											+		
	Melaleuca preissiana		+	+	+	+								
	Melaleuca rhaphiophylla	+	+	+							+			
	Melaleuca affin. *subtrigona*		+											
	Melaleuca systena ms											+		
	Melaleuca trichophylla				+									+
	Melaleuca ?trichophylla												+	+
	Melaleuca sp. (GW 37-1)								+					
	Scholtzia involucrata				+	+	+							
	Verticordia densiflora		+								+		+	+
	Verticordia drummondii												+	
	Verticordia nitens								+					
Apiaceae	*Platysace ramosissima* (P3)													+
	Trachymene pilosa			+	+							+		
	Xanthosia huegelii subsp. *huegelii*				+			+	+				+	

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Epacridaceae	*Andersonia lehmanniana*							+						
	Astroloma glaucescens												+	
	Astroloma pallidum							+					+	
	Conostephium minus (P4)				+									
	Conostephium pendulum				+			+						
	Conostephium preissii		+		+	+						+		
	Leucopogon conostephioides		+		+	+		+					+	
	Leucopogon polymorphus						+	+	+					
	Leucopogon propinquus						+							
	Leucopogon ?propinquus			+										
	Leucopogon sp. (Op4)												+	+
	Lysinema ciliatum												+	
Primulaceae	* *Anagallis arvensis*			+	+									
Lamiaceae	*Hemiandra glabra*				+									
Goodeniaceae	*Dampiera linearis*				+				+					
	Goodenia caerulea							+						
	Goodenia pulchella										+			
	Lechenaultia floribunda							+						
	Lechenaultia linarioides				+							+		
	Lechenaultia stenosepala										+		+	
	Scaevola canescens									+				

APPENDIX A4: VASCULAR PLANT SPECIES RECORDED ON VACANT CROWN LAND AND PRIVATE PROPERTY

Family	Species	F4	F5	F6	W5	W5b	W16	W18	W19	S4	S5	S1/H1	H4	H5
Goodeniaceae	*Scaevola glandulifera*												+	
(Continued)	*Scaevola repens* var. *repens*							+					+	
Stylidiaceae	*Stylidium brunonianum* subsp. *brunonianum*				+			+	+				+	+
	Stylidium crossocephalum		+		+									
	Stylidium dichotomum												+	+
	Stylidium diuroides subsp. *diuroides*							+						
	Stylidium piliferum							+						
	Stylidium repens		+					+						+
Asteraceae	*Brachyscome ?glandulosa*				+	+		+			+		+	
	Podotheca angustifolia				+		+	+						
	Podotheca chrysantha													
	* *Pseudognaphalium luteoalbum*										+			
	Siloxerus filifolius										+			
	* *Sonchus oleraceus*			+								+		
	* *Ursinia anthemoides*			+	+		+	+	+			+	+	

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Azollaceae	*Azolla filiculoides*	+							
Zamiaceae	*Macrozamia riedlei*		+	+	+				
Poaceae	* *Aira caryophyllea*	+							
	Amphipogon turbinatus				+				
Cyperaceae	* *Isolepis marginata*		+	+					+
	Lepidosperma longitudinale	+						+	
	Lepidosperma pubisquameum				+				
	Lepidosperma squamatum						+		
	Lepidosperma tenue			+	+				+
	Schoenus affin. *laevigatus*							+	
	Schoenus brevisetis			+	+	+	+		
	Schoenus clandestinus			+					
	Schoenus curvifolius		+		+	+			
Restionaceae	*Alexgeorgea nitens*		+		+	+			
	Desmocladus flexuosus		+	+					
	Dielsia stenostachya	+							
	Hypolaena exsulca					+	+	+	
	Lyginia barbata		+		+	+	+		
Juncaceae	*Juncus pallidus*	+							

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Dasypogonaceae	*Calectasia cyanea*		+						
	Dasypogon bromellifolius	+	+	+	+		+		+
	Lomandra hermaphrodita				+	+			
	Lomandra maritima				+				
Xanthorrhoeaceae	*Xanthorrhoea preissii*	+	+	+	+			+	+
Anthericaceae	*Corynotheca micrantha*		+						
	Laxmannia sessiliflora				+				
Colchicaceae	*Burchardia umbellata*		+	+	+	+			
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*		+	+	+				
	Conostylis aculeata		+	+	+				
	Conostylis juncea			+	+		+		
	Conostylis teretifolia subsp. *teretifolia*			+	+				
	Phlebocarya ciliata			+	+	+	+		
Iridaceae	* *Gladiolus caryophyllaceus*		+		+				
	Patersonia occidentalis		+	+	+	+	+		+
Orchidaceae	*Caladenia flava* subsp. *flava*			+					
	Cyanicula sp.			+	+				
	Elythranthera brunonis				+				
	Pyrorchis nigricans		+		+		+		
	Thelymitra campanulata					+			

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Casuarinaceae	*Allocasuarina fraseriana*				+				
	Allocasuarina humilis			+	+				
Proteaceae	*Adenanthos cygnorum*			+	+	+	+	+	+
	Banksia attenuata		+	+	+	+	+		+
	Banksia grandis			+	+				
	Banksia ilicifolia	+	+	+	+	+	+	+	+
	Banksia littoralis							+	
	Banksia menziesii		+	+	+	+	+		
	Conospermum acerosum subsp. *acerosum*			+					
	Conospermum incurvum		+	+					
	Conospermum stoechadis subsp. *stoechadis*			+	+				
	Dryandra sp. (seedling)				+				
	Hakea ruscifolia			+	+				
	Persoonia comata			+	+	+	+		
	Petrophile linearis		+	+	+	+	+		+
	Stirlingia latifolia			+	+	+			
Santalaceae	*Leptomeria empetriformis*		+	+	+		+		
	Leptomeria pauciflora				+				
Loranthaceae	*Nuytsia floribunda*	+		+	+				+
Aizoaceae	*Carpobrotus virescens*	+							+
Molluginaceae	*Macarthuria australis*		+						

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Lauraceae	*Cassytha glabella*				+				
	Cassytha sp.			+	+	+		+	+
Droseraceae	*Drosera erythrorhiza*			+	+		+	+	
	Drosera menziesii subsp. *penicillaris*		+		+	+			+
	Drosera platystigma	+							
	Drosera sp.			+	+		+		
Crassulaceae	*Crassula colorata*				+				
Mimosaceae	*Acacia pulchella* var. *glaberrima*		+	+	+	+			+
	Acacia saligna	+							
	Acacia sessilis			+					
	Acacia stenoptera						+		
Papilionaceae	*Aotus procumbens*						+		
	Bossiaea eriocarpa	+	+	+	+				+
	Daviesia divaricata subsp. *divaricata*			+					
	Daviesia incrassata subsp. *incrassata*						+	+	
	Daviesia physodes						+		
	Daviesia podophylla			+	+			+	
	Euchilopsis linearis						+	+	
	Gompholobium scabrum			+	+				
	Gompholobium tomentosum				+		+		
	Hovea pungens			+	+	+			
	Hovea trisperma			+	+				
	Isotropis cuneifolia			+					

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Papilionaceae	*Jacksonia floribunda*		+	+	+	+	+		
(Continued)	*Jacksonia furcellata*	+	+		+		+		+
	Pultenaea reticulata	+							
	* *Trifolium* sp.	+							
Geraniaceae	* *Pelargonium capitatum*		+						
Rutaceae	*Boronia ramosa* subsp. *anethifolia*		+	+	+		+		
	Philotheca spicata		+	+	+	+			+
Euphorbiaceae	*Monotaxis grandiflora*			+					
	Monotaxis occidentalis						+		
	Stachystemon axillaris (P4)						+		
Stackhousiaceae	*Stackhousia monogyna*							+	
Dilleniaceae	*Hibbertia acerosa*				+	+			
	Hibbertia huegelii		+	+	+	+		+	
	Hibbertia hypericoides			+	+				
	Hibbertia subvaginata		+	+	+	+		+	+
Thymelaeaceae	*Pimelea sulphurea*			+	+				
Myrtaceae	*Astartea* sp. Brixton Rd. (G.J.Keighery 5389)	+							
	Beaufortia elegans			+	+	+	+		
	Calothamnus sanguineus				+	+			
	Calytrix angulata		+						

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Myrtaceae	*Calytrix flavescens*		+	+	+	+			
(Continued)	*Calytrix fraseri*			+	+	+	+		
	Calytrix sapphirina				+	+			
	Corymbia calophylla	+							
	Eremaea asterocarpa			+					
	Eremaea pauciflora		+	+	+	+	+		+
	Eremaea purpurea			+					
	Eucalyptus rudis	+							
	Eucalyptus todtiana			+	+		+		
	Hypocalymma angustifolium	+					+	+	
	Kunzea ericifolia	+	+		+		+	+	
	Leptospermum spinescens			+		+			
	Melaleuca preissiana	+	+		+		+	+	
	Melaleuca rhaphiophylla	+							
	Melaleuca sp. (GW 37-1)		+	+	+	+			+
	Pericalymma spongiocaule							+	
	Regelia ciliata							+	
	Regelia inops		+	+	+				+
	Scholtzia involucrata		+	+	+	+	+		
	Verticordia nitens		+	+	+	+	+		
Haloragaceae	*Gonocarpus pithyoides*								+
Apiaceae	*Daucus glochidiatus*	+		+					+
	Xanthosia huegelii subsp. *huegelii* ms				+			+	

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Epacridaceae	*Andersonia heterophylla*			+	+				
	Andersonia lehmanniana subsp. *lehmanniana*			+	+	+			
	Astroloma xerophyllum			+	+				
	Conostephium pendulum		+	+	+	+	+		
	Conostephium preissii		+	+	+	+			
	Leucopogon conostephioides			+	+		+		
	Leucopogon oxycedrus			+			+		
	Leucopogon polymorphus			+	+	+			
	Leucopogon sprengelioides				+				
	Lysinema ciliatum			+	+				
Primulaceae	* *Anagallis arvensis*	+	+						
Verbanaceae	*Pityrodia bartlingii*			+					
Scrophulariaceae	*Glossostigma diandrum*	+							
Goodeniaceae	*Dampiera linearis*			+	+	+	+		+
	Scaevolea repens var. *repens*			+	+				
Stylidiaceae	*Stylidium brunonianum* subsp. *brunonianum*			+			+		
	Stylidium diuroides subsp. *diuroides*			+	+				
	Stylidium ?maritimum				+				
	Stylidium piliferum		+	+	+				
	Stylidium repens			+	+		+	+	

APPENDIX A5: VASCULAR PLANT SPECIES RECORDED WITHIN THE YEAL SWAMP NATURE RESERVE

Family	Species	F1	F3	W2	W3	W4	W7	S3	D1
Asteraceae	* *Arctotheca calendula*	+							
	Cotula coronopifolia	+							+
	* *Hypochaeris glabra*								+
	Olearia paucidentata		+						
	Pithocarpa pulchella var. *pulchella*				+				
	Podotheca angustifolia			+	+				
	Rhodanthe citrina								+
	Senecio lautus	+							
	* *Ursinia anthemoides*	+	+		+				+

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Cupressaceae	*Actinostrobus pyramidalis*					+
Poaceae	*Amphipogon turbinatus*		+		+	
Cyperaceae	Cyperaceae sp.					+
	Cyperaceae/Liliaceae sp. (DW op41)			+		
	Lepidosperma pubisquameum		+	+	+	
	Lepidosperma squamatum			+		
	Lepidosperma sp.		+	+		
	Mesomelaena pseudostygia		+		+	
	Schoenus curvifolius		+	+		
	Schoenus pleiostemoneus				+	
	Schoenus subfascicularis	+	+			
Restionaceae	*Alexgeorgea nitens*		+	+		
	Chordifex microcodon ms		+	+	+	
	Chordifex sinuosus ms		+	+		
	Hypolaena exsulca	+	+			+
	Lyginia barbata		+	+	+	
	Restionaceae sp.					+
Dasypogonaceae	*Calectasia cyanea*		+			
	Lomandra hermaphrodita		+	+		
Xanthorrhoeaceae	*Xanthorrhoea preissii*		+	+	+	+

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Anthericaceae	*Corynotheca micrantha*	+				
	Laxmannia ramosa subsp. *ramosa*		+			
Haemodoraceae	*Anigozanthos humilis* subsp. *humilis*		+			
	Blancoa canescens		+	+	+	
	Conostylis angustifolia		+			
	Conostylis aurea		+			
	Conostylis juncea		+			
	Conostylis teretifolia subsp. *teretifolia*		+		+	
	Haemodorum spicatum		+			
	Haemodorum sp.				+	
	Phlebocarya ciliata			+		
	Phlebocarya filifolia		+		+	
Iridaceae	*Patersonia occidentalis*		+	+	+	
Orchidaceae	*Caladenia flava* subsp. *flava*		+	+	+	
	Pterostylis sp.					+
Casuarinaceae	*Allocasuarina humilis*		+			
Proteaceae	*Adenanthos cygnorum*		+	+	+	+
	Banksia attenuata		+	+	+	+
	Banksia ilicifolia		+	+		
	Banksia laricina			+		+
	Banksia menziesii		+	+	+	+
	Conospermum acerosum subsp. *acerosum*		+			

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Proteaceae (Continued)	*Conospermum incurvum*		+			
	Conospermum stoechadis subsp. *stoechadis*		+		+	
	Dryandra lindleyana				+	
	Dryandra nivea subsp. *nivea*					+
	Hakea costata		+			
	Hakea psilorrhyncha		+		+	+
	Hakea ruscifolia		+		+	
	Hakea varia	+				+
	Petrophile divaricata		+	+		
	Petrophile linearis		+	+	+	
	Petrophile macrostachya		+		+	
	Petrophile recurva				+	
	Petrophile seminuda					+
	Stirlingia latifolia		+	+	+	
	Synaphea spinulosa				+	
Santalaceae	*Leptomeria empetriformis*		+			
Loranthaceae	*Nuytsia floribunda*	+	+		+	+
Molluginaceae	*Macarthuria australis*		+			
Lauraceae	*Cassytha glabella* forma *dispar*	+	+		+	

