



**District Structure North Ellenbrook
(Bullsbrook)**

Environmental Assessment Report

**Prepared for
Parcel Property Pty Ltd**

January 2021

● people ● planet ● professional

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Executive Summary

360 Environmental Pty Ltd (360 Environmental) was commissioned to prepare an Environmental Assessment Report (EAR) to support a District Structure Plan (DSP) (613 ha) for various lots generally bounded by Chitty Road and the Perth to Darwin Highway in North Ellenbrook (Bullsbrook) ('the site') within the City of Swan.

Historically, a significant portion of the site has been used for agricultural activities (i.e. grazing), plantations, harvesting and quarrying (The Maralla Road Sand Mine).

Existing Environmental Approvals

In 2018, an amended *Environment Protection Biodiversity Conservation Act (1999)* (EPBC Act) approval was granted within conditions to clear 57 ha native vegetation on Lots 5889, 294, 1876 and 1808 in Bullsbrook.

Relevant Matters of National Environmental Significance (MNES) on site include Black Cockatoo foraging habitat and potential breeding trees and Banksia Woodland of the Swan Coastal Plain (SCP) Threatened Ecological Community (TEC).

In 2015, A Native Vegetation Clearing Permit (NVCP) was approved by Department of Water and Environmental Regulation (DWER) to clear 56.65 ha of vegetation which included 55.3 ha of Carnaby's Cockatoo foraging habitat on Lots 5889, 2294, 1876 and 1808 (CPS 5981/2) and conservation covenant. Vegetation within the approved permit areas has been cleared for agricultural purposes.

Overview

The elevation across the site ranges from 68 m Australian Height Datum (AHD) to 44 m AHD, elevation decreasing from the west to the east. Regional Soil Landscapes and Land Systems mapping (Department of Agriculture and Food WA, 2012) has identified the site is within the Bassendean System and Yanga System.

Typical seasonal variation in groundwater levels range between 1.0 and 1.5 m below ground level (mbgl) across the site (JDA, 2019). The eastern portion of the site is within Priority 3 Public Drinking Water Source Area (PDWSA) of the Gngangara Underground Water Pollution Control Area (UWPCA) (Department of Water and Environmental Regulation, 2019b).

The site is located within the Ellen Brook Catchment which is a natural ephemeral waterway with two minor perennial watercourses traversing the site. Two Conservation Category Wetlands (CCW)s (UFI 15045 and 15046) exist in the northern portion of the site and two Resource Enhancement Wetlands (REW)s are mapped in the northwest and south (UFI 8538 and 13387) (DBCA, 2017b). Multiple Use wetlands (MUW) exist in a large portion to the east of the site, as well as smaller portions spread out the site.

The site is within the Bassendean vegetation association and within two vegetation complexes Yanga Complex: Closed scrub and low open forest and Bassendean Complex-North: Low open forest, low woodland and sedgelands.

In accordance with EPA (2016b) guidelines a Reconnaissance Flora and Vegetation Survey and Level 2 (Detailed) Flora and Vegetation Survey has been completed for the site on separate occasions for different lots.

A total of 225 flora species were recorded across the site. The most frequently recorded genus was *Banksia*. A total of 26 vegetation types (179.14 ha) were recorded on site. The site has large portions of cleared pasture paddocks with some patches of remnant native vegetation that have been disturbed from previous land uses. The vegetation condition of remnant vegetation on site varies between Excellent to Completely Degraded condition. The areas of the site mapped within the Yanga Vegetation Complex were cleared farmland, with patches of sedge regrowth in the paddocks. Due to the cleared and degraded nature it is unlikely to be representative of Yanga Vegetation Complex.

No Declared Rare Flora was recorded. However, One Priority 3 species- *Cyathochaeta teretifolia* was recorded at three locations within the site.

Four vegetation types (112.53 ha) are inferred to be representative of Banksia Woodland SCP TEC, which include Ba (1.69 ha), BaBmEt (92.40 ha), BaBmBi (13.00 ha), BiXp (5.44 ha). Vegetation type BaBmEt and BaBmBi has been inferred to have an affiliation with FCT SCP23a - *Central Banksia attenuata – Banksia menziesii woodlands* while vegetation type BiXp has been inferred to have an affiliation with FCT SCP23b - *Northern Banksia attenuata - Banksia menziesii woodlands* and FCT SCP21c: *Low lying Banksia attenuata woodlands or shrublands*. These FCT has been listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016) and are also listed as a Priority 3 by DBCA. (360 Environmental, 2019).

The site occurs within the known breeding distribution of the Carnaby's Black Cockatoo (DoEE, 2017), the Forest Red-tailed Black Cockatoo is also likely to occur within the site based on modelled distribution (DSEWPaC, 2012; DoEE, 2017) while the Baudin's Black Cockatoo may occur within the site, which is situated on the northwest extremity of the modelled distribution (DSEWPaC, 2012; DoEE, 2017). The Black Cockatoo Habitat Assessment identified the several vegetation types within the site as representative of Black Cockatoo foraging habitat (approximately 149.10 ha).

Foraging evidence for both the Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo was recorded on site. No evidence of Black Cockatoo roosting was observed within the site.

The Department of Planning, Lands and Heritage (DPLH) Aboriginal Heritage Information System (AHIS) database indicates there is one registered site Ellenbrook: Upper Swan (ID 3525) (mythological) and one other heritage place NATGAS 122 (ID 4143) (artefact scatter).

A tributary of Ellen Brook extends into the site. A map of the tributary extension of ID 3525. AHA Logic (2019a) confirmed that the tributary is part of Aboriginal site ID 3525.

An Ethnographic and Archaeological Heritage Assessment was undertaken which also identified five areas of wetlands (Aboriginal heritage sensitivity zones) within the site by the Aboriginal people participating in the survey as places of cultural importance and significance and are may meet the requirements of section 5 of the Aboriginal Heritage Act (AH Act) (AHA Logic, 2019a).

Implementation of DSP

A summary of the application on the current DSP on environmental factors is provided below:

- The DSP proposes POS and urban development (sewered) within the P3 area, these are compatible land uses in accordance with DoW (2016) guidelines.
- Most major perennial water courses/drainage lines (central and southern) including Sawpit Gully have been allocated within POS. Allocation for a 30m foreshore buffer to these drainage lines has also been depicted on the DSP.
- CCWs and associated 50m buffer within allocated POS. The REW (UFI 8538) and 50m buffer is within POS while the REW (UFI 13387) and a generic 30 m buffer is proposed within POS.
- There is opportunity for 97.50 ha of remnant vegetation to be retained on site through POS allocation (35.47 ha proposed MRS P&R ha and 62.03 ha POS) which includes 59.25 ha of inferred Banksia Woodland SCP TEC (20.35 ha within proposed MRS P&R and 38.50ha within POS).
- Bush Forever sites (No. 298 and 399) are to be protected within POS. The DSP proposed hard edges to POS and Bush Forever interface with proposed urban development.
- The known population of Priority 3 species- *Cyathochaeta teretifolia* (in Lots 1479 and 1480) is located within proposed POS.
- Possible retention of approximately 74.54 ha of Black Cockatoo foraging habitat within POS (proposed MRS P&R- 26.68 ha and POS-47.86 ha).
- Incorporation of local ecological linkage through the site. Width ranges from approximately 50 to 250 m and roads intersecting the linkages have been kept to a minimum. This will assist fauna movement across the site.
- The POS areas capture a variety of fauna habitats such as wetland areas, transition zones from low lying to uplands to Banksia woodlands.
- Potential development of tributary of Ellen Brook (ID 3525), consent under section 18 of the AH Act would be required prior to any disturbance to this site. The NATGAS122 (ID 4143) is proposed to be retained within POS.
- Four of the five wetland Aboriginal heritage sensitivity zones are proposed to be retained or part retained within POS.

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1 Introduction

1.1 Background

360 Environmental Pty Ltd (360 Environmental) was commissioned by Parcel Property Pty Ltd (Parcel Property) to prepare an Environmental Assessment Report (EAR) to support a District Structure Plan (DSP) for various lots generally bounded by Chitty Road and the Perth to Darwin Highway in North Ellenbrook (Bullsbrook) ('the site') (Figure 1).

The site is approximately 613 ha in size and is located approximately 26 km northeast of Perth's Central Business District (CBD) and is situated within the City of Swan (the City). A Metropolitan Regional Scheme (MRS) amendment was submitted to rezone the site from 'Rural' to 'Urban Deferred' in 2019. Preliminary comment on the MRS was received from the Department of Biodiversity, Conservation and Attractions (DBCA) (Appendix A). Determination of the MRS amendment is expected to be early 2020. The site is currently zoned 'General Rural' under the City's Town Planning Scheme No. 17 (TPS 17).

1.2 District Structure Plan

Further to the above, a District Structure Plan (DSP) has been developed for the site to guide development and to identify areas of environmental significance to be considered and implemented for the future Local Structure Plan (LSP) precincts (Figure 2). The DSP consists of the following attributes:

- Residential Area
- Light Industrial/Service Commercial
- District and Neighbourhood Centre
- Public Purpose (Primary and High Schools)
- Public Open Space (POS) (encompass vegetation retention, heritage and hydrology land requirements of DSP significance)
- Metropolitan Regional Scheme (MRS) Parks and Recreation Reserve (recognise Bush Forever, Conservation Category Wetland (CCW) and Environment Protection Biodiversity Conservation Act 1999 (EPBC Act) areas to be retained).

The Western Australian Planning Commission (WAPC) identified the northern portion of the site as 'Industrial Expansion' and the southern portion as 'Urban Investigation' in the Metropolitan Perth and Peel Sub-regional Planning Framework (WAPC 2018). The key environmental considerations association with the investigation area included:

- Protection of Bush Forever areas and conservation category wetlands
- Protection of high value Carnaby's Black Cockatoo habitat and vegetation with 10-30% remaining in Perth and Peel regions
- Protection of Threatened Ecological Communities (TEC) and flora populations

- Impacts, risks and management of Gngangara groundwater resources (existing Priority 3 Source Protection Area)
- Transition/interface with regional open space areas.

During the MRS amendment process the DBCA provided comment on the following to be considered during the subsequent planning processes:

- Application of Environmental Protection Authority (EPA) (2008b) Guidance Statement No. 33 which recommends the retention and if applicable protection of significant wetlands (i.e. Conservation Category Wetlands [CCW] and Resource Enhancement Wetlands [REW]) and application of appropriate buffers
- Where the wetland buffer/foreshore reserve (in the case of floodplains) is part of POS, its treatment should be appropriate and contribute towards the maintenance of ecological functioning within the wetland
- Planning for the future development should make provision to retain as much of the banksia woodland and associated black cockatoo habitat as possible, identify and quantify habitat which will be lost, and consider if offsets may be required to mitigate any residual impact on habitat of this species
- Land use transition adjacent to the State Forest and the site and consideration of edge effects, local groundwater and surface water impacts.

The above key consideration have been assessed (refer to Section 3 for further information) and have influenced the design of the DSP (Figure 2).

The following lots are included within the DSP area.

Table 1: Lots within the DSP Area

| Lot | Area (ha) |
|---------------------------|-----------|
| Lot 2294 Delta South Road | 40.49 |
| Lot 5889 Delta South Road | 64.9 |
| Lot 1474 Delta South Road | 39.8 |
| Lot 1876 Warbrook Road | 40.44 |
| Lot 1767 Warbrook Road | 80.99 |
| Lot 7 Chitty Road | 24.48 |
| Lot 1 Warbrook Road | 15.99 |
| Lot 114 Warbrook Road | 56.24 |
| Lot 112 Warbrook Road | 14.08 |
| Lot 1808 Warbrook Road | 10.53 |
| Lot 2946 Halden Road | 14.71 |
| Lot 2382 Warbrook Road | 40.46 |
| Lot 2953 Halden Road | 15.38 |

| Lot | Area (ha) |
|---------------------------------|-----------|
| Lot 5890 Warbrook Road | 15.77 |
| Lot 5891 Warbrook Road | 15.66 |
| Lot 1479 and 1480 Warbrook Road | 16.2 |
| Lot 1572 Warbrook Road | 55.22 |

1.3 Scope of Report

The report includes the following:

- Review of key environmental issues relevant to the site and the DSP
- Provision of environmental features of the site through review of existing information, desktop assessment and the results of the biological surveys undertaken to support the LSP
- Address comments / advice provided by the DBCA regarding the MRS amendment (Appendix A)
- Potential environmental impacts and recommended mitigation and management measures.

2 Key Environmental Legislation and Policies

2.1 Commonwealth Legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The decision whether to refer any proposed action under the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) to the Commonwealth Department of Environment and Energy (DEE) is based upon whether the proposed action is likely to have a significant impact on Matters of National Environmental Significance (MNES) in accordance with the Significance Impact Guidelines 1.1 Matters of National Significance (Department of the Environment, 2013). A referral to the DEE may be required due to impacts to the following:

- World Heritage Properties
- National Heritage Places
- Wetlands of international importance (listed under the Ramsar Convention)
- Listed threatened species and ecological communities
- Migratory species protected under international agreements
- Commonwealth Marine Areas
- The Great Barrier Reef Marine Park
- Nuclear actions (including uranium mines).

Based on information reported in Section 3, the MNES applicable for the site are listed threatened species and ecological communities i.e. Black Cockatoo's and Banksia Woodland of the Swan Coastal Plain (SCP) Threatened Ecological community (TEC). The policies and guidelines relevant to the site include the following:

- EPBC Act referral guidelines for the three threatened black cockatoo species: Carnaby's Cockatoo (endangered) *Calyptorhynchus latirostris*, Baudin's Cockatoo (vulnerable) *Calyptorhynchus baudinii*, Forest Red-tailed Black Cockatoo (vulnerable) *Calyptorhynchus banksii naso* (2012)
- Carnaby's Cockatoo (*Calyptorhynchus latirostris*) Recovery Plan (2013)
- Approved Conservation Advice (incorporating listing advice) for Banksia Woodland of the Swan Coastal Plain ecological community (2016).

2.1.2 Existing Environmental Approvals

In 2014, an EPBC approval was granted within conditions to clear no more than 74 ha of native vegetation on Lots 5889, 294, 1876 and 1808 in Bullsbrook. The EPBC approval has effect until 31 December 2024 (Appendix B).

Subsequent to the above approval, an amendment to the original EPBC Act approval was endorsed by DEE on 12 April 2018. The amendment included clearing no more than 57 ha within

the referral area and confirmation of offset property (Lot 24 Mimegarra Road Mimegarra WA) (Appendix B) (Figure 3).

2.2 State Legislation

2.2.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) is the key legislative tool for environmental protection in Western Australia. It is administered by the Environmental Protection Authority (EPA) and the Minister for Environment. Under Section 48A of the EP Act, when a scheme amendment (i.e. MRS amendment) is referred to the EPA, the EPA must decide whether or not to assess the scheme or determine that it is incapable of being made environmentally acceptable. The assessment levels include the following:

- Scheme amendment not to be assessed under part IV of the EP Act. No advice given (not appealable)
- Scheme amendment not to be assessed under part IV of the EP Act. Advice given (not appealable)
- Scheme incapable of being made environmentally acceptable
- Assess - Environmental Review.

As per Section 1.2, a MRS amendment was submitted to rezone the site from 'Rural' to 'Urban Deferred' in 2019. Preliminary comment on the MRS was received from the DBCA (Appendix A). Determination of the MRS amendment is expected to be early 2020.

2.2.2 Relevant Legislation and Regulations

Development of the site will be required to comply with the requirements of other relevant state legislation and regulations. Table 2 provides a summary of the key state legislation and regulations relevant to the proposed residential development.

Table 2: Key State Legislation

| Key Legislation | Responsible Government Agency | Aspect |
|---|---|--|
| <i>Aboriginal Heritage Act 1972</i> | Department of Planning, Lands and Heritage | Archaeological and ethnographic heritage |
| <i>Aboriginal Heritage Regulations 1974</i> | Department of Planning, Lands and Heritage | Archaeological and ethnographic heritage |
| <i>Agricultural and Related Resources Protection Act 1976</i> | Department of Primary Industries and Regional Development | Weeds and feral animals |
| <i>Biosecurity and Agriculture Management Act 2007</i> | Department of Primary Industries and Regional Development | Weeds / pests / diseases |
| <i>Bush Fires Act 1954</i> | Department of Fires and Emergency Services | Bush fire control |

| Key Legislation | Responsible Government Agency | Aspect |
|--|--|---|
| <i>Conservation and Land Management Act 1984</i> | Department of Biodiversity Conservation and Attractions Department of Agriculture | Flora and fauna / habitat / weeds / pests / diseases |
| <i>Conservation and Land Management Regulations 2002</i> | Department of Biodiversity Conservation and Attractions Department of Agriculture | Flora and fauna / habitat / weeds / pests / diseases |
| <i>Contaminated Sites Act 2003</i> | Department of Water and Environmental Regulation | Management of contaminated soils and water |
| <i>Environmental Protection Act 1986</i> | Environmental Protection Authority Department of Water and Environmental Regulation | Part IV – Environmental Impact Assessment Part V – Works Approvals and Licences |
| <i>Environmental Protection (Clearing of Native Vegetation) Regulations 2004</i> | Department of Water and Environmental Regulation | Clearing of native vegetation |
| <i>Environmental Protection (Noise) Regulations 1995</i> | Department of Water and Environmental Regulation | Noise and vibration |
| <i>Planning and Development Act 2005</i> | Department of Planning, Lands and Heritage | Structure planning and subdivision approval |
| <i>Rights in Water and Irrigation Act 1914</i> | Department of Water and Environmental Regulation | Governs management of the use, service and health of water and watercourses (including beds and banks). Water licensing is required in all proclaimed areas and for all artesian groundwater wells throughout the state. |
| <i>Biodiversity and Conservation Act 2016</i> | Department of Biodiversity Conservation and Attractions | Listing of and protection of native species, threatened species, ecological communities, fauna, critical habitat, and threatening processes. |

2.2.3 Relevant Standards, Guidelines and Policies

The following table details the key standards, guidelines, and State Planning Policies relevant to future residential development of the site (Table 3).

Table 3: Relevant Standards, Guidelines and Policies

| Document | Description |
|---|---|
| EPA Policies and Guidance | |
| <i>Statement of Environmental Principles, Factors and</i> | This statement communicates the EPA considers the object and principles of the EP Act, uses environmental factors and objectives to organise and systemise environmental impact |

| Document | Description |
|---|---|
| <i>Objectives</i> (Environmental Protection Authority, 2016a) | assessment, taking a holistic view of the environment and considering significance of a proposal. |
| Guidance Statement No. 3: <i>Separation Distances between Industrial and Sensitive Land Uses</i> (Environmental Protection Authority, 2005) | Provides guidance on the generic separation (buffer) distances between Industrial and Sensitive land uses to avoid conflicts between these land uses. |
| Guidance Statement No. 33: <i>Environmental Guidance for Planning and Development</i> (Environmental Protection Authority, 2008b) | Provides information and advice to assist land use planning and development processes to protect, conserve and enhance the environment. Describes the processes the EPA may apply under the EP Act to land use planning and development in Western Australia, and the environmental impact assessment process applied by the EPA to schemes. |
| Guidance Statement No. 41: <i>Aboriginal Heritage Assessment</i> (Environmental Protection Authority, 2004) | Provides guidance on the EPA's position on the assessment of Aboriginal heritage and information that the EPA will consider when assessing proposals where Aboriginal heritage is a relevant environmental factor. |
| <i>WA Environmental Offsets Policy</i> (Environmental Protection Authority, 2011) | Seeks to protect and conserve environmental and biodiversity values for present and future generations. The policy ensures that economic and social development may occur while supporting long term environmental and conservation values. |
| EPA Bulletins | |
| Environmental Protection Bulletin No. 1: <i>Environmental Offsets – Biodiversity</i> (Environmental Protection Authority, 2008a) | Clarifies how the EPA will consider offsets through the environmental impact assessment process. |
| State Planning Policies | |
| State Planning Policy 2.8: <i>Bushland Policy for the Perth Metropolitan Region</i> (Western Australian Planning Commission, 2010) | Provide policy and implementation framework that will ensure bushland protection and management issues in the Perth Metropolitan Region are appropriately addressed and integrated with broader land use planning and decision making. Ensure the long-term protection of biodiversity and associated environmental values. |
| State Planning Policy 2.9: <i>Water Resources</i> (Western Australian Planning Commission, 2006) | Provides clarification and additional guidance to planning decision-makers for consideration of water resources identified as having significant economic, social, cultural, or environmental values. |
| State Planning Policy 3.7: <i>Planning in Bushfire Prone Areas</i> (Western Australian Planning Commission, 2015) | Provides guidance on the implementation of effective risk-based land use planning and development to preserve life and reduce the impact of bushfire on property and infrastructure. |
| State Planning Policy 5.4: <i>Road and Rail Transport Noise and Freight Considerations in Land Use Planning</i> (Western | Provides guidance to promote a system in which sustainable land use and transport are mutually compatible. |

| Document | Description |
|--|---|
| Australian Planning Commission, 2009) | |
| Statement of Planning Policy 2.2 <i>Gnangara Groundwater Protection</i> (Western Australian Planning Commission, 2005b) | Purpose of the policy is to prevent, control or manage development and land use changes in the policy area that are likely to cause detrimental effects to the groundwater resource. |
| <i>Guideline for the Determination of Wetland Buffer Requirements</i> (Western Australian Planning Commission, 2005a) | Provides guidance on the consideration of wetland during a change in land use or a proposed development in the immediate vicinity of a wetland where future land use is likely to conflict with the established wetland management objectives. Under these guidelines, an appropriate buffer distance should be identified to achieve an acceptable planning outcome. |
| Department of Water and Environmental Regulation (DWER) Guidelines | |
| <i>Assessment and management of contaminated sites Guideline</i> (Department of Environment Regulation, 2014) | Provides guidance on the assessment and management of contaminated sites in Western Australian within legislative framework of the <i>Contaminated Sites Act 2003</i> and the <i>Contaminated Sites Regulations 2006</i> . |
| <i>Identification and investigation of acid sulfate soils and acidic landscapes</i> (Department of Environment Regulation, 2015) | Provides guidance to assist with the identification, assessment, and management of acid sulfate soils in Western Australia. |
| Water Quality Protection Note No. 25 <i>Land Use Compatibility Tables for public drinking water source areas</i> (Department of Water, 2016) | This note provides guidance for land use planning within onshore PDWSAs. It sets out guidelines on appropriate land uses and activities within PDWSAs that represents best management practice to protect water quality and public health. |
| <i>Better Urban Water Management</i> (Western Australian Planning Commission and Department of Planning and Infrastructure, 2008) | Provides guidance on the implementation of State Planning Policy 2.9 Water Resources and is designed to facilitate better management and use of urban water resources. |
| DFCA Guidelines | |
| <i>A Guide to managing and restoring wetlands in Western Australia</i> (Department of Environment and Conservation, 2012) | This guide provides information about the nature of Western Australia's wetlands and practical guidance on how to manage and restore wetlands for nature conservation. |

2.2.4 Existing Approvals

In 2015, A Native Vegetation Clearing Permit (NVCP) was approved by Department of Water and Environmental Regulation (DWER) to clear 56.65 ha of vegetation which included 55.3 ha of Carnaby's Cockatoo foraging habitat on Lots 5889, 2294, 1876 and 1808 (CPS 5981/2) (Appendix C). The approval included the revegetate and rehabilitate of 31.1 ha area and conservation covenant under section 30B of the *Soil and Land Conservation Act 1945* (Appendix C).

Areas subject to conservation covenants are subject to potential future Parks and recreation (P&R) reservation under the Metropolitan Region Scheme (MRS).

2.2.5 Other

A NVCP (8019/1) was submitted and subsequently withdrawn (April 2018) for the clearing of 15.77 ha of native vegetation on Lots 1479, 1480, 5890 and 5891 for the purposes of an extractive industry.

3 Site Environmental Features

3.1 Topography

The elevation across the site ranges from 68 m Australian Height Datum (AHD) to 44 m AHD, elevation decreasing from the west to the east (Figure 4).

3.2 Regional Geology and Soils

Regional surface geology mapping (Gozzard, 1982) indicates that the site is located upon the Bassendean Dune System with portions of the site consisting of thin Bassendean Sands (S₈) over Guildford Formation (S₁₀).

Regional Soil Landscapes and Land Systems mapping (Department of Agriculture and Food WA, 2012) has identified the site is within the following land systems:

- Bassendean System: Sand dunes and sandplains with pale deep, semi-wet and wet soil
- Yanga System: Poorly drained plain with pale sands and deep sandy duplex, wet, semi-wet and saline wet soils (Figure 4).

The (then) Department of Agriculture and Food (DAFWA) Soil Subsystems (Department of Agriculture and Food WA, 2012) mapping indicates the site is within the following soil subsystems (Figure 5):

- Bassendean, Joel Phase (212Bs_J): Poorly drained depressions.
- Bassendean, Jandakot Phase (212Bs_Ja): Grey sand over pale yellow sands generally underlain by humic and iron podsoils.
- Bassendean, Jandakot Steep Phase (212Bs_Jas): Slope <15% and usually more than 10 m relief. Grey medium sand overlying pale yellow sands generally underlain by humic and iron podsoils.
- Yanga 8x Phase (213Ya_8x): Deep white and pale-yellow sands interspersed with swamp and generally underlain by siliceous/humic pan at depth.
- Yanga 9x Phase (213Ya_9x): Subject to seasonal inundation. Humic and peaty sands, wet and semi-wet soils generally underlain by siliceous/humic pans at depth
- Yanga 13 Subsystem (213Ya13): Drainage depressions in very gently sloping plain. Deep white humic sands overlying siliceous and humic pans.
- Yanga 14x Phase (213Ya14): Sandy rises of white and pale-yellow sand overlying Siliceous/humic pans, bog iron and clay soils.

3.3 Acid Sulfate Soils

DWER regional mapping indicates that there are small pockets in the northern, centre and western portions of the site mapped as having a high to moderate risk of Acid Sulfate Soil (ASS) occurring within <3m below the natural ground surface(Class I) (DWER, 2019). The remainder

of the site is mapped as moderate to low risk of ASS disturbance within <3m below the natural ground surface (Figure 6) .

3.4 Hydrology

3.4.1 Groundwater

The estimated pre-development Average Annual Maximum Groundwater Level (AAMGL) contours indicate that groundwater flow is from west to the east. Data from the Perth Groundwater Map indicates the AAMGL ranges from approximately 54 mAHD in the west to 40 mAHD in the east (Figure 7). Typical seasonal variation in groundwater levels range between 1.0 and 1.5 m below ground level (mbgl) across the site (JDA 2019).

Information sourced from DWER identify three aquifers underlying the site; each assigned the name of the major geological unit in which the aquifer occurs (Department of Water and Environmental Regulation, 2019b). In descending order of depth from natural surface they are:

- Perth-Mirrabooka Aquifer: Fully Allocated
- Perth Superficial Swan: Fully Allocated
- Perth Leederville Aquifer (confined): Fully Allocated.

There are currently seven licences to take groundwater within the site. Details of each licence are provided in Table 4 and lot coverage in Figure 7.

Table 4: Groundwater Licences

| Licence No. | Location | Allocation | Expiry |
|-------------|---|------------------------------------|------------|
| 182065 | Lot 1876 On Plan 131371 Volume/Folio 1301/221 Lot 1876 Warbrook Rd Bullsbrook Lot 5889 On Plan 208236 Volume/Folio 1319/108 Lot 5889 Della South Rd Bullsbrook Lot 1808 On Plan 108469 Volume/Folio 411/143a Lot 1808 Warbrook Rd Bullsbrook Lot 2294 On Plan 124824 Volume/Folio 1911/803 Lot 2294 Della South Rd Bullsbrook | 25000 KL Perth Superficial Swan | 07/03/2026 |
| 105534 | Lot 1572 On Plan 101340 Volume/Folio 1844/688 Lot 1572 Warbrook Rd Bullsbrook | 10400 KL Perth Superficial Swan | 21/12/2027 |
| 183541 | Lot 2382 On Plan 143703 Volume/Folio 1300/575 Lot 2382 Warbrook Rd Bullsbrook | 10000 KL Perth Superficial Swan | 20/10/2021 |
| 202308 | Lot 2382 Warbrook Road Bullsbrook 6084 | 11100 KL Perth Superficial Swan | 8/1/2029 |
| 107395 | 2953, Halden Rd, Bullsbrook | 9160 KL Perth Superficial Swan | 30/5/2021 |
| 184451 | Lot 114 On Plan 404850 Volume/Folio 2882/135 Lot 114 Warbrook Rd Bullsbrook | 10000 KL | 30/05/2027 |

The eastern portion of the site is within Priority 3 (P3) Public Drinking Water Source Area (PDWSA) of the Gnamagara Underground Water Pollution Control Area (UWPCA) (DWER, 2019b) (Figure 7). P3 areas are defined and managed to maintain the quality of the drinking water source for as long as possible with the objective of risk management. P3 areas occur within PDWSAs where the land is zoned for urban and commercial or light industrial uses (Department of Water, 2016).

3.4.2 Surface Water

The site is located within the Ellen Brook Catchment which is a natural ephemeral waterway and is known to be a major contributor of total nitrogen and total phosphorous entering the Swan River within the Swan Coastal Plain due to historical agricultural uses that have taken place within the catchment (Swan River Trust 2009).

Several surface water features are mapped within the site. Two minor perennial watercourses traverse from east to west in the middle and southern portions of the site (Figure 8). Several earth dams are located throughout the site. The site is not within a mapped 100 Year ARI Floodplain Area (Department of Water and Environmental Regulation, 2016).

3.4.3 Wetlands

DBCA geomorphic wetland mapping has identified several wetlands within the site. Two CCWs (UFI 15045 and 15046) exist in the northwest of the site and two REWs are mapped in the northwest and south (UFI 8538 and 13387) (Department of Biodiversity Conservation and Attractions, 2017b). Multiple Use wetlands (MUW) exist in a large portion to the east of the site, as well as smaller portions spread out in the north, west and southwest of the site (Figure 8).

Wetland categories and their management objectives are described within Table 5 below:

Table 5: Wetland Categories and Management Objectives (Western Australian Planning Commission, 2005)

| Category | Category Description | Management Objective |
|-----------------------|--|---|
| Conservation Category | High conservation and ecological value | To preserve the wetlands (natural) attributes and functions |
| Resource Enhancement | Moderate natural and human use attributes that can be restored or enhanced | To restore wetlands through maintenance and enhancement of wetland functions and attributes |
| Multiple Use | Little remaining important wetland attributes, functions, and ecological value | To use, develop and manage wetlands in the context of water, town, and environmental planning |

The EPA recommends a minimum 50 m wetland buffer to CCWs. While it is noted that generic 50 m buffer is generally applicable to CCW to protect the wetlands ecosystem, wetland buffers will be determined during the local structure planning process.

3.5 Flora and Vegetation

3.5.1 General

The site is located within the SCP bioregion of the Interim Biogeographic Regionalisation of Australia (IBRA).