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Droseraceae	*Drosera erythrorhiza*		+	+		
	Drosera pallida		+	+	+	+
	Drosera platystigma		+			
Mimosaceae	*Acacia barbinervis* subsp. *borealis*			+		
	Acacia pulchella var. *glaberrima*	+	+			
	Acacia stenoptera		+		+	+
Papilionaceae	*Bossiaea eriocarpa*		+	+		
	Daviesia angulata		+		+	+
	Daviesia incrassata subsp. *incrassata*		+			
	Daviesia triflora		+			
	Euchilopsis linearis					+
	Gompholobium scabrum					+
	Gompholobium tomentosum		+	+		
	Hovea stricta		+		+	
	Jacksonia floribunda		+	+	+	
	Jacksonia nutans		+		+	+
	Jacksonia sternbergiana		+	+	+	
	Nemcia capitata		+	+	+	
Rutaceae	*Boronia ramosa* subsp. *ramosa*		+			
	Philotheca spicata		+		+	
	Philotheca spicata subsp. Moore River Nat. Pk. (G&D Woodman Op47)		+	+		
Rhamnaceae	*Stenanthemum humile*		+			

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Dilleniaceae	*Hibbertia acerosa*		+		+	
	Hibbertia ?desmophylla		+	+	+	
	Hibbertia affin. *helianthemoides*			+		
	Hibbertia huegelii		+	+	+	
	Hibbertia hypericoides		+		+	
	Hibbertia subvaginata		+	+	+	+
Myrtaceae	*Astartea* sp. (DW 13-2)	+				
	Beaufortia elegans		+		+	
	Beaufortia squarrosa			+		+
	Calothamnus sanguineus		+			
	Calytrix flavescens		+	+		
	Calytrix fraseri		+	+		
	Calytrix sapphirina		+	+	+	
	Corymbia calophylla	+				
	Eremaea asterocarpa subsp. *asterocarpa*		+	+	+	
	Eremaea pauciflora		+	+	+	
	Eremaea purpurea			+		
	Eucalyptus todtiana		+	+	+	+
	Hypocalymma angustifolium	+				+
	Hypocalymma robustum		+			
	Hypocalymma xanthopetalum		+	+		
	Kunzea micrantha subsp. *?petiolata*					+
	Leptospermum spinescens		+			
	Melaleuca preissiana			+		+
	Melaleuca rhaphiophylla	+				
	Melaleuca ?subtrigona		+		+	

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Myrtaceae	*Melaleuca trichophylla*		+	+		+
(Continued)	*Pericalymma spongiocaule*					+
	Scholtzia involucrata		+	+	+	
	Verticordia densiflora		+			
	Verticordia nitens		+	+		+
Apiaceae	*Xanthosia huegelii* subsp. *huegelii* ms				+	
Epacridaceae	*Andersonia heterophylla*		+	+	+	
	Andersonia lehmanniana subsp. *lehmanniana*		+			+
	Astroloma stomarrhena		+			
	Astroloma xerophyllum		+	+	+	
	Conostephium preissii		+	+	+	
	Leucopogon conostephioides		+	+		
	Leucopogon polymorphus			+		
	Leucopogon sp. Moore River (M.Hislop 1695)			+		
	Leucopogon sprengelioides		+			
	Lysinema ciliatum		+			
	Lysinema elegans		+	+		
Verbenaceae	*Pityrodia bartlingii*		+			
Lamiaceae	*Hemiandra linearis*		+			
	Hemiandra pungens				+	

APPENDIX A6: VASCULAR PLANT SPECIES RECORDED IN THE MOORE RIVER NATIONAL PARK

Family	Species	F2	W5	W8	W15	H3
Goodeniaceae	*Dampiera linearis*			+		
	Lechenaultia floribunda			+		
	Scaevola repens var. *repens*				+	
	Verreauxia reinwardtii		+		+	
Stylidiaceae	*Stylidium brunonianum* subsp. *brunonianum*		+		+	
	Stylidium ?carlquistii (P1)		+			
	Stylidium divaricatum		+			
	Stylidium nonscandens (P3)		+			
	Stylidium piliferum		+			
	Stylidium repens		+			

Legend

Forests

F1: Dense Forest of *Eucalyptus rudis*, *Melaleuca* spp., and *Corymbia calophylla* over *Kunzea ericifolia* and mixed herbs and sedges on brown sandy-loam.

F2: Dense Low Forest of *Melaleuca rhaphiophylla* and *Corymbia calophylla* over *Astartea* sp., *Hypocalymma angustifolium* and sedges on brown clay.

F3: Low Forest of *Banksia* spp. and *Melaleuca preissiana over Hibbertia subvaginata*, *Melaleuca* sp., *Beaufortia elegans* and *Calytrix angulata* on grey sand in low-lying areas.

F4: Dense Forest of *Eucalyptus rudis*, *Melaleuca rhaphiophylla* and *Banksia prionotes* over weed species, along the Moore River.

F5: Low Forest of *Eucalyptus decipiens*, *Melaleuca preissiana* and *Banksia* spp. over tall shrubs on grey sand.

F6: Dense Low Forest of *Eucalyptus rudis*, *Melaleuca preissiana*, *Melaleuca rhaphiophylla* and *Banksia prionotes* on brown sand.

Woodlands on grey sand

W1: Open Tall Woodland of *Melaleuca preissiana*, *Eucalyptus rudis and Banksia littoralis* over *Kunzea ericifolia* and *Adenanthos cygnorum* on grey sand in low-lying areas.

W2: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* over a very low shrub layer dominated by *Melaleuca* sp., *Stirlingia latifolia* and *Scholtzia involucrata* on grey sand.

W3: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* over *Eremaea pauciflora*, *Xanthorrhoea preissii*, *Phlebocarya ciliata* and *Verticordia nitens* on grey sand.

W4: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over shrubs dominated by *Eremaea pauciflora* and *Beaufortia elegans* on grey sand.

W5: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed low shrubs dominated by *Eremaea pauciflora* on grey sand.

W5b: Low Woodland of similar understorey species composition to W5, but dominated by *Banksia prionotes*. These areas appeared to have been disturbed.

W5d: Areas of type W5 that have been modified through disturbances such as clearing, grazing or burning.

W6: Open Low Woodland of *Banksia menziesii* and *Banksia attenuata* over a tall shrub layer dominated by *Adenanthos cygnorum* over *Hibbertia hypericoides* and *Eremaea pauciflora* on grey sand.

W6d: Areas of type W6 that have been modified through disturbances such as clearing, grazing or burning.

W7: Low Woodland of *Banksia attenuata*, *Melaleuca preissiana* and *Banksia menziesii* over *Xanthorrhoea preissii*, *Hypocalymma angustifolium*, *Adenanthos cygnorum* and *Verticordia nitens* on grey sand in low-lying areas.

W8: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii over Banksia laricina* and *Verticordia nitens* on grey-brown sand.

Woodlands on yellow sand

W9: Low Woodland of *Allocasuarina fraseriana*, *Banksia attenuata* and *Eucalyptus todtiana* over open low shrubs on yellow sand.

W10: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over *Hibbertia hypericoides*, *Xanthorrhoea preissii* and *Adenanthos cygnorum* on yellow sand.

W11: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed shrubs dominated by *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Eremaea pauciflora*, *Stirlingia latifolia* and *Mesomelaena pseudostygia* on yellow sand.

W12: Low Woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia grandis* over *Jacksonia sternbergiana*, *Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

W13: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia sternbergiana*, *Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

W14: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over *Xanthorrhoea preissii*, *Calytrix ?fraseri*, *Thryptomene prolifera* and *Stirlingia latifolia* on yellow sand in low-lying areas.

W15: Low Woodland of *Banksia attenuata,* with occasional *Banksia menziesii* and *Eucalyptus todtiana,* over mixed tall shrubs dominated by *Petrophile recurva*, *Eremaea pauciflora* and *Adenanthos cygnorum* on yellow sand.

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

W17: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Hibbertia hypericoides*, *Hakea costata*, *Hakea trifurcata* and *Mesomelaena pseudostygia* on yellow sand.

W18: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over low shrubs dominated by *Eremaea pauciflora*, *Stirlingia latifolia*, *Xanthorrhoea preissii* and *Conospermum canaliculatum* on yellow sand.

W18d: Areas of type W18 that have been modified through disturbances such as clearing, grazing or burning.

W19: Open Low Woodland of *Banksia ilicifolia* over low shrubs dominated by *Xanthorrhoea preissii* on yellow sand in low-lying areas.

Woodlands on limestone

W20: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia hakeoides*, *Melaleuca systena*, *Acacia lasiocarpa*, *Calothamnus quadrifidus* and *Conospermum canaliculatum* on yellow sand with occasional limestone outcropping.

W21: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia grandis* over *Hibbertia hypericoides*, *Xanthorrhoea preissii, Conospermum canaliculatum* and *Stirlingia latifolia* on yellow sand over limestone.

Shrublands

S1: Shrubland of *Melaleuca systena* and *Melaleuca huegelii* subsp. *huegelii* on limestone ridges.

S2: Shrubland of *Dryandra sessilis*, *Melaleuca systena*, *Baeckea ?robusta* and *Diplolaena angustifolia* on yellow sand with limestone outcropping.

S3: Shrubland of *Regelia ciliata* and *Pericalymma spongiocaule*, with occasional emergent *Melaleuca preissiana* and *Banksia littoralis*, on grey sand.

S4: Dense Shrubland of *Hakea trifurcata* over low shrubs and weeds on yellow sand with limestone outcropping.

S5: Dense Shrubland of *Leptospermum erubescens*, *Calothamnus sanguineus* and *Banksia telmatiaea*, with occasional emergent *Banksia littoralis* and *Melaleuca rhaphiophylla,* on grey sandy-loam.

Western Power

PINJAR NORTH TRANSMISSION LINE
VEGETATION MAPPING
LEGEND

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CAD Ref: j562VLEG.dgn	Revision: A	A4

S1/H1: Shrubland of *Hakea trifurcata*, *Melaleuca systena*, *Dryandra sessilis*, *Calothamnus quadrifidus* and *Melaleuca huegelii* subsp. *huegelii* on yellow sand with limestone outcropping.

Heaths

H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessilis*, *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* and, *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

H2: Dense Heath dominated by *Jacksonia hakeoides* on yellow sand.

H3: Dense Low Heath of *Pericalymma spongiocaule*, *Andersonia lehmanniana*, *Euchilopsis linearis* and *Xanthorrhoea preissii* on grey clay.

H4: Dense Heath of mixed low shrubs on grey sandy-clay.

H5: Low Heath dominated by *Xanthorrhoea preissii* and *Melaleuca ?trichophylla* on grey sand.

Disturbed

D1: Disturbed area severely impacted by *Phytophthora cinnamomi*.

D2: Borrow Pit

D3: Banksia Woodland areas so disturbed by clearing, grazing or burning that little or none of the original understorey layer is remaining.

Pines

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

TIWEST LEASE AREA LEGEND

Woodlands

1a.1: Open Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow-brown sand.

1a.2: Woodland of *Banksia prionotes* and *Eucalyptus todtiana* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow sand.

1b: Woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia menziesii* over mixed Proteaceous and Myrtaceous shrubs on lower slopes on grey sand.

1e: Woodland of *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* over *Banksia telmatiaea*, *Beaufortia squarrosa* and *Adenanthos cygnorum* on lower slopes on grey-brown sand.

1f: Woodland of *Melaleuca preissiana*, *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over *Adenanthos cygnorum*, *Eremaea pauciflora* and *Calytrix fraseri* over *Dasypogon obliquifolius*, on mid to lower slopes on grey-brown sand.

Heaths on sand

3a: Heath of occasional *Nuytsia floribunda*, *Banksia* spp. and *Eucalyptus todtiana* over *Beaufortia elegans*, *Petrophile macrostachya* and *Allocasuarina* spp. on grey sand.

3k: Low Heath dominated by *Banksia telmatiaea*, with occasional emergent *Nuytsia floribunda* and *Eucalyptus todtiana*, on brown sandy-loam.

Cl Cleared

Rare, Priority and other Restricted or Unusual Flora Species

- **Ah** *Anigozanthos humilis* subsp. *chrysanthus*
- **Gh** *Georgeantha hexandra*
- **Sa** *Stachystemon axillaris*
- **Sl** *Schoenus* affin. *laevigatus*
- **Sc** *Stylidium ?carlquistii*
- **Ms** *Melaleuca ?subtrigona*
- **Ps** *Philotheca spicata* subsp. Moore River Nat. Pk.
- **Lm** *Leucopogon* sp. Moore River (M. Hislop 1695)
- **Sn** *Stylidium nonscandens*
- **CL** Cyperaceae/Liliaceae sp.
- **Av** *Anigozanthos viridis* subsp. *terraspectans*
- **Cm** *Conostephium minus*
- **Ca** *Comesperma acerosum*
- **Pr** *Platysace ramosissima*

Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
WESTERN OPTION
Sheet 1 of 7