The Swan Coastal Plain Perth subregion (SWA02) is a low-lying coastal plain composed of colluvial and Aeolian sands, alluvial river flats and coastal limestone rising to duricrusted Mesozoic sediments in the east. Outwash plains are extensive only in the south, while a complex series of seasonal wetlands and swamps extends from north to south. Vegetation comprises heath and/or Tuart woodlands on limestone, Banksia, and Jarrah- Banksia woodlands on Quaternary marine dunes of various ages, Marri on colluvial and alluvial soils, *Casuarina obesa* on out-wash plains, and paperbark (*Melaleuca* spp.) in wetland areas (Mitchell et al. 2002).

Vegetation association mapping of the Swan Coastal Plain subregion of Western Australia was completed on a broad scale (1:100,000) by Beard, J. S. & Beard, (1976). These vegetation units were re-assessed by Shepherd, et al., (2002) to account for clearing in the intensive land use zone, dividing some larger vegetation units into smaller units.

The site is within one vegetation association described below (Shepherd et al. 2002) :

- Bassendean 949: Low woodland, Banksia Remnant vegetation statistics of the IBRA region and the above vegetation association is detailed in Table 6.

Table 6: Remnant Vegetation Association (Beard)

| | Pre-European (ha) | Current Extent (ha) | % Remaining | % Remaining in DBCA Reserves |
|--|----------------------|------------------------|-------------|---------------------------------|
| State-wide Western Australia | | | | |
| Bassendean 949 | 218,193.94 | 123,104.02 | 56.42 | 31.52 |
| In IBRA Region Swan Coastal Plain | | | | |
| Bassendean 949 | 209,983.26 | 120,287.93 | 57.28 | 32.31 |
| In IBRA Subregion SWA02 | | | | |
| Bassendean 949 | 184,475.82 | 104,128.96 | 56.45 | 33.30 |
| Local Government Authority – City of Swan | | | | |
| Bassendean 949 | 16,235.19 | 7,970.07 | 49.09 | 27.35 |

Regional vegetation complexes mapping, indicates that there are two vegetation complexes exist across the site which relates to the underlying soil profile (Figure 9):

- Yanga Complex: Closed scrub and low open forest
- Bassendean Complex-North: Low open forest, low woodland and sedgelands.

The estimated extent of the vegetation complex remaining on the SCP and within the Perth Metropolitan Region are presented in Table 7. These estimates are based on the 2018 Vegetation Statistics for the South-West WA (DBCA, 2019)

Table 7: Remnant Vegetation Complex (Heddle)

| | Pre-European (ha) | Current Extent (ha) | % Remaining | % Remaining in DBCA Reserves |
|--|-------------------|---------------------|-------------|------------------------------|
| In IBRA Region Swan Coastal Plain | | | | |
| Bassendean North | 79,057 | 56,659 | 71.6 | 25.9 |
| Yanga | 26,176 | 4,268 | 16.3 | 1.8 |
| Perth Metropolitan Region (PMR) | | | | |
| Bassendean North | 22,939 | 11,770 | 51.3 | 2.9 |
| Yanga | 5,779 | 775 | 13.4 | 4.2 |
| Local Government Authority – City of Swan | | | | |
| Bassendean North | 14,216 | 7,286 | 51.2 | - |
| Yanga | 5,776 | 775 | 13.42 | - |

EPA Policy recommends that on the SCP vegetation complexes are maintained above the threshold level of 30% of the original pre-clearing extent of each community and 10% of the original pre-clearing extent of each community representation within the Perth Metropolitan Region (PMR), Bassendean North Complex meets this recommendation. However, the Yanga Complex meets the 10% within the PMR only (EPA, 2008b).

3.5.2 Desktop Database Searches

The database searches identified 50 conservation significant flora species as potentially occurring within a 5 km radius of the Survey Area. Of these, 31 species were Priority and 19 Threatened (Department of Biodiversity Conservation and Attractions, 2018, 2019b, 2019e, 2019f; Department of the Environment and Energy, 2019). The 31 Priority flora included one Priority 1 (P1), five Priority 2 (P2), 15 Priority 3 (P3) and 10 Priority 4 (P4) (Appendix D).

A likelihood assessment of the species was undertaken based on the following criteria:

- High: Suitable habitat present and records less than 5 km from the site
- Moderate: Suitable habitat present and records between 5 km and 10 km from the site
- Low: No suitable habitat present and/or records greater than 10 km from the site.

Conservation significant flora species were considered to have a high or medium likelihood of occurrence within the site due to the presence of suitable habitat and proximity to previous records and/or the species was previously recorded in the 360 Environmental (2011) Flora and Vegetation Survey (Appendix E). These included:

- *Caladenia huegelii*
- *Grevillea curviloba subsp. Curviloba*
- *Grevillea curviloba subsp. Incurva*.

Four Priority Ecological Communities (PEC) and three TEC listed by the State were within a 5 km radius of the site (Appendix D). All these communities are also listed as TEC under the EPBC Act:

- Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (Priority 3 [DBCA], Endangered [EPBC])
- SCP15: Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain (Vulnerable DBCA)
- Muchea Limestone: Shrublands and woodlands on Muchea Limestone (Endangered [DBCA], Endangered [EPBC])
- SCP23b: Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands (Priority 3 [DBCA], Endangered [EPBC])
- SCP21c: Low lying *Banksia attenuata* woodlands or shrublands (Priority 3 [DBCA], Part of Endangered [EPBC])
- SCP22: *Banksia ilicifolia* woodlands (Priority 3 [DBCA], Part of Endangered [EPBC])
- Mound Springs SCP: Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain) (Critically Endangered [DBCA], Endangered [EPBC]).

3.5.3 Site Surveys

In accordance with EPA (2016b) 'Technical Guidance Flora and Vegetation Surveys for Environmental Impact Assessment' the following surveys have been completed for the site:

- 360 Environmental (2019) Reconnaissance Flora and Vegetation Survey (Appendix D). Included lots 1767, 114 and 112
- 360 Environmental (2011) Level 2 Flora and Vegetation Survey (Appendix E). Included lots (or part lots) except lots 1767, 114 and 112.

A total of 225 flora species were recorded across the site. The most commonly occurring families were Myrtaceae (32 taxa), Asparagaceae (12 taxa) and Proteaceae (5 taxa). The most frequently recorded genus was *Banksia*. A complete flora species list is presented in Appendices D and E.

The number of native species recorded on site was a low number for size of the survey area. This was due mostly to the large part of the survey area that was cleared farmland or was degraded after conversion to other land use purposes. The timing of the surveys 2011 in late Spring (late November/early December) and 2019 in Autumn (May) would also have contributed to a lower species count.

3.5.3.1 Vegetation Types

The combined 2011 and 2019 surveys described the vegetation within the site as having 26 recorded vegetation types.

Table 8:Vegetation Type Recorded within the Site

| Vegetation Type Code and Description | Year Surveyed | Total Area (ha) Remaining Based on Aerial Photography (Dec 2019) ¹ |
|--|---------------|---|
| As: Isolated clumps of trees of <i>Melaleuca preissiana</i> over closed shrubland of <i>Astartea scoparia</i> over open forbland of <i>*Carpobrotus edulis</i> , <i>*Cyperus tenuiflorus</i> and <i>Desmocladius flexuosus</i> . | 2019 | 0.15 |
| Ba*: Mixed <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Banksia ilicifolia</i> | 2019 | 1.69 |
| BaBmBi*: <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> , <i>Banksia menziesii</i> low woodland over <i>Xanthorrhoea preissii</i> , <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> shrubland over <i>Calytrix flavescens</i> , <i>Conostephium pendulum</i> , <i>Adenanthos obovatus</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> low open shrublands over <i>Phlebocarya ciliata</i> , <i>Patersonia occidentalis</i> , <i>Dasyogon bromeliifolius</i> low herblands. | 2012 | 13.00 |
| BaBmEt*: Low open woodland of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> , <i>Eucalyptus todtiana</i> low over open shrubland of <i>Scholtzia involucrata</i> over low open shrubland of <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Croninia kingiana</i> and <i>Leucopogon conostephioides</i> | 2012, 2019 | 92.40 |
| BiXp*: <i>Banksia ilicifolia</i> scattered low trees over <i>Xanthorrhoea preissii</i> shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> low shrublands over <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> open sedgelands. | 2012 | 5.44 |
| Cc: Isolated <i>Corymbia calophylla</i> | 2012, 2019 | 16.50 |
| CcAs: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over shrubland of <i>Astartea scoparia</i> and <i>Xanthorrhoea gracilis</i> over sparse forbland of <i>Desmocladius flexuosus</i> , <i>*Sonchus oleraceus</i> , <i>*Poa annua</i> and <i>*Carpobrotus edulis</i> . | 2019 | 2.29 |
| CcEm: <i>Eucalyptus marginata</i> subsp. <i>marginata</i> , <i>Corymbia calophylla</i> scattered trees over <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> scattered low trees to low open woodland (patches) over <i>Xanthorrhoea preissii</i> shrublands over <i>Hypocalymma angustifolium</i> scattered low shrubs to low shrublands over <i>Hypolaena exsulca</i> open sedgelands | 2012 | 3.41 |
| CcJs: Open woodland of <i>Corymbia calophylla</i> over sparse shrubland of <i>Jacksonia furcellata</i> | 2019 | 1.29 |
| CcLI: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over open shrubland of <i>Astartea scoparia</i> , <i>Taxandria linearifolia</i> and <i>Xanthorrhoea preissii</i> over open sedgeland of <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> and <i>Dasyogon bromeliifolius</i> . | 2019 | 1.73 |
| CcMp: Isolated <i>Corymbia calophylla</i> and isolated <i>Melaleuca preissiana</i> | 2019 | 0.53 |
| CcXp: Open woodland of <i>Corymbia calophylla</i> over closed shrubland of <i>Xanthorrhoea preissii</i> | 2019 | 6.15 |
| Et: Isolated <i>Eucalyptus todtiana</i> | 2019 | 0.12 |
| Er: <i>Eucalyptus rudis</i> (Flooded Gum) open forest over <i>Xanthorrhoea preissii</i> , <i>Astartea scoparia</i> high open shrubland over <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> open sedgeland. | 2012 | 1.38 |

¹ Noted a portion of Lot 2294 was not surveyed 2.54ha and there is a section within the DSP area (includes chitty Road and Raphael road reserves were not part of the survey area)

| Vegetation Type Code and Description | Year Surveyed | Total Area (ha) Remaining Based on Aerial Photography (Dec 2019) ¹ |
|---|---------------|---|
| Kg: <i>Kunzea glabrescens</i> closed scrub over <i>Aotus gracillima</i> open shrubland over <i>Schoenus foliatus</i> , <i>Dielsia stenostachya</i> very open sedgeland. | 2012 | 0.50 |
| Mp: Isolated <i>Melaleuca preissiana</i> | 2019 | 5.00 |
| MpAs: Open woodland of <i>Melaleuca preissiana</i> over sparse shrubland of <i>Astartea scoparia</i> | 2019 | 12.77 |
| MpHa: Open woodland of <i>Melaleuca preissiana</i> over sparse shrubland of <i>Hypocalymma angustifolium</i> | 2019 | 0.35 |
| MpPeAs: <i>Melaleuca preissiana</i> low woodland over open shrubland over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> , <i>Astartea scoparia</i> , <i>Regelia inops</i> , <i>Xanthorrhoea preissii</i> shrublands and <i>Hypocalymma angustifolium</i> low shrublands. | 2012 | 0 |
| MpRi: <i>Melaleuca preissiana</i> scattered low trees over <i>Regelia inops</i> , (<i>Xanthorrhoea preissii</i>) open to closed heath. | 2012 | 4.42 |
| EmBiXp: <i>Eucalyptus marginata</i> subsp. <i>marginata</i> scattered trees over <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> shrubland over <i>Dielsia stenostachya</i> , <i>*Pentaschistis airoides</i> very open grassland/sedgeland. | 2012 | 1.47 |
| BaBmEtBaBmBi | 2012 | 3.17 |
| CcEmBaBmBi | 2012 | 1.38 |
| MpPeAs/CcEm | 2012 | 2.94 |
| Xp: <i>Xanthorrhoea preissii</i> | 2012 | 1.06 |
| NE: Non endemic species | 2019 | 0.18 |

* Inferred and representative of Banksia Woodland SCP TEC (refer to Section 3.5.3.4)

3.5.3.2 Vegetation Condition

The site has large portions of cleared pasture paddocks with some patches of remnant native vegetation that have been disturbed from previous land uses. The vegetation condition of remnant vegetation on site varies between Excellent to Completely Degraded condition (Figure 11).

The areas of the site mapped within the Yanga Vegetation Complex (Figure 9) were significantly cleared farmland, with patches of sedge regrowth in the paddocks and isolated *Corymbia calophylla*.

Table 9: Vegetation Condition Recorded within the Site

| Vegetation Condition | Extent within Site (ha) |
|---------------------------------|-------------------------|
| Excellent | 18.79 |
| Very Good to Excellent | 10.28 |
| Very Good | 15.41 |
| Good to Very Good | 31.00 |
| Good | 46.17 |
| Good to Degraded | 26.04 |
| Degraded | 27.21 |
| Degraded to Completely Degraded | 36.99 |
| Completely Degraded | 395.69 |

3.5.3.3 Significant Flora

During both surveys (360 Environmental, 2012 and 2019) no Declared Rare Flora was recorded. However, One Priority 3 species- *Cyathochaeta teretifolia* was recorded at three locations within the site (Figure 10).

Nine plant species recorded on site were considered to have regional significance, which include:

- *Burchardia bairdiae* (Lot 1480 wetland depressions)
- *Conostylis aculeata subsp. Cygnorum* (Lots 1480,1572 and 1808 upland)
- *Dielsia stenostachya* (Lot 1808 wetland depressions)
- *Hensmania turbinata* (Lot 1572 upland)
- *Stachystemon axillaris* (Lot 1808 upland)
- *Stylidium crossocephalum* (Lot 5889 Banksia Woodland)
- *Stylidium utricularioides* (Lot 2294 wetland depressions)
- *Stylidium rigidulum* (Lots 2946 and 2294 Banksia Woodland)
- *Verticordia nitens* (widespread upland).

3.5.3.4 Potential Threatened and Priority Ecological Communities

In 2016, The DEE released the *Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain Ecological Community*, based on the key diagnostic characteristic (i.e. location and physical environment, soil and landform, vegetation structure and composition) the following vegetation types (112.53 ha) are inferred to be representative of Banksia Woodland SCP TEC:

- Ba (1.69 ha)
- BaBmEt (92.40 ha)
- BaBmBi (13.00 ha)
- BiXp (5.44 ha).

Vegetation type BaBmEt and BaBmBi has been inferred to have an affiliation with FCT SCP23a - *Central Banksia attenuata* – *Banksia menziesii* woodlands. Vegetation type BiXp has been inferred to have an affiliation with FCT SCP23b - *Northern Banksia attenuata* - *Banksia menziesii* woodlands and FCT SCP21c: Low lying *Banksia attenuata* woodlands or shrublands.

These FCTs have been listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016). SCP23a is also listed as a Priority 3 by DBCA. (360 Environmental, 2019).

3.5.3.5 Introduced Flora

Numerous introduced species have been recorded in site, which include the following presented in Table 10. None of these are listed as weeds of national significance and three species (**Zantedeschia aethiopica*, **Moraea flaccida* and **Asparagus asparagoides*) is listed as a Declared Pest under the BAM Act.

Table 10: Recorded Weed Species (360 Environmental 2011 and 2019)

| Taxa | Common Name | Legal Status |
|-----------------------------------|-------------------|---------------|
| <i>*Aira caryophylla</i> | Silvery Hairgrass | Permitted |
| <i>*Asparagus asparagoides</i> | Bridle creeper | Declared Pest |
| <i>*Briza maxima</i> | Blowfly Grass | Permitted |
| <i>*Carpobrotus edulis</i> | Pigface | Permitted |
| <i>*Chamaecytisus palmensis</i> | Tagasaste | Permitted |
| <i>*Cortaderia selloana</i> | Pampus grass | Permitted |
| <i>*Conyza bonariensis</i> | Flaxleaf Fleabane | Permitted |
| <i>*Cyperus tenuiflorus</i> | Scaly Sedge | Permitted |
| <i>*Gladiolus caryophyllaceus</i> | Wild Gladiolus | Permitted |
| <i>*Leptospermum laevigatum</i> | Coastal Teatree | Permitted |
| <i>*Olea europaea</i> | Olive Tree | Permitted |
| <i>*Moraea flaccida</i> | Cape Tulip | Declared Pest |
| <i>*Phytolacca octandra</i> | Red Ink Plant | Permitted |
| <i>*Pinus sp.</i> | Pine | Permitted |
| <i>*Poa annua</i> | Winter Grass | Permitted |
| <i>*Schinus terebinthifolia</i> | Brazilian Pepper | Permitted |
| <i>*Sonchus oleraceus</i> | Common Sowthistle | Permitted |
| <i>*Ursinia anthemoides</i> | Ursinia | Permitted |
| <i>*Zantedeschia aethiopica</i> | Arum Lily | Declared Pest |

3.6 Fauna and Habitats

3.6.1 Overview

A review of the DBCA's NatureMap and DEE's PMST databases have identified 22 conservation significant fauna potentially occurring within a 5 km radius of the site (DEE 2018; DBCA 2018c).

A likelihood assessment was undertaken to determine the likelihood of these species occurring within the site based on suitable habitat present and the species known distribution based on the following criteria.

- High: Preferred habitat is present on the site; the site is in the species' known distribution and the species has been recorded on more than one occasion within the vicinity (<5 km of the site)
- Medium: Limited or no suitable habitat occurs in the site, but is nearby and the species has good dispersal abilities and is known from the general area or preferred habitat occurs
- Low: No suitable habitat is present in the site or the site is outside the species known distribution or the species is known from the general area but has poor dispersal abilities.

The species with a high likelihood of occurrence is presented in Table 11.

Table 11: Fauna Species with a High Likelihood of Occurrence on Site

| Species | Conservation Status | |
|--|-----------------------|-----------------------|
| | WA | Federal |
| Forest Red-tailed Black Cockatoo (<i>Calyptorhynchus banksii naso</i>) | Vulnerable | Vulnerable |
| Carnaby's Cockatoo (<i>Calyptorhynchus latirostris</i>) | Endangered | Endangered |
| Rainbow Bee-eater (<i>Merops ornatus</i>) | - | Marine |
| Western Swamp Tortoise (<i>Pseudemydura umbrina</i>) | Critically Endangered | Critically Endangered |
| Black-striped Snake (<i>Neelaps colonotos</i>) | Priority 3 | - |
| Southwestern Brown Bandicoot (<i>Isodon fusciventer</i>) | Priority 4 | - |

Watercourses and patches of remnant native vegetation within the site would likely provide suitable habitat for some conservation significant fauna identified in the database searches. However, the remainder of the site is largely cleared and used for rural purposes and species would most likely utilise large areas of intact vegetation to the west of the site, and therefore may provide better fauna habitat than the site itself.

Known Western Swamp Tortoise habitat is located within 3 km of the site as part of the Twin Swamps Reserve and within the Gnangara-Moore River State Forest.

3.6.2 Black Cockatoos

3.6.2.1 General

The site occurs within the known breeding distribution of the Carnaby's Black Cockatoo (DoEE, 2017). The DBCA database search returned 282 records of the species within a 10 km radius of the Survey Area, 39 of which occurred in the past decade (DBCA, 2019d). A confirmed Carnaby's breeding area occurs approximately 17 km north of the site and a possible Carnaby's breeding area occurs approximately 18 km south of the Survey area (DBCA, 2019d). At least four confirmed Carnaby's roost sites occur between 7 and 12 km from the site, approximately west, southwest and northeast of the site (DBCA, 2019d). Birdlife Australia has recorded a Black Cockatoo roosting site approximately 300 m south of the site (located in adjacent Lot 108 Maralla Road) (Western Australian Local Government Authority, 2018).

The Forest Red-tailed Black Cockatoo is likely to occur within the site based on modelled distribution (DSEWPaC, 2012; DoEE, 2017). The DBCA database search returned three records of the species within a 10 km radius of the site, all of which occurred in the past decade (DBCA, 2019d).

The Baudin's Black Cockatoo may occur within the site, which is situated on the northwest extremity of the modelled distribution (DSEWPaC, 2012; DoEE, 2017). The DBCA database search did not return any records of the species (DBCA, 2019d).

3.6.2.2 Foraging and Roosting Habitat

The Black Cockatoo Habitat Assessment identified several vegetation types (approximately 149.10 ha) within the site as representative of Black Cockatoo foraging habitat. The foraging habitat included the following natural vegetation associations is presented in Table 12 and Figure 13.

Marri species is commonly used for foraging by all three Black Cockatoo species while *Banksia* sp., is commonly used for foraging by Carnaby's Black Cockatoo. Foraging evidence for both the Carnaby's Black Cockatoo and Forest Red-tailed Black Cockatoo was recorded on site.

Table 12: Black Cockatoo Foraging Habitat on Site

| Vegetation Type Code and Description | Total Area (ha) Remaining based on Aerial Photography (Dec 2019) |
|--|--|
| Ba | 1.69 |
| BaBmBi: <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> , <i>Banksia menziesii</i> low woodland over <i>Xanthorrhoea preissii</i> , <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> shrubland over <i>Calytrix flavescens</i> , <i>Conostephium pendulum</i> , <i>Adenanthos obovatus</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> low open shrublands over <i>Phlebocarya ciliata</i> , <i>Patersonia occidentalis</i> , <i>Dasypogon bromeliifolius</i> low herblands. | 13.00 |
| BaBmEt: Low open woodland of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> , <i>Eucalyptus tottiana</i> low over open shrubland of <i>Scholtzia involucreta</i> over low open shrubland of <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Croninia kingiana</i> and <i>Leucopogon conostephioides</i> | 92.40 |

| Vegetation Type Code and Description | Total Area (ha) Remaining based on Aerial Photography (Dec 2019) |
|---|--|
| BiXp: <i>Banksia ilicifolia</i> scattered low trees over <i>Xanthorrhoea preissii</i> shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> low shrublands over <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> open sedgeland. | 5.44 |
| Cc: Isolated <i>Corymbia calophylla</i> | 16.50 |
| CcAs: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over shrubland of <i>Astartea scoparia</i> and <i>Xanthorrhoea gracilis</i> over sparse forbland of <i>Desmocladus flexuosus</i> , <i>*Sonchus oleraceus</i> , <i>*Poa annua</i> and <i>*Carpobrotus edulis</i> . | 2.29 |
| CcEm: <i>Eucalyptus marginata</i> subsp. <i>marginata</i> , <i>Corymbia calophylla</i> scattered trees over <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> scattered low trees to low open woodland (patches) over <i>Xanthorrhoea preissii</i> shrublands over <i>Hypocalymma angustifolium</i> scattered low shrubs to low shrublands over <i>Hypolaena exsulca</i> open sedgeland | 3.41 |
| BaBmEtBaBmBi: | 3.17 |
| CcEmBaBmBi | 1.38 |
| CcJs: Open woodland of <i>Corymbia calophylla</i> over sparse shrubland of <i>Jacksonia furcellata</i> | 1.29 |
| CcLi: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over open shrubland of <i>Astartea scoparia</i> , <i>Taxandria linearifolia</i> and <i>Xanthorrhoea preissii</i> over open sedgeland of <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> and <i>Dasypogon bromeliifolius</i> . | 1.73 |
| CcMp: Isolated <i>Corymbia calophylla</i> and isolated <i>Melaleuca preissiana</i> | 0.53 |
| CcXp: Open woodland of <i>Corymbia calophylla</i> over closed shrubland of <i>Xanthorrhoea preissii</i> | 6.15 |
| Et: Isolated <i>Eucalyptus todtiana</i> | 0.12 |
| Total | 149.10 |

No evidence of Black Cockatoo roosting was observed within the site.

3.6.2.3 Black Cockatoo Breeding Habitat

A Black Cockatoo Breeding Habitat survey has not been completed for the whole site. However, the following lots (or part lots) have been assessed Lots 5889, 2294, 1808 (360 Environmental, 2013, Appendix F) and Lots 1767, 112 and 114 (360 Environmental 2019, Appendix D).

The following criteria was used to determine potential breeding habitat:

- Native trees (e.g. Jarrah, Tuart, Marri, Wandoo and Salmon Gum)
- Diameter at Breast Height (DBH @ 1.3 m) \geq 500 mm (\geq 300 mm for Wandoo and Salmon Gum) regardless of the presence or absence of hollows
- All hollows observed within trees were recorded and categorised as follows:
 - Hollows = Total number of hollows observed within the tree, or 'no' if none are observed
 - Hollows > 12 cm diameter = Number of hollows within the tree that are observed to contain an opening diameter > 12 cm, which has the potential of being used by Black

Cockatoo species (DEC, 2010; Saunders, Mawson and Dawson, 2014). This also included recording any evidence of chewing around the hollow opening.

The 360 Environmental (2013) survey recorded 14 trees with no visual hollows within Lots 5889, 2294, 1808.

The following was recorded within Lots 1767, 112 and 114 (Figure 13):

- 157 Black Cockatoo potential breeding trees with a DBH of greater than 500 mm within the Survey Area. The trees comprised of Marri trees, stags, Coastal Blackbutt trees Jarrah trees, Flooded Gum trees, Tuart trees, Powderbark tree and non-endemic Eucalyptus trees.
- Of the 157 potential breeding trees, 20 contained hollows. This comprised of a total of 55 hollows as there were multiple hollows recorded on some of the trees. Eleven trees contained hollows with an opening diameter greater than 12 cm. Twenty hollows with a diameter greater than 12 cm were recorded within these 11 trees (Appendix D).
- No evidence of Black Cockatoo breeding, including observations of birds or chew marks around hollows, was observed within the Survey Area.

3.7 Potential Contamination

Under the *Contaminated Sites Act 2003*, contaminated sites must be reported to the DWER, investigated and, if necessary, remediated.

Review of DWER's Contaminated Sites Database has identified there are no registered contaminated sites within a 5 km radius of the site (DWER, 2018). The closest registered contaminated site is located 6.5 km to the north east of the site and is remediated for restricted use.

Historical aerial photography indicates that the site has been historically and currently used for pine plantations, sand extraction, pasture paddocks and a wildflower farm. There is a potential likelihood that the site may have soil or groundwater contamination as a result from the use of pesticides, herbicides, fertilisers, and hydrocarbons associated with these activities.

3.8 Reserves and Conservation Areas

Desktop mapping has identified that the site is partially within and abutting several conservation areas. Bush Forever Site 298: Della Road South Bushland impinges the northern portion of the site and Bush Forever Site 399: Melaleuca Park and adjacent Bushland abuts the western site boundary (Department of Planning, 2014) (Figure 14).

According to Del Marco et al. (2004) the importance of ecological linkage is to connect natural areas, preferably with continuous corridors of native vegetation, which assists in fauna movement between the areas and to access resources and habitats. The protection, management and buffering of existing natural areas within an ecological linkage is a higher priority than revegetation of cleared portions of the link. One Perth Regional Ecological Linkage

(ID: 13) impinges a portion of the west and southwest of the site and traverses north-south connecting Bush Forever Sites (Western Australian Local Government Authority, 2018) (Figure 14).

The City of Swan (2005) Biodiversity Strategy has identified remnant vegetation within the site as Local Natural Areas (LNA) (Western Australian Local Government Authority, 2018). LNA have been identified for priority of retention, protection, and management. These areas are usually the responsibility of the Local Government Area and private landowners (Dal Marco, 2004) (City of Wanneroo, 2011).

The site abuts the Gngara-Moore River State Forest to the west which is managed by the DBCA and vested with the Conservation and Parks Commission under Section 5(1)(a) of the *Conservation and Land Management Act 1984* (CALM Act) (DBCA 2018b) (Figure 14).

3.8.1 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are areas that have been identified for protection due to their environmental significance as outlined in the Western Australian *Environmental Protection (Environmentally Sensitive Areas) Notice 2005* under Section 51B of the EP Act. ESAs include the following:

- World Heritage areas
- Areas included on the National Estate Register
- Defined conservation wetlands and areas within 50m of the wetland
- Vegetation within 50 m of a listed rare flora
- TEC
- Bush Forever Site.

Under the Notice, it is an offence to kill or destroy vegetation within an ESA without a Native Vegetation Clearing Permit (NVCP). ESAs are present within the northern section of the site associated with CCW and Bush Forever Site (Figure 14).

3.9 Heritage

3.9.1 Aboriginal Heritage

The site is within the Whadjuk Native Title Claim Area (WC2011/009). The Whadjuk region is one of six regions within Noongar Country.

The Department of Planning, Lands and Heritage (DPLH) maintains a Register of Aboriginal Sites (Register) and a database of heritage survey reports, which are accessed through the Aboriginal Heritage Information System (AHIS). There is one registered site Ellenbrook: Upper Swan (ID 3525) (mythological) and one other heritage place NATGAS 122 (ID 4143) (artefact scatter). (Figure 15).

Aboriginal heritage site ID 3252 Ellenbrook: Upper Swan is of importance and significance for its association within the mythological narratives of the Waugal, and is associated with the waters and river bed of the Ellen Brook, the main channel of which is located approximately 5km east of the site. The actual boundary of the site closely is aligned to the margins of Ellen Brook and its tributaries (AHA Logic, 2019a)

NATGAS 122 an artefact scatter (ID 4143) is awaiting formal assessment by the Aboriginal Cultural Material Committee to determine whether it is an Aboriginal site under section 5 of the *Aboriginal Heritage Act 1972* (AH Act) (AHA Logic, 2019b).

An Archaeological Heritage Assessment and Ethnographic Heritage was completed for the site by AHA Logic in 2019. A summary of the assessment is provided below with the full reports within Appendix G.

3.9.1.1 Ethnographic Heritage Assessment

The Aboriginal survey participants confirmed that wetland areas on site held some cultural significance because all water is important in the customs and traditions of Noongar People. The historic presence of cultural artefacts (NATGAS 122 ID 4143) is evidence that Aboriginal people were using these wetlands (AHA Logic, 2019b).

3.9.1.2 Archaeological Heritage Assessment

A tributary of Ellen Brook extends into the site, north and roughly parallel with Warbrook Road. A map of the tributary extension of ID 3525. AHA Logic (2019a) confirmed that the tributary is part of Aboriginal site ID 3525.

Five areas of wetlands (Aboriginal heritage sensitivity zones) within the survey area are confirmed by the Aboriginal people participating in the survey as places of cultural importance and significance and may potentially meet the requirements of section 5 of the AH Act (AHA Logic, 2019a).

No Aboriginal objects were identified within the areas surveyed, although Aboriginal objects may exist in subsurface deposits in areas of intact original ground surface within and in the immediate vicinity of the 5 wetlands (AHA Logic, 2019a).

3.9.2 European Heritage

A desktop search of the State Heritage Office has identified there are no State Heritage Sites within the Site or within a 5 km radius of the site (State Heritage Office, 2019). No World Heritage or National Heritage places are located within a 5 km radius of the Site (DEE 2018).

One City of Swan Municipal Heritage site abuts the site; Melaleuca Park (No. 18693), this site is also registered on the National estate (SHO 2018). This site is located outside of the site boundary and will not be impinged by future subdivision and development of the site.

3.10 Surrounding Land Uses

3.10.1 Overview

The surrounding land uses are mostly cleared and rural. The Bullsbrook Material Recovery Centre and a turf farm is located approximately 1.7 km northeast and north of the site, respectively. The Vines Country Club and Golf Course is located approximately 2.6 km southeast of the site. A silica sand quarry is currently in operation within the adjacent Lot 5892 Maralla Road, Bullsbrook approximately 570 m to the south of the site.

Turf farms, poultry farms and sand quarries have been identified as industrial land uses that require a buffer distance from sensitive land uses, such as residential development. The EPA's Guidance Statement No. 3 Separation Distances between Industrial and Sensitive Land Uses, recommend a 500 m buffer from these land uses to sensitive receptors (EPA, 2005).

3.10.2 Maralla Road Sand Mine

The Maralla Road Sand Mine is located on Lot 5892 immediately south of the site boundary with a mining lease (M 70/326) held by Stefanelli Developments Pty Ltd and operated by Urban Resources Pty Ltd for a silica sand quarry. The quarry boundary is approximately 420 south of the site southern cadastral boundary. The quarry was assessed by the EPA and approved by the Minister for Environment and Heritage on 6 December 2013. Since then, only a portion (approximately 7.89 ha) has been disturbed to date for the sand mine.

Review of the 2017 Annual Environmental Report (AER) submitted to the Department of Mines, Industry, Regulation and Safety (DMIRS) has identified the total approved disturbance area for the mine is 16 ha (DMIRS 2017). In addition to sand extraction, the quarry has a licence to process the ore onsite and discharge tailings into a containment cell under Licence #L8868/2014/1.

Review of City of Swan council minutes has identified an extension for sand extraction activities at the mine was sought in 2017 until October 2020 (City of Swan 2017). The extension for Maralla Road Sand Quarry was approved in July 2017.

3.11 Bush Fire Risk

Based on regional Bush Fire Prone Mapping (Department of Fire and Emergency Services, 2019) the site is mapped within the designated bushfire prone area. State Planning Policy (SPP) 3.7 stipulates that to reduce vulnerability to bushfire, the identification of bushfire risks should be considered in decision making at all stages of the planning and development process.

A Bushfire Hazard Assessment has been prepared to identify the strategic ability to address bushfire risk and the consideration of bushfire protection criteria (i.e. Bushfire Management Plan) support the urban development on site. The Bushfire Hazard Assessment should be read in conjunction with this EAR.



Plate 1: Bushfire Prone Mapping (WALGA, 2019)

4 Environmental Factors, Potential Impact and Recommended Mitigation and Management Measures

4.1 Acid Sulfate Soils

4.1.1 Overview

As discussed in Section 3.3, while ASS is not considered to be a limited factor to the development potential of the site some portions of the site are mapped high to moderate risk ASS (Class I). In accordance with Department of Environment Regulation (2015) an ASS investigation may be warranted subject to the following being undertaken at the site:

- Earthworks that will disturb more than 100m³ of soil
- Dewatering or soil draining activity.

Other areas of the site with a moderate to low ASS disturbance risk (<3 m from surface) (Class II) (Figure 6) may require an ASS investigation subject to the following being undertaken at the site:

- Works involving lowering of watertable (temporary or permanent)
- Earthworks extending to beyond 3 metres below natural ground surface
- Works within 500m of wetlands (Department of Environment Regulation, 2015).

4.1.2 DSP Mitigation and Management Measures

Some POS areas are proposed within the high to moderate risk ASS at the northern and southwestern corner of the site which may limit the risk as ASS exposure.

4.1.3 Further Environmental Considerations

Subject to engineering specifications, filling of the site may be required and can be determined during subsequent planning phases i.e. Local Structure Plan and Subdivision. The WAPC's ASS Self-Assessment form should be filled out to identify the need of an ASS investigation. If required, prior to ground disturbing activities an ASS and Dewatering Management Plan (ASSDMP) can be developed to manage the ASS risk within the site and adjacent wetland area. The objective of the ASS investigation is usually to determine the extent to which soils and groundwater will be disturbed and to determine the nature and extent of ASS and non-ASS that may be impacted by site redevelopment activities. The ASSDMP has the objective of preventing potentially adverse impacts to the environment as a result of soil acidification related to earthworks and dewatering activities.

4.2 Groundwater

4.2.1 Overview

Portions of the site around some of the wetlands have been mapped as areas subject to inundation and the site contains shallow depths to groundwater.

JDA (2019) has estimated that the depth to pre-development AAMGL mapping range between 1.0 and 1.5 mbgl across the site. These areas are consistent with aerial photography which suggests possible seasonal waterlogging in the shallower gradient areas to the north-east and east. This also correlates with the wetland mapping (JDA 2019).

While the superficial and confirmed aquifers are fully allocated, there are existing groundwater licences with an approximate superficial aquifer allocation of 75,660 KL which could be transferred and utilised for future urban development use.

4.2.2 DSP Mitigation and Management Measures

Subject to engineering specifications, filling of the site may be required and can be determined during subsequent planning phases i.e. LSP and Subdivision.

The DWER standard irrigations rates for POS is typically 7,500KL/ha for POS. The DPS proposes two ovals/playing fields (approximately 10.5 ha). The minimum water requirement for the ovals/fields would be 78,750 KL /year which is 78% of the current groundwater allocation (est. 100,660 KL of existing license within the site. Water requirements for the POS areas is to be confirmed during LSP. Refer to Section 4.2.3.

4.2.3 Further Environmental Considerations

A Local Water Management Strategy (LWMS) will be required at structure planning. A groundwater monitoring program will also be required prior to the development of a LWMS at subdivision stage.

Potential impacts to hydrological processes will be addressed through the implementation of the following measures at subsequent planning stages and to ensure the environmental objective for hydrological processes can be met:

- Urban development of the land will require the establishment of an improved drainage system and incorporating water management design principles
- Bio-retention areas will be provided to ensure water from low ARI rainfall events will be contained and maximise the useability of any POS areas
- Structural and non-structural best management practices will be used to encourage infiltration and restricting water velocities within the development
- Encouraging on-source surface recharge where possible
- Retention of native trees within POS to reduce the demand for water and minimise irrigating and fertilizer demands.

An Urban Water Management Plan (UWMP) will be developed and submitted to support future subdivision for the site. The UWMP will address the DWMS and LWMS criteria and objectives to the satisfaction of the City of Swan and DWER.

4.3 Public Drinking Water Source Area

4.3.1 Overview

As discussed in Section 3.4.1, the eastern portion of the site is located within the Priority 3 PDWSA. The identified DSP land uses and their compatibility within a P3 area are as follows:

- Residential Area: acceptable (connected to deep sewerage)
- Industrial/Service Commercial: acceptable (connected to deep sewerage) or compatible with conditions
- Schools: acceptable (connected to deep sewerage)
- Playing Fields: compatible with conditions
- Public Open Space (unrestricted): compatible with conditions.

4.3.2 DSP Mitigation and Management Measures

The DSP proposes POS and urban development (sewered) within the P3 area, these are compatible land uses in accordance with DoW (2016) guidelines.

4.4 Surface Water and Wetlands

4.4.1 Overview

Altering the hydrological regimes can significantly impact on water dependent ecosystems and other values supported by groundwater and surface water.

- There are two CCW areas (UFI 8536, 15045 and 15046) and REW areas (UFI 8538 and 13387) mapped within the within the site.
- A significant portion of REW (UFI 13387) is degraded due to historical clearing and grazing activities with isolated *Melaleuca preissiana* (Mp) recorded within the eastern section of the REW. The vegetation in the REW has been mapped as Degraded to Completely Degraded condition.
- Portions of the site is mapped as areas subject to inundation and swamps which generally follows the boundary of the wetlands.
- The site contains four mapped watercourses, three existing major drains and multiple earth dams.

4.4.2 DSP Mitigation and Management Measures

Most major perennial water courses/drainage lines (central and southern) including Sawpit Gully have been allocated within POS. Allocation for a 30m foreshore buffer to these drainage lines has also been depicted on the DSP.

The DSP has represented the CCW and generic buffer within allocated POS. The REW (UFI 8538) and 50m buffer and REW (UFI 13387) and a generic buffer is proposed within POS.

All MUWs (except UFI 8524) are proposed to be developed.

4.4.3 Further Environmental Considerations

4.4.3.1 REW (UFI 13387)

Due the current condition of REW (UFI 13387), the wetland may currently no longer support the environmental attributes, function and value associated with REW management status (refer to Table 5). A wetland reclassification and verification assessment can be completed for the REW in accordance with DBCA (2017a) "A methodology for the evaluation of wetlands on the Swan Coastal Plain, Western Australia" to confirm the management classification.

Subject to the above, a buffer study in accordance with the draft Guideline for the Determination of Wetland Buffer Requirements (WAPC, 2005) may need undertaken at subsequent planning phases (i.e. LSP) to accurately determine the buffer required to protect the wetland (UFI 13387) values. The purpose of a site-specific buffer study would be to identify the values, functions and processes of the wetland, the threats posed by the proposed changes, and the appropriate buffer required to mitigate potential threats.

4.4.3.2 Central and Southern Foreshore Areas

The site contains several watercourses and drains that traverse the northern, middle, and southern portions of the site that are likely to require a defined foreshore area in accordance with the (then) Department of Water's Operational Policy 4.3: *Identifying and establishing waterways foreshore areas* (2012). While the DSP is provided for a 30m foreshore buffer to the watercourses/drainage lines, further on-site investigations i.e. biophysical assessment to determine foreshore areas and buffer zones will be required at LSP stage.

4.4.3.3 Management Plans

A wetland and/or foreshore management plan will be prepared as part of future structure planning process for the central and southern watercourse/drainage line. It is recommended that the contents and format of the management plan be prepared in accordance with Guidelines checklist for preparing a wetland management plan (DEC 2008).

4.5 Flora and Vegetation

4.5.1 Overview

The implementation of the DSP may require the clearing of approximately 83.16 ha² of native vegetation which consists of the following vegetation types (**Error! Reference source not**

² Based on DPS (2020) design which is subject to engineering specifications i.e. cut and fill, infrastructure and drainage.

found.). Of the 83.16 ha to be cleared approximately 51.94 ha is representative of the Banksia Woodland SCP TEC.

Based on the current DSP design approximately there is opportunity for 97.50 ha to be retained on site through POS allocation (35.47 ha proposed MRS P&R and 62.03 ha POS) which includes 59.25 ha of inferred Banksia Woodland SCP TEC (20.35 ha within proposed MRS P&R and 38.9 ha within POS). It is noted that Bushfire requirements (areas to be thinned and/or cleared) have not be confirmed or reflected in **Error! Reference source not found.**

Table 13: Potential Vegetation to be Cleared and Retained Via POS

| Element | Total Area (ha) remaining based on Aerial Photography (Dec 2019) | Area to be cleared (ha) | Approximate Area to be retained within proposed MRS P&R (ha)* | Approximate Area to be retained within POS (ha)* |
|---|--|-------------------------|---|--|
| Remnant vegetation consisting of the following vegetation types: As, Ba, BaBmBi, BaBmE, BiXp, Cc, CcAs, CcEm, CcJs, CcLI, CcMp, CcXp, Et, Er, Kg, Mp, MpAs, MpHa, MpPeBi, MpRi, EmBiXp, BaBmEtBaBmBi, CcEmBaBmBi, Xp | 180.66 | 83.16 | 35.47 | 62.03 |
| NE: Non endemic species | 0.18 | 0 | 0 | 0 |
| Cleared and Pasture Paddock: | 426.76 | 146.30 | 24.52 | 84.29 |
| Total | 607.62 | 229.76 | 60.00 | 146.33 |

* Note: POS areas are based on DPS (2020) design which is subject to engineering specifications i.e. cut and fill, infrastructure and drainage. Areas will be refined during LSP process and clearing/thinning of vegetation within POS maybe required.

4.5.2 DSP Mitigation and Management

The DSP reflects the retention of remnant vegetation addressed under existing approvals and protected (by existing conservation covenant) and POS. (refer to Figure 2 and Figure 3). Bush Forever sites (No. 298 and 399) are to be protected within proposed MRS P&R. The DSP proposed hard edges to POS and Bush Forever interface with proposed urban development.

Approximately 97.05 ha of remnant vegetation has potential be retained within POS areas.

The known population of Priority 3 species- *Cyathochaeta teretifolia* (in Lots 1479 and 1480) is located within proposed POS.

4.5.3 Further Environmental Considerations

Potential impacts to conservation significant flora and vegetation will be addressed at subsequent stages of the planning process and through the implementation of the following:

- A Vegetation Management Plan will likely be required at subdivision stage to reduce the risk of the introduction or distribution of pathogens or weed species to the retained vegetation within the site and the abutting Gngangara-Moore River State Forest. This will

include ongoing monitoring to ensure the effectiveness of the management measures implemented.

As discussed in Section 2.1.1, Banksia Woodland SCP TEC is present on site. Potentially clearing remnant vegetation (representative of this TEC) to implement the DSP would likely be considered as a significant impact on any MNES in accordance with the *Significant Impact Guidelines 1.1-Matters of National Significance*. The existing environmental challenges for the site include the uneven distribution of MNES is across the site and that there are multiple landowners/stakeholders with varying lot sizes. The above can be addressed through the approvals process under the EPBC Act.

4.6 Terrestrial Fauna

4.6.1 Overview

The implementation of the DSP may potentially clear up to 67.89 ha* of Black Cockatoo foraging habitat (Table 14).

Table 14: Black Cockatoo Foraging Habitat on Site

| Black Cockatoo Habitat | Total Area (ha) remaining based on Aerial Photography (Dec 2019) | Area to be cleared (ha) | Approximate Area to be retained within proposed MRS P&R (ha)* | Approximate Area to be retained within POS (ha)* |
|---|--|-------------------------|---|--|
| Vegetation Units consisting of the following: Ba, BaBmBi, BaBmEt, BiXp, Cc, CcAs, CcEm, CcJs, CcLI, CcMp, CcXp, Et, EmBiXp, BaBmEtBaBmBi, BaBmEtBaBmBi | 142.43 | 67.89 | 26.68 | 47.86 |

* Note: POS areas are based on DPS (2020) design which is subject to engineering specifications i.e. cut and fill, infrastructure and drainage. Areas will be refined during LSP process and clearing/thinning of vegetation within POS maybe required.

4.6.2 DSP Mitigation and Management Measures

The DSP proposes to retain approximately 74.54 ha of Black Cockatoo foraging habitat within POS (proposed MRS P&R- 26.68 ha and POS- 47.86 ha). There are two local ecological linkages which transverse the site connecting Bush Forever site 399 and No. 13 which is located on the other side of the Perth to Darwin Highway. The width of the local ecological linkages ranges from approximately 50 to 250 m and roads intersecting the linkages have been kept to a minimum. This will assist fauna movement across the site.

The POS areas capture a variety of fauna habitats such as wetland areas, transition zones from low lying to uplands to Banksia woodlands.

4.6.3 Further Environmental Considerations

Section 3.6.2.3, highlights that a Black Cockatoo breeding habitat assessment has not been completed for the whole site. It is recommended that a survey be completed on these lots, to determine whether there is any further potential impact during later stages of planning.

As discussed in Section 2.1.1, Black Cockatoo foraging and potential breeding habitat (MNES) is present on site. Potentially clearing 67.89 ha to implement the DSP would likely be considered as a significant impact on any MNES in accordance with the *Significant Impact Guidelines 1.1-Matters of National Significance*. The existing environmental challenges for the site include the uneven distribution of MNES across the site and that there are multiple landowners/stakeholders with varying lot sizes. The above can be addressed through the approvals process under the EPBC Act.

Prior to subdivision, a Construction Environmental Management Plan (CEMP) can be developed for precincts and can incorporate clearing procedures. The CEMP can include a fauna management section or a separate Fauna Management Plan can be prepared concurrently which can include fauna relocation procedures and contingency measures should injured wildlife be ensured during site works. For example:

- If clearing of potential habitat trees is to occur within the Black Cockatoo breeding season, assessments of potential breeding trees within the site should be conducted to check nesting hollows usage by Black Cockatoos.
- If a hollow is actively being used by Black Cockatoos the tree must be clearly demarcated (with fencing and signage) and not cleared or tampered with until the hollow is no longer being used. An exclusion zone of approximately 10m is recommended.
- Incorporation of Black Cockatoo nesting boxes within the adjacent Bush Forever Site and or POS areas (Department of Environment Conservation, 2010).

4.7 Contamination

4.7.1 Overview

The DER (2015) has a guidance on the assessment and management of contaminated sites in WA within the legislative framework provided by the *Contaminated Sites Act 2003* (CS Act). This includes assessing and managing contaminated sites and assessing risks to human health, the environment, and environmental values.

4.7.2 DSP Mitigation and Management

The DSP proposes residential development over areas which have been previously quarried, plantations. The potential contamination risk from these activities may be low and will be investigated during later stages of planning.

4.7.3 Further Environmental Considerations

If required, the following assessment process, taken from DER (2014 pg. 17) guidelines, can be instigated in relation to potentially contaminated areas within the site. These phases are typically completed prior to earthworks (i.e. subdivision):

- Preliminary site investigation (PSI) consists of a desktop study, a detailed site inspection and interviews with relevant personnel. A PSI may also include limited sampling and

analysis. The information is used to develop an initial Conceptual Site Model (CSM). If contamination or sources of contamination (potential areas of concern) are identified, further detailed site investigation is necessary (i.e. Detailed Site Investigation).

- Subject to PSI conclusions. A Detailed site investigation (DSI) assesses potential or actual contamination through an appropriate sampling and analysis program. Several phases of investigation (including risk assessment) may be required to adequately characterise the site, particularly for complex sites. The CSM is refined on an iterative basis until there is sufficient information and understanding of the site to devise risk-based strategies to manage the identified risks.
- Subject to PSI conclusions. Remedial action plan (RAP) documents the type and extent of remediation required to ensure that the site is suitable for its current or intended future use, and to protect the surrounding environment and land uses. The plan details the clean-up techniques proposed to achieve the remedial objectives and criteria for assessing the effectiveness of the clean-up in the site validation process.

4.8 Aboriginal Heritage

4.8.1 Overview

AHA Logic (2019b) reported that the Aboriginal survey participants requested that development on site to avoid the wetland Aboriginal heritage sensitivity zones and their buffer (Figure 15), the tributary of Ellen Brook ID 3525. It is noted that while not considered Aboriginal sites, the traditional owner recommended that mature trees are retained in site.

4.8.2 DSP Mitigation and Management Measures

The DSP proposes to retain the tributary of Ellen Brook (ID 3525), within the allocation of POS. The NATGAS122 (ID 4143) is also proposed to be retained within POS.

Three of the five wetland Aboriginal heritage sensitivity zones are proposed to be retained or part retained within POS.

4.8.3 Further Environment Considerations

Approval for engineering works (such as earth works, infrastructure [culverts] and roads) within the registered and lodged Aboriginal heritage sites may be conditional upon a heritage survey and consultation with traditional owners being undertaken for the site (DPLH 2018). Liaison with the DPLH will be required prior to clearing or development works.

If any potential remains, scatter or suspended artefacts are discovered, all works will be required to cease immediately and reported to the DPLH in accordance with the AH Act.

Prepare a cultural heritage management plan in consultation with the Aboriginal knowledge holders for the area that identifies appropriate management measures and provisions for heritage areas to be retained and managed on site.

4.9 Surrounding land Uses

4.9.1 Overview

The current quarry operations (development area) based on aerial photography is approximately 420 m south of the site which is less than the recommended EPA (2005) 500 m separation distance.

4.9.2 DSP Mitigation and Management

There is POS proposed along the south section of the site which provides further buffer to the sand quarry operations, resulting in a buffer of approximately 600 to 650 m which complies with EPA (2005) buffer distances.

5 Limitations

This report is produced strictly in accordance with the scope of services set out in the contract or otherwise agreed in accordance with the contract. 360 Environmental makes no representations or warranties in relation to the nature and quality of soil and water other than the visual observation and analytical data in this report.

In the preparation of this report, 360 Environmental has relied upon documents, information, data, and analyses (“client’s information”) provided by the client and other individuals and entities. In most cases where client’s information has been relied upon, such reliance has been indicated in this report. Unless expressly set out in this report, 360 Environmental has not verified that the client’s information is accurate, exhaustive, or current and the validity and accuracy of any aspect of the report including, or based upon, any part of the client’s information is contingent upon the accuracy, exhaustiveness, and currency of the client’s information. 360 Environmental shall not be liable to the client or any other person in connection with any invalid or inaccurate aspect of this report where that invalidity or inaccuracy arose because the client’s information was not accurate, exhaustive, and current or arose because of any information or condition that was concealed, withheld, misrepresented, or otherwise not fully disclosed or available to 360 Environmental.

Aspects of this report, including the opinions, conclusions, and recommendations it contains, are based on the results of the investigation, sampling and testing set out in the contract and otherwise in accordance with normal practices and standards. The investigation, sampling and testing are designed to produce results that represent a reasonable interpretation of the general conditions of the site that is the subject of this report. However, due to the characteristics of the site, including natural variations in site conditions, the results of the investigation, sampling and testing may not accurately represent the actual state of the whole site at all points.

It is important to recognise that site conditions, including the extent and concentration of contaminants, can change with time. This is particularly relevant if this report, including the data, opinions, conclusions, and recommendations it contains, are to be used a considerable time after it was prepared. In these circumstances, further investigation of the site may be necessary.

Subject to the terms of the contract between the Client and 360 Environmental Pty Ltd, copying, reproducing, disclosing, or disseminating parts of this report is prohibited (except to the extent required by law) unless the report is produced in its entirety including this page, without the prior written consent of 360 Environmental Pty Ltd.

6 References

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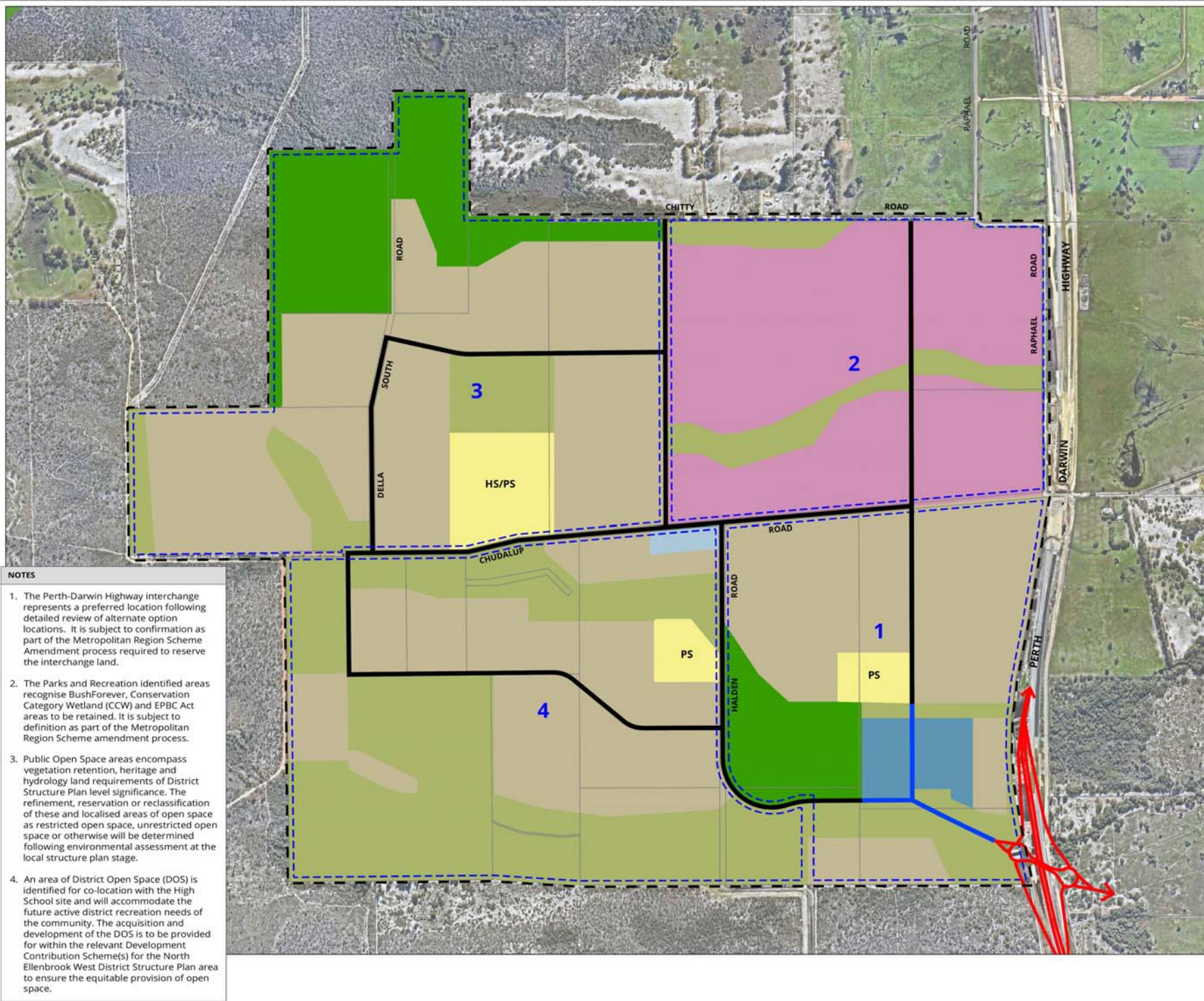
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Figures



- NOTES**
1. The Perth-Darwin Highway interchange represents a preferred location following detailed review of alternate option locations. It is subject to confirmation as part of the Metropolitan Region Scheme Amendment process required to reserve the interchange land.
 2. The Parks and Recreation identified areas recognise BushForever, Conservation Category Wetland (CCW) and EPBC Act areas to be retained. It is subject to definition as part of the Metropolitan Region Scheme amendment process.
 3. Public Open Space areas encompass vegetation retention, heritage and hydrology land requirements of District Structure Plan level significance. The refinement, reservation or reclassification of these and localised areas of open space as restricted open space, unrestricted open space or otherwise will be determined following environmental assessment at the local structure plan stage.
 4. An area of District Open Space (DOS) is identified for co-location with the High School site and will accommodate the future active district recreation needs of the community. The acquisition and development of the DOS is to be provided for within the relevant Development Contribution Scheme(s) for the North Ellenbrook West District Structure Plan area to ensure the equitable provision of open space.