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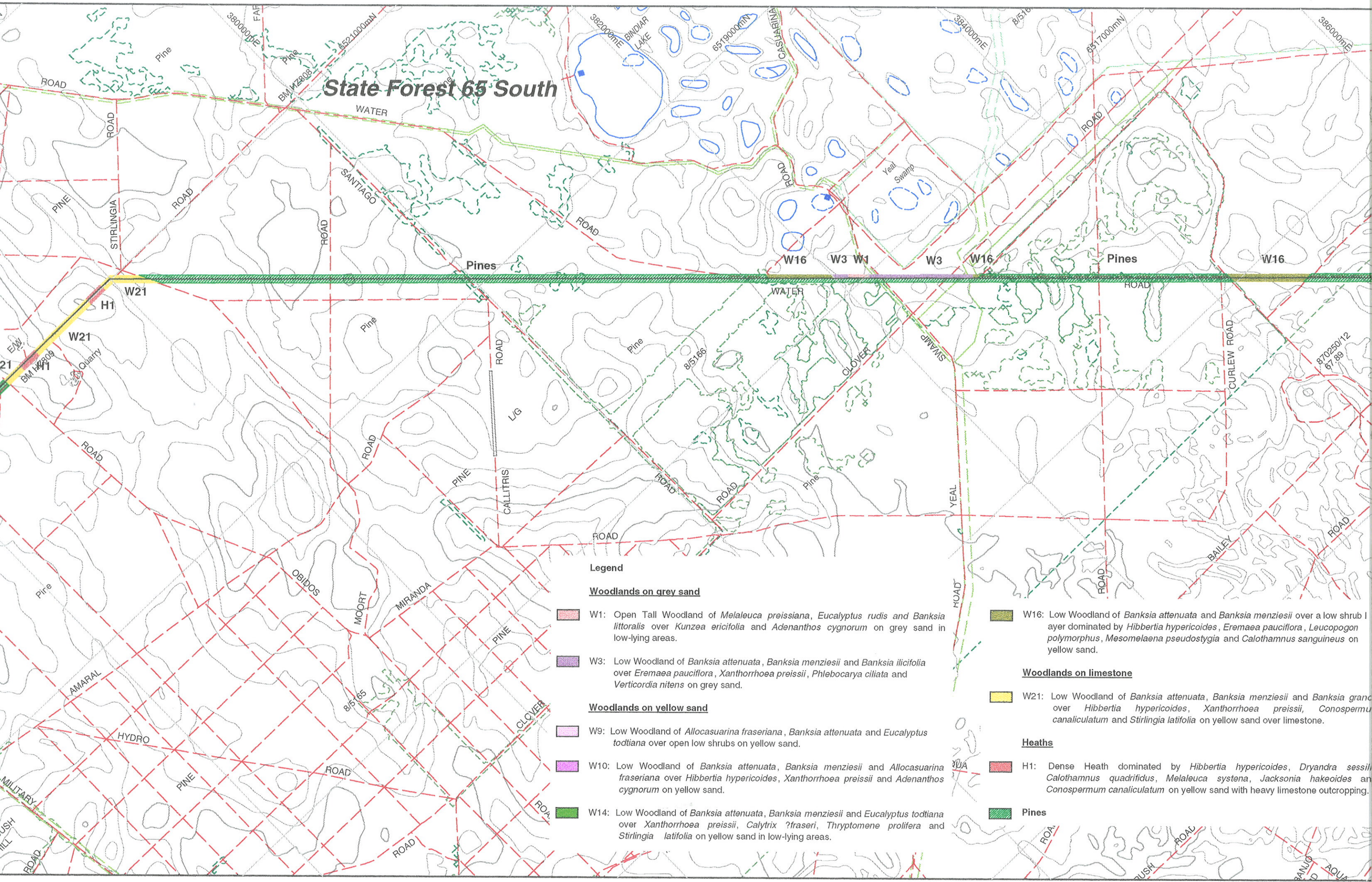
CAD Ref: j562RF01.dgn	Revision: A	A3+

enziesii over a low shrub l
pauciflora, *Leucopogon*
thamnus sanguineus on

enziesii and *Banksia grandis*
preissii, *Conospermum*
over limestone.

icoides, *Dryandra sessilis*,
Jacksonia hakeoides and,
avy limestone outcropping.

0 0.5 1.0 1.5km
SCALE



Legend

Woodlands on grey sand

🟥 W1: Open Tall Woodland of *Melaleuca preissiana*, *Eucalyptus rudis and Banksia littoralis* over *Kunzea ericifolia* and *Adenanthos cygnorum* on grey sand in low-lying areas.

🟪 W3: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* over *Eremaea pauciflora*, *Xanthorrhoea preissii*, *Phlebocarya ciliata* and *Verticordia nitens* on grey sand.

Woodlands on yellow sand

🟪 W9: Low Woodland of *Allocasuarina fraseriana*, *Banksia attenuata* and *Eucalyptus todtiana* over open low shrubs on yellow sand.

🟪 W10: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over *Hibbertia hypericoides*, *Xanthorrhoea preissii* and *Adenanthos cygnorum* on yellow sand.

🟩 W14: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over *Xanthorrhoea preissii*, *Calytrix ?fraseri*, *Thryptomene prolifera* and *Stirlingia latifolia* on yellow sand in low-lying areas.

🟫 W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub l ayer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

Woodlands on limestone

🟨 W21: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia granc* over *Hibbertia hypericoides*, *Xanthorrhoea preissii*, *Conospermu* *canaliculatum* and *Stirlingia latifolia* on yellow sand over limestone.

Heaths

🟥 H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessil* *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* an *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

▨ **Pines**

State Forest 65 South

Legend

Woodlands on grey s

W1: Open Tall Wood
littoralis over *K*
low-lying areas.

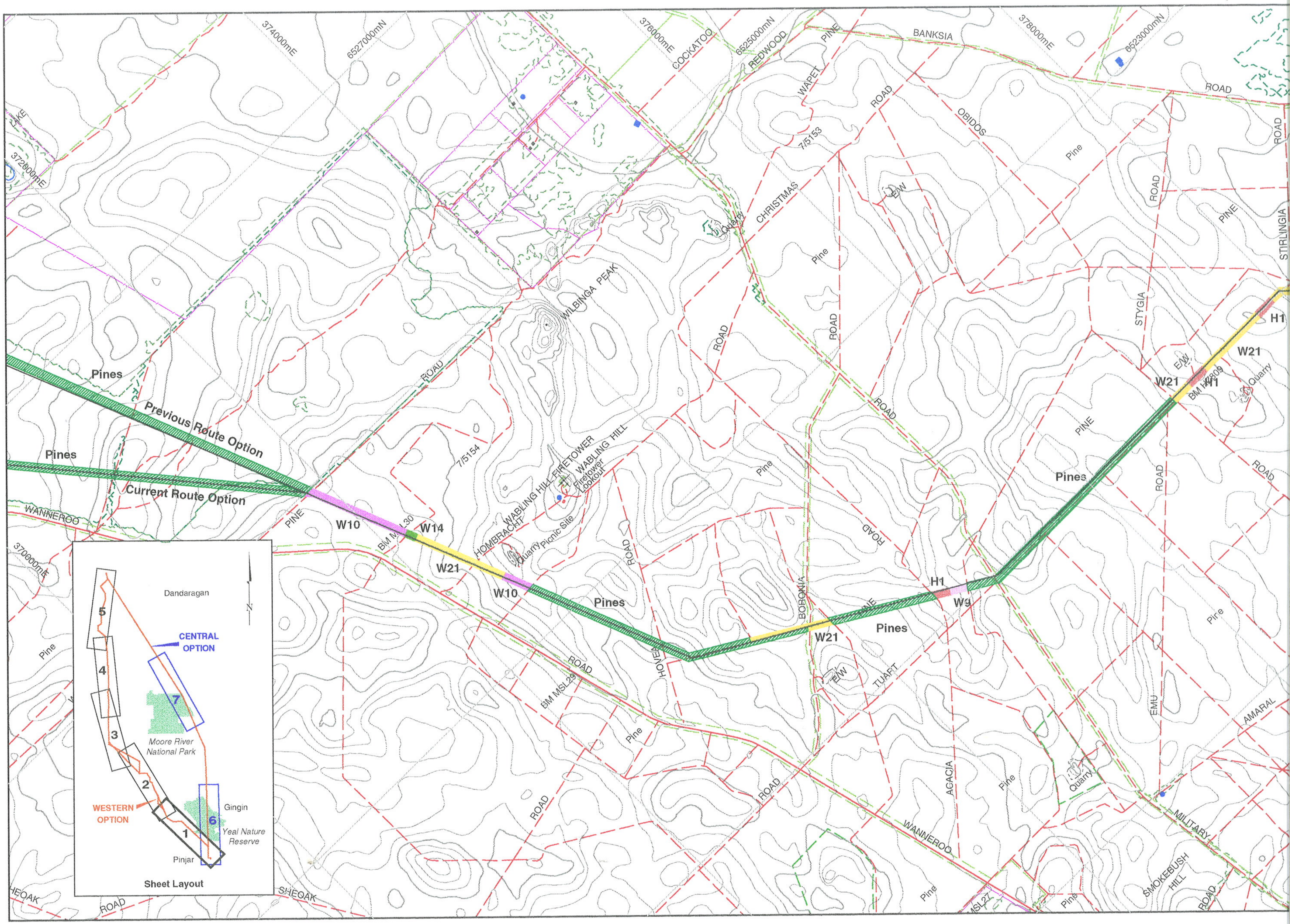
W3: Low Woodland o
over *Eremaea pa*
Verticordia nitens

Woodlands on yellow

W9: Low Woodland of
todtiana over ope

W10: Low Woodland
fraseriana over
cygnorum on ye

W14: Low Woodland
over *Xanthorrh*
Stirlingia latifo



Previous Route Option
Current Route Option
Pines
W10
W14
W21
W9
H1
WABLING HILL
WILBINGA PEAK
WABLING HILL FIRETOWER
Firetower Lookout
Picnic Site
Quarry
WANNEROO
ROAD
PINE
CHRISTMAS
COCKATOO
REDWOOD
BANKSIA
OBIDOS
STYGIA
STIRLINGIA
BORONIA
HOVEA
TUART
ACACIA
EMU
AMARAL
MILITARY
SMOKEBUSH HILL
SHEOAK
HOMBRACHT
7/5154
7/5153
BM MSL29
374000mE
376000mE
378000mE
372000mE
370000mE
6527000mN
6525000mN
6523000mN
Dandaragan
CENTRAL OPTION
WESTERN OPTION
Moore River National Park
Gingin
Yeal Nature Reserve
Pinjar
Sheet Layout

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
WESTERN OPTION
Sheet 1 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
A.C.N.088 055 903
4 Millcroft Elbow, Jandakot W.A. 6164
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Author: D. Woodman	Date: Dec 2000	Scale: 1:25,000
Drawn: CAD Resources ~ www.cadresources.com.au Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202		Figure: **1a**
CAD Ref: j562DB01.dgn	Revision: A	A3+

386000mE
6515000mN
388000mE
6513000mN
390000mE
6511000mN
6509000mN
6507000mN
5023/1 76.54
5022/2 79.62
5023/2 81.78
2336/0 68.18
HZ 284 69.77
870250/12 67.89
ROAD
HILL
SWALLOW
L.G.
A.R.O. AREA
DAVIESIA
ROSELLA
PERRY
McKINLEY
ROBIN
WAGTAIL
SWIFT
CHAPMAN
PINJAR PLANTATION
HADRILL
Tk
Mast
Dam
R.A.A.F

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

0 0.5 1.0 1.5km
SCALE

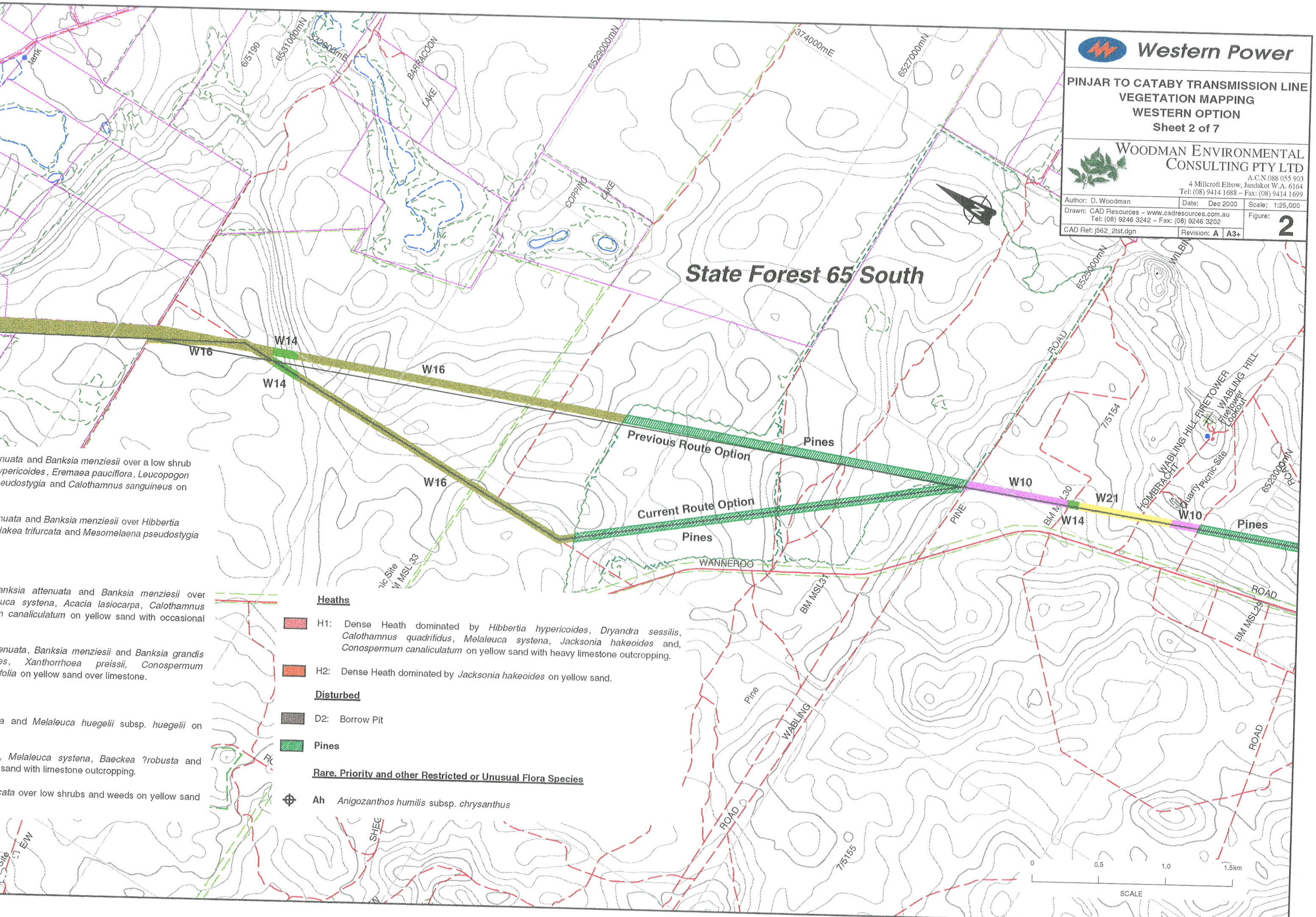
State Forest 65 South

380000mE
6521000mN
382000mE
6519000mN
384000mE
6517000mN
386000mE
BM HZ808
BINDIAR LAKE
CASUARINA
WATER
SANTIAGO
ROAD
Yeal Swamp
SWALLOW
Pine
L/G
CALLITRIS
PINE
OBIDOS
MOORT
MIRANDA
CLOVER
SWAMP
YEAL
HERON
CURLEW ROAD
BAILEY
ROBIN
CHAPMAN
WAGTAIL
SWIFT
MISTLETOE
AQUA
HYDRO
8/5166
5166/3
45.50
870250/12
67.89