LEGEND

- DISTRICT STRUCTURE PLAN BOUNDARY
- LOCAL STRUCTURE PLAN BOUNDARY
- CADASTRAL BOUNDARIES
- RESIDENTIAL
- LIGHT INDUSTRIAL / SERVICE COMMERCIAL
- DISTRICT CENTRE
- NEIGHBOURHOOD CENTRE
- PS PUBLIC PURPOSE - PRIMARY SCHOOL
- HS/PS PUBLIC PURPOSE - HIGH SCHOOL / PRIMARY SCHOOL COMBINED
- OPEN SPACE
- FUTURE MRS PARKS AND RECREATION RESERVE
- PRIMARY DISTRIBUTOR ROAD
- INTEGRATOR ARTERIAL ROAD
- NEIGHBOURHOOD CONNECTOR ROAD

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - DSP SOURCED ROWE GROUP 19.01.21

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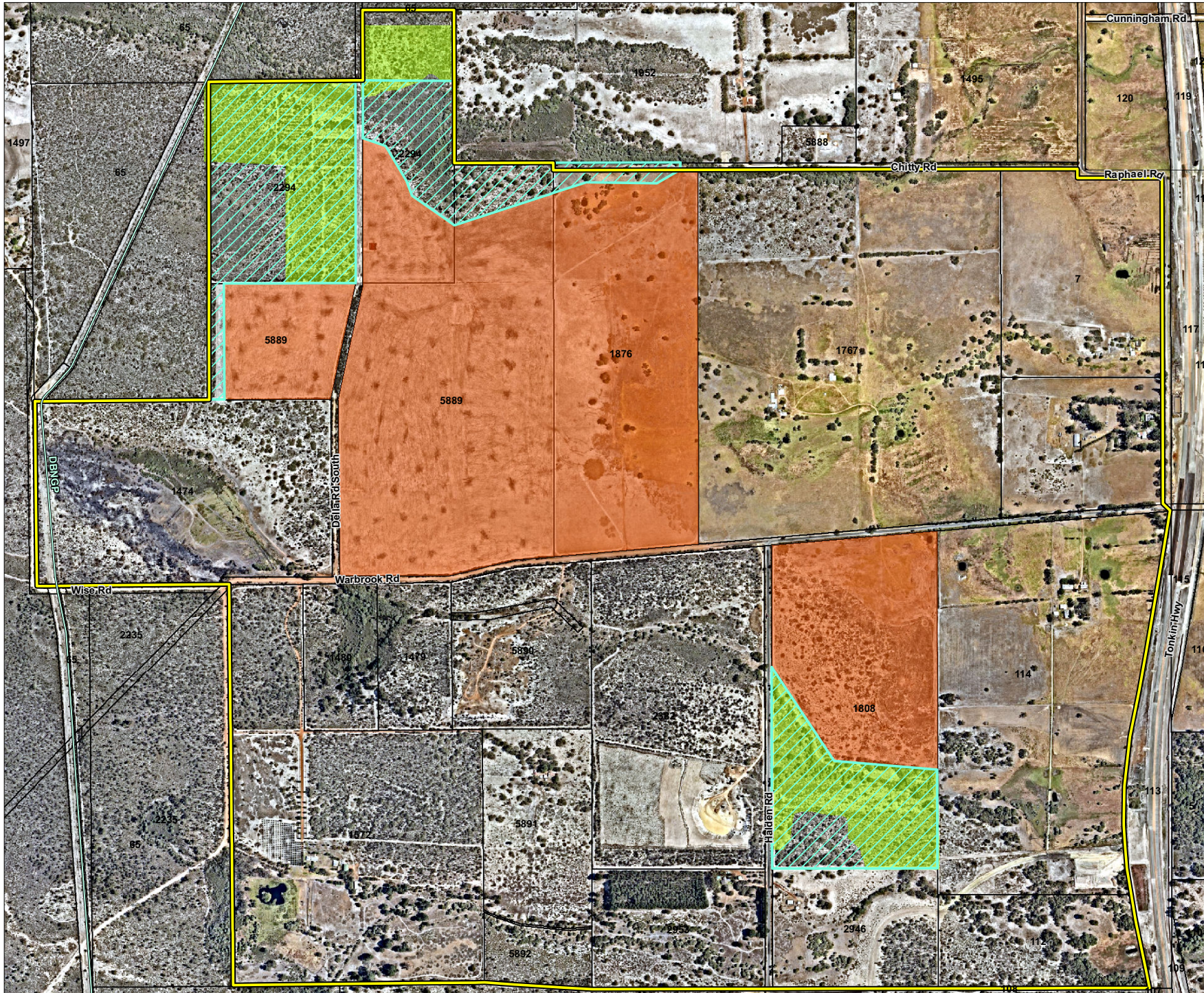
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Figure 2
 District Structure Plan



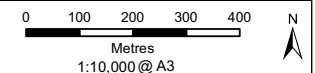
- Legend**
- Site Boundary
 - Cadastre
 - DWER Clearing Permit (CPS 5981/2) Conservation Covenant Area
 - DWER Clearing Permit (CPS 5981/2) Approval Area
 - EPBC Act Area to be
 - Gas Pipeline (DBNGP)

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
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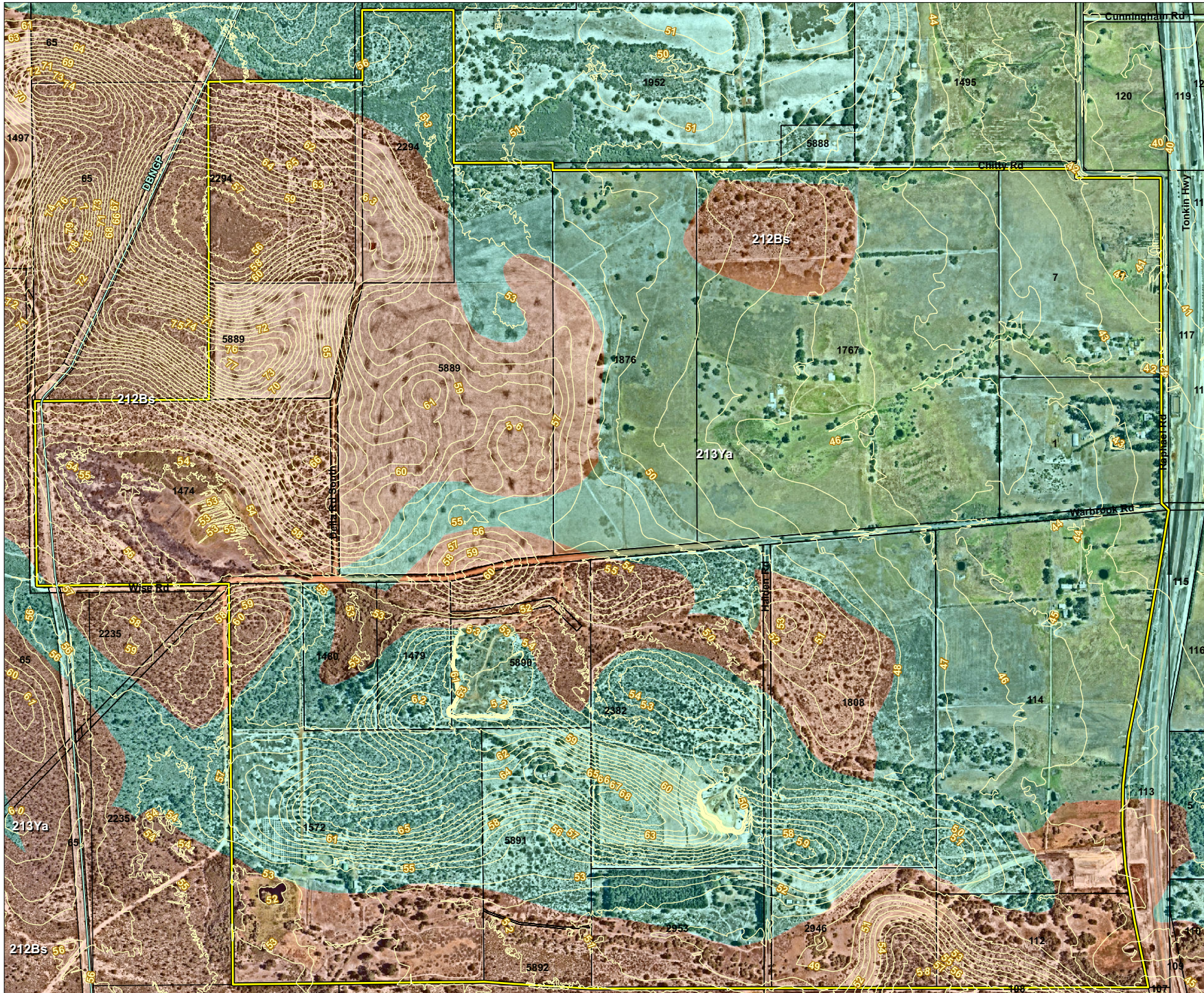
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Figure 3
 Existing Environmental Approvals

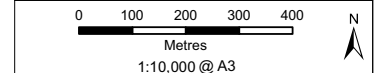


- Legend**
- Site Boundary
 - Cadastre
 - Gas Pipeline (DBNGP)
 - Contour (mAHD)
- Soil Landscape Systems**
- 212Bs: Bassendean System: Swan Coastal Plain from Busseton to Jurien. Sand dunes and sandplains with pale deep sand, semi-wet and wet soil. Banksia-paperbark woodlands and mixed heaths.
 - 213Ya: Yanga System: Poorly drained plain with pale sands and deep sandy duplex, wet, semi-wet and saline wet soils. Banksia-pricklybark-marri-swamp sheoak-paperbark woodlands.

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - SOIL LANDSCAPE SYSTEMS SOURCED FROM DAFWA
 - AERIAL PHOTOGRAPHY SOURCED NEARMAPS 09.12.19

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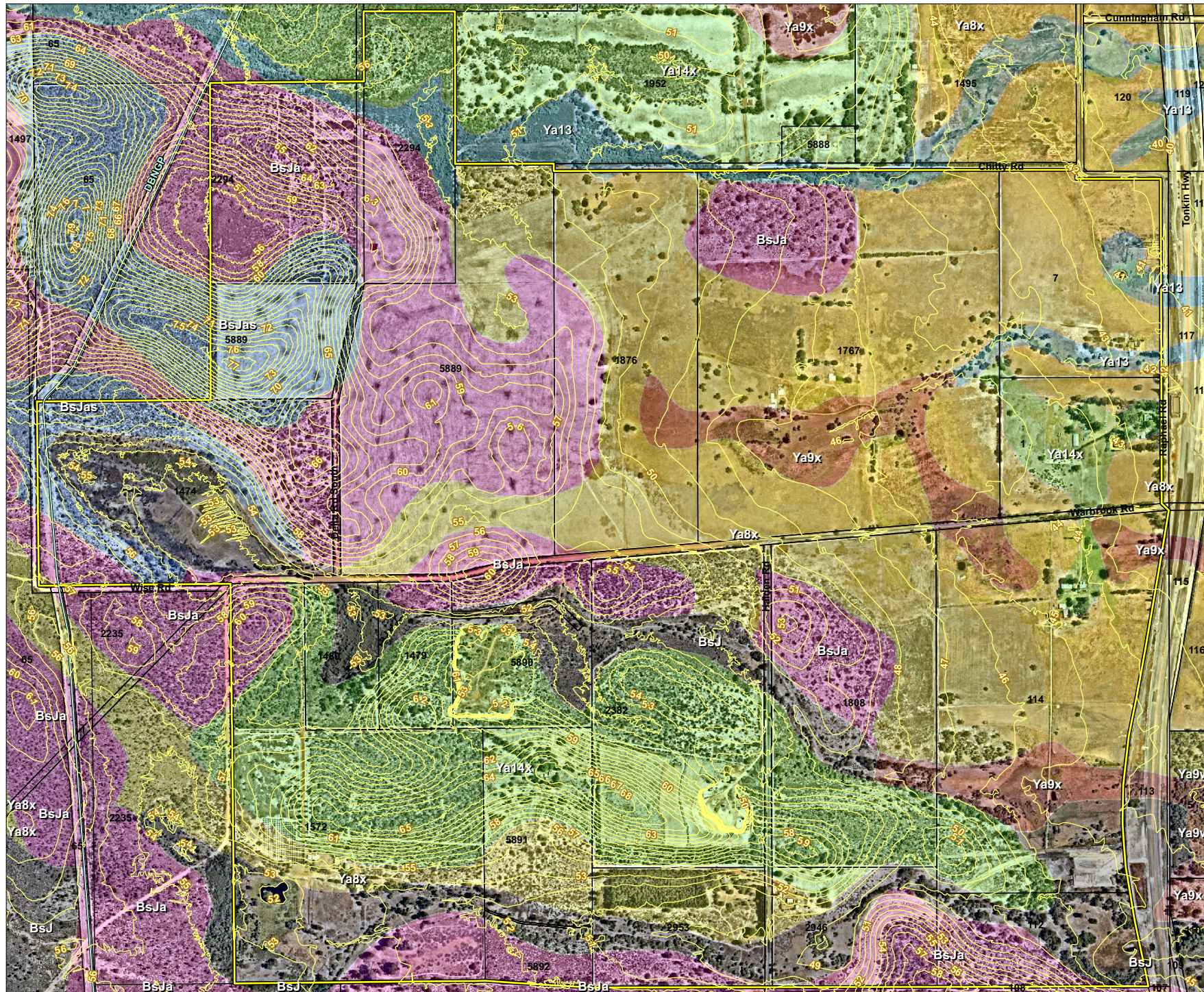


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Figure 4
**Topography and
 Soil Landscape System**



Legend

- Site Boundary
- Cadastral
- Gas Pipeline (DBNGP)
- Contour (mAHD)

Soil Subsystems

BsJ: Bassendean, Joel Phase: Poorly drained depressions. Humus podzols. Scattered *M. preissiana*, *E. rudis* and *Banksia ilicifolia* with a dense shrub layer.

BsJa: Bassendean, Jandakot Phase: Jandakot low dunes. Slopes <10% and generally more than 5m relief. Grey sand over pale yellow sands generally underlain by humic and iron podzols; *Banksia* spp. low open woodland with a dense shrub layer.

BsJas: Bassendean, Jandakot steep Phase: Jandakot dune ridges. Slopes <15% and usually more than 10m relief. Grey medium sand overlying pale yellow sands generally underlain by humic and iron podzols; *Banksia* spp. low open woodland with sparse shrub layer.

Ya13: Yanga 13 Subsystem: Drainage depressions in very gently sloping plain. Deep white humic sands overlying siliceous and humic pans. Woodland of *E. rudis*, *E. camaldulensis* and *Melaleuca* spp..

Ya14x: Yanga 14x Phase: Sandy rises on flat to gently sloping plain with occasional low dunes. Pale sands overlying siliceous / humic pans, bog iron and clay. Low woodland of *Banksia* prionotes, *ilicifolia* and *littoralis*, *Melaleuca* dense shrubbery.

Ya8x: Yanga 8x Phase: Flat plain with occasional low dunes. Subject to seasonal inundation. Deep white and pale yellow sands interspersed with swamp and generally underlain by siliceous/humic pans at depth.

Ya9w: Yanga 9I Phase: Water areas of lakes and permanent swamps.

Ya9x: Yanga 9x Phase: Flat plain with occasional low dunes. Subject to seasonal inundation. Humic and peaty sands, wet and semi-wet soils generally underlain by siliceous / humic pans at depth. *E. rudis*, *Melaleuca* spp., reeds and some *Banksia* on dunes.

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - SOIL SUBSYSTEMS SOURCED FROM DAFWA
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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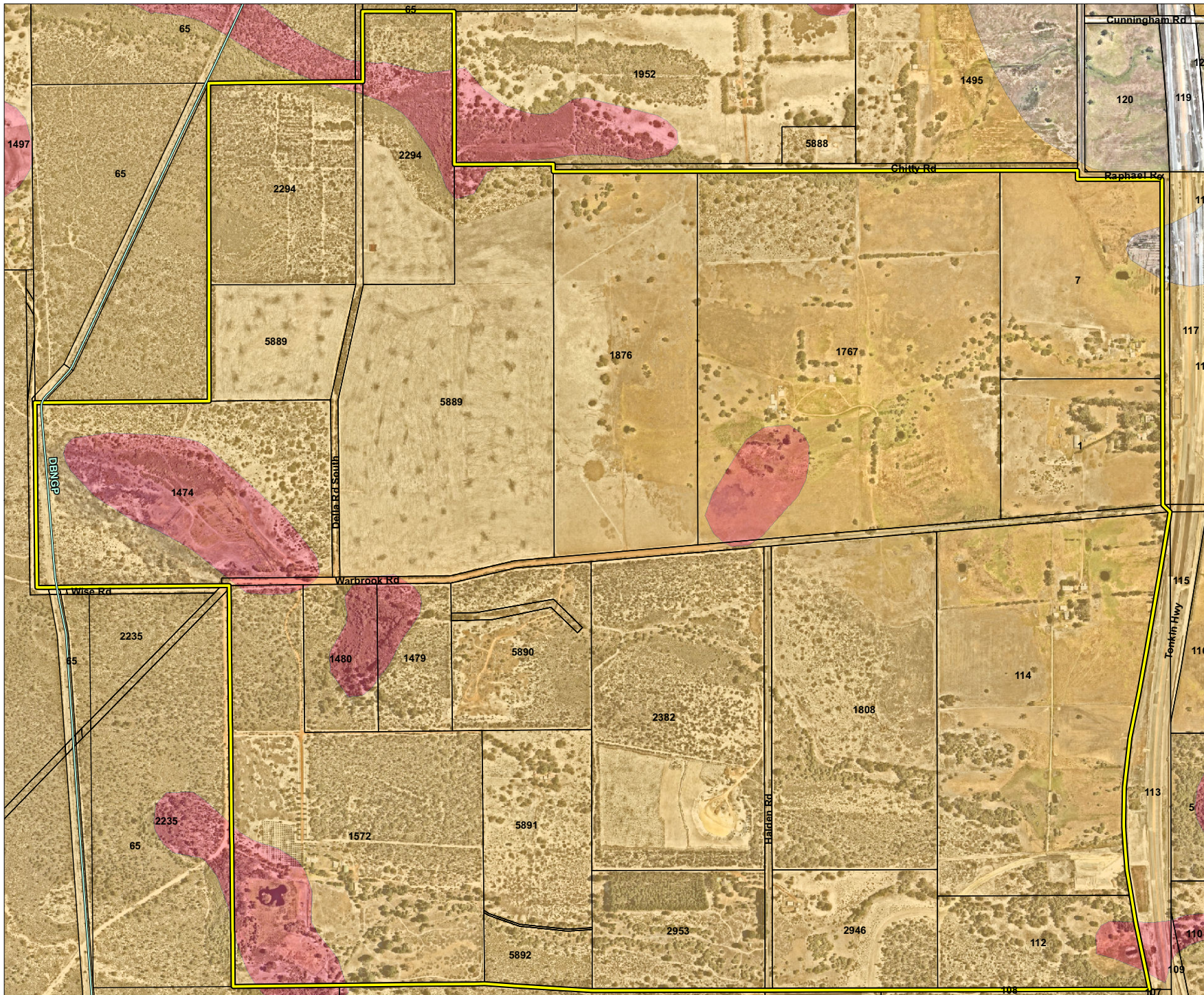
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Figure 5
Soil Subsystems



Legend

- Site Boundary
- Cadastre
- Gas Pipeline (DBNGP)

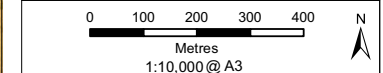
Acid Sulfate Soil Risk Mapping

- High to Moderate Risk
- Moderate to Low Risk

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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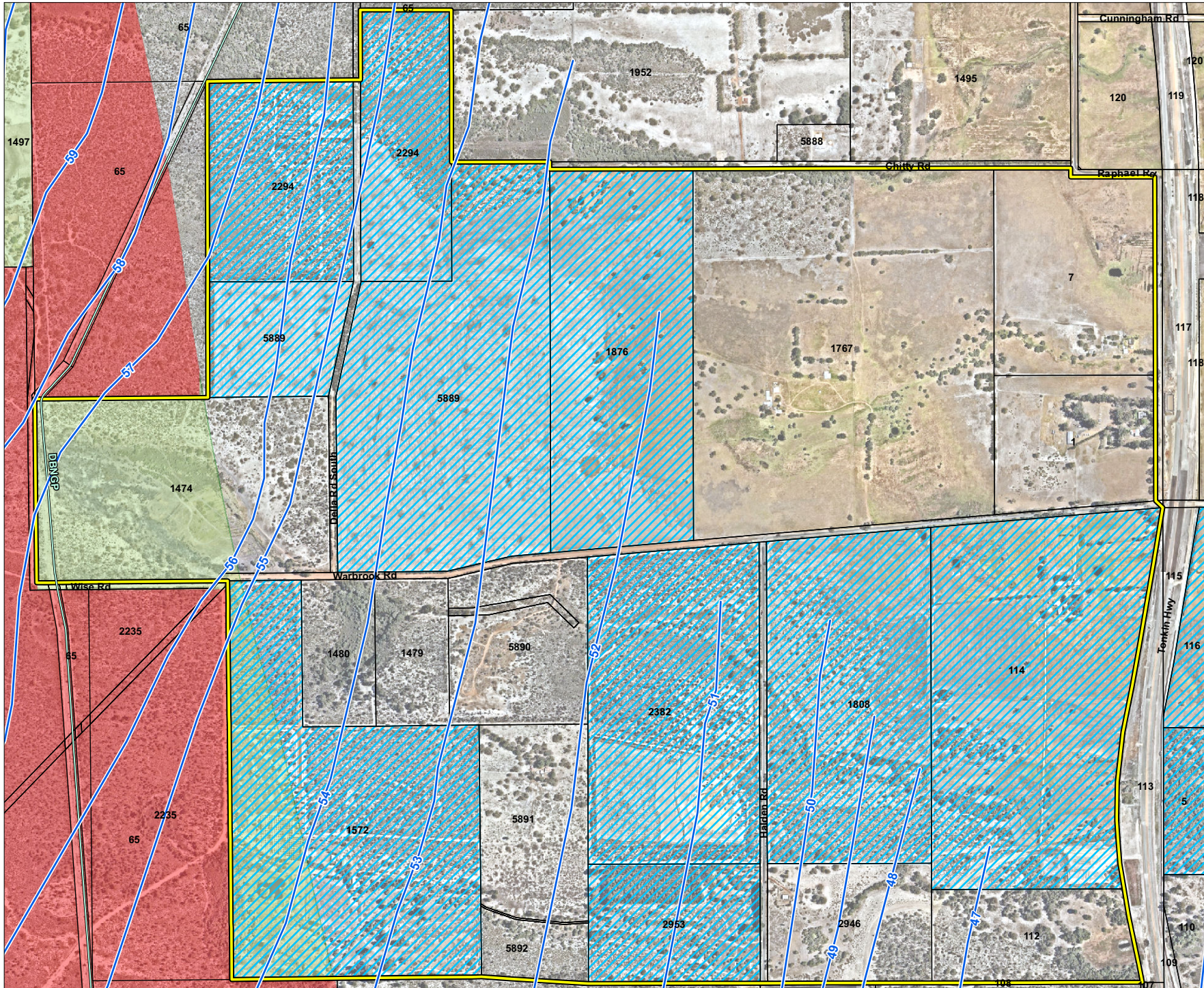


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Figure 6
Acid Sulfate Soil

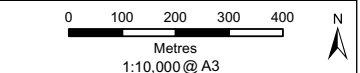


- Legend**
- Site Boundary
 - Cadastre
 - Gas Pipeline (DBNGP)
 - Maximum Groundwater Contour (mAH)
 - Groundwater Licence Area
 - Public Drinking Water Source Areas
 - P1 Area
 - P3 Area

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - GROUNDWATER INFORMATION SOURCED DWER
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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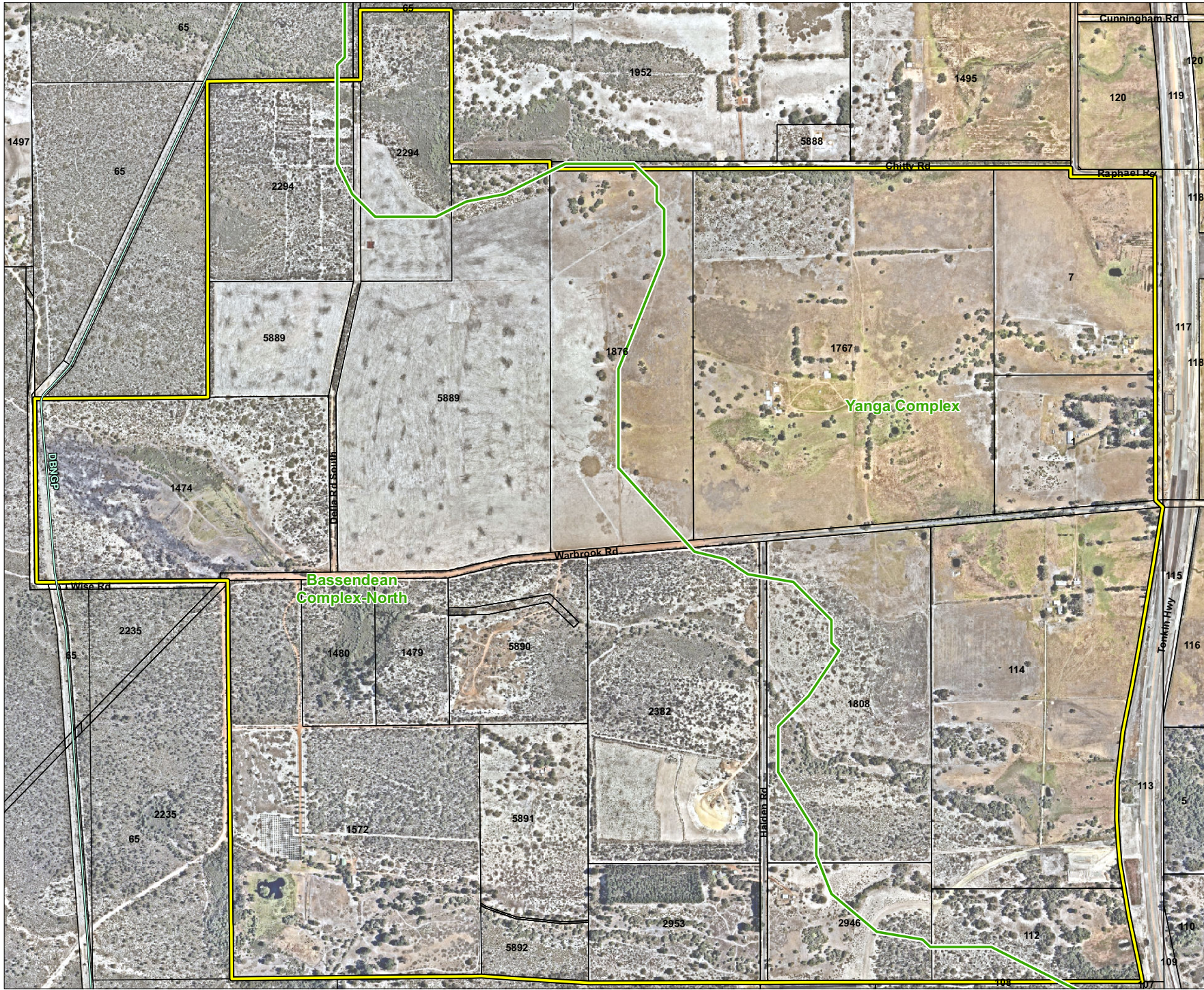
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Figure 7
Groundwater

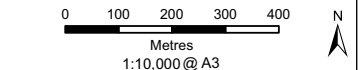


- Legend**
- Site Boundary
 - Cadastre
 - Gas Pipeline (DBNGP)
 - Heddele Vegetation Complex Boundary

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - VEGETATION COMPLEXES SOURCED DBCA
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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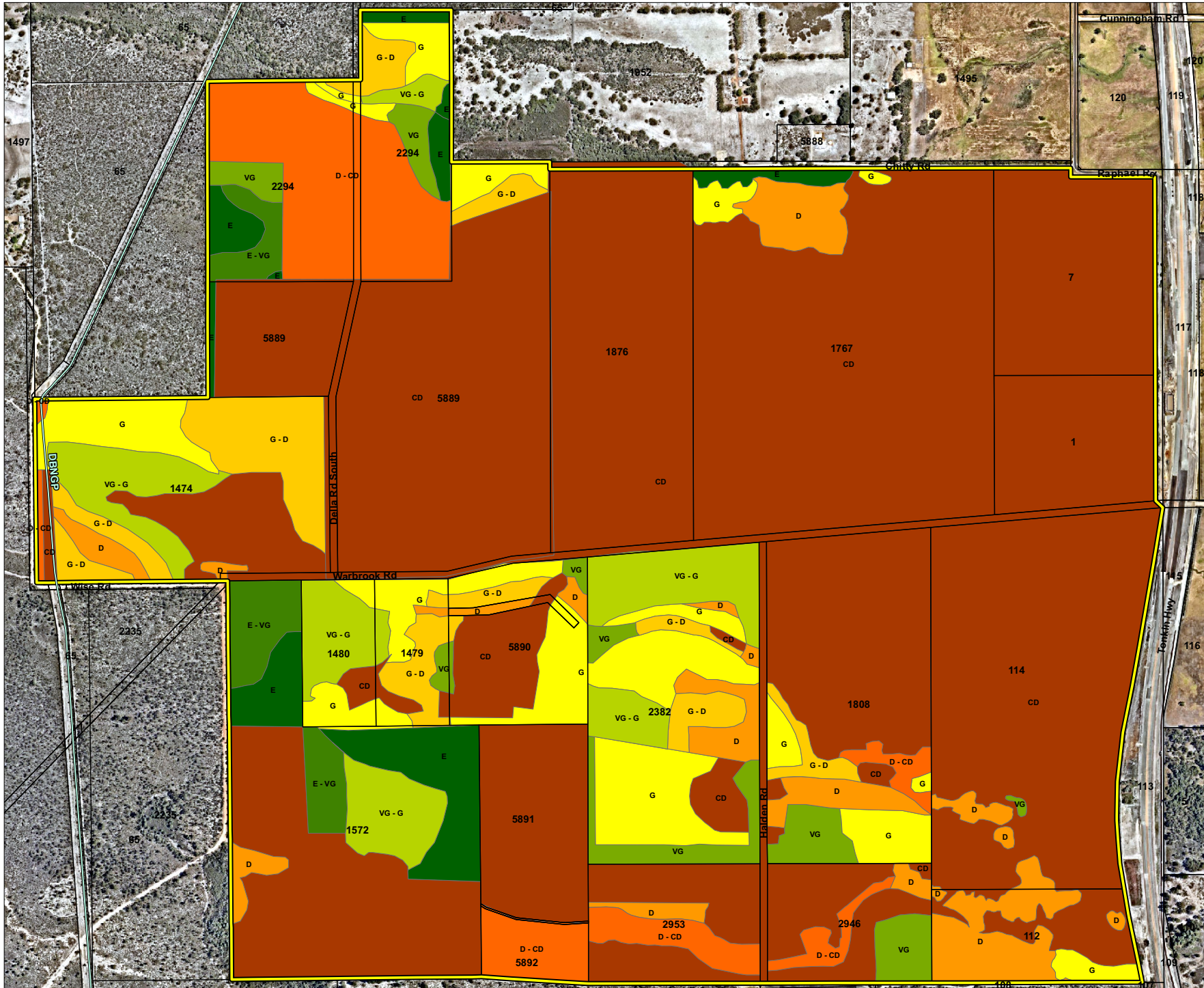
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Figure 9
Vegetation Associations
and Complexes



Legend

- Site Boundary
- Cadastre
- Gas Pipeline (DBNGP)

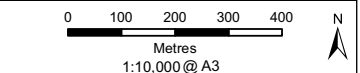
Vegetation Condition

- Excellent
- Excellent - Very Good
- Very Good
- Very Good - Good
- Good
- Good - Degraded
- Degraded
- Degraded - Completely Degraded
- Completely Degraded

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 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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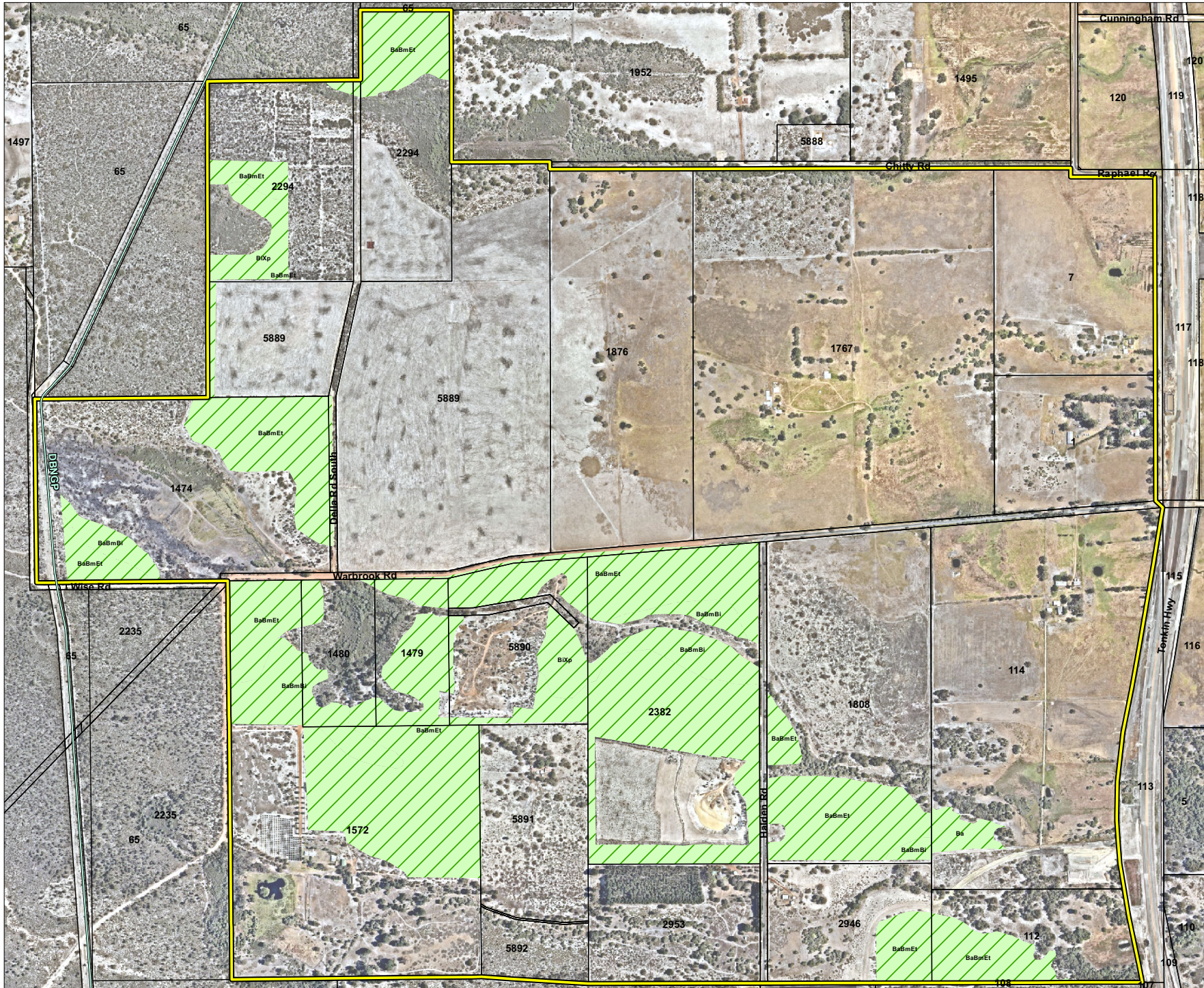
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Figure 11
 Vegetation Condition