State Forest 65 South

376000mE
COCKATOO
6525000mN
REDWOOD
PINE
BANKSIA
378000mE
6523000mN
ROAD
OBIDOS
Pine
WAPET
7/5153
CHRISTMAS
Quarry
ELM
ROAD
Pine
WILBINGA PEAK
ROAD
ROAD
ROAD
STYGIA
ROAD
PINE
STIRLINGIA
ROAD
380000mE
FAR
Pine
BM HZ808
6521000mN
WATER
SANTIAGO
ROAD
382000mE
BINDIAR
LAKE
ROAD
Pine
ELM
BM HZ809
Quarry
ROAD
L/G
7/5154
WABLING HILL FIRETOWER
WABLING HILL
Firetower
Lookout
HOMBRACHT
Quarry
Picnic Site
ROAD
Pine
ROAD
ROAD
PINE
ROAD
CALLITRIS
ROAD
BORONIA
PINE
HOVEA
ROAD
BM MSL29
ELM
TUART
EMU
OBIDOS
MOORT
MIRANDA
PINE
Pine
AMARAL
8/5165
CLOVER
AQUA
ROAD
ACACIA
Pine
Quarry
HYDRO
ROAD
PINE
ROAD
ROAD
WANNEROO
MILITARY
Pine
Pine
SMOKEBUSH
HILL
ROAD
ROAD
MSL27
ROAD
Pine

374000mE
6527000mN
376000mE
6525000mN
378000mE
6523000mN
372000mE
370000mE
LAKE
COCKATOO
REDWOOD
WAPET
PINE
BANKSIA
ROAD
OBIDOS
7/5153
7/5154
Pine
E/W
CHRISTMAS
Quarry
WILBINGA PEAK
STYGIA
STIRLINGIA
BM HZ809
Previous Route Option
Current Route Option
WANNEROO
WABLING HILL FIRETOWER
WABLING HILL
Firetower Lookout
HOMBRACHT
Quarry
Picnic Site
BM MSL30
BM MSL29
HOVEA
BORONIA
TUART
EMU
AMARAL
ACACIA
MILITARY
SMOKEBUSH HILL
SHEOAK
Dandaragan
N
CENTRAL OPTION
WESTERN OPTION
Moore River National Park
Gingin
Yeal Nature Reserve
Pinjar
1
2
3
4
5
6
7
Sheet Layout


Western Power
PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
WESTERN OPTION
Sheet 2 of 7
WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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Scale: 1:25,000
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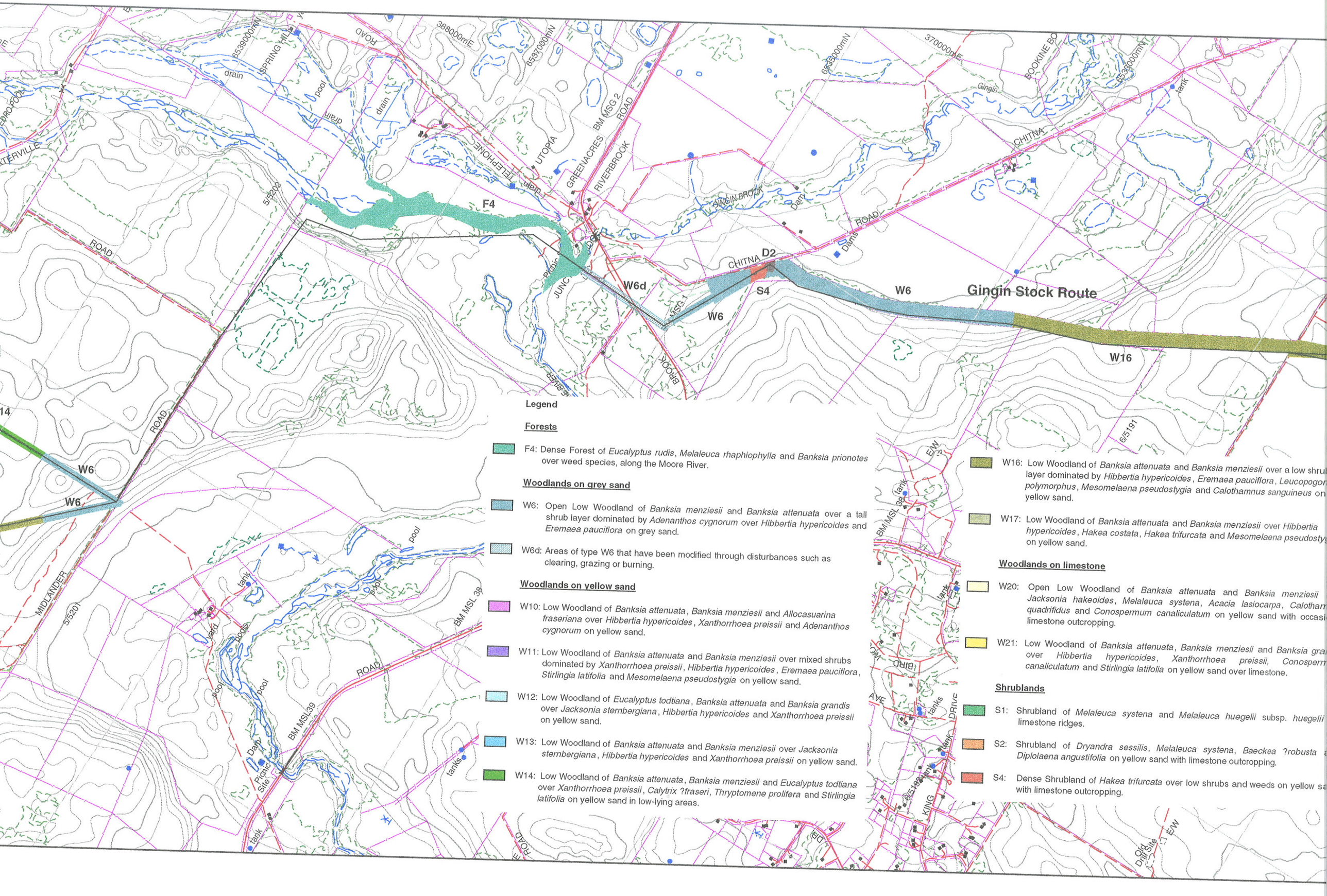
Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202
Figure: 2
CAD Ref: j562_2tst.dgn
Revision: A
A3+
State Forest 65 South
W16
W14
W16
W14
W16
Previous Route Option
Pines
Current Route Option
Pines
W10
W21
W14
W10
Pines
BARRACOON LAKE
COPPING LAKE
WABLING HILL FIRETOWER
WABLING HILL
Firetower Lookout
Quarry Picnic Site
HOMBRACHT
WANNEROO ROAD
PINE ROAD
WABLING
BM MSL30
BM MSL31
BM MSL29
6531000mN
6529000mN
6527000mN
6525000mN
6523000mN
372000mE
374000mE
7/5154
7/5155
6/5190
tank
nuata and Banksia menziesii over a low shrub
ypericoides, Eremaea pauciflora, Leucopogon
eudostygia and Calothamnus sanguineus on
nuata and Banksia menziesii over Hibbertia
lakea trifurcata and Mesomelaena pseudostygia
anksia attenuata and Banksia menziesii over
uca systena, Acacia lasiocarpa, Calothamnus
n canaliculatum on yellow sand with occasional
enuata, Banksia menziesii and Banksia grandis
es, Xanthorrhoea preissii, Conospermum
folia on yellow sand over limestone.
a and Melaleuca huegelii subsp. huegelii on
, Melaleuca systena, Baeckea ?robusta and
sand with limestone outcropping.
cata over low shrubs and weeds on yellow sand
Heaths
H1: Dense Heath dominated by Hibbertia hypericoides, Dryandra sessilis, Calothamnus quadrifidus, Melaleuca systena, Jacksonia hakeoides and, Conospermum canaliculatum on yellow sand with heavy limestone outcropping.
H2: Dense Heath dominated by Jacksonia hakeoides on yellow sand.
Disturbed
D2: Borrow Pit
Pines
Rare, Priority and other Restricted or Unusual Flora Species
Ah Anigozanthos humilis subsp. chrysanthus
0
0.5
1.0
1.5km
SCALE



Legend

Forests

F4: Dense Forest of *Eucalyptus rudis*, *Melaleuca rhaphiophylla* and *Banksia prionotes* over weed species, along the Moore River.

Woodlands on grey sand

W6: Open Low Woodland of *Banksia menziesii* and *Banksia attenuata* over a tall shrub layer dominated by *Adenanthos cygnorum* over *Hibbertia hypericoides* and *Eremaea pauciflora* on grey sand.

W6d: Areas of type W6 that have been modified through disturbances such as clearing, grazing or burning.

Woodlands on yellow sand

W10: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Allocasuarina fraseriana* over *Hibbertia hypericoides*, *Xanthorrhoea preissii* and *Adenanthos cygnorum* on yellow sand.

W11: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed shrubs dominated by *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Eremaea pauciflora*, *Stirlingia latifolia* and *Mesomelaena pseudostygia* on yellow sand.

W12: Low Woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia grandis* over *Jacksonia sternbergiana*, *Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

W13: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia sternbergiana*, *Hibbertia hypericoides* and *Xanthorrhoea preissii* on yellow sand.

W14: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over *Xanthorrhoea preissii*, *Calytrix ?fraseri*, *Thryptomene prolifera* and *Stirlingia latifolia* on yellow sand in low-lying areas.

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

W17: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Hibbertia hypericoides*, *Hakea costata*, *Hakea trifurcata* and *Mesomelaena pseudostyg* on yellow sand.

Woodlands on limestone

W20: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii* *Jacksonia hakeoides*, *Melaleuca systena*, *Acacia lasiocarpa*, *Calotham quadrifidus* and *Conospermum canaliculatum* on yellow sand with occasi limestone outcropping.

W21: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia gra* over *Hibbertia hypericoides*, *Xanthorrhoea preissii*, *Conosperm canaliculatum* and *Stirlingia latifolia* on yellow sand over limestone.

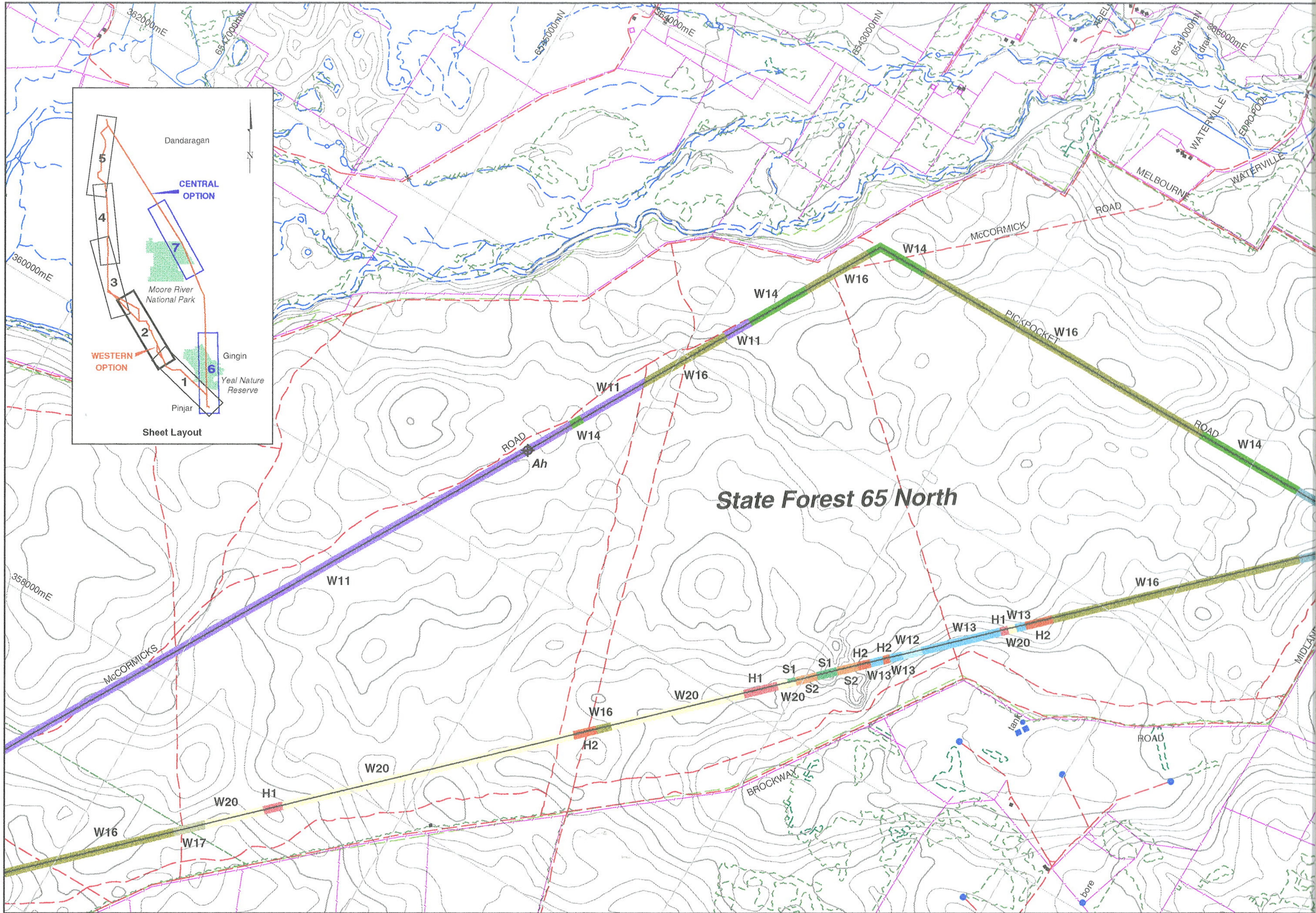
Shrublands

S1: Shrubland of *Melaleuca systena* and *Melaleuca huegelii* subsp. *huegelii* limestone ridges.

S2: Shrubland of *Dryandra sessilis*, *Melaleuca systena*, *Baeckea ?robusta* *Diplolaena angustifolia* on yellow sand with limestone outcropping.

S4: Dense Shrubland of *Hakea trifurcata* over low shrubs and weeds on yellow sa with limestone outcropping.

6542000mN
364000mE
6543000mN
6541000mN
366000mE
6539000mN
368000mE
SPRING HILL
ROAD
drain
pool
drain
drain
WATERVILLE
EDDYPOOL
WATERVILLE
MELBOURNE
ROAD
McCORMICK
ROAD
5/5202
ROAD
W14
W16
W14
W11
W16
W11
PICKPOCKET
W16
ROAD
W14
ROAD
W14
Ah
State Forest 65 North
W6
W6
ROAD
W16
/11
pool
MIDLANDER
5/5201
H1
W13
W13
H2
W20
W12
H2
H2
W13
W13
S1
S1
S2
S2
H1
W20
W20
W16
H2
W20
tank
tank
yard
pools
pool
pool
ROAD
BROCKWAY
ROAD
BM MSL39
Dam
Picnic Site
tanks
BM MSL
tank
bore



Sheet Layout
Dandaragan
CENTRAL OPTION
WESTERN OPTION
Moore River National Park
Gingin
Yeal Nature Reserve
Pinjar
1
2
3
4
5
6
7
State Forest 65 North
McCORMICK
ROAD
PICKPOCKET
McCORMICKS
BROCKWAY
MELBOURNE
WATERVILLE
Ah
tank
bore
W11
W12
W13
W14
W16
W17
W20
H1
H2
S1
S2
360000mE
358000mE
362000mE
364000mE
366000mE
6541000mN
6543000mN
6545000mN
6547000mN

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
WESTERN OPTION
Sheet 2 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562DB02.dgn	Revision: A	A3+

State Forest 65 South

Previous Route Option

Current Route Option

Dieback Legend

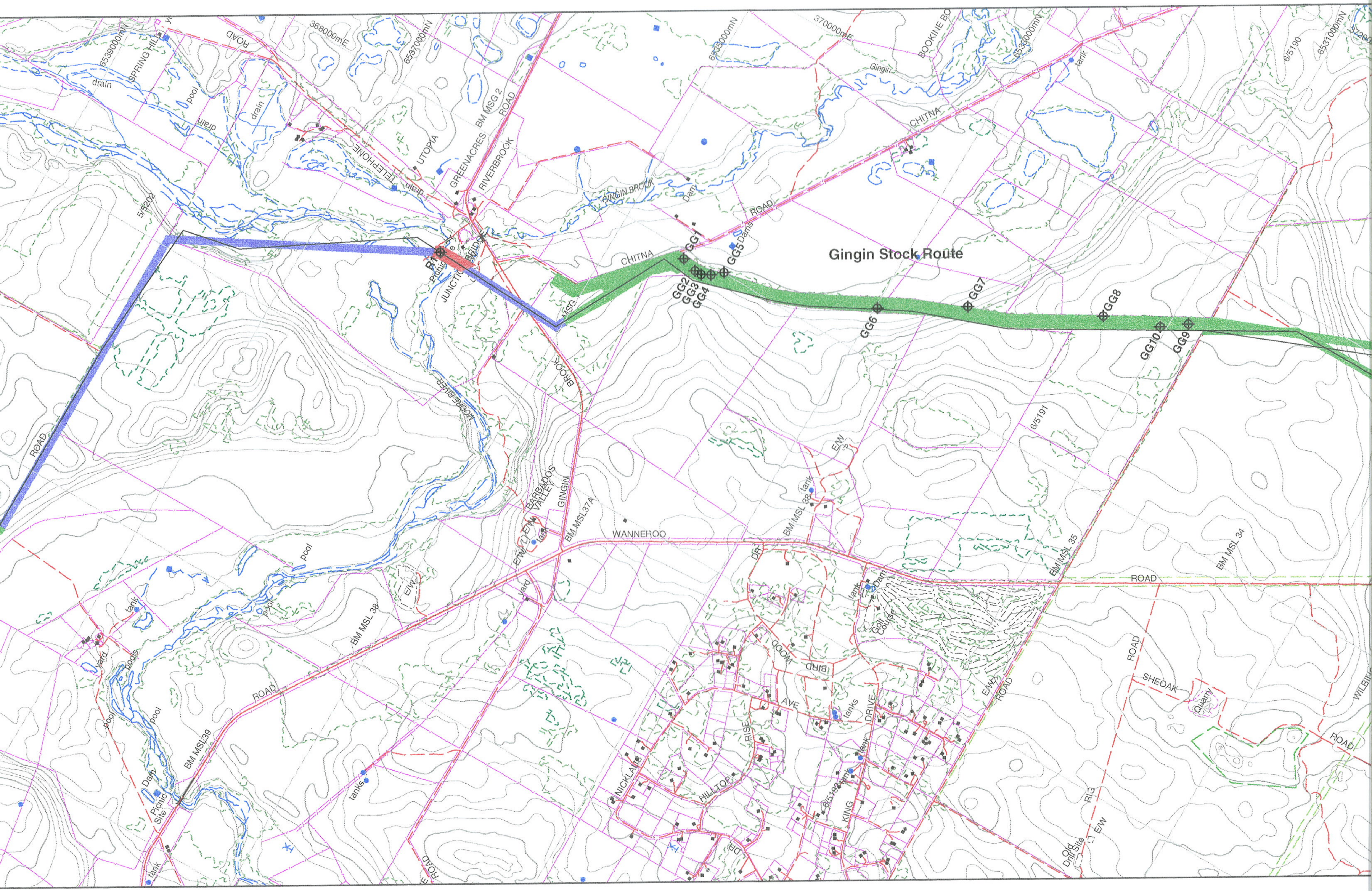
Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

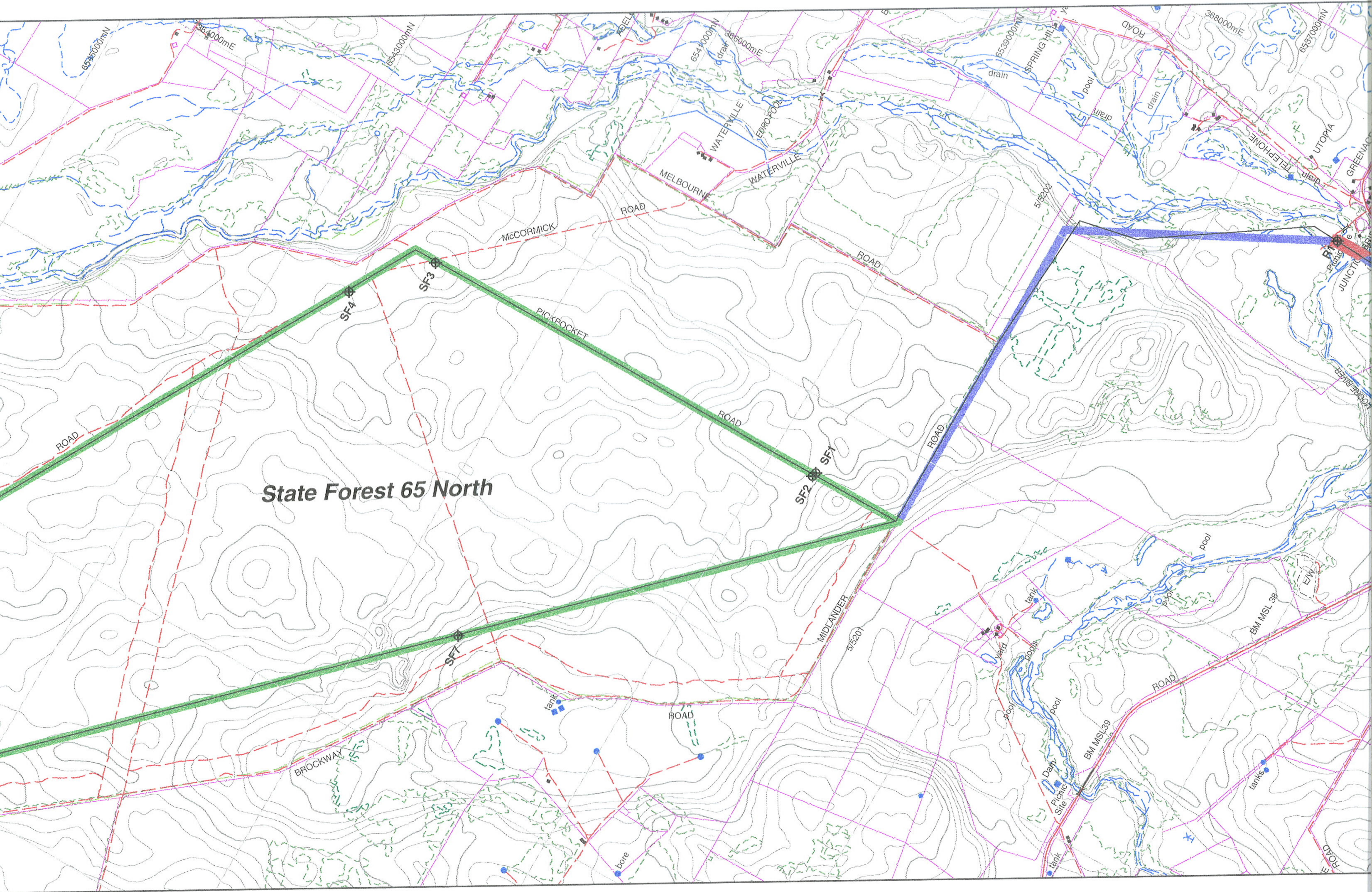
Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

0 0.5 1.0 1.5km
SCALE


Gingin Stock Route
GG1
GG2
GG3
GG4
GG5
GG6
GG7
GG8
GG9
GG10
CHITNA
ROAD
GINGIN BROOK
RIVERBROOK
GREENACRES
UTOPIA
TELEPHONE
SPRING HILL
BM MSG 2
368000mE
370000mE
6539000mN
6537000mN
6535000mN
6533000mN
6531000mN
BOOKINE BO
drain
pool
MOORE RIVER
JUNCTION
BROOK
BARBADOS VALLEY
GINGIN
BM MSL37A
WANNEROO
BM MSL 38
BM MSL 39
BM MSL 35
BM MSL 34
tank
tanks
Dam
Dams
yard
pools
Picnic Site
E/W
6/5191
6/5190
5/5202
Golf Course
WOOD
BIRD
AVE
RISE
DRIVE
HILLTOP
NICKLAUS
KING
DR
SHEOAK
Quarry
R13
Old Drill Site
WILBING


State Forest 65 North
SF1
SF2
SF3
SF4
SF7
R1
PICKPOCKET
ROAD
McCORMICK
ROAD
MELBOURNE
WATERVILLE
WATERVILLE
EDRO POOL
SPRING HILL
TELEPHONE
UTOPIA
MIDLANDER
BROCKWAY
ROAD
5/5201
5/5202
BM MSL 38
BM MSL39
Picnic Site
Dam
pool
drain
tank
tanks
bore
364000mE
366000mE
368000mE
6543000mN
6541000mN
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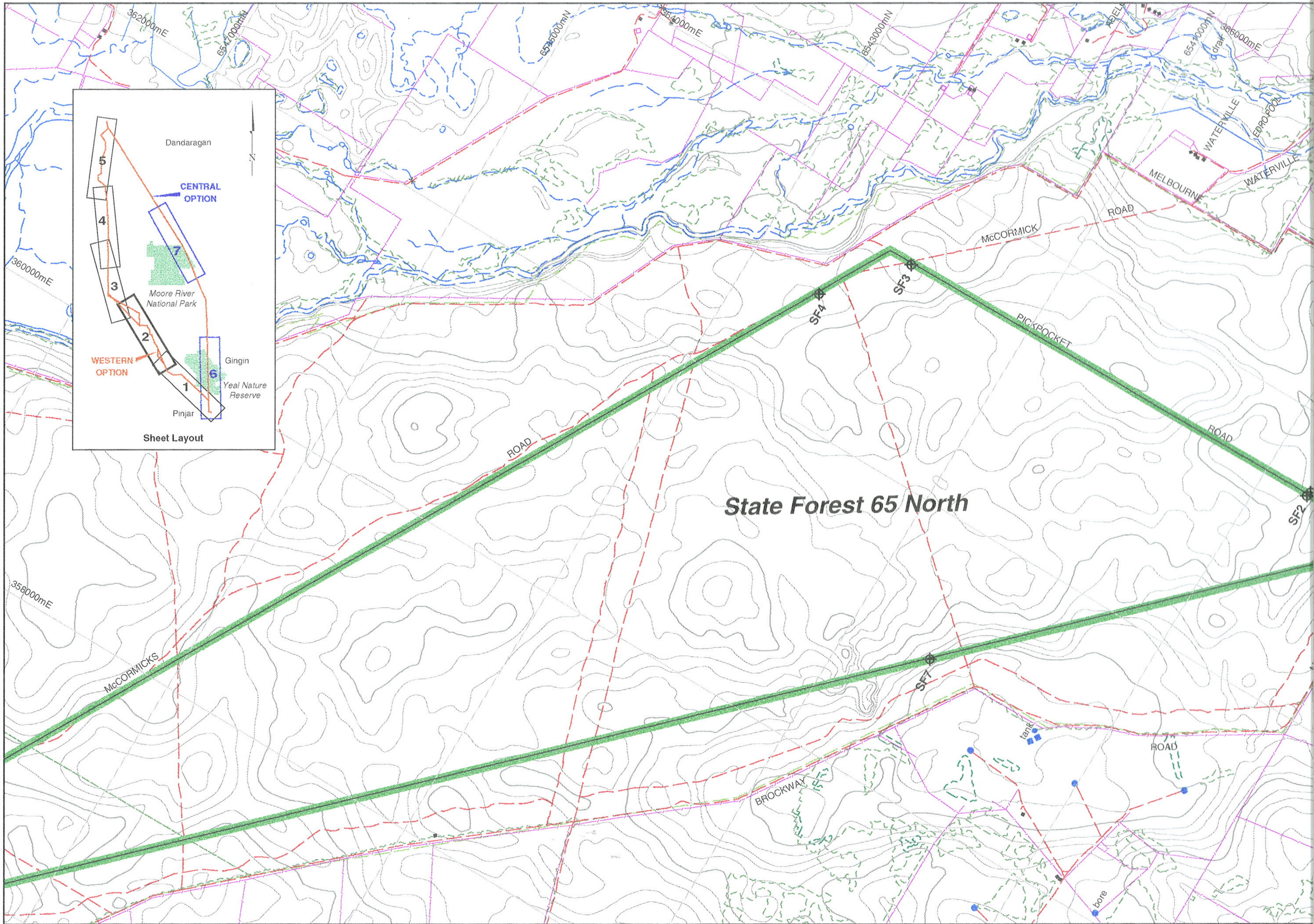
6537000mN



State Forest 65 North
SF2
SF3
SF4
SF7
PICKPOCKET
ROAD
McCORMICK
ROAD
McCORMICKS
ROAD
BROCKWAY
ROAD
MELBOURNE
WATERVILLE
EDROPOOL
tank
bore
360000mE
358000mE
362000mE
Dandaragan
CENTRAL OPTION
Moore River National Park
WESTERN OPTION
Gingin
Yeal Nature Reserve
Pinjar
N
Sheet Layout

Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
WESTERN OPTION
Sheet 3 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562RF03.dgn	Revision: A	A3+

McCORMICKS
ZIEMA
EDWARDS RD
ROAD
EDWARDS
LANCELIN
E.W.
RD
W11
W16
W17
W20
H1
S1
Gh

0 0.5 1.0 1.5km
SCALE

State Forest 65 North

RD
RD
RD
DEBJRGH
YANGTSE
BENNIES
ZIEMA
W17
W16
W17
H1
W17
W20
McCORMICKS
H1
W20
W20
H1
E.W.
RD
E.W.
BENNIES
E.W.
E.W.
E.W.
RD

and *Banksia menziesii* over mixed shrubs
Hibbertia hypericoides, *Eremaea pauciflora*,
pseudostygia on yellow sand.

a and *Banksia menziesii* over a low shrub
ericoides, *Eremaea pauciflora*, *Leucopogon*
dostygia and *Calothamnus sanguineus* on

and *Banksia menziesii* over *Hibbertia*
trifurcata and *Mesomelaena pseudostygia*

and *Banksia menziesii* over low shrubs
tirlingia latifolia, *Xanthorrhoea preissii* and
ow sand.

ilicifolia over low shrubs dominated by
d in low-lying areas.