Legend

- Site Boundary
- Cadastre
- Gas Pipeline (DBNGP)
- Inferred Banksia Woodland SCP TEC

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

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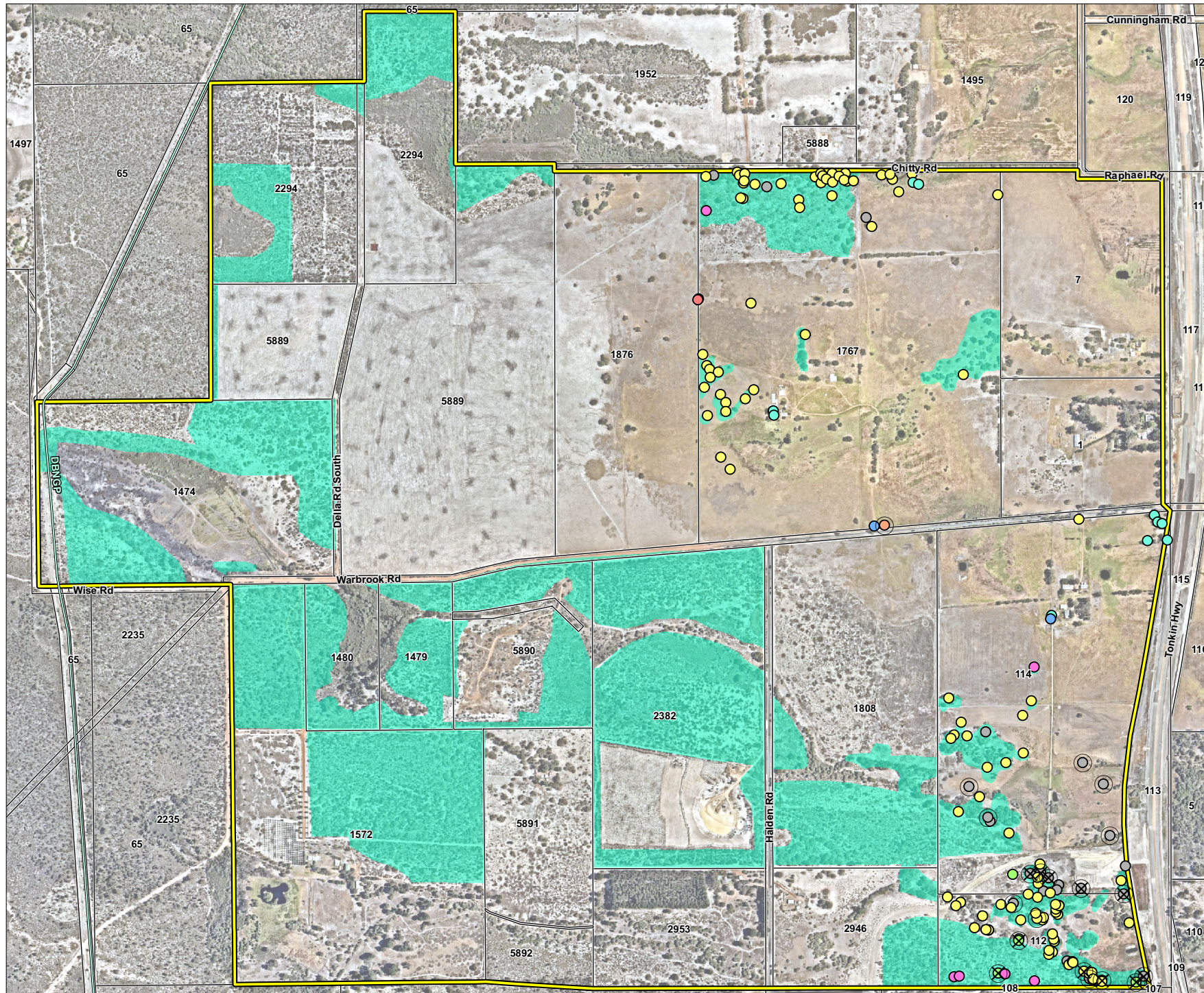
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Figure 12
 Inferred Banksia Woodland SCP TEC



Legend

- Site Boundary
- Cadastre
- Gas Pipeline (DBNGP)
- Black Cockatoo Foraging and Potential Breeding Habitat

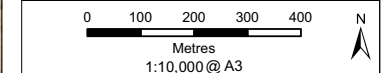
Black Cockatoo Significant Trees

- Coastal blackbutt (*Eucalyptus tottiana*)
- Flooded gum (*Eucalyptus rudis*)
- Introduced Eucalypt
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Powderbark (*Eucalyptus accedens*)
- Tuart (*Eucalyptus gomphocephala*)
- Stag
- Tree Contain Hollow
- × Tree Containing Hollow Over 12cm

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2006
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

360 environmental
 a 10 Bermondsey St, West Leederville, 6007 WA
 t (08) 9388 8360
 f (08) 9381 2360
 www.360environmental.com.au

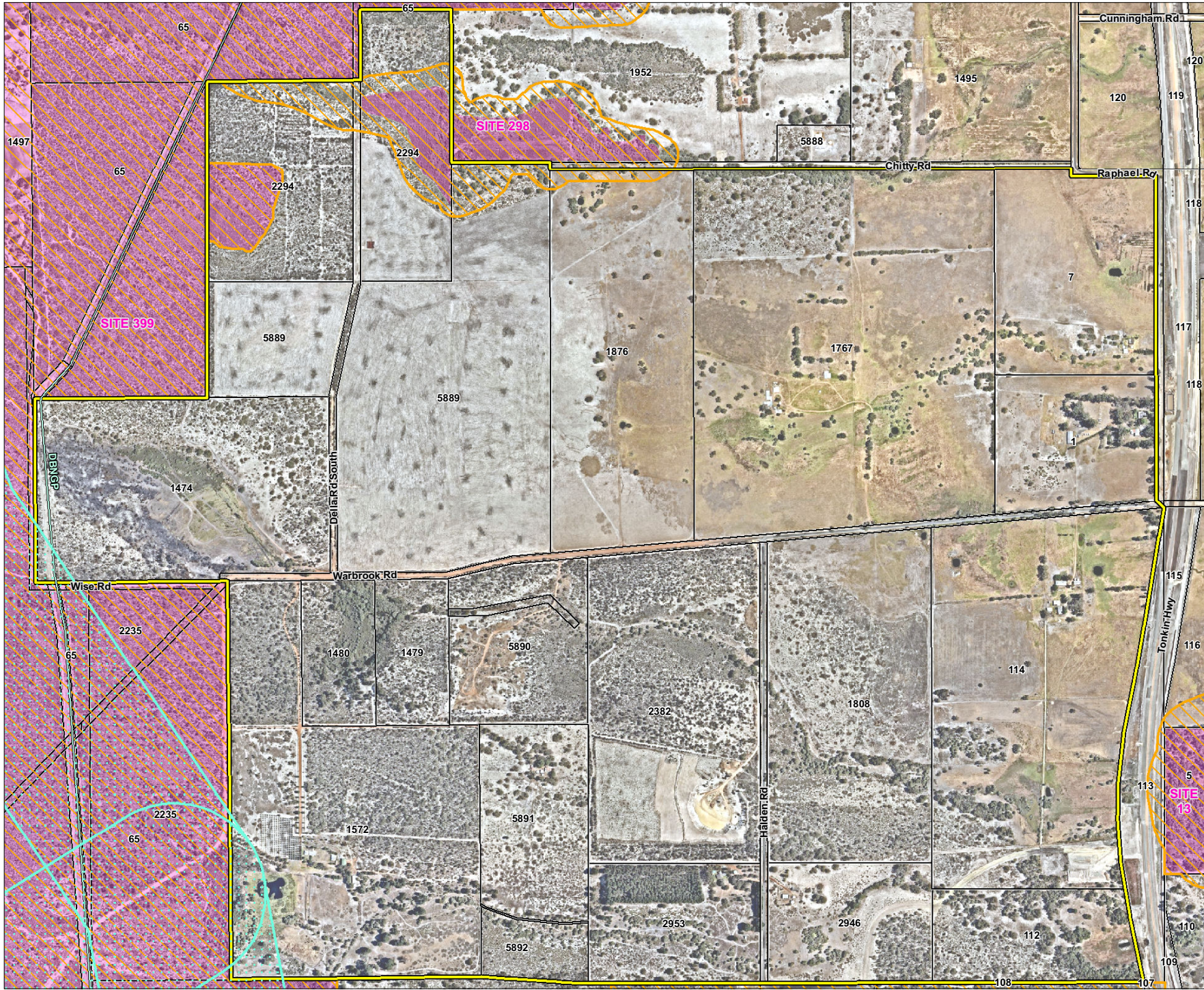


| | | | |
|--|---------------------------|-----------------------|----------------------|
| PROJECT NO 117 | DATE 28/01/2021 | | |
| HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50 | | | |
| CREATED ENVRONMAPS | CHECKED KC | APPROVED KC | REVISION 0 |

Parcel Property Pty Ltd

**North Ellenbrook (Bullsbrook)
 Environmental Assessment Report**

Figure 13
**Black Cockatoo Foraging
 and Potential Breeding Habitat**

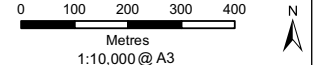


- Legend**
- Site Boundary
 - Cadastre
 - Gas Pipeline (DBNGP)
 - Environmentally Sensitive Area
 - Ecological Linkages
 - Bush Forever Site

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - CONSERVATION AREAS SOURCED FROM DPLH & DWER
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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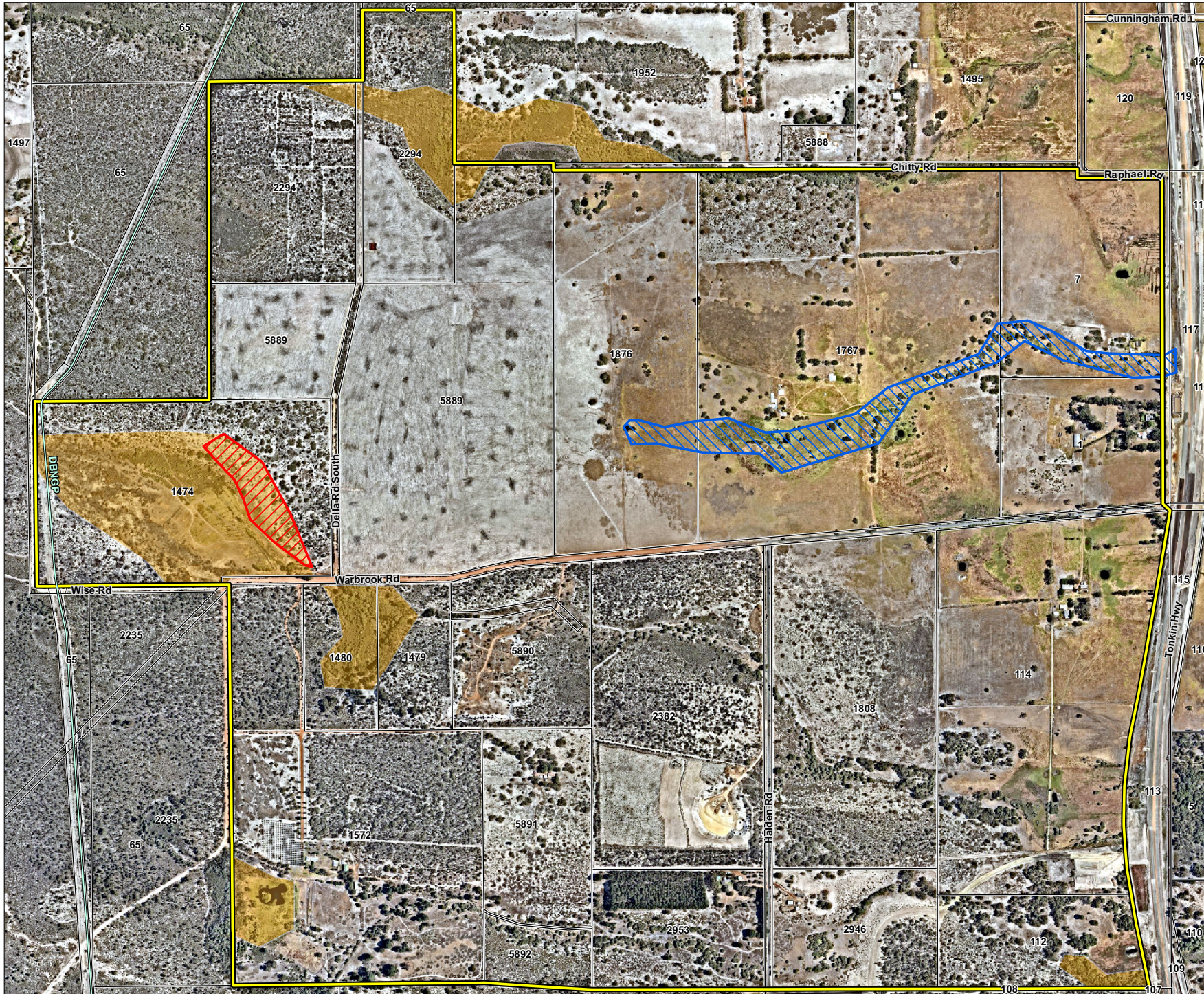
LOCALITY MAP



| | | | |
|---|--------------------|----------------|---------------|
| PROJECT NO 117 | DATE 28/01/2021 | | |
| HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50 | | | |
| CREATED ENVIROMAPS | CHECKED KC | APPROVED KC | REVISION 0 |

Parcel Property Pty Ltd
North Ellenbrook (Bullsbrook)
Environmental Assessment Report

Figure 14
Conservation Areas

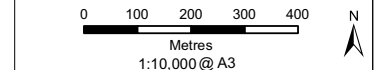


- Legend**
- Site Boundary
 - Cadastre
 - Gas Pipeline (DBNGP)
 - ID 3525 Ellen Brook Tributary Heritage Zone
 - ID 4143 Artefact Scatter
 - Heritage Sensitivity Zone

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - ABORIGINAL HERITAGE SOURCED FROM AHA LOGIC 2019
 - AERIAL PHOTOGRAPHY SOURCED FROM NEARMAPS 09.12.19

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS

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 a 10 Bermondsey St, West Leederville, 6007 WA
 t (08) 9388 8360
 f (08) 9381 2360
 w www.360environmental.com.au



LOCALITY MAP



| | |
|--------------------------|---------------------------|
| PROJECT NO 117 | DATE 28/01/2021 |
|--------------------------|---------------------------|

HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

| | | | |
|------------------------------|----------------------|-----------------------|----------------------|
| CREATED ENVIROMAPS | CHECKED KC | APPROVED KC | REVISION 0 |
|------------------------------|----------------------|-----------------------|----------------------|

Parcel Property Pty Ltd
North Ellenbrook (Bullsbrook)
Environmental Assessment Report

Figure 15
Aboriginal Heritage

Appendices

Appendix A

DBCA Comment Regarding MRS Amendment



Department of **Biodiversity,
Conservation and Attractions**



Your ref: 809-2-21-44
Our ref: PRS 43892
Enquiries: Michael Roberts
Phone: 9303 7755
Email: Michael.Roberts@dbca.wa.gov.au

Ms Sam Fagan
Secretary
Western Australian Planning Commission
Locked Bag 2506
PERTH WA 6001

Attention: Anthony Muscara

Dear Ms Fagan

Proposed Metropolitan Region Scheme Amendment – North Ellenbrook(West)

I refer to your follow-up correspondence of 10 September 2019 requesting preliminary comments on the above Metropolitan Region Scheme Amendment. The Parks and Wildlife Service of the Department of Biodiversity, Conservation and Attractions (the department) provide the following advice.

Wetland Values

There are several geomorphic wetlands in the amendment area identified in the department's geomorphic wetlands database, the majority of which are classified as multiple use wetlands, however there are a number of Conservation Category (CCW) and Resource Enhancement (REW) wetlands which will require further consideration at future stages of the planning process.

The department advises that EPA Guidance Statement 33 recommends that wetlands that are to be protected (ie CCW and REW) in the planning system are afforded a 50 metre minimum wetland buffer. If a buffer of less than 50 m is proposed from the wetland boundary to areas of development, a buffer study in accordance with the draft Guideline for the Determination of Wetland Buffer Requirements (WAPC, 2005) may need to be conducted to accurately determine the buffer required to protect the wetland values. The purpose of a site-specific buffer study would be to identify the values, functions and processes of the wetland, the threats posed by the proposed changes, and the buffer required to mitigate these threats. This buffer study would then be able to assist you in providing justification to decision makers to demonstrate the reasoning for the buffer distances in this case. It should be noted that department is not a decision maker in regard to the implementation of wetland buffers; however, the department can provide advice to decision makers as requested.

Where the wetland buffer/foreshore reserve (in the case of floodplains) is part of public open space (POS), its treatment should be appropriate and contribute towards the maintenance of ecological functioning within the wetland; that is the buffer should be revegetated with appropriate native vegetation species of local provenance. Vegetation of natural structure including groundcovers, mid-storey and over-storey around wetlands is critical for filtering and absorption of nutrients and pollutants, provision of fauna habitat,

Swan Region
Cnr Australia II Drive and Hackett Drive, Crawley WA 6009
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Phone: (08) 9303 7755 Email: michael.roberts@dbca.wa.gov.au
www.dbca.wa.gov.au

abating nuisance insect issues and restricting the spread of rubbish into the wetlands. Therefore, while some passive recreation may be acceptable in defined areas of the wetland buffer, the placement of lawns, playgrounds and other active recreation areas are generally not considered appropriate.

It is recommended that a wetland or foreshore management plan is prepared as part of future structure planning process. It is recommended that the contents and format of the wetland management plan be prepared in accordance with Guidelines checklist for preparing a wetland management plan (DEC 2008) available on DBCA's website. It is also important to engage with the Department of Water and Environment Regulation (DWER) during the preparation of the wetland management plan.

Existing Environmental Approvals

Portions of the amendment area were the subject of a clearing permit assessment and approval under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (CPS 5981/2) and concurrent approval (2014/7120) under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The conditional approval of these assessments stipulated the retention and rehabilitation of two areas of native vegetation within the amendment area. It is recommended that the Department of Water and Environment Regulation (DWER) and Commonwealth Department of Environment and Energy is contacted to determine the ramifications of future development on these areas subject to vegetation conservation notices.

Banksia woodland

The subject area contains banksia woodland vegetation which may meet the description and condition thresholds of the Banksia Woodland of the Swan Coastal Plain Threatened Ecological Community (TEC) declared under the Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act). In addition, the banksia woodland vegetation may contain foraging habitat for threatened species listed under State and Federal legislation such as Carnaby's black cockatoo (*Calyptorhynchus latirostris*), forest red-tailed black cockatoo (*Calyptorhynchus banksii naso*) and Baudin's cockatoo (*Calyptorhynchus baudinii*). Planning for the future development should make provision to retain as much of the banksia woodland and associated cockatoo habitat as possible, identify and quantify habitat which will be lost, and consider if offsets may be required to mitigate any residual impact on habitat of this species.

Consideration should therefore be given to the obligations for assessment of future proposals in accordance the *Biodiversity Conservation Act 2016* and the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). The landowners of affected properties should contact the Commonwealth Department of Environment and Energy for further information on these responsibilities, prior to future planning stages.

The department understands that the environmental consultants did not undertake a targeted cockatoo habitat tree assessment of the amendment area to identify the locations of potential habitat trees. As such is recommended that a habitat tree assessment is undertaken at Structure Plan stage to identify cockatoo habitat values within the amendment area.

Environmental Assessment

The Level 2 Flora and Vegetation Survey undertaken by 360 Environmental was conducted in December 2010 and was acknowledged by the consultant to not be an optimal time of year to undertake a survey, given that some species of threatened flora

may not have been flowering. In addition, it was acknowledged that access to a number of the private property lots were not provided to the consultants and as such there is the possibility that threatened flora and vegetation communities could be present on these unsurveyed lots. Accordingly, the department recommends that further comprehensive biological surveys are undertaken as later planning stages to inform the structure planning and environmental approval processes.

Land use transition adjacent to State Forest

It is noted that the western boundary of the subject area which abuts Gngangara-Moore River State Forest is proposed to be rezoned from a rural zoning designation to Urban as displayed in the draft Structure Plan Concept Map. The department recommends that a portion of the western boundary of the subject area is retained as a rural land use zone to act as a buffer to the ecological assets to the west, which includes the Gngangara-Moore River State Forest, Bush Forever areas and the Gngangara Mound groundwater protection area.

In the event that this entire precinct is developed for urban and industrial purposes it is likely that the adjacent conservation estate will be detrimentally impacted by the following:

- "Edge Effects" caused by the convoluted boundary interface which increases the perimeter of the conservation estate exposed to intensive land development. The existing rural land use is unlikely to have any appreciable impact of the adjacent remnant vegetation when compared to an urban/industrial land use. For example, urban land uses are likely to increase the amount of rubbish, weeds and dieback exposure to the adjacent state forest.
- Local groundwater and surface water impacts causing detrimental impacts to groundwater dependent ecosystems and conservation category wetlands. This is particularly evident in cases where sub-surface drainage systems are implemented.
- Given the adjacent State forest is identified as containing significant landscape scale bushfire risk, it is likely to result in an increased fire risk to future urban developments, which will be exacerbated by the design of the boundary interface exposing the urban area to bushfire risk in multiple directions (ie northern, western and southern interfaces). The proximity of the urban development will also introduce an increased risk of fires escaping into the adjoining DBCA managed land.
- Further impacts upon the natural environment will also be associated with the increased unauthorized access into the adjacent state forest and additional administrative and management impositions on DBCA due to increased requirements for neighbour liaison and modification of projects, responsibilities and management programs, particularly an increased onus on the department to manage the fuel loading at the interface of the state forest.

Western Swamp Tortoise

The amendment area is located approximately 2.5km from the Twin Swamps Nature Reserve which is managed by the department and contains the Critically Endangered Western Swamp Tortoise (WST) *Pseudemydura umbrina* and a number of occurrences of threatened flora and ecological communities (TEC). Although the subject lot is located outside of the Environmental Protection Authorities (EPA) Environmental Protection Policy (EPP) Western Swamp Tortoise habitat protection area, it is noted that proposals which have the potential to detrimentally impact the surface or groundwater quality of the local catchment, have the potential to impact on the habitat of the Western Swamp Tortoise. The department considers it important that future urban water management plans take into consideration the potential impacts the development of the surface and

groundwater catchment of the subject area may have on the habitat values of the nearby Twin Swamps Nature Reserve.

Thank you for the opportunity to comment on this proposal. Please contact Michael Roberts at Parks and Wildlife Service's Swan Coastal District on 9303 7755 or by email at michael.roberts@dbca.wa.gov.au if you have any queries regarding this advice.

Yours faithfully



Benson Todd
REGIONAL MANAGER

27 September 2019

Appendix B

EPBC Approval



VARIATION TO CONDITIONS ATTACHED TO APPROVAL

Vegetation clearing for agricultural use, Bullsbrook, Western Australia (EPBC 2014/7120)

This decision to vary the conditions attached to the approval is made under section 143(1)(c) of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Person to whom the approval is granted ABN Developments Pty Ltd
ACN :147 746 003

Approved action To clear vegetation for future agricultural use on Lots 5889, 2294, 1876 and 1808 in Bullsbrook, Western Australia
[See EPBC Act referral 2014/7120].

Variation

Variation of conditions of approval The variation is:
Delete conditions 1 and 3, Attachment 1 and Attachment 2, and definitions for **Offset property, Western Australian Government Agencies** and the **Western Australian Department of Parks and Wildlife** attached to the approval, and substitute with conditions 1 and 3, Attachment 1 and Attachment 2 and definitions specified below.

Date of effect This variation has effect on the date the instrument is signed.

Person authorised to make decision

Name and position

Greg Manning
Assistant Secretary
Assessment (WA, SA, NT) & Post Approvals Branch

Signature

Date of decision 19 April 2018

Conditions attached to the approval

1. The **approval holder** must not **clear** more than 57 hectares of native vegetation and this **clearing** must be within the **project area**.
3. To mitigate potential impacts to Carnaby's Black Cockatoo **habitat** adjacent to the **project area**, the **approval holder** must ensure that any **clearing** within 50 m of the boundary of the **project area** must only be done by vehicles that have been washed down in accordance with the **Dieback (*Phytophthora cinnamomi*) management guidelines** issued by the **Western Australian Department of Biodiversity, Conservation and Attractions**.

Definitions:

Offset property is an area 319 hectares in size containing **habitat** for the Carnaby's Black Cockatoo, located in the northern portion of Lot 24 (on Deposited Plan 75789), Mimegarra Road, Mimegarra, WA, or an alternative suitable property as agreed by the **Minister**. The northern portion of Lot 24 (on Deposited Plan 75789), Mimegarra Road, Mimegarra, WA is the area marked as "Offset Site" in Attachment 2.

Western Australian Government Agencies include the **Western Australian Department of Biodiversity, Conservation and Attractions** and the Western Australian Department of Water and Environmental Regulation, or any successor agency, which is the government body responsible for the administration of the *Environmental Protection Act 1986*.

Western Australian Department of Biodiversity, Conservation and Attractions, or any successor agency, which is the Western Australian government body responsible for the administration of the *Conservation and Land Management Act 1984*.

Attachment 1



Appendix C

Native Vegetation Clearing Permit (CPS 5981/2)



Government of Western Australia
Department of Water and Environmental Regulation

Your ref:
Our ref: CPS 5981/2
Enquiries: Abbie Crawford
Phone: 6364 7126
Email: info-der@dwer.wa.gov.au

Ms Kathy Choo
Environmental Scientist
360 Environmental Pty Ltd
PO Box 14
WEST PERTH WA 6872

RECEIVED
16 NOV 2017

BY:

Dear Ms Choo

AMENDED PERMIT TO CLEAR NATIVE VEGETATION UNDER THE ENVIRONMENTAL PROTECTION ACT 1986

Please find enclosed Parcel Property Pty Ltd's amended Clearing Permit CPS 5981/2 to clear native vegetation granted under s.51E of the *Environmental Protection Act 1986*. This amended permit has been granted following the Minister for Environment's appeal determination for an appeal against the grant of Clearing Permit CPS 5981/1.

Clearing Permit CPS 5981/2 gives Parcel Property Pty Ltd approval to clear, subject to certain terms, conditions or restrictions.

A copy of the permit is now available for the public to view, as required by the regulations.

Please read the permit carefully. If you wish to discuss the permit, contact the Department of Water and Environmental Regulation immediately. There are penalties for failing to comply with the requirements of the permit.

Please also note that in undertaking the clearing authorised under this permit, the Permit Holder is to have regard to avoiding clearing, minimising clearing, and reducing the impacts of clearing on any environmental value.

Compliance with the terms, conditions or restrictions of this permit does not absolve the Permit Holder from responsibility for compliance with the requirements of all Commonwealth and State and Local Government legislation.

Please note, as the permit requires the submission of a report, this should be provided electronically via email to: info-der@dwer.wa.gov.au.

If you have any queries regarding this matter, please contact Senior Clearing Regulation Officer Ms Abbie Crawford on 6364 7126.

Yours sincerely

James Widenbar
MANAGER
CLEARING REGULATION

*Officer delegated under Section 20
of the Environmental Protection Act 1986*

10 November 2017

Attached: Clearing Permit (CPS 5981/2), Plan 5981/2 and Decision Report
Fact Sheet: Complying with your Clearing Permit

168 St Georges Terrace Western Australia 6000
Locked Bag 33 Cloisters Square Perth WA 6850
Telephone: 08 6364 7000 Facsimile: 08 6364 7001
www.dwer.wa.gov.au



CLEARING PERMIT

Granted under section 51E of the Environmental Protection Act 1986

| | |
|-------------------------------|-----------------------------------|
| Purpose Permit number: | CPS 5981/2 |
| Permit Holder: | Parcel Property Pty Ltd |
| Duration of Permit: | 22 January 2015 – 22 January 2022 |

ADVICE NOTE:

The funds referred to in condition 11 of this permit are intended for contributing towards purchasing 150 hectares of black cockatoo foraging habitat within the Swan Coastal Plain to be added into conservation estate.

The Permit Holder is authorised to clear native vegetation subject to the following conditions of this Permit.

PART I – CLEARING AUTHORISED

1. Purpose for which clearing may be done

Clearing for the purpose of pasture and grazing.

2. Land on which clearing is to be done

Lot 5889 on Deposited Plan 208236 (Bullsbrook 6084)

Lot 1808 on Deposited Plan 108469 (Bullsbrook 6084)

Lot 1876 on Deposited Plan 131371 (Bullsbrook 6084)

3. Area of Clearing

The Permit Holder must not clear more than 56.65 hectares of native vegetation within the areas hatched yellow on attached Plan 5981/2.

4. Application

This Permit allows the Permit Holder to authorise persons, including employees, contractors and agents of the Permit Holder, to clear native vegetation for the purposes of this Permit subject to compliance with the conditions of this Permit and approval from the Permit Holder.

PART II – MANAGEMENT CONDITIONS

5. Avoid, minimise etc clearing

In determining the amount of native vegetation to be cleared authorised under this Permit, the Permit Holder must have regard to the following principles, set out in order of preference:

- avoid the clearing of native vegetation;
- minimise the amount of native vegetation to be cleared; and
- reduce the impact of clearing on any environmental value.

6. Dieback and weed control

When undertaking any clearing or other activity authorised under this Permit, the Permit Holder must take the following steps to minimise the risk of the introduction and spread of *weeds* and *dieback*:

- (a) clean earth-moving machinery of soil and vegetation prior to entering and leaving the area to be cleared;
- (b) ensure that no *dieback* or *weed*-affected soil, *mulch*, *fill* or other material is brought into the area to be cleared; and
- (c) restrict the movement of machines and other vehicles to the limits of the areas to be cleared.

7. Type of clearing authorised

Clearing shall be conducted in a slow, progressive manner towards the conservation areas to the north and west of the area approved to be cleared.

8. Vegetation management

- (a) The Permit Holder shall construct boundary fencing of the area hatched yellow on Plan 5981/2 to exclude stock from surrounding vegetation.
- (b) Within one month of installing the fence the Permit Holder shall notify the CEO in writing that the fence has been completed.

9. Land degradation management

The Permit Holder must implement the following management measures:

| Action | Timeframe |
|---|--------------------------------------|
| Machinery and vehicle access will be restricted to one entry point where possible | Ongoing |
| Use of heavy machinery will be limited to between December - May | During clearing |
| Clearing will be undertaken in stages | During clearing |
| Where use of heavy machinery cannot be undertaken in dry conditions and compaction occurs, compacted areas will be ripped to depth of 30-40 cm with lines following natural contours. Lines will be spaced 2 m apart | Within three months of clearing |
| Vegetation will be reinstated through sowing of pasture grass at an approximate rate of 4 kg/ha | Within one month of clearing |
| Annual monitoring and removal of weed species that are identified to have a significant impact on the reinstatement of vegetation. A site visit will be conducted with a qualified weed contractor prior to any control programs to determine weed species, their location, and appropriate control measures. | Annually, over a three year period |
| Stock and other grazing animals (such as kangaroos) will be prevented from entering seeded areas until vegetation is reinstated | Up to three years following clearing |
| Drainage contours will be installed where necessary to slow water movement and redirect flow into natural catchment points | Within six months of clearing |
| Annual monitoring of remediated areas to determine where contingency actions are required (such as additional sowing or reinstatement of drainage contours) | Annually, over a three year period |

10. Revegetation and Rehabilitation Offset

- (a) The Permit Holder must implement and adhere to the Revegetation Plan for Lot 2294 and 1808, North Ellenbrook, May 2017 (Attachment 1);
- (b) Prior to undertaking any clearing authorised under this permit the Permit Holder must give a conservation covenant under section 30B of the *Soil and Land Conservation Act 1945* setting aside the covenant area, being the area cross hatched red on attached Plan 5981/2, for the protection and management of vegetation in perpetuity;
- (c) The Permit Holder shall *revegetate* and *rehabilitate* the 31.1 hectare area cross-hatched red on attached Plan 5981/2;
- (d) *Revegetation* and *rehabilitation*, identified under condition 10(c), must commence within 12 months following the beginning of clearing authorised under this permit;
- (d) The Permit Holder shall establish two 10x10 metre quadrats within each Management Zone, with an additional two being established in Management Zone 1, and monitor vegetation condition, plant species diversity, plant density, plant cover and abundance, weed cover and plant structure. Monitoring must be undertaken for ten years, with annual monitoring occurring in the first five years and twice in the last five years;
- (e) The Permit Holder shall achieve the following completion criteria after the 10 year monitoring period for areas *revegetated* and *rehabilitated* under this Permit; and

| Criteria | Basis | Target |
|---------------------------------|---|--|
| Vegetation condition | 10 x 10m quadrat or equivalent 100m ² | Vegetation is: Well-formed and exhibits signs of healthy growth, 70% free of disease symptoms (yellowing, wilting etc.), and 70% free from signs of insect pests |
| Plant species diversity | 10 x 10m quadrat or equivalent 100m ² | Minimum of 70% of native species returned, based on reference sites. |
| Plant density (excluding weeds) | 10 x 10m quadrat or equivalent 100m ² | 3 species per 2.5m x 2.5m quadrat for any 2 representative quadrats over any treated area of 100m ² /6,000 stems per hectare. |
| Plant cover and abundance | 10 x 10m quadrat or equivalent 100m ² | 70% coverage of native species within any 100m ² area by year 5. |
| Weed cover | 10 x 10m quadrat or equivalent 100m ² | Less than 20% weed cover per quadrat of 2.5m x 2.5m for any 2 representative quadrats over any treated area of 100m ² . |
| Plant structure | 10 x 10m quadrat or equivalent 100m ² | Vegetation structure consists of 20% overstorey, 50% midstorey and 30% understorey within any 100m ² area by year 5. |

- (f) The Permit Holder shall undertake the following remedial actions for areas *revegetated* and *rehabilitated* where monitoring indicates that revegetation is not trending towards meeting the completion criteria.

| Item | Issue/trigger | Action |
|---------------------------|---|---|
| Weeds | Excessive weeds in revegetation area | Employ weed control contractor before weeds set seed. Undertake weed control as required until targeted species effect on native seedling establishment is minimised. |
| Grazing | Excessive grazing of seedlings by rabbits or kangaroos | Check integrity of fencing (e.g. holes). Undertake repairs and maintenance of fencing where required. Undertake rabbit baiting if required. |
| Species diversity | Species diversity completion criteria is not met by year 5 | Undertake infill planting at 30% of the initial planting rate ensuring that species selection for planting are based on the species list for each Management Zone. Planting should be undertaken using the approved method. |
| Plant cover and abundance | Plant cover and abundance completion criteria is not met by year 5 and year 10. | Undertake infill planting at 30% of the initial planting rate ensuring that species selection for planting are based on the species list for each Management Zone. Planting should be undertaken using the approved method. |
| Topsoil | Inadequate quantities of good quality topsoil available. | The thickness of good quality topsoil will be reduced to cover the area to be rehabilitated. |

11. Monetary contributions to a fund maintained for the purpose of establishing or maintaining vegetation (offset)

Prior to undertaking any clearing authorised under this permit and no later than 31 December 2018, the Permit Holder shall provide documentary evidence to the CEO that funding of \$71,370 has been transferred to the Department of Water and Environmental Regulation for the purpose of establishing or maintaining vegetation.

PART III - RECORD KEEPING AND REPORTING

12. Records must be kept

The Permit Holder must maintain the following records for activities done pursuant to this Permit:

- (a) In relation to the clearing of native vegetation authorised under this Permit:
- (i) the location where the clearing occurred;
 - (ii) the date(s) that the area was cleared; and
 - (iii) the size of the area cleared (in hectares).
- (b) In relation to the revegetation of areas pursuant to condition 10 of this Permit:
- (i) the location of any area *revegetated* and *rehabilitated* recorded as a *shapefile*;
 - (ii) a description of the *revegetation* and *rehabilitation* activities undertaken;
 - (iii) the size of the area *revegetated* and *rehabilitated* (in hectares); and
 - (iv) the date that the area was *revegetated* and *rehabilitated*.

13. Reporting

- (a) The Permit Holder must provide to the CEO on or before 30 June of each year, a written report:
- (i) of records required under condition 12 of this Permit; and
 - (ii) concerning activities done by the Permit Holder under this Permit between 1 January to 31 December of the preceding calendar year.
- (b) If no clearing authorised under this Permit was undertaken between 1 January to 31 December of the preceding calendar year, a written report confirming that no clearing under this permit has been carried out, must be provided to the CEO on or before 30 June of each year.
- (c) Prior to 22 October 2021, the Permit Holder must provide to the CEO a written report of records required under condition 12 of this Permit where these records have not already been provided under condition 13(a) of this Permit.

DEFINITIONS

The following meanings are given to terms used in this Permit:

dieback means the effect of *Phytophthora* species on native vegetation;

fill means material used to increase the ground level, or fill a hollow;

mulch means the use of organic matter, wood chips or rocks to slow the movement of water across the soil surface and to reduce evaporation;

rehabilitate/ed/ion means actively managing an area containing native vegetation in order to improve the ecological function of that area;

revegetate/ed/ion means the re-establishment of a cover of *local provenance* native vegetation in an area using methods such as natural *regeneration*, *direct seeding* and/or *planting*, so that the species composition, structure and density is similar to pre-clearing vegetation types in that area;

weed/s means any plant -

- (a) that is a declared pest under section 22 of the *Biosecurity and Agriculture Management Act 2007*; or
- (b) published in a Department of Parks and Wildlife Regional Weed Rankings Summary, regardless of ranking; or
- (c) not indigenous to the area concerned.



James Widenbar
MANAGER
CLEARING REGULATION

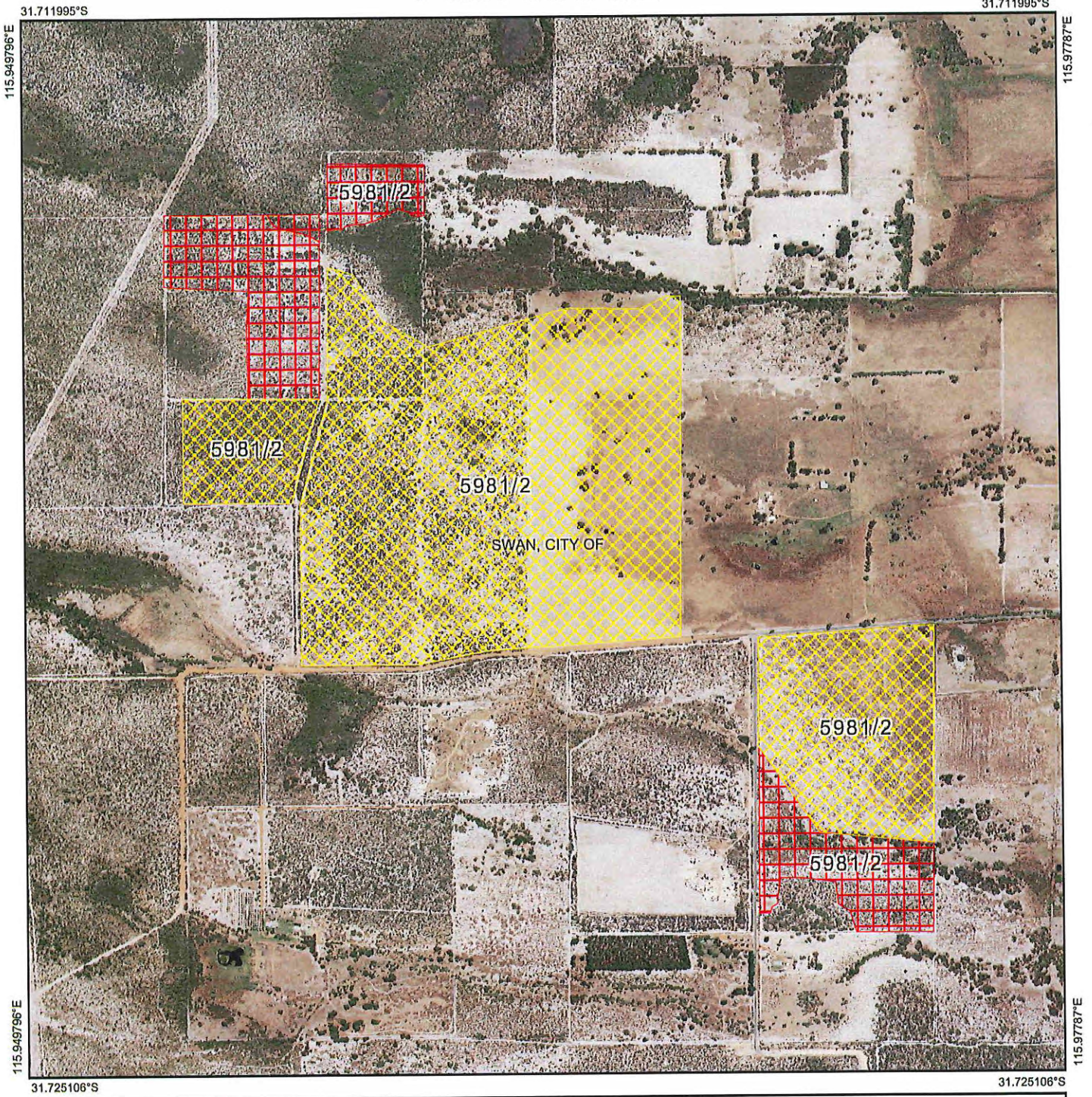
Officer delegated under Section 20
of the *Environmental Protection Act 1986*

10 November 2017

Attachment 1

Lot 2294 and 1808, North Ellenbrook Revegetation Plan. Prepared for ABN Group, May 2017

Plan 5981/2



Legend

-  Imagery
-  Clearing Instruments Activities
-  Local Government Authority
-  Clearing Instruments Conditions



1:14,095
(Approximate when reproduced at A4)
GDA 94 (Lat/Long)
Geocentric Datum of Australia 1994

Swan Date *10/11/17*

Officer with delegated authority under Section 20 of the Environmental Protection Act 1986

Appendix D

360 Environmental (2019) Reconnaissance Flora and Vegetation Survey

The logo for 360 environmental, featuring the number '360' in a large, bold, black sans-serif font.

environmental



Precinct A North Ellenbrook

Reconnaissance
Flora and Vegetation
Survey and Black
Cockatoo Habitat
Assessment

Prepared for:

Parcel Property

July 2019

● people ● planet ● professional

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| 3248AA | Rev1 | 360 Environmental | Parcel Property | S. Hick | 1 Electronic (email) | 09/07/2019 |
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Executive Summary

Parcel Property commissioned 360 Environmental Pty Ltd to undertake a Reconnaissance Flora and Vegetation Survey and a Black Cockatoo Habitat Assessment in May 2019. The Survey Area was approximately 150 ha that expanded over Lots 112, 114 and 1767 of Precinct A North Ellenbrook. The majority of Precinct A North Ellenbrook has been previously surveyed (360 Environmental Pty Ltd, 2012), therefore this report is an addendum to the previous North Ellenbrook – Level 2 Flora and Vegetation Survey.

Flora and Vegetation

The following conclusions can be drawn from the Reconnaissance Flora and Vegetation survey:

- The database searches identified 50 conservation significant flora species as potentially occurring within a 5 km radius of the Survey Area. Of these, 31 species were Priority and 19 are Threatened.
- A total of 45 flora species (including species, subspecies, varieties and forms) from 20 families and 42 genera were recorded in the Survey Area.
- No flora species of conservation significance were identified during the survey.
- The majority of the Survey Area is in Completely Degraded condition.
- Floristic Community Types (FCTs) have been inferred for three of the vegetation types described for the Survey Area. The remaining vegetation consisted of isolated species with no community structure therefore unlikely to represent any FCT. The three vegetation types with their inferred FCT are listed below:
 - BaBmEt: SCP23a – Central *Banksia attenuata* – *Banksia menziesii* woodlands
 - CcAs: SCP4 – *Melaleuca preissiana* damplands
 - CcLI: SCP11 – Wet forests and woodlands
- FCT SCP4 and SCP11 are not listed as TECs or PECs.
- Vegetation type BaBmEt has been inferred as FCT SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands, which is listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016).
- To determine if BaBmEt warrants National protection further analyses against guideline parameters determined that this vegetation type is unlikely to be a TEC due to its degraded condition and fragmented nature.

Black Cockatoo Habitat Assessment

The following conclusions can be drawn from the Black Cockatoo Habitat Assessment:

- A large flock of more than 100 individual Carnaby's Black Cockatoos was directly observed foraging within the Survey Area.
- Direct evidence of Black Cockatoo breeding was not observed. 157 trees were identified as potential breeding trees for Black Cockatoos, of which eleven contained hollows that may be suitable for Black Cockatoo breeding.
- 9.98 ha of Black Cockatoo foraging habitat was recorded in the Survey Area, of which 8.99 ha was suitable for foraging by all three Black Cockatoo species and 0.99 ha was suitable for foraging by Carnaby's Black Cockatoo.

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1 Introduction

1.1 The Project

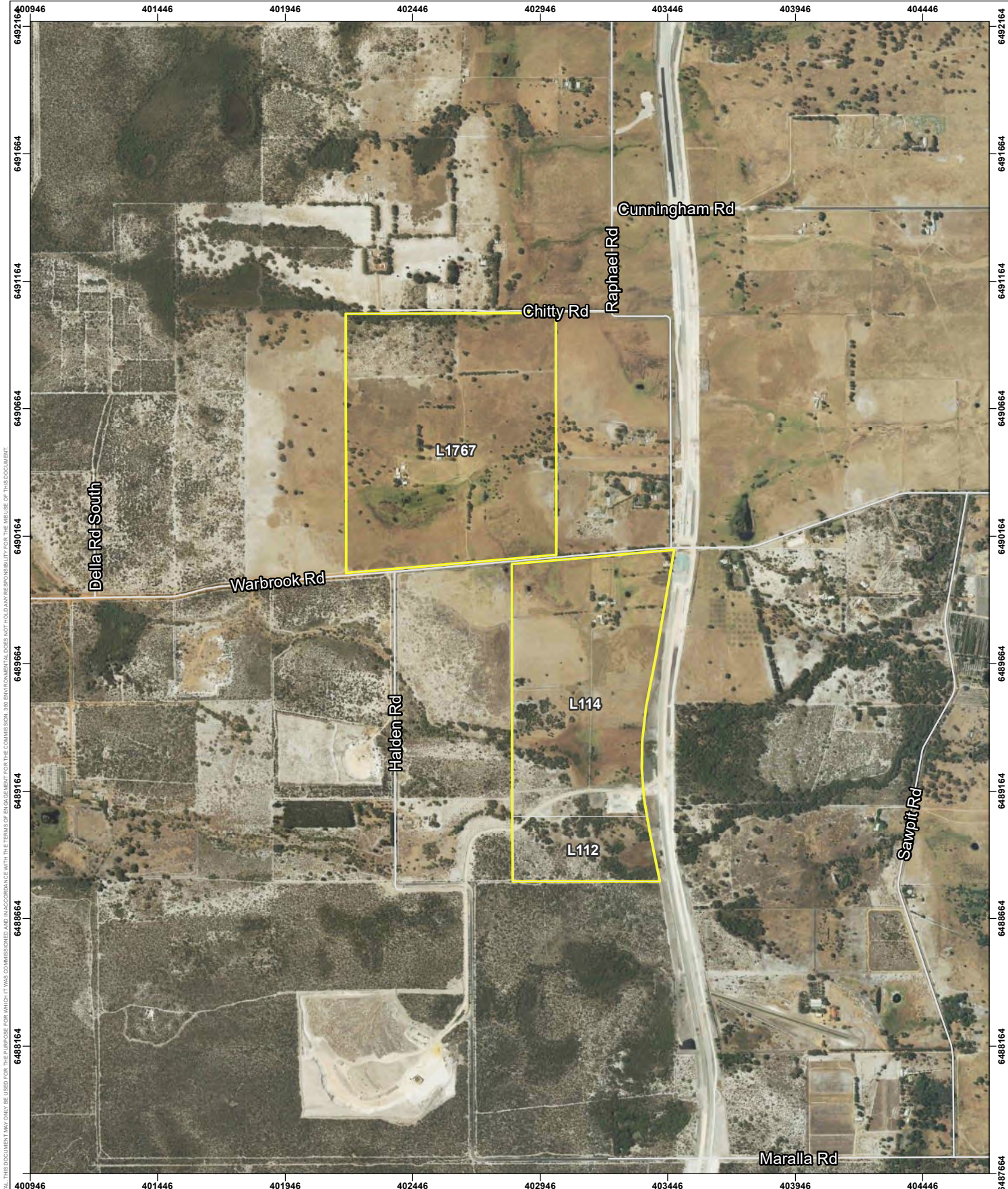
Parcel Property commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake a Reconnaissance Flora and Vegetation Survey and a Black Cockatoo Habitat Assessment within Lots 112, 114 and 1767 (150 ha). The survey covered 150 hectares of Precinct A, North Ellenbrook hereafter known as the 'Survey Area' (Figure 1). The majority of Precinct A North Ellenbrook has been surveyed previously, however some of the lots were not available to be surveyed during the 2010 survey. This report is an addendum to the previous North Ellenbrook – Level 2 Flora and Vegetation Survey (360 Environmental 2012) to provide information on the above mentioned Lots (Appendix A).

1.2 Objective and Scope of Works

The overall objective of this survey was to ensure completeness and close gaps to support finer detailed planning for the project at local structure planning stage.

The assessment of the Survey Area included:

- A comprehensive desktop review designed to gather current information relevant to the Survey Area
- A single season (out of season) reconnaissance flora and vegetation survey to facilitate the future development of the site
- A Black Cockatoo Habitat Assessment, comprising an assessment of breeding, foraging and roosting habitat for all three of the conservation significant Black Cockatoos - Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)

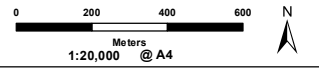


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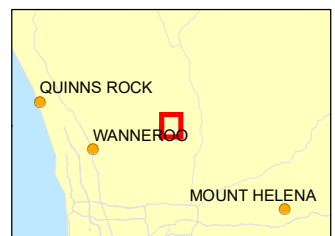
- Survey Area
- Local Roads

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Precinct A North Ellenbrook
Flora, Vegetation and Black Cockatoo Survey

Figure 1 Site Location

2 Methods

2.1 Requirements for Flora and Fauna Surveys

This survey has been carried out as per the EPA requirements for environmental surveying and reporting of flora and fauna surveys in Western Australia where relevant, and as documented in:

Western Australia

- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016a)
- Technical Guidance – Sampling Methods for Terrestrial Vertebrate Fauna (EPA, 2016b)
- Technical Guidance – Terrestrial Fauna Surveys (EPA, 2016c)

Federal

- Matters of National Environmental Significance impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999 (DoE, 2013)
- EPBC Act referral guidelines for three threatened black cockatoo species: Carnaby's Cockatoo (Endangered) *Calyptorhynchus latirostris* Baudin's Cockatoo (Vulnerable) *Calyptorhynchus baudinii* Forest Red-tailed Black Cockatoo (Vulnerable) *Calyptorhynchus banksii naso* (DSEWPaC, 2012)
- Survey guidelines for Australia's threatened birds Guidelines for detecting birds listed as threatened under the Environment Protection and Biodiversity Conservation Act 1999 (DSEWPaC, 2010)

2.2 Desktop Assessment

2.2.1 Database Searches

Database searches were undertaken to identify potential conservation significant flora and fauna taxa and Ecological Communities within or surrounding the Survey Area. Database searches are outlined in Table 1.

Priority Ecological Communities (PEC) and Threatened Ecological Communities (TEC) within the Swan Coastal Plain bioregion were examined to determine if any corresponded with the Survey Area. In addition, an EPBC Protected Matters Search (PMST) was undertaken to identify the potential for Matters of National Environmental Significance (MNES) to occur within or surrounding the Survey Area.

Table 1: Database Searches of the Survey Area

| Database Name | Date Received | Search Target | Search Area |
|---|---------------|---------------------------|---|
| Threatened and Priority Ecological Communities database (DBCA, 2019c) | 4 June 2019 | Listed TECs and PECs | 5 km radial search around Survey Area centre point |
| Threatened and Priority Flora Database (TPFL) (DBCA, 2019e) | 22 May 2019 | Threatened Priority Flora | 5 km radial search around Survey Area centre point |
| Western Australian Herbarium flora (DBCA, 2019f) | 22 May 2019 | | 5 km radial search around Survey Area centre point |
| DBCA Black Cockatoo Record List (DBCA, 2019d) | 31 May 2019 | Black Cockatoo Species | 10 km radial search around Survey Area centre point |
| NatureMap (DBCA, 2019b) | 11 June 2019 | Threatened Priority Flora | 5 km radial search around Survey Area centre point |
| Protected Matters Search Tool (DoEE, 2019) | 11 June 2019 | | 5 km radial search around Survey Area centre point |

2.3 Reconnaissance Flora and Vegetation Survey

2.3.1 Field Survey

A single season (out of season) reconnaissance flora and vegetation survey was undertaken on 21 May 2019 by 360 Environmental Principal Botanist Narelle Whittington (flora licence SL012480 and declared rare flora permit 58-1819) and Ecologist Colleen McDonald (flora licence number SL012436).

The survey included five relevés and vegetation mapping notes. Relevés are unbounded vegetation survey plots with information recorded at each relevé including landscape features, surface soil colour and texture, bare ground, litter cover, disturbance, fire age, aspect and vegetation condition. Each species of dominant plant at each relevé was recorded, including information on height and percentage cover. Opportunistic searches were undertaken for perennial conservation significant flora likely to occur in the Survey Area based on database searches and vegetation communities present.

2.3.1.1 Taxonomy and Nomenclature

Where field identification of plant taxa was not possible, specimens were collected systematically for later identification utilising resources of the Western Australian Herbarium (WAH).

The finalised species list was checked against FloraBase (Department of Biodiversity Conservation and Attractions, 2019a) to determine the species' conservation status. Threatened and Priority Flora were verified against the EPBC Act listing of threatened species to determine Commonwealth listing. Introduced flora species were compared to the Weeds of National Significance (WONS) list (Thorp and Lynch, 2000) and the Department of Agriculture and Food Western Australia (DAFWA) list to determine if any are listed as Declared (Department of Primary Industries and Regional Development, 2018).

2.4 Black Cockatoo Habitat Assessment

2.4.1 Field Survey

The Black Cockatoo Habitat Assessment was undertaken on 21 May 2019 by 360 Environmental Senior Zoologist Andrew Hide and Ecologist Evan Webb and involved traversing the Survey Area by foot.

2.4.1.1 Breeding Habitat

The following criteria was used to determine potential breeding habitat:

- Native trees (e.g. Jarrah, Tuart, Marri, Wandoo and Salmon Gum)
- Diameter at Breast Height (DBH @ 1.3 m) \geq 500 mm (\geq 300 mm for Wandoo and Salmon Gum) regardless of the presence or absence of hollows
- All hollows observed within trees were recorded and categorised as follows:
 - Hollows = Total number of hollows observed within the tree, or 'no' if none are observed
 - Hollows > 12 cm diameter = Number of hollows within the tree that are observed to contain an opening diameter > 12 cm, which has the potential of being used by Black Cockatoo species (DEC, 2010; Saunders, Mawson and Dawson, 2014). This also included recording any evidence of chewing around the hollow opening.

Trees with multiple stems, swellings or forking/branching at breast height were measured dependent on the form to ensure accurate measurement. When this occurred, the diameter was measured just above or below breast height to gain a more accurate measurement of diameter and only the largest forking branch was recorded if this occurred below breast height.

2.4.1.2 Foraging Habitat

The Black Cockatoo assessment involved assessing the habitat for tree and shrub species known to be important dietary items e.g. Marri and *Banksia* sp. as outlined within the referral and revised draft referral guidelines. It also included looking for:

- Evidence of feeding (chewed cones, seed and nut material)
- Opportunistic observations of Black Cockatoos foraging or utilising the Survey Area

2.4.1.3 Roosting Habitat

While undertaking the assessment any evidence of roosting or areas identified as having high roosting potential were identified, recorded and mapped.

3 Results

3.1 Limitations

Survey constraints are often difficult to predict, as is the extent to which they influence survey effort. Survey limitations and constraints of the flora and vegetation and black cockatoo habitat assessment are detailed in Table 2.

Table 2: Limitations and Constraints Associated with the Survey Area

| Variable | Degree of Limitation | Impact on Survey Outcomes |
|-------------------------|-------------------------|---|
| Access | Considerable limitation | <p>The southern section of the Survey Area (Lots 112 and 114) was accessible and traversed on foot.</p> <p>The northern section of the Survey Area (Lot 1767) was inaccessible due to permission issues, therefore the lot boundary was traversed on foot. Flora, Vegetation and Black Cockatoo habitat was assessed from outside the lot boundary using binoculars, and aerial imagery to assist with mapping.</p> |
| Experience | No limitation | <p>The personnel who executed the survey were practitioners suitably qualified in their respective fields:</p> <ul style="list-style-type: none"> • Field Staff: Narelle Whittington (Principal Botanist), Colleen McDonald (Ecologist), Andrew Hide (Senior Zoologist), Evan Webb (Ecologist) • Flora Taxonomy: Narelle Whittington (Principal Botanist) • Data Interpretation and Reporting: Colleen McDonald, Evan Webb and Narelle Whittington • Report Review: Scott Walker (Principal Ecologist/ Group Leader). |
| Timing, weather, season | Moderate limitation | <p>The survey was conducted during May which is outside of the recommended flora survey period for the Southwest botanical province (Spring, September - November) (EPA 2016a). For the three months prior to the survey, the Pearce</p> |

| Variable | Degree of Limitation | Impact on Survey Outcomes |
|---------------------------|-------------------------|--|
| | | <p>RAAF weather station (closest to the Survey Area) recorded 30.4 mm of rainfall which is 33.4 mm below the long-term average rainfall for the same period. No rainfall was recorded during the survey.</p> <p>Flora composition changes with time, particularly seasonally as a result of changes in conditions such as rainfall. Therefore, botanical surveys completed at different times of the year will often produce varying results.</p> |
| Scope: Life forms sampled | Minor limitation | An appropriate number of life forms were sampled in relation to the level of survey undertaken, however as the survey was completed out of season, some species were not flowering which made identification to species level difficult. |
| Sources of information | No limitation | <p>Relevant DBCA and EPBC searches were undertaken for the Survey Area. Relevant DBCA database searches were undertaken for the Survey Area and are listed in Appendix B (Excluding GPS coordinates).</p> <p>The desktop analyses used several sources to produce a list of fauna species previously recorded in the vicinity of the Survey Area. These included DBCA Threatened Flora and Black Cockatoo Database Searches (DBCA, 2019d, 2019c, 2019f, 2019e), NatureMap (DBCA, 2019b), records from the EPBC PMST (DoEE, 2019), field guides and other scientific literature.</p> <p>In addition, previous flora and fauna survey reports for the area were sourced proving enough information to accurately undertake the survey.</p> |
| Completeness | Considerable limitation | The survey was partially completed due to the access issues discussed previously. As the northern lot (Lot 1767) was unable to be accessed approximately 47.6 % of the Survey |

| Variable | Degree of Limitation | Impact on Survey Outcomes |
|----------|----------------------|---|
| | | Area was not sufficiently traversed according to the EPA guidelines All specimens were able to be identified with confidence to species level. |

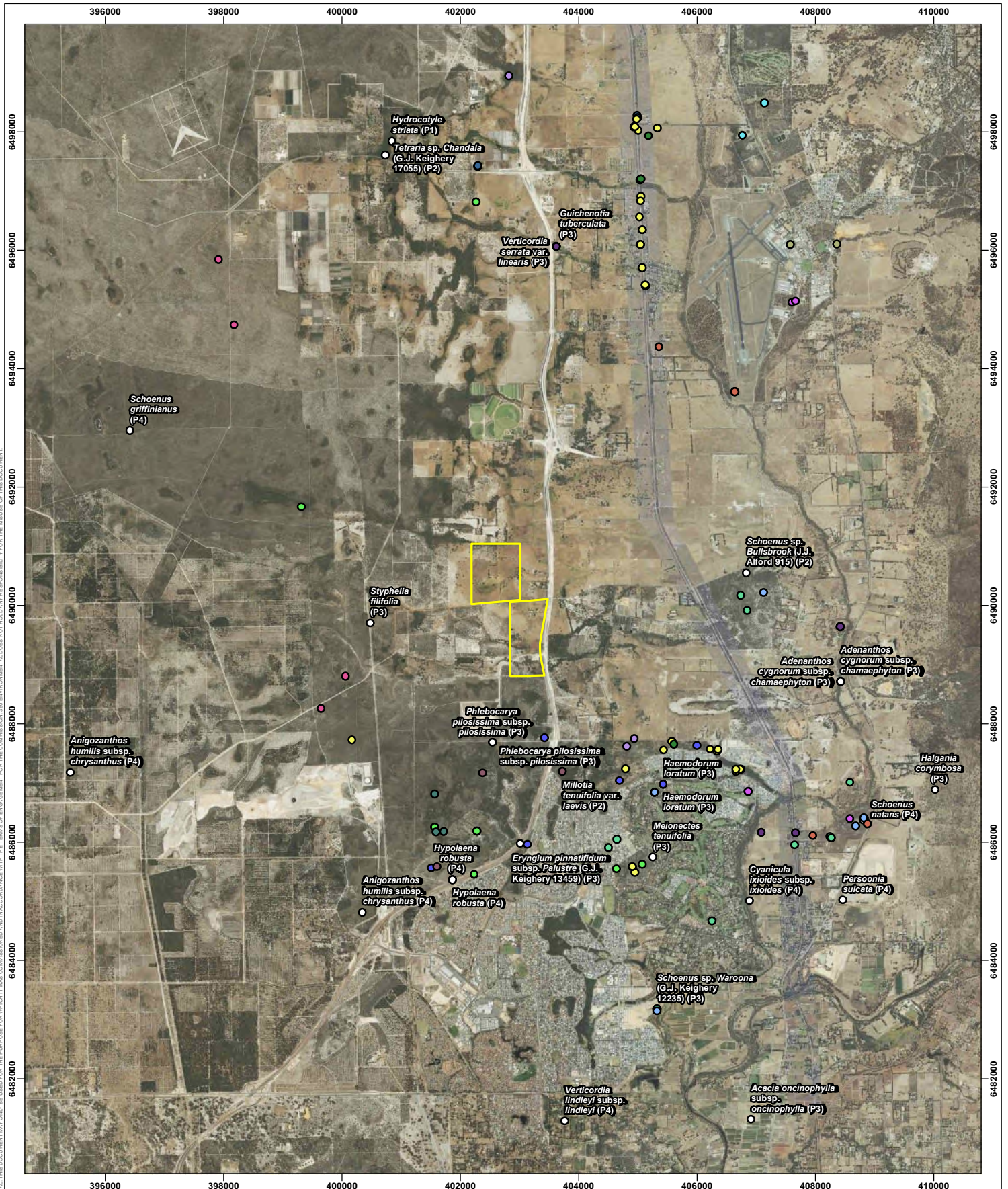
3.2 Reconnaissance Flora and Vegetation Survey

3.2.1 Desktop Assessment

The database searches identified 50 conservation significant flora species as potentially occurring within a 5 km radius of the Survey Area. Of these, 31 species were Priority and 19 Threatened (Department of Biodiversity Conservation and Attractions, 2018, 2019b, 2019e, 2019f; Department of the Environment and Energy, 2019). The 31 Priority flora included one Priority 1 (P1), five Priority 2 (P2), 15 Priority 3 (P3) and 10 Priority 4 (P4) (Figure 2; Appendix C).