Woodlands on limestone

W20: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia hakeoides*, *Melaleuca systena*, *Acacia lasiocarpa*, *Calothamnus quadrifidus* and *Conospermum canaliculatum* on yellow sand with occasional limestone outcropping.

Shrublands

S1: Shrubland of *Melaleuca systena* and *Melaleuca huegelii* subsp. *huegelii* on limestone ridges.

Heaths

H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessilis*, *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* and, *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

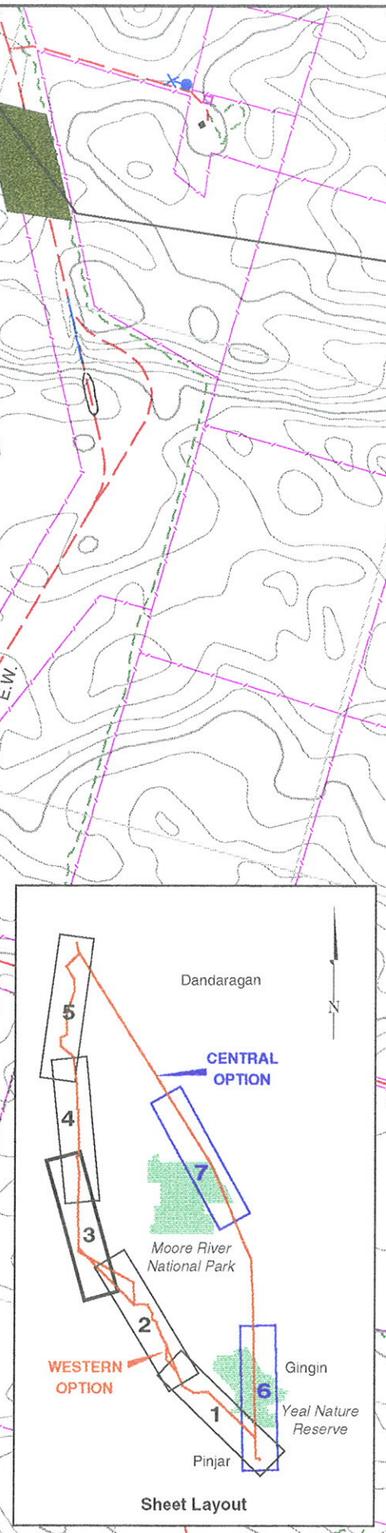
Disturbed

D3: Banksia Woodland areas so disturbed by clearing, grazing or burning that little or none of the original understorey layer is remaining.

Rare, Priority and other Restricted or Unusual Species

Gh *Georgeantha hexandra* ms

GARAGAIN LAKE
D3
RD
GARBANUP
DEBJIRGH
YANGTSE
BENNIES
W17
W16
H1
E.W.



Legend

W11: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed shrubs dominated by *Xanthorrhoea preissii*, *Hibbertia hypericoides*, *Eremaea pauciflora*, *Stirlingia latifolia* and *Mesomelaena pseudostygia* on yellow sand.

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

W17: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Hibbertia hypericoides*, *Hakea costata*, *Hakea trifurcata* and *Mesomelaena pseudostygia* on yellow sand.

W18: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over low shrubs dominated by *Eremaea pauciflora*, *Stirlingia latifolia*, *Xanthorrhoea preissii* and *Conospermum canaliculatum* on yellow sand.

W19: Open Low Woodland of *Banksia ilicifolia* over low shrubs dominated by *Xanthorrhoea preissii* on yellow sand in low-lying areas.

Woodlands on limestone

W20: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii* over *Jacksonia hakeoides*, *Melaleuca systena*, *Acacia lasiocarpa*, *Calothamnus quadrifidus* and *Conospermum canaliculatum* on yellow sand with occasional limestone outcropping.

Shrublands

S1: Shrubland of *Melaleuca systena* and *Melaleuca huegelii* subsp. *huegelii* on limestone ridges.

Heaths

H1: Dense Heath dominated by *Hibbertia hypericoides*, *Dryandra sessilis*, *Calothamnus quadrifidus*, *Melaleuca systena*, *Jacksonia hakeoides* and, *Conospermum canaliculatum* on yellow sand with heavy limestone outcropping.

Disturbed

D3: Banksia Woodland areas so disturbed by clearing, grazing or burning that little or none of the original understorey layer is remaining.

Rare, Priority and other Restricted or Unusual Species

Gh *Georgeantha hexandra* ms

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
WESTERN OPTION
Sheet 3 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562DB03.dgn	Revision: A	A3+

6549000mN
358000mE
6547000mN
6545000mN
6543000mN
6541000mN
McCORMICKS RD
ZIEMA
EDWARDS RD
ROAD
SF6
RD
E.W.
0 0.5 1.0 1.5km
SCALE

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

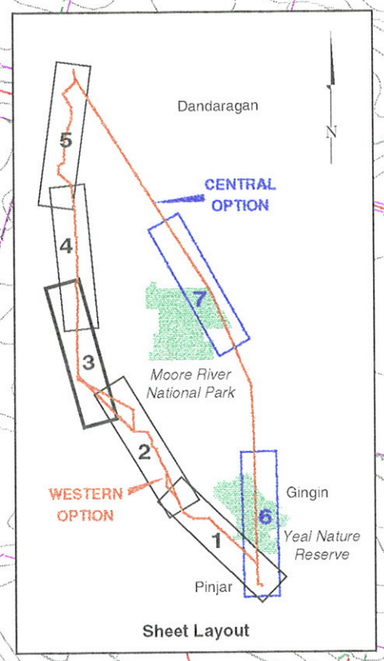
Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

356000mE
6557000mN
6555000mN
6553000mN
6551000mN
6549000mN
RD
DEBJRGH
YANGTSE
BENNIES
ZIEMA
McCORMICKS
E.W.
SF5
State Forest 65 North

6565000mN
6563000mN
354000mE
6561000mN
6559000mN
6557000mN
GARAGAINLAKE
RD
LAKES
MAST
KARAKIN
GARBANUP
DEBURGH
YANGTSE
BENNIES
E.W.
agan
NTRAL
PTION
Gingin
6
Yeal Nature Reserve
ut

6567000mN
6565000mN
6563000mN
354000mE
6561000mN
6559000mN
352000mE
RD
GARAGAN LAKE
LAKES
MAST
E.W.
350000mE
GARBANUP
KARAKIN
348000mE
RD



Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
WESTERN OPTION
Sheet 4 of 7

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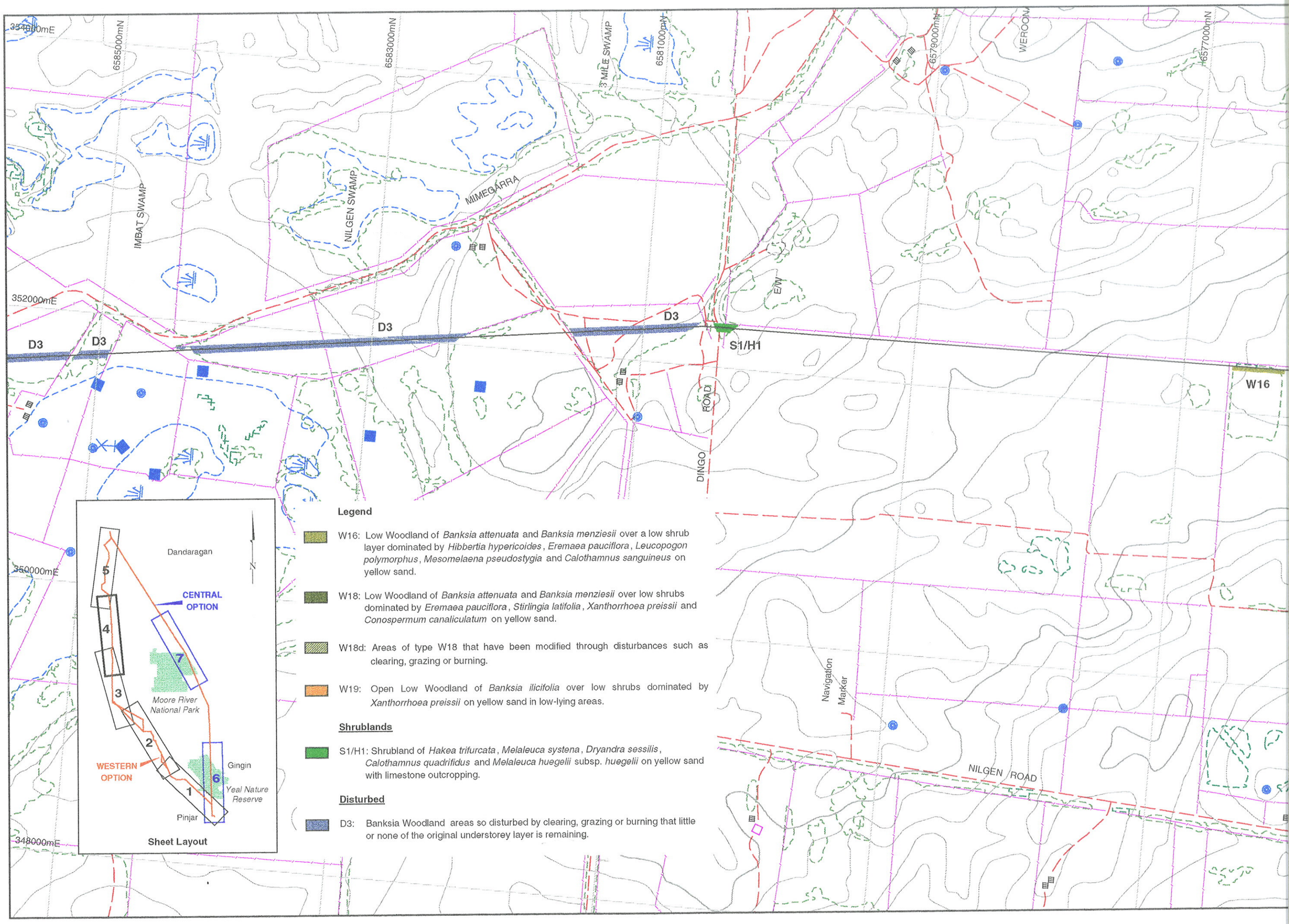
CAD Ref: j562RF04.dgn	Revision: A	A3+

6567000mN
6565000mN
356000mE
6563000mN
6561000mN
6559000mN
KARAKIN LAKES
GARAGAIN LAKE
N
W19
W18
D3
RD
ROAD
E.W.
SAPPERS
LAKES
KARAKIN
MAST
GARBANUP
0 0.5 1.0 1.5km
SCALE



Legend

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

W18: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over low shrubs dominated by *Eremaea pauciflora*, *Stirlingia latifolia*, *Xanthorrhoea preissii* and *Conospermum canaliculatum* on yellow sand.

W18d: Areas of type W18 that have been modified through disturbances such as clearing, grazing or burning.

W19: Open Low Woodland of *Banksia ilicifolia* over low shrubs dominated by *Xanthorrhoea preissii* on yellow sand in low-lying areas.

Shrublands

S1/H1: Shrubland of *Hakea trifurcata*, *Melaleuca systena*, *Dryandra sessilis*, *Calothamnus quadrifidus* and *Melaleuca huegelii* subsp. *huegelii* on yellow sand with limestone outcropping.

Disturbed

D3: Banksia Woodland areas so disturbed by clearing, grazing or burning that little or none of the original understorey layer is remaining.

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
WESTERN OPTION
Sheet 4 of 7

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CAD Ref: j562RF04.dgn	Revision: A	A3+

356000mE
6567000mN
6565000mN
6563000mN
6561000mN
6559000mN
KARAKIN LAKES
GARAGAN LAKE
R2
RD
E.W.
MAST
GARBANUP
0 0.5 1.0 1.5km
SCALE

E W

R2

RD

RD

6567000mN

6569000mN

6571000mN

6573000mN

6575000mN

6577000mN

354000mE

6585000mN

6583000mN

6581000mN

6579000mN

6577000mN

IMBAT SWAMP

NILGEN SWAMP

3 MILE SWAMP

MIMEGARRA

WEROONA

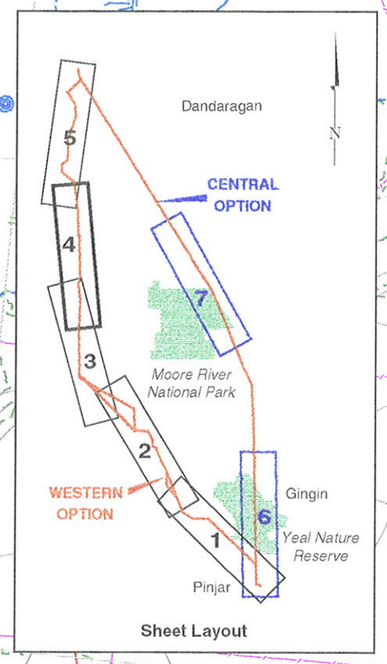
E/W

352000mE

350000mE

348000mE

Navigation Marker



Sheet Layout

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
WESTERN OPTION
Sheet 5 of 7

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CAD Ref: j562RF05.dgn	Revision: B	A3+

6589000mN
6587000mN
6585000mN
6583000mN
346000mE
CARBA GAR
MIMEGARRA
WALYENGARRA LAKE
D3
W5
W5b
F5
F6
Cm

Legend

Forests

F5: Low Forest of *Eucalyptus decipiens*, *Melaleuca preissiana* and *Banksia* spp. over tall shrubs on grey sand.

F6: Dense Low Forest of *Eucalyptus rudis*, *Melaleuca preissiana*, *Melaleuca rhaphiophylla* and *Banksia prionotes* on brown sand.

Woodlands on grey sand

W5: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed low shrubs dominated by *Eremaea pauciflora* on grey sand.

W5b: Low Woodland of similar understorey species composition to W5, but dominated by *Banksia prionotes*. These areas appeared to have been disturbed.

W5d: Areas of type W5 that have been modified through disturbances such as clearing, grazing or burning.

Shrublands

S5: Dense Shrubland of *Leptospermum erubescens*, *Calothamnus sanguineus* and *Banksia telmatiaea*, with occasional emergent *Banksia littoralis* and *Melaleuca rhaphiophylla*, on grey sandy-loam.

Heaths

H4: Dense Heath of mixed low shrubs on grey sandy-clay.

H5: Low Heath dominated by *Xanthorrhoea preissii* and *Melaleuca ?trichophylla* on grey sand.

Disturbed

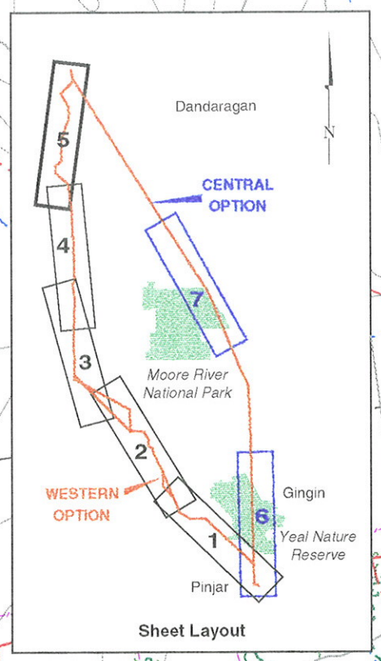
D3: Banksia Woodland areas so disturbed by clearing, grazing or burning that little or none of the original understorey layer is remaining.

Rare, Priority and other Restricted or Unusual Flora Species

- **Av** *Anigozanthos viridis* subsp. *terraspectans*
- **Ca** *Comesperma acerosum*
- **Cm** *Conostephium minus*
- **Pr** *Platysace ramosissima*

0 0.5 1.0 1.5km
SCALE

6599000mN
6597000mN
6595000mN
6593000mN
6591000mN
E/W
D3
D3
W5d
W5
H4
S5
Ca
H4
W5
Pr
H5
W5
F5
Cm
W5
F5
Cm
W5
F5
DOUARABA SWAMP



TIWEST LEASE AREA LEGEND

Woodlands

1a.1: Open Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow-brown sand.

1a.2: Woodland of *Banksia prionotes* and *Eucalyptus todtiana* over mixed Proteaceous and Myrtaceous shrubs in upper slope areas on yellow sand.

1b: Woodland of *Eucalyptus todtiana*, *Banksia attenuata* and *Banksia menziesii* over mixed Proteaceous and Myrtaceous shrubs on lower slopes on grey sand.

1e: Woodland of *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* over *Banksia telmatiaea*, *Beaufortia squarrosa* and *Adenanthos cygnorum* on lower slopes on grey-brown sand.

1f: Woodland of *Melaleuca preissiana*, *Banksia attenuata*, *Banksia menziesii* and *Eucalyptus todtiana* over *Adenanthos cygnorum*, *Eremaea pauciflora* and *Calytrix fraseri* over *Dasypogon obliquifolius*, on mid to lower slopes on grey-brown sand.

Heaths on sand

3a: Heath of occasional *Nuytsia floribunda*, *Banksia* spp. and *Eucalyptus todtiana* over *Beaufortia elegans*, *Petrophile macrostachya* and *Allocasuarina* spp. on grey sand.

3k: Low Heath dominated by *Banksia telmatiaea*, with occasional emergent *Nuytsia floribunda* and *Eucalyptus todtiana*, on brown sandy-loam.

Cl Cleared

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
WESTERN OPTION
Sheet 5 of 7

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CAD Ref: j562DB05.dgn	Revision: A	A3+

6589000mN
CARBA GAR
6587000mN
6585000mN
6583000mN
MIMEGARRA
WALYENGARRA LAKE
346000mE
Pump
0 0.5 1.0 1.5km
SCALE

DOUARABA SWAMP

E/W

PD

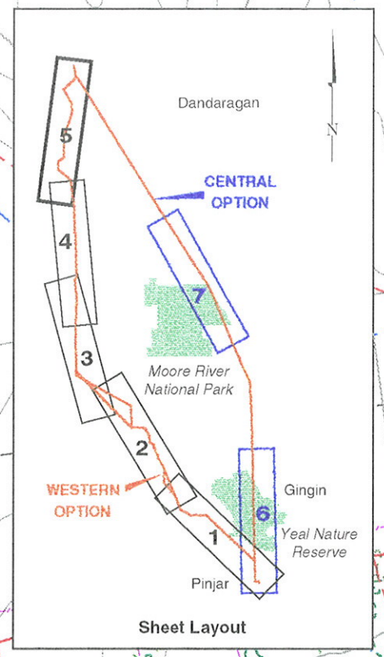
6591000mN

6593000mN

6595000mN

6597000mN

6599000mN



354000mE
352000mE
350000mE
348000mE
6609000mN
6605000mN
6603000mE
6601000mN
MULLERING
GAS
NATURAL
UNDERGROUND
BRAND
RD
E/W

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
CENTRAL OPTION
Sheet 6 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562EF01.dgn	Revision: A	A3+

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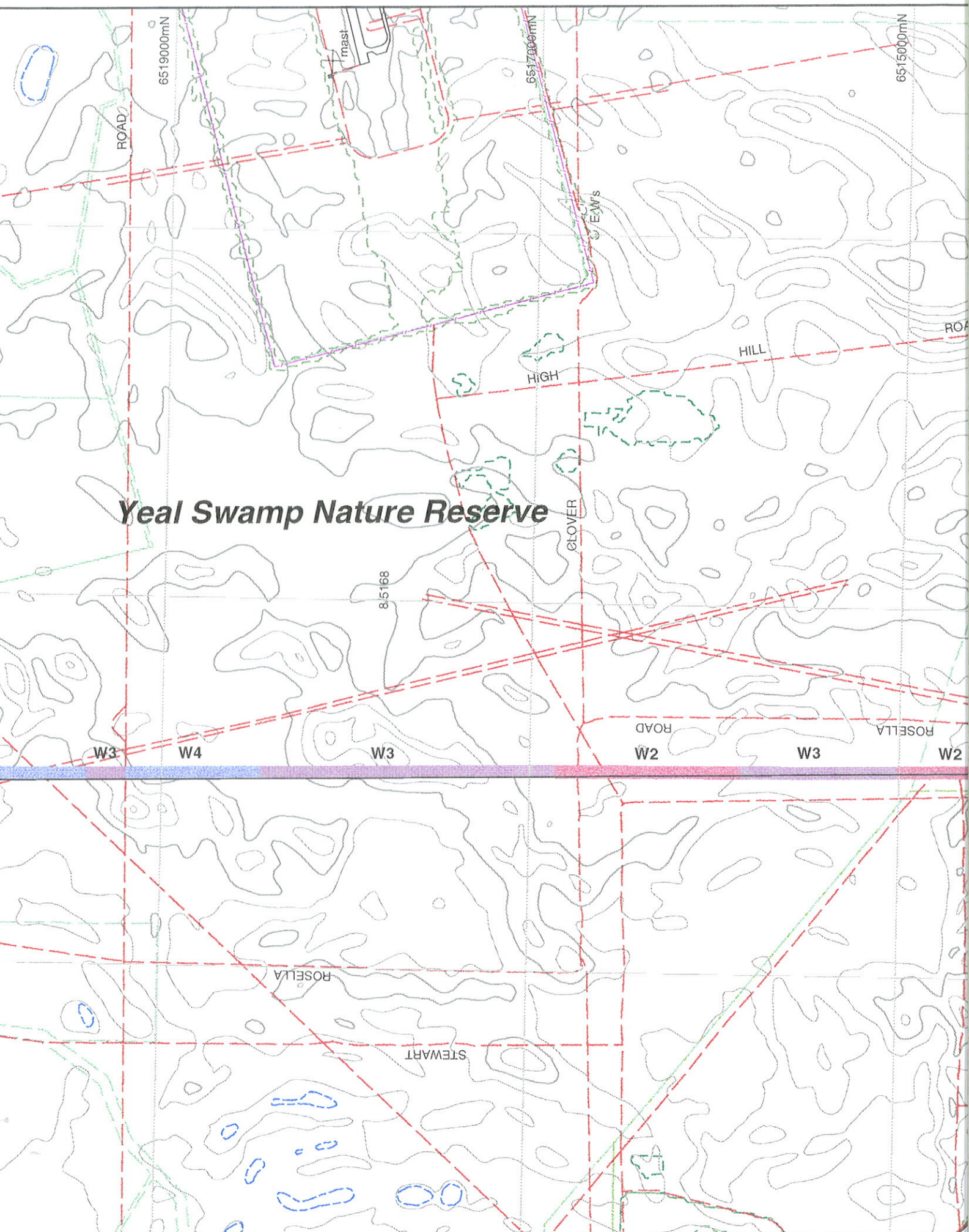
6513000mN
6511000mN
6509000mN
6507000mN
5022/2 79.62
5023/1 76.54
5023/2 81.78
2336/0 68.18
HZ 284 69.77
HILL
ROAD
HIGH
ROSELLA
W2
DAVIESIA
PERRY
McKINLEY
DINGO
SWALLOW
WATER
SCABRA
L.G.
A.R.O.
TAMEGA
SHRIKE
Mast
Dam
Tk
0 0.5 1.0 1.5km
SCALE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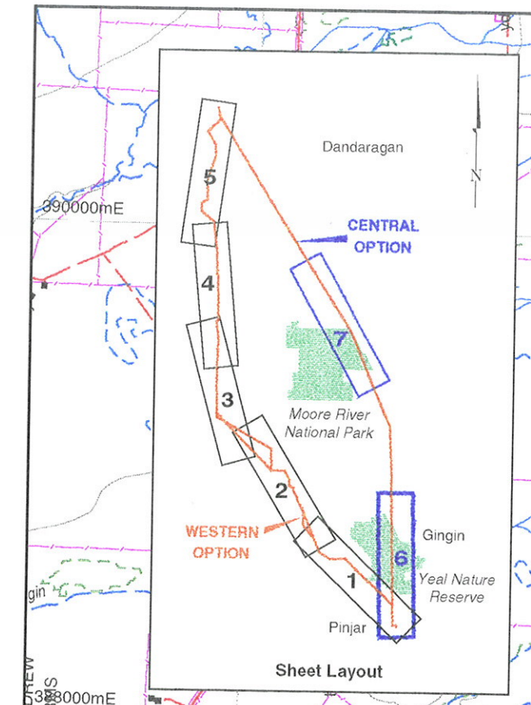
651700mN
651500mN
ROAD
mast
E.W's
HILL
HIGH
ROA
Yeal Swamp Nature Reserve
CLOVER
8/5168
ROAD
ROSELLA
W3
W4
W3
W2
W3
W2
ROSELLA
STEWART



Legend

Forests

F1: Dense Forest of *Eucalyptus rudis*, *Melaleuca* spp., and *Corymbia calophylla* over *Kunzea ericifolia* and mixed herbs and sedges on brown sandy-loam.

F3: Low Forest of *Banksia* spp. and *Melaleuca preissiana over Hibbertia subvaginata*, *Melaleuca* sp., *Beaufortia elegans* and *Calytrix angulata* on grey sand in low-lying areas.

Woodlands on grey sand

W2: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Nuytsia floribunda* over a very low shrub layer dominated by *Melaleuca* sp., *Stirlingia latifolia* and *Scholtzia involucrata* on grey sand.

W3: Low Woodland of *Banksia attenuata*, *Banksia menziesii* and *Banksia ilicifolia* over *Eremaea pauciflora*, *Xanthorrhoea preissii*, *Phlebocarya ciliata* and *Verticordia nitens* on grey sand.

W4: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over shrubs dominated by *Eremaea pauciflora* and *Beaufortia elegans* on grey sand.

W7: Low Woodland of *Banksia attenuata*, *Melaleuca preissiana* and *Banksia menziesii* over *Xanthorrhoea preissii*, *Hypocalymma angustifolium*, *Adenanthos cygnorum* and *Verticordia nitens* on grey sand in low-lying areas.

Woodlands on yellow sand

W16: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over a low shrub layer dominated by *Hibbertia hypericoides*, *Eremaea pauciflora*, *Leucopogon polymorphus*, *Mesomelaena pseudostygia* and *Calothamnus sanguineus* on yellow sand.

Shrublands

S3: Shrubland of *Regelia ciliata* and *Pericalymma spongiocaule*, with occasional emergent *Melaleuca preissiana* and *Banksia littoralis*, on grey sand.

Disturbed

D1: Disturbed area severely impacted by *Phytophthora cinnamomi*.