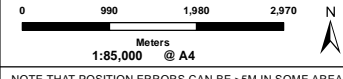
Four Priority Ecological Communities (PEC) and three Threatened Ecological Communities (TEC) listed by the State were within a 5 km radius of the Survey Area (Figure 3). All these communities are also listed as Threatened Ecological Communities (TEC) under the EPBC Act:

- Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region (Priority 3 [DBCA], Endangered [EPBC])
- SCP15: Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain (Vulnerable DBCA)
- Muehea Limestone: Shrublands and woodlands on Muehea Limestone (Endangered [DBCA], Endangered [EPBC])
- SCP23b: Swan Coastal Plain *Banksia attenuata* - *Banksia menziesii* woodlands (Priority 3 [DBCA], Endangered [EPBC])
- SCP21c: Low lying *Banksia attenuata* woodlands or shrublands (Priority 3 [DBCA], Part of Endangered [EPBC])
- SCP22: *Banksia ilicifolia* woodlands (Priority 3 [DBCA], Part of Endangered [EPBC])
- Mound Springs SCP: Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain) (Critically Endangered [DBCA], Endangered [EPBC])



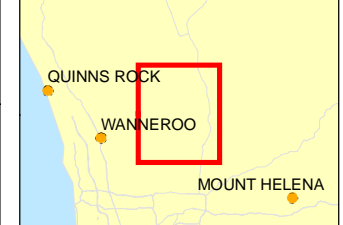
Legend

- Survey Area**
- DBCAs Flora Records**
- *Acacia anomala* (T)
 - *Caladenia huegelii* (T)
 - *Calectasia elegans* (P2)
 - *Cyathochaeta teretifolia* (P3)
 - *Darwinia foetida* (T)
 - *Drosera occidentalis* (P4)
 - *Eleocharis keigheryi* (T)
 - *Grevillea curviloba* subsp. *curviloba* (T)
 - *Grevillea curviloba* subsp. *incurva* (T)
 - *Hydrocotyle lemnoides* (P4)
 - *Poranthera moorokatta* (P2)
 - *Schoenus capillifolius* (P3)
 - *Stylidium longitubum* (P4)
 - *Stylidium paludicola* (P3)
 - *Stylidium trudgenii* (P3)
 - *Trithuria occidentalis* (T)
 - Other



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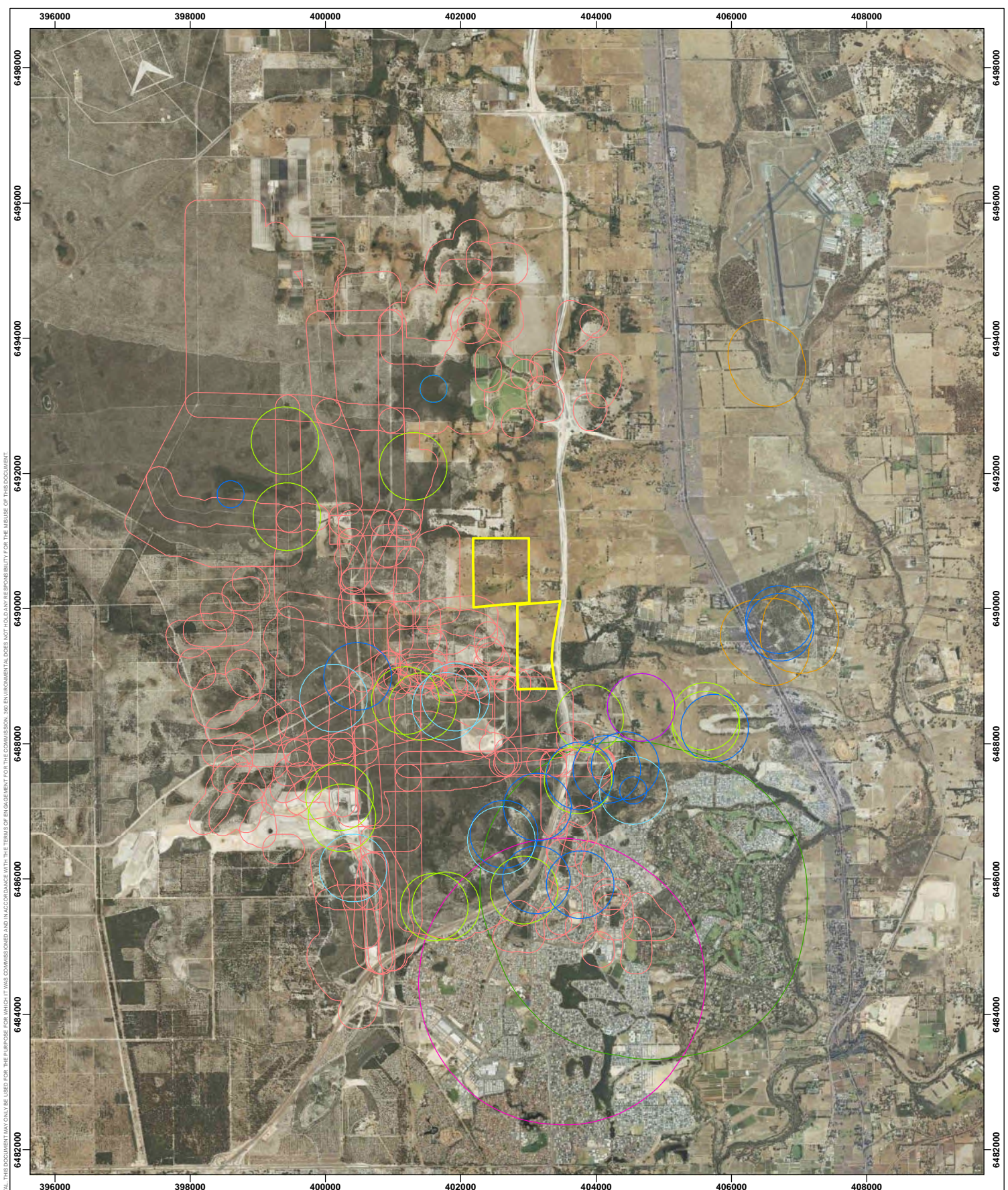
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Flora, Vegetation and Black Cockatoo Survey
Figure 2 Threatened and Priority Flora Desktop Results

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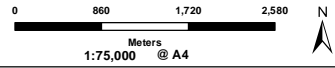
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Legend

- Survey Area
- TEC and PEC Buffers**
- Banksia Dominated Woodlands of the Swan Coastal Plain IBRA Region
- Banksia ilicifolia woodlands
- Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)
- Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain
- Low lying Banksia attenuata woodlands or shrublands
- Shrublands and woodlands on Muchea Limestone
- Shrublands on calcareous silts of the Swan Coastal Plain
- Swan Coastal Plain Banksia attenuata - Banksia menziesii woodlands

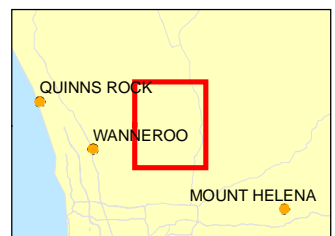
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Flora, Vegetation and Black Cockatoo Survey

Figure 3 TECs and PECs

3.2.2 Field Survey

A total of 45 flora species (including species, subspecies, varieties and forms) from 20 families and 42 genera were recorded in the Survey Area. The most commonly occurring families were Myrtaceae (9 taxa) and Proteaceae (5 taxa). The most frequently recorded genus was Banksia. A complete flora species list is presented in Appendix D and each survey site sheet is provided in Appendix E.

All specimens collected were confidently identified to species level.

3.2.2.1 Conservation Significant Flora

No flora species of conservation significance were identified during the survey.

3.2.2.2 Introduced Flora

A total of 16 introduced species were recorded during the survey, representing approximately 35% of the total taxa. None of these are listed as WONS and one species (**Zantedeschia aethiopica*) is listed as a Declared Pest under the BAM Act (Table 3). Two recorded locations of the **Zantedeschia aethiopica* are identified on Figure 5.

Table 3: Introduced Flora Recorded in the Survey Area

| Taxa | Common Name | Legal Status (BAM Act) |
|-----------------------------------|-------------------|------------------------|
| <i>*Aira caryophyllea</i> | Silvery Hairgrass | Permitted |
| <i>*Briza maxima</i> | Blowfly Grass | Permitted |
| <i>*Carpobrotus edulis</i> | Pigface | Permitted |
| <i>*Chamaecytisus palmensis</i> | Tagasaste | Permitted |
| <i>*Conyza bonariensis</i> | Flaxleaf Fleabane | Permitted |
| <i>*Cyperus tenuiflorus</i> | Scaly Sedge | Permitted |
| <i>*Gladiolus caryophyllaceus</i> | Wild Gladiolus | Permitted |
| <i>*Leptospermum laevigatum</i> | Coastal Teatree | Permitted |
| <i>*Olea europaea</i> | Olive Tree | Permitted |
| <i>*Phytolacca octandra</i> | Red Ink Plant | Permitted |
| <i>*Pinus sp.</i> | Pine | Permitted |
| <i>*Poa annua</i> | Winter Grass | Permitted |
| <i>*Schinus terebinthifolia</i> | Brazilian Pepper | Permitted |
| <i>*Sonchus oleraceus</i> | Common Sowthistle | Permitted |
| <i>*Ursinia anthemoides</i> | Ursinia | Permitted |
| <i>*Zantedeschia aethiopica</i> | Arum Lily | Declared Pest |

3.2.2.3 Vegetation Types

The Survey Area recorded 14 vegetation types (Figure 4)(Table 5). The data collected from each releve is presented in Appendix E. Figure 4 includes previously surveyed areas to provide spatial context.

Table 4: Vegetation Types recorded across the Survey Area

| Vegetation Association Code and Description | Sites | Total Area (ha) | Total Area (%) |
|--|--------------|-----------------|----------------|
| As: Isolated clumps of trees of <i>Melaleuca preissiana</i> over closed shrubland of <i>Astartea scoparia</i> over open forbland of <i>*Carpobrotus edulis</i> , <i>*Cyperus tenuiflorus</i> and <i>Desmocladius flexuosus</i> . | PAR04 | 0.1 | 0.1 |
| Ba: Mixed <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Banksia ilicifolia</i> | - | 1.7 | 1.1 |
| BaBmEt: Low open woodland of <i>Banksia attenuata</i> , <i>Banksia menziesii</i> , <i>Eucalyptus todtiana</i> low over open shrubland of <i>Scholtzia involucrata</i> over low open shrubland of <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Croninia kingiana</i> and <i>Leucopogon conostephioides</i> | PAR01 | 4.6 | 3.1 |
| Cc: Isolated <i>Corymbia calophylla</i> | - | 6.3 | 4.2 |
| CcAs: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over shrubland of <i>Astartea scoparia</i> and <i>Xanthorrhoea gracilis</i> over sparse forbland of <i>Desmocladius flexuosus</i> , <i>*Sonchus oleraceus</i> , <i>*Poa annua</i> and <i>*Carpobrotus edulis</i> . | PAR02, PAR03 | 2.3 | 1.5 |
| CcJs: Open woodland of <i>Corymbia calophylla</i> over sparse shrubland of <i>Jacksonia furcellata</i> | - | 0.3 | 0.2 |
| CcLI: Open forest of <i>Corymbia calophylla</i> and <i>Melaleuca preissiana</i> over open shrubland of <i>Astartea scoparia</i> , <i>Taxandria linearifolia</i> and <i>Xanthorrhoea preissii</i> over open sedgeland of <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> and <i>Dasypogon bromeliifolius</i> . | PAR05 | 1.7 | 1.1 |
| CcMp: Isolated <i>Corymbia calophylla</i> and isolated <i>Melaleuca preissiana</i> | - | 0.5 | 0.3 |
| CcXp: Open woodland of <i>Corymbia calophylla</i> over closed shrubland of <i>Xanthorrhoea preissii</i> | - | 6.2 | 4.1 |
| Et: Isolated <i>Eucalyptus todtiana</i> | - | 0.1 | 0.1 |
| Mp: Isolated <i>Melaleuca preissiana</i> | - | 0.9 | 0.6 |
| MpAs: Open woodland of <i>Melaleuca preissiana</i> over sparse shrubland of <i>Astartea scoparia</i> | - | 0.9 | 0.6 |
| MpHa: Open woodland of <i>Melaleuca preissiana</i> over sparse shrubland of <i>Hypocalymma angustifolium</i> | - | 0.4 | 0.3 |
| NE: Non endemic species | - | 0.2 | 0.1 |
| Completely Degraded | - | 53.0 | 35 |
| Not Visited | - | 72.1 | 47.6 |
| Total | | 151.3 | 100 |

3.2.3 Floristic Community Types

Due to the parameters of the survey (reconnaissance) and sampling using relevés instead of quadrats, Floristic Community Types (FCTs) could not be determined through statistical analysis (multivariate analysis). Potential FCTs have therefore been inferred based on factors that are diagnostic for them, including the presence of indicator species, soil types and landform position.

FCTs have only been inferred for three of the vegetation types described for the Survey Area. The remaining vegetation consisted of isolated species with no community structure and are therefore considered unlikely to represent any FCT. The three vegetation types that were inferred as an FCT are listed below:

- BaBmEt: SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands
- CcAs: SCP4 – *Melaleuca preissiana* damplands
- CcLI: SCP11 – Wet forests and woodlands

3.2.4 Threatened and Priority Ecological Communities

Statistical analysis was not undertaken of the vegetation to determine if there are any TECs or PECs present.

FCT SCP4 and SCP11 are not listed as TECs or PECs.

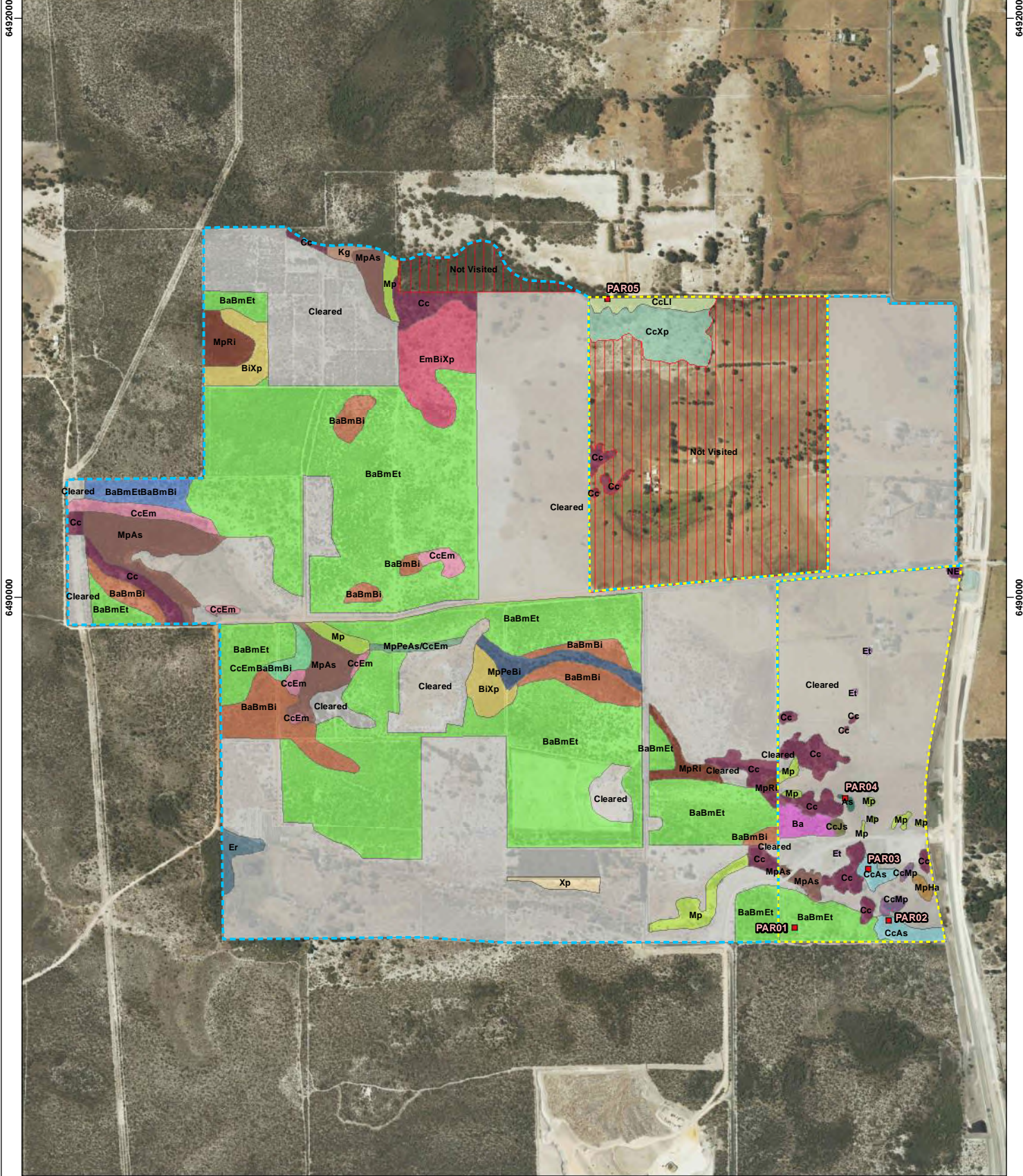
Vegetation type BaBmEt has been inferred to have an affiliation with FCT SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands. This FCT has been listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016). SCP23a is also listed as Priority 3 by DBCA.

3.2.4.1 Vegetation Condition

The majority of the Survey Area is in Completely Degraded condition according to EPA (2016a). The majority of the Survey Area has been cleared for private property, farmland and sand mining. The major disturbances identified were grazing by livestock kept on the property and weed infestations along high traffic areas such as tracks and roads. The vegetation condition mapping is presented in Figure 5 and a summary of vegetation condition extent within the Survey Area is outlined in Table 5. Figure 5 is inclusive of previously surveyed areas to provide spatial context.

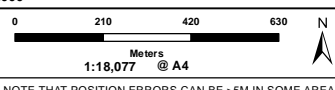
Table 5: Vegetation Condition Extent within the Survey Area

| Condition | Extent in survey area (ha) | Proportion in survey area (%) |
|--------------------|----------------------------|-------------------------------|
| Excellent | 1.73 | 1.1% |
| Very Good | 0.15 | 0.1% |
| Good | 3.19 | 2.1% |
| Degraded | 14.17 | 9.4% |
| Completed Degraded | 132.05 | 87.3% |
| Total | 151.3 | 100% |



Legend

- Survey Area (2010)
 - Survey Area (2019)
 - Releve Locations
- Vegetation Types**
- | | | |
|--|--|---|
| <ul style="list-style-type: none"> BaBmEtBaBmBi BiXp Cc CcAs CcEm CcEmBaBmBi CcJs CcLI | <ul style="list-style-type: none"> CcMp CcXp EmBiXp Er Et Kg Mp MpAs | <ul style="list-style-type: none"> MpHa MpPeAs/CcEm MpPeBi MpRi NE Xp Cleared Not Visited |
|--|--|---|



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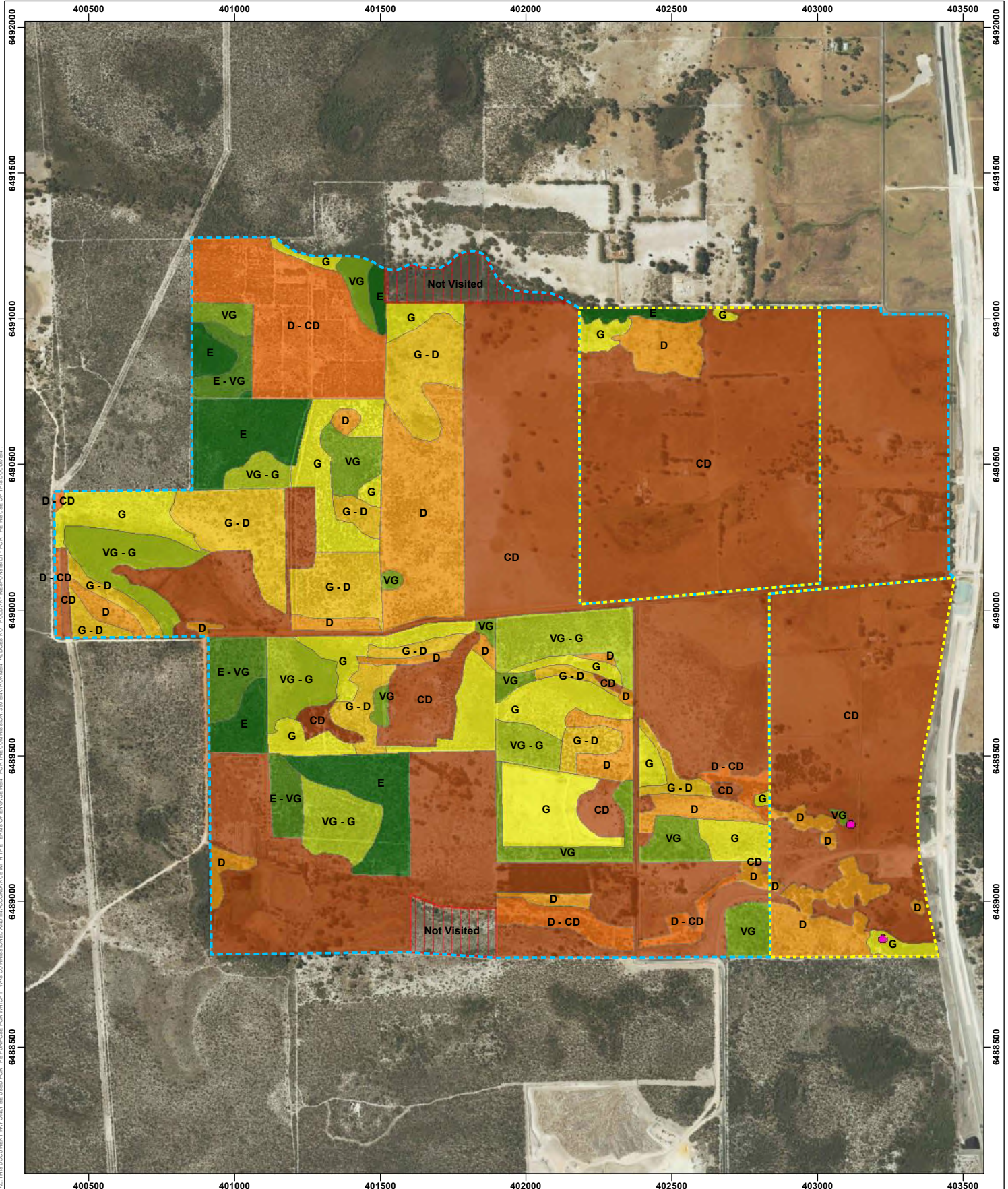
HORIZONTAL DATUM AND PROJECTION
 GDA 1994 MGA Zone 50

| CREATED | CHECKED | APPROVED | REVISION |
|---------|---------|----------|----------|
| SL | CM | NW | 0 |

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 Flora, Vegetation and Black
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Figure 4 Vegetation Types

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Legend

 Survey Area (2010)
 Survey Area (2019)

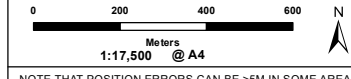
Declared Pest Locations

● *Zantedeschia aethiopica* (Arum Lily)

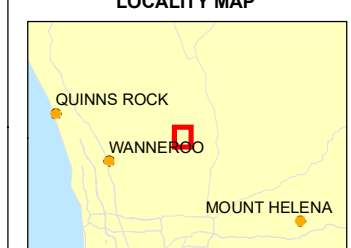
Vegetation Condition

Excellent
 Excellent - Very Good

Very Good
 Very Good - Good
 Good
 Good - Degraded
 Degraded
 Degraded - Completely Degraded
 Completely Degraded
 Not Visited



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|---------|---------|----------|----------|
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Figure 5 Vegetation Condition

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3.3 Black Cockatoo Habitat Assessment

3.3.1 Desktop Assessment

The Survey Area occurs within the known breeding distribution of the Carnaby's Black Cockatoo (DSEWPaC, 2012; DoEE, 2017). The DBCA database search returned 282 records of the species within a 10 km radius of the Survey Area, 39 of which occurred in the past decade (DBCA, 2019d). A confirmed Carnaby's breeding area occurs approximately 17 km north of the Survey Area and a possible Carnaby's breeding area occurs approximately 18 km south of the Survey area (DBCA, 2019d). At least four confirmed Carnaby's roost sites occur between 7 and 12 km from the Survey Area, approximately west, southwest and northeast of the Survey Area, and an unconfirmed Carnaby's roost site occurs approximately 2 km southeast of the Survey Area (DBCA, 2019d).

The Forest Red-tailed Black Cockatoo is likely to occur within the Survey Area based on modelled distribution (DSEWPaC, 2012; DoEE, 2017). The DBCA database search returned three records of the species within a 10 km radius of the Survey Area, all of which occurred in the past decade (DBCA, 2019d).

The Baudin's Black Cockatoo may occur within the Survey Area, which is situated on the northwest extremity of the modelled distribution (DSEWPaC, 2012; DoEE, 2017). The DBCA database search did not return any records of the species (DBCA, 2019d).

The results of the desktop assessment are displayed in Figure 6.

3.3.2 Field Survey

More than 100 individual Carnaby's Black Cockatoos were observed within the southern section of the Survey Area. They were observed foraging on *Pinus* sp., perching in Marri trees and flying overhead (Plate 1-Plate 3). Carnaby's Black Cockatoos were also observed in a pine plantation 600 m west of the Survey Area. Locations of sighted individuals are displayed in Figure 7 and raw data is presented in Appendix F.



Plate 1: Photo taken during the survey of Carnaby's Black Cockatoos perching in a Marri



Plate 2: Photo taken during the survey of Carnaby's Black Cockatoos foraging in *Pinus* sp.



Plate 3: Photo taken during the survey of Carnaby's Black Cockatoos flying over the Survey Area

3.3.2.1 Breeding Habitat

The field survey identified 157 Black Cockatoo potential breeding trees with a DBH of greater than 500 mm within the Survey Area (Figure 8; Appendix G). The trees comprised of 107 Marri trees (*Corymbia calophylla*), 24 stags (dead trees), six Coastal Blackbutt

trees (*Eucalyptus todtiana*), five Jarrah trees (*Eucalyptus marginata*), two Flooded Gum trees (*Eucalyptus rudis*), two Tuart trees (*Eucalyptus gomphocephala*), one Powderbark tree (*Eucalyptus accedens*) and ten non-endemic Eucalyptus trees.

Of the 157 potential breeding trees, 20 contained hollows. This comprised of a total of 55 hollows as there were multiple hollows recorded on some of the trees. Eleven trees contained hollows with an opening diameter greater than 12 cm. Twenty hollows with a diameter greater than 12 cm were recorded within these 11 trees.

No evidence of Black Cockatoo breeding, including observations of birds or chew marks around hollows, was observed within the Survey Area.

3.3.2.2 Foraging Habitat

The Black Cockatoo foraging assessment identified a total of 9.98 ha of Black Cockatoo foraging habitat (Figure 7), of which:

- 8.99 ha consisted predominantly of Marri which is commonly used for foraging by all three Black Cockatoo species
- 0.99 ha consisted predominantly of *Banksia* sp., which is commonly used for foraging by Carnaby's Black Cockatoo

Evidence of Carnaby's Black Cockatoo foraging was recorded at five locations within the Survey Area, three of which were *Banksia* cones and two of which were Pine cones (Plate 4). Evidence of Forest Red-tailed Black Cockatoo foraging was recorded at six locations within the Survey Area, five of which were Marri nuts and one was Coastal Blackbutt nuts (Plate 5). Foraging evidence locations are displayed in Figure 7 and raw data is presented in Appendix F.