Rare, Priority and other Restricted or Unusual Flora Species

Sa *Stachystemon axillaris*
Sl *Schoenus* affin. *laevigatus*

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
CENTRAL ROUTE OPTION
Sheet 6 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562EDB01.dgn	Revision: A	A3+

6515000mN
6513000mN
6511000mN
6509000mN
6507000mN
5022/2 79.62
5023/1 76.54
5023/2 81.78
2336/0 68.18
HZ 284 69.77
Mast
Dam
Tk
HILL
HIGH
ROAD
ROSELLA
PERRY
McKINLEY
DINGO
SWALLOW
WATER
SCABRA
L.G.
A.R.O.
TAMEGA
SHRIKE
ILEY
N
0 0.5 1.0 1.5km
SCALE

6525000mN
6523000mN
6521000mN
6519000mN
6517000mN
6515000mN
yards
yard
Drain
7/5149
mast
ROAD
E3Ws
HILL
HiGH
Yeal Swamp Nature Reserve
CLOVER
8.5168
ROAD
ROSELLA
Y5
Y4
Y1
Y3
Y2
7/5150
ROAD
ROAD
ROSELLA
STEWART

Dieback Legend

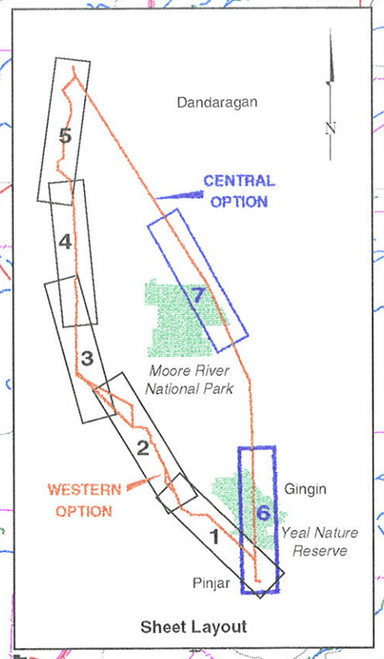
Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

6531000mN
Brook
6529000mN
yards
6527000mN
BRYALANA
SULLIVAN
Drain
6525000mN
yards
Drain
6523000mN
6521000mN
7/3149
ROAD
yard
COONABIDGEE
Drains
yard
COONABIDGEE
Drain
Drain
Y7
Y6
Y5
Y4
Y1
Y3
Y2
7/5150
GINGIN WANNEROO BRANCH BROOK
ROAD
ROAD
ROAD
SANDRINGHAM
Dam
ank



Dieback Legend

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Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location

Y7 Y6 Y5 Y4 Y1 Y3 Y2

Western Power

PINJAR TO CATABY TRANSMISSION LINE
VEGETATION MAPPING
CENTRAL OPTION
Sheet 7 of 7

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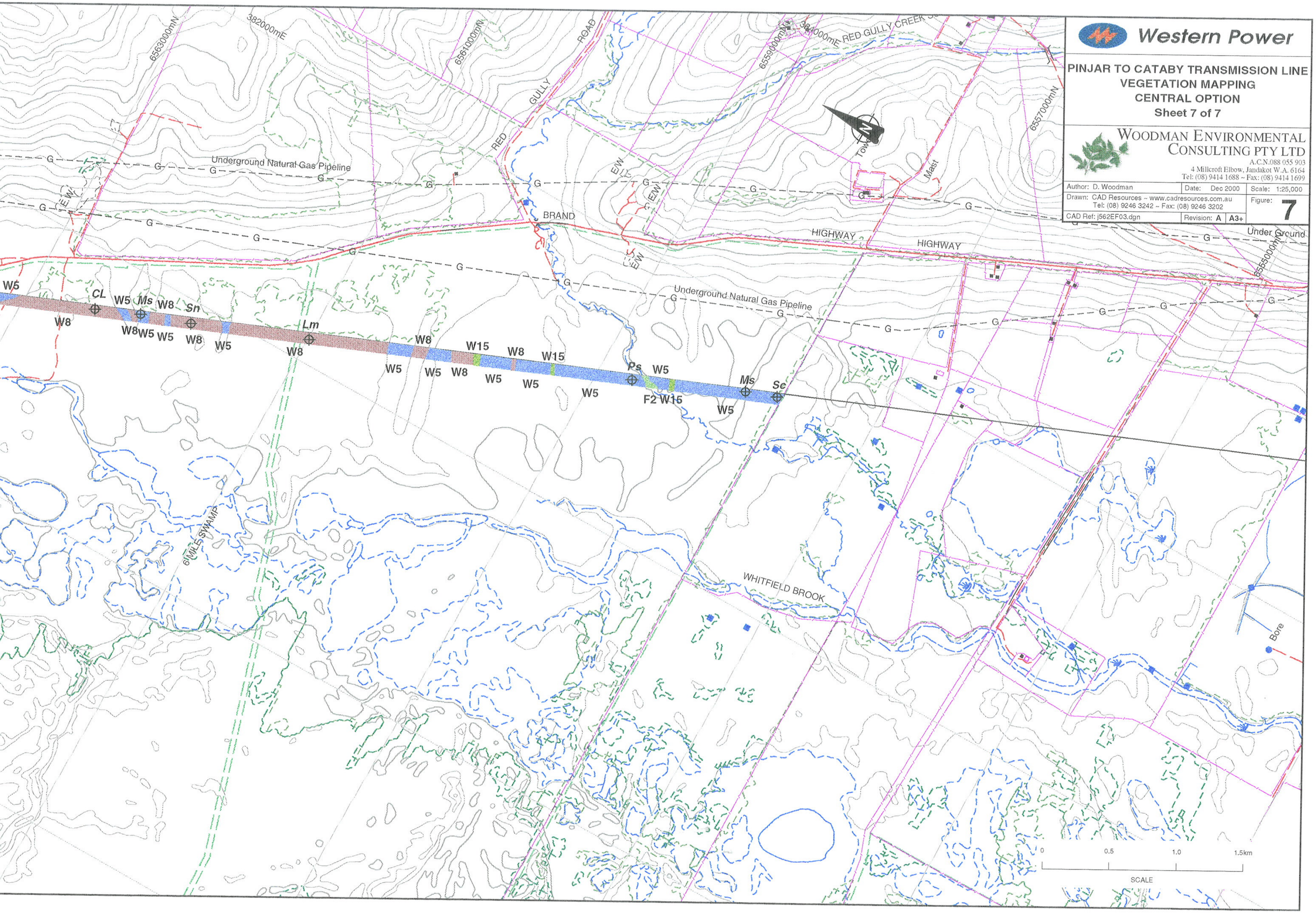
CAD Ref: j562EF03.dgn	Revision: A	A3+



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BRAND
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ROAD
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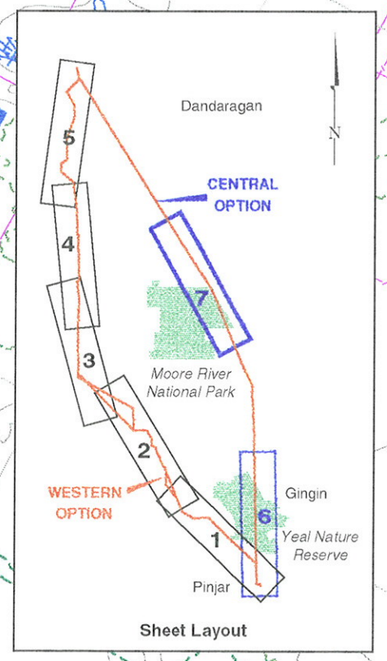

Legend

Forests

F2: Dense Low Forest of *Melaleuca rhaphiophylla* and *Corymbia calophylla* over *Astartea* sp., *Hypocalymma angustifolium* and sedges on brown clay.

Woodlands on grey sand

W5: Low Woodland of *Banksia attenuata* and *Banksia menziesii* over mixed low shrubs dominated by *Eremaea pauciflora* on grey sand.

W8: Open Low Woodland of *Banksia attenuata* and *Banksia menziesii over Banksia laricina* and *Verticordia nitens* on grey-brown sand.

Woodlands on yellow sand

W15: Low Woodland of *Banksia attenuata,* with occasional *Banksia menziesii* and *Eucalyptus todtiana,* over mixed tall shrubs dominated by *Petrophile recurva*, *Eremaea pauciflora* and *Adenanthos cygnorum* on yellow sand.

Heaths

H3: Dense Low Heath of *Pericalymma spongiocaule*, *Andersonia lehmanniana*, *Euchilopsis linearis* and *Xanthorrhoea preissii* on grey clay.

Rare, Priority and other Restricted or Unusual Flora Species

Cl *Cyperaceae/Liliaceae* sp
Ms *Melaleuca ?subtrigona*
Sn *Stylidium nonscandens*
Lm *Leucopogon* sp. Moore River (M. Hislop 1695)
Ps *Philotheca spicata* subsp. Moore River Nat. Pk.
Sc *Stylidium ?carlquistii*

Western Power

PINJAR TO CATABY TRANSMISSION LINE
DIEBACK MAPPING
CENTRAL ROUTE OPTION
Sheet 7 of 7

WOODMAN ENVIRONMENTAL CONSULTING PTY LTD
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CAD Ref: j562EDB03.dgn	Revision: A	A3+

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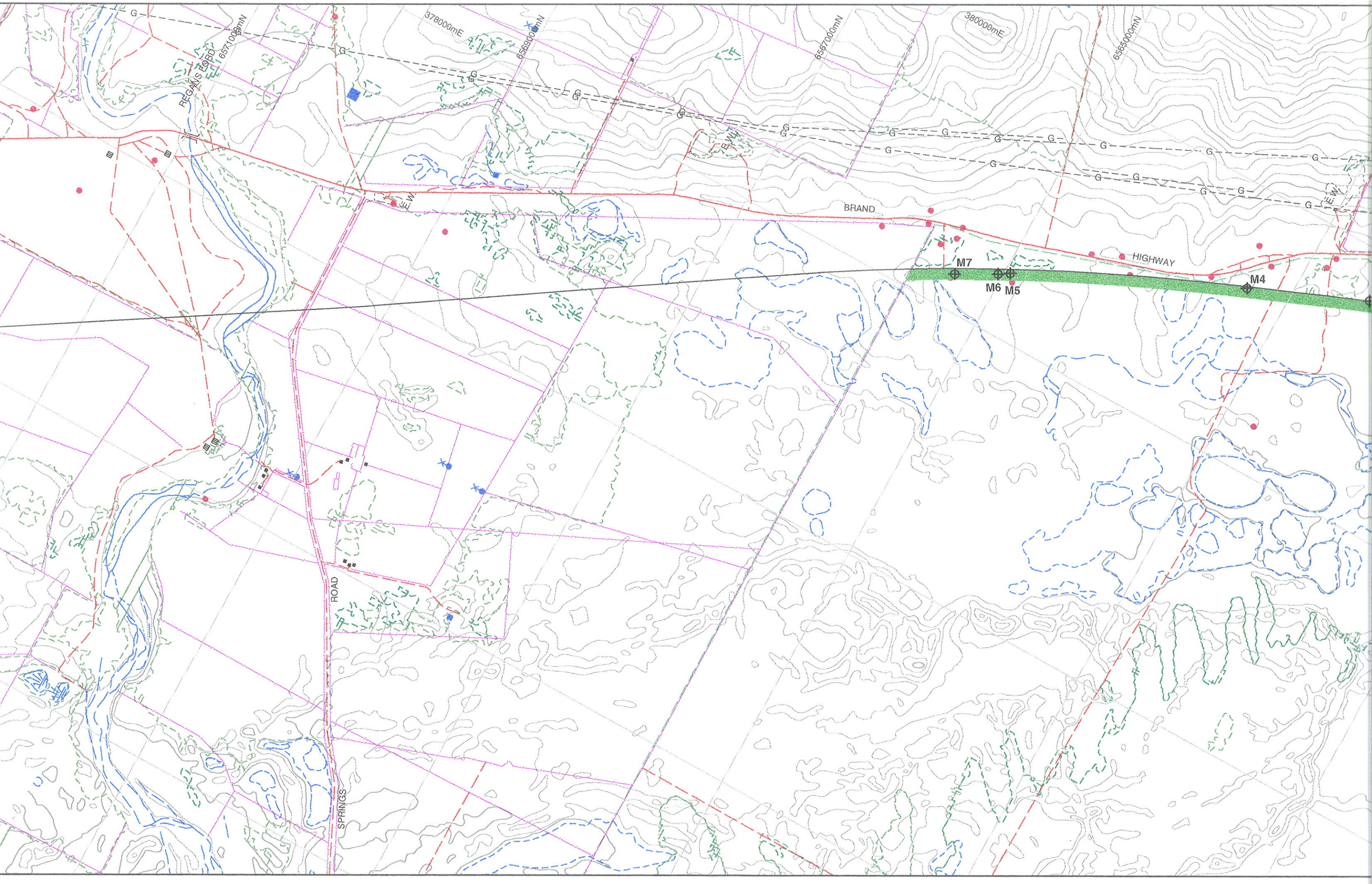
6561000mN
RED GULLY ROAD
6559000mN
382000mE
RED GULLY CREEK
6557000mN
6555000mN
Underground Natural Gas Pipeline
EW
BRAND HIGHWAY
Tower
Mast
Under Ground
M1
M2
M3
6 MILE SWAMP
WHITFIELD BROOK
Bore

0 0.5 1.0 1.5km
SCALE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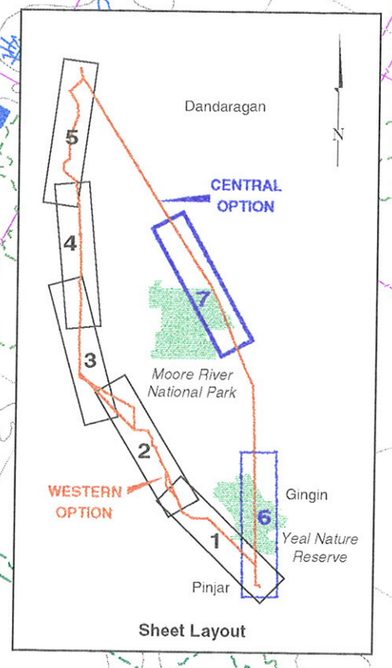

Sheet Layout

Dieback Legend

Infested Area Areas that a accredited interpreter has determined have plant disease symptoms consistent with the presence of the pathogen *Phytophthora cinnamomi* and the pathogen has been recovered from samples of soil and/or plant tissue samples collected from the diseased area.

Uninterpretable Area Areas in which Indicator plants are absent or too few to determine the presence or absence of disease caused by *Phytophthora cinnamomi*. Uninterpretable areas may also include areas that have received significant disturbance in recent times such as fire, or have been cleared so as to remove indicator plants.

Uninfested Area Areas that a accredited interpreter has determined to be free of plant disease symptoms which would indicate the presence of the pathogen *Phytophthora cinnamomi*

R2 Dieback sample location