3.3.2.3 Roosting Habitat

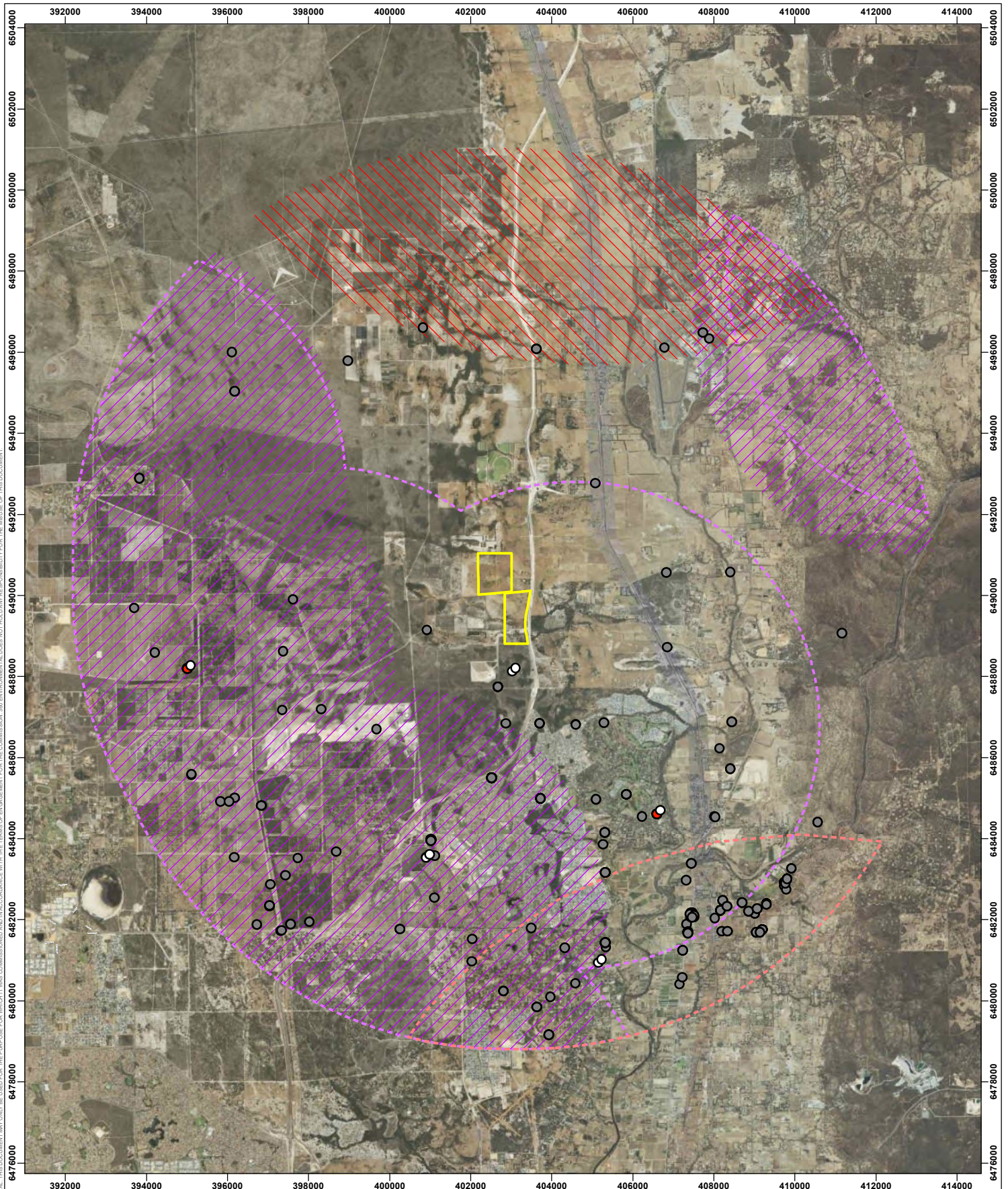
No evidence of Black Cockatoo roosting was observed within the Survey Area.



Plate 4: Carnaby's Black Cockatoo foraging evidence (*Banksia* sp. and *Pinus* sp.)



Plate 5: Forest Red-tailed Black Cockatoo foraging evidence

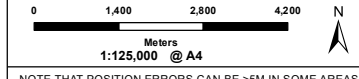


Legend

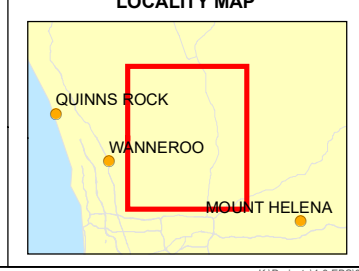
- Survey Area
- Carnaby's cockatoo
- Forest red-tailed black cockatoo
- White-tailed black cockatoo
- Carnaby's Breeding Area - Confirmed
- Carnaby's Breeding Area - Possible
- Carnaby's Roost Area Confirmed
- Carnaby's Roost Area Unconfirmed

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- LOCALITY MAP SOURCED FROM LANDGATE 2017
- OTHER DATA SOURCED LANDGATE 2018
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2019
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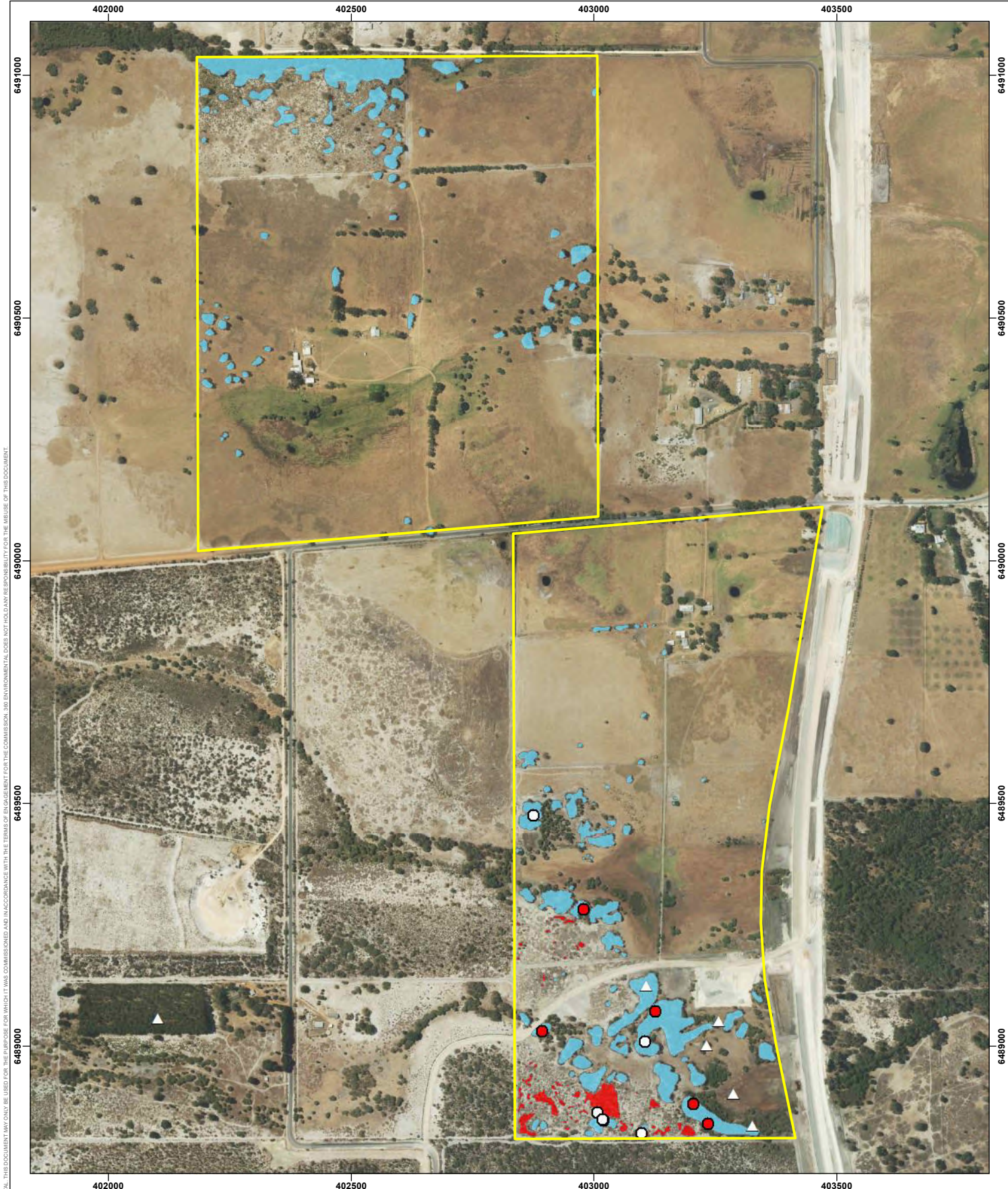
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Flora, Vegetation and Black Cockatoo Survey

Figure 6 Black Cockatoo Desktop Results

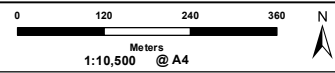
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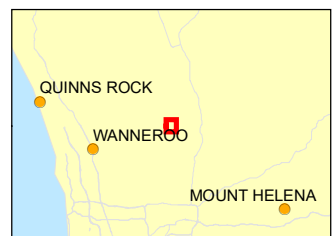
Legend

- Survey Area
- BC Foraging Habitat**
- All Three BC Species
- Carnaby Only
- Black Cockatoo Foraging Evidence**
- Sighting, Carnaby's Black Cockatoo
- Foraging evidence, Carnaby's Black Cockatoo
- Foraging evidence, Forest Red-tailed Black Cockatoo



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Flora, Vegetation and Black Cockatoo Survey
Figure 7 Black Cockatoo Evidence and Foraging Habitat

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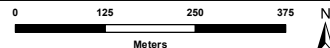
Survey Area

BC Significant Trees

- Coastal blackbutt (*Eucalyptus totidiana*)
- Flooded gum (*Eucalyptus rudis*)
- Introduced Eucalypt
- Jarrah (*Eucalyptus marginata*)
- Marri (*Corymbia calophylla*)
- Powderbark (*Eucalyptus accedens*)
- Tuart (*Eucalyptus gomphocephala*)
- Stag
- Tree contains hollow
- hollow over 12cm

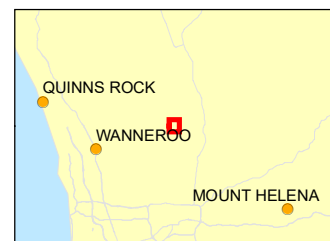
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Flora, Vegetation and Black Cockatoo Survey
Figure 8 Black Cockatoo Breeding Habitat

4 Discussion

4.1 Flora and Vegetation

4.1.1 Flora of Conservation Significance

No Threatened species listed under the EPBC Act or gazetted as T/DRF (Threatened) pursuant to the Biodiversity Conservation Regulations 2018 were recorded during the survey. No Priority species as listed by DBCA was recorded.

The review of the database searches identified 19 T/DRF flora species as potentially occurring in the vicinity of the Survey Area. Of these potential Threatened species, 15 are considered to have a Low Likelihood of occurrence, based on the habitat type present and known distribution, one species has a medium likelihood and two species have a high likelihood of occurrence, these are as follows:

- *Caladenia huegelii* is a tuberous perennial which are short lived and flowers between September and November. Outside of these times they are unlikely to be found and/or difficult to identify. Even though the survey was undertaken outside of the flowering period for the species, given the condition of the Survey area and level of historical disturbance it is unlikely that the species would be on site.
- *Grevillea curviloba* subsp. *incurva* is a narrow curved-leaf grevillea that grows as a vigorous, sprawling shrub to 2.5 m high and wide. The narrow curved-leaf grevillea is thought to be confined to an area between Muchea and Badgingarra in Western Australia. No specimens of the species were found during the survey and as they are perennial, they would have been located if present.
- *Grevillea curviloba* subsp. *curviloba* is a spreading shrub with pinnatifid leaves prostrate that grows to 2.5 m high. The species is thought to be confined to an area between Muchea and Ellenbrook in Western Australia. No specimens of the species were found during the survey and as they are perennial, they would have been located if present.

Of the 31 Priority Flora identified as potentially occurring within the Survey Area during the desktop assessment; 23 are considered to have a Low Likelihood of occurrence, based on the habitat type present and known distribution, three species, *Anigozanthos humilis* subsp. *chrysanthus* (P4), *Hydrocotyle lemnoides* (P4) and *Schoenus natans* (P4) have a medium likelihood and five species, *Calectasia elegans* (P2), *Poranthera moorokatta* (P2), *Cyathochaeta teretifolia* (P3), *Meionectes tenuifolia* (P3) and *Stylidium trudgenii* (P3) have a high likelihood of occurrence. These species, both *Calectasia elegans* (P2) and *Cyathochaeta teretifolia* (P3) would have been able to be identified at the time of the survey if they were present. The remaining three priority species are herbs which are unlikely to be present due to timing of the survey as it was outside their recommended flowering period.

4.1.2 Vegetation of Conservation Significance

The desktop assessment identified four Priority Ecological Communities (PEC) and three Threatened Ecological Communities (TEC) listed by the State being within a 5 km radius of the Survey Area. All these communities are listed as Threatened Ecological Communities (TEC) under the EPBC Act.

Due to the fragmented nature and degraded vegetation condition only three vegetation types were inferred as FCTs. Two were inferred as FCTs SCP4 and SCP11, of which neither are classified as a TEC or PEC.

Vegetation type BaBmEt has inferred to be affiliated with FCT SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands. This FCT has been listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016) and also listed as a Priority 3 community by DBCA.

Key diagnostic characteristics must be met when determining if remnant vegetation requires national protection. The Approved Conservation Advice (Department of the Environment and Energy, 2016) states that the classification of a TEC should meet the following thresholds:

- Vegetation in Excellent condition with a patch size greater than 0.5 ha or
- Vegetation in Very Good condition with a patch size greater than 1.0 ha or
- Vegetation in Good condition with a patch size greater than 2.0 ha

If a vegetation patch is considered Degraded or worse, it is not considered favourable for national protection.

The Banksia woodland TEC generally have a dominant Banksia component, which includes at least one of four key species in *Banksia attenuata*, *B. menziesii*, *B. prionotes* and/or *B. ilicifolia*. The remnant vegetation type BaBmEt was inferred to be associated with SCP23a due to the dominant flora species recorded. Despite its size of approximately 4.5 ha this vegetation type was not considered a FCT due to its Degraded condition plus the understorey species diversity was recorded as very low compared to what would be normally expected for this vegetation type. There was also a pocket of dead Banksias surrounding coordinates (-31.7315798 S, 115.9761632 E) for which a cause could not be determined. This vegetation type is therefore not considered to warrant National protection under the EPBC Act.

Under State legislation, FCT SCP23a is listed as a Priority 3 as it is considered to form part of the Priority 3 Ecological community *Banksia dominated woodlands of the Swan Coastal Plain IBRA region*. All vegetation that has an overstorey dominated by Banksia species are listed as Priority 3 ecological communities by the State. The results from the survey determined that this vegetation type is unlikely to be of conservation significance due to the Degraded condition recorded.

4.2 Black Cockatoo Habitat Assessment

The Survey Area contains 157 native trees that meet the criteria to be considered potential breeding trees, eleven of which contain hollows of a suitable size to be used for breeding by Black Cockatoo species. The potential breeding trees which do not currently contain suitable hollows may develop them in the future. Maintaining the long-term supply of trees of a certain size with suitable nest hollows is crucial in woodland stands that are known to support Black Cockatoo breeding (DSEWPaC, 2012).

Evidence of Black Cockatoo breeding was not recorded during the field survey, however the Survey Area occurs within the known breeding range of the Carnaby's Black Cockatoo (DSEWPaC, 2012; DoEE, 2017) and may be used for breeding in future. The Forest Red-tailed Black Cockatoos may also use the Survey Area for breeding in future. The Survey Area occurs well outside the Baudin's Black Cockatoo breeding range (DSEWPaC, 2012; DoEE, 2017), therefore the species is unlikely to breed within the Survey Area.

Pinus sp. and *Banksia* sp. occurring within the Survey Area provide a valuable foraging resource for Carnaby's Black Cockatoo (DSEWPaC, 2012; DoEE, 2017). A large flock of Carnaby's Black Cockatoos was directly observed foraging on *Pinus* sp. Stands of Marri occurring within the Survey Area are clearly used for foraging by Forest Red-tailed Black Cockatoos. Marri may also be used by Baudin's Black Cockatoos; however, the lack of records or evidence suggests that the species does not currently use the Survey Area.

Although no evidence of roosting was observed within the Survey Area, both Marri and *Pinus* sp. have potential to be used for roosting by Black Cockatoos.

5 Conclusion

Flora and Vegetation

The following conclusions can be drawn from the Reconnaissance Flora and Vegetation survey:

- The database searches identified 50 conservation significant flora species as potentially occurring within a 5 km radius of the Survey Area. Of these, 31 species were Priority and 19 are Threatened.
- A total of 45 flora species (including species, subspecies, varieties and forms) from 20 families and 42 genera were recorded in the Survey Area.
- No flora species of conservation significance were identified during the survey.
- The majority of the Survey Area is in Completely Degraded condition.
- FCTs have only been inferred for three of the vegetation types described for the Survey Area. The remaining vegetation consisted of isolated species with no community structure therefore unlikely to represent any FCT. The three vegetation types with their inferred FCT are listed below:
 - BaBmEt: SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands
 - CcAs: SCP4 – *Melaleuca preissiana* damplands
 - CcLI: SCP11 – Wet forests and woodlands
- FCT SCP4 and SCP11 are not listed as TECs or PECs.
- Vegetation type BaBmEt has been determined to have affiliation with FCT SCP23a - Central *Banksia attenuata* – *Banksia menziesii* woodlands. This FCT has been listed as a sub-community under the EPBC Act listed TEC Banksia woodlands of the Swan Coastal Plain (Department of the Environment and Energy, 2016).
- It is doubtful that the vegetation in the Survey Area identified as BaBmEt meet the diagnostic characteristics which would define it under the TEC Banksia woodlands due to its condition. This vegetation type, therefore, is not considered to warrant National protection.

Black Cockatoo Habitat Assessment

The following conclusions can be drawn from the Black Cockatoo Habitat Assessment:

- A large flock of more than 100 individual Carnaby's Black Cockatoos was directly observed foraging within the Survey Area.
- Direct evidence of Black Cockatoo breeding was not observed. 157 trees were identified as potential breeding trees for Black Cockatoos, of which eleven contained hollows that may be suitable for Black Cockatoo breeding.

- 9.98 ha of Black Cockatoo foraging habitat was recorded in the Survey Area, of which 8.99 ha was suitable for foraging by all three Black Cockatoo species and 0.99 ha was suitable for foraging by Carnaby's Black Cockatoo.

6 Limitations

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APPENDICES

APPENDIX A

North Ellenbrook – Level 2 Flora and Vegetation Survey



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environmental



North Ellenbrook

Level 2 Flora and Vegetation Survey

Prepared for:

Greg Rowe and Associates

July 2012

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Executive Summary

A Level 2 flora and vegetation survey was commissioned for a survey area that lay in the Warbrook Rd locality, mostly on the west side of the proposed Perth-Darwin Highway, south-west of Bullsbrook. The area actually surveyed ('North Ellenbrook') consisted of properties ('Lots') that were accessible within that area (7 properties could not be accessed during the survey).

The North Ellenbrook survey area lies across two Swan Coastal Plain geomorphological elements, the Yanga fluvial unit (northern units analogous to the Guilford unit) in the eastern part and the Bassendean Dune System in the western part. These correspond to two mapped vegetation complexes: the 'Bassendean Complex – North' in the western part and the Yanga Complex in the eastern part. A search of DEC records found that seven Threatened and Priority Ecological Communities (TECs and PECs) and thirty two Threatened and Priority taxa had been previously recorded within ten kilometres of the survey area. BushForever 298 and a small area of BushForever 399 lie within the survey area. Two conservation category wetland areas lie within the area surveyed.

The North Ellenbrook field survey was mostly conducted between the 5 November and 4 December 2011 (2 quadrats recorded after the 4 December).

One hundred and eighty one (181) native plant species were recorded in the North Ellenbrook survey area. This number of native species was probably a low number for size of the survey area. This was attributed to the large part of the survey area that was cleared farmland (pasture paddocks) or which was remnant bushland degraded from other activities (including wildflower farming (Properties 64, 65 and 66(?)), grazing, horse paddocks and sand mining). Areas of dampland had also been cleared or partially cleared in the past (now mostly regrowth) and appear to have been impacted by drawdown of the water table from bores. The timing of the survey in late Spring would also have contributed to a lower species count.

No Threatened flora were recorded in the North Ellenbrook survey area. One Priority 3 species, *Cyathochaeta teretifolia*, was recorded in the North Ellenbrook survey area.

Nine other recorded plant species were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum*, *Verticordia nitens*.

Forty five (45) non-native (introduced) species were recorded from the survey area, including a few records of three (3) listed as Declared weeds: **Asparagus asparagoides* (Bridle creeper), **Moraea flaccida* (Cape Tulip (formerly *Homeria flaccida*)) and **Zantedeschia aethiopica* (Arum lily). Other weed species of note that were recorded in the survey area were **Leptospermum laevigatum* (Victorian tea-tree) and **Cortaderia selloana* (Pampus grass).

Fourteen vegetation units were described and mapped in the remnant bushland in the North Ellenbrook survey area. These were organised into the following three broad groupings:

- Banksia and Pricklybark woodlands on dune crests and slopes;
- Vegetation on the sandy parts of swales and flats; and
- Dampland vegetation;

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland covered the dune slopes and crests. The statistical analysis of the quadrat data suggested that this vegetation on the lower slopes may be floristically different (a PEC SCP23b), but further work would be needed to confirm this. Vegetation on the sandy flats included *Banksia illicifolia* low woodlands, *Corymbia calophylla* (Marri) woodlands and a few small areas of *Eucalyptus marginata* subsp. *marginata* (Jarrah) - *Corymbia calophylla* (Marri) - *Banksia illicifolia* woodlands. The dampland vegetation included *Melaleuca preissiana* scattered low trees to low woodlands over *Astartea scoparea* heaths and *Regelia inops* heaths, *Melaleuca preissiana* low closed forests and a small area of *Eucalyptus rudis* open forest.

Most of the remnant vegetation in the survey area occurred in that part mapped as the Bassendean-North Vegetation Complex. Approximately all of that part of the survey area mapped as Yanga Vegetation Complex was Completely Degraded pasture paddocks. Large areas of the remnant bushland in the survey area had been impacted by past human activities.

Groups of up to 20 dead *Banksia*'s were recorded in the survey area and *Banksia* spp. deaths were recorded across at least 8 properties with remnant vegetation. It is recommended that a dieback survey by accredited 'dieback interpreters' be undertaken to determine the Dieback status in the survey area.

Lomandra hermaphrodita plants were recorded opportunistically at 22 locations in the survey area, mostly in the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodlands. It is probably scattered throughout that vegetation type in the survey area. *Lomandra maritima* was not recorded (and would not be expected) in the survey area.

The ordination analysis found that the North Ellenbrook sites appeared to belong to seven FCTs: 4, 11, 12, 13, 21c, 23a and 23b. However, it is likely that further work would find that the number is more likely to be about 5 FCTs, with fewer FCTs than the 4 suggested for the damplands vegetation. The vegetation in two quadrats could not be assigned an FCT, but this is likely to be an anomaly of the seasonal sampling and the disturbed condition and small size (possible boundary effects) of one of the vegetation areas.

Two site in *Banksia* woodland vegetation on lower slopes were found to be the Priority 3 PEC SCP23b 'Swan Coastal Plain *Banksia attenuata*-*Banksia menziesii* woodlands', as was the Jarrah-Marri open woodland on the lower slopes adjacent to a dampland

(property 11). The analysis also found that the lower slope *Banksia illicifolia* low open woodlands and one area of dry heaths were Priority 3 PEC SCP21c 'Low lying *Banksia attenuata* woodlands or shrublands'.

The North Ellenbrook survey area includes Conservation Category Wetlands and therefore has regional significance for these. The Conservation Category Wetland areas occur on two of the surveyed properties: in the BushForever 298 damplands area on Property 64 and on Property 11 (Excellent condition). The North Ellenbrook survey area was also considered to have moderate to high values for 'contiguous or largely contiguous corridor of bushland/wetland areas' linkages, and moderate values for both representation of ecological communities and diversity.

It was considered that the North Ellenbrook survey area rarity values for flora could not be fully assessed because of the late season of the survey relative to the flowering time of some of the Threatened and Priority flora occurring in the general locality (eg *Caladenia huegelii*).

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1 Introduction

1.1 Background

There is an interest in developing an area around Warbrook Road, south-east of Bullsbrook and mostly on the west side of the proposed Perth-Darwin Highway. This may involve a Metropolitan Region Scheme Amendment of the land to urban. 360 Environmental was commissioned to undertake a Level 2 flora and vegetation survey of the area to meet requirements for this process.

1.2 Purpose of the Study

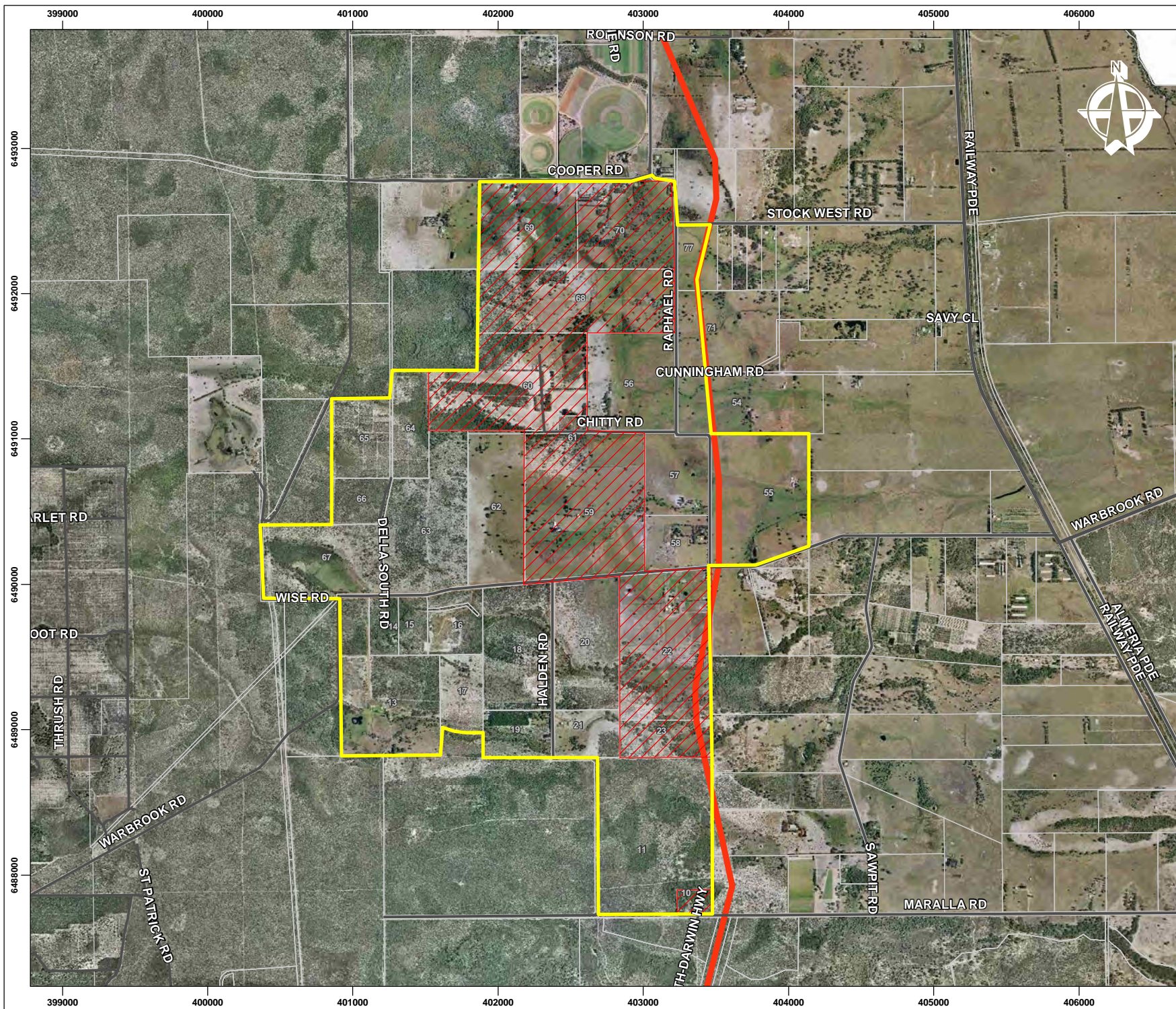
The purpose of the Level 2 flora and vegetation survey was to:

- Compile a list of the flora in the survey area, including any Significant flora;
- Map the vegetation and the vegetation condition in the survey area;
- Assess the flora and vegetation values in the survey area; and
- Report on the survey results.

1.3 The Survey Area

The survey area (here after referred to as the 'North Ellenbrook' survey area) consisted of properties ('Lots') that were accessible within a broader survey area that lay in the Warbrook Rd locality, mostly on the west side of the proposed Perth-Darwin Highway, south-west of Bullsbrook (Figure 1).

The over all survey area was approximately 1,000 ha in size.



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Minor Roads
- Major Roads
- Perth-Darwin Highway

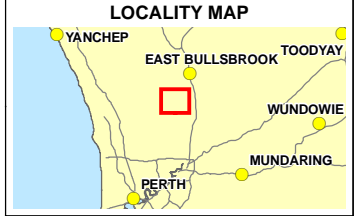
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North Ellenbrook

North Ellenbrook Level 2 Flora & Vegetation Survey Site Location

Figure 1

2 Site Description and Background Information

2.1 Physical Environment

2.1.1 Climate

The Swan Coastal Plain, which includes the survey area, has a Mediterranean type climate with hot, dry summers and mild, wet winters.

2.1.2 Geomorphology of the Survey Area

The Swan Coastal Plain consists of a series of geomorphological elements which are sub-parallel to the present coastline (McArthur and Bettenay, 1960; Churchward and McArthur, 1980). Each of these geomorphic elements has distinctive geology, vegetation, topography and soils.

The North Ellenbrook survey area lies in across two of these elements, the Yanga fluviatile unit in the eastern part and the Bassendean Dune System in the western part (Churchward and McArthur, 1980). The Yanga unit is one of the northern units analogous to the Guilford unit, part of the alluvial terrain along the eastern edge of the Swan Coastal Plain and characterized by duplex soils. The Yanga unit is described as being “poorly drained plain with grey sandy benches and intervening swamps” (Churchward and McArthur, 1980). The Bassendean Dune System is the most eastern one of three main aeolian deposits on the Swan Coastal Plain that can be arranged in age sequence. The Bassenean Dune System consists of sand plains with low dunes and occasional swamps (Churchward and McArthur, 1980).

2.2 Flora and Vegetation Background

2.2.1 Vegetation

2.2.1.1 Regional Vegetation

Beard (1980) defined boundaries for botanical provinces, districts and subdistricts for Western Australia on the basis of his vegetation mapping of the State. In this framework, the survey area lies in the Drummond Botanical Subdistrict (more or less equivalent to the Swan Coastal Plain and part of the Dandaragan Plateau) of the Darling Botanical District of the South Western Botanical Province of Western Australia.

Hedde *et al.* (1980) mapped the vegetation of part of the Drummond Botanical Sub-district at a very broad scale, describing a series of vegetation complexes. These are related groups of vegetation associations found on particular landform-soil units (geomorphic elements, see above). They mapped a total of 38 vegetation complexes on the Swan Coastal Plain. The North Ellenbrook survey area corresponds to two mapped vegetation complexes: the ‘Bassendean Complex – North’ in the western part

and the Yanga Complex in the eastern part (Figure 2; Heddle *et al.*, 1980). The Bassendean Complex – North was described as ranging from 'low open forest and low woodland of *Banksia* spp.-*Eucalyptus todtiana* to a low woodland of *Melaleuca* spp. and sedgelands' on 'moister sites' (Heddle *et al.*, 1980). The Yanga Complex on low-lying flats has a low open forest of swamp Sheoak with patches of *Actinostrobus* and *Melaleuca* spp. while the vegetation on the drier sites reflects the adjacent Bassendean Complex with a mixture of *Banksia- Eucalyptus todtiana* low open forest and an open woodland of Marri-*Banksia* on moister low lying areas (Heddle *et al.*, 1980).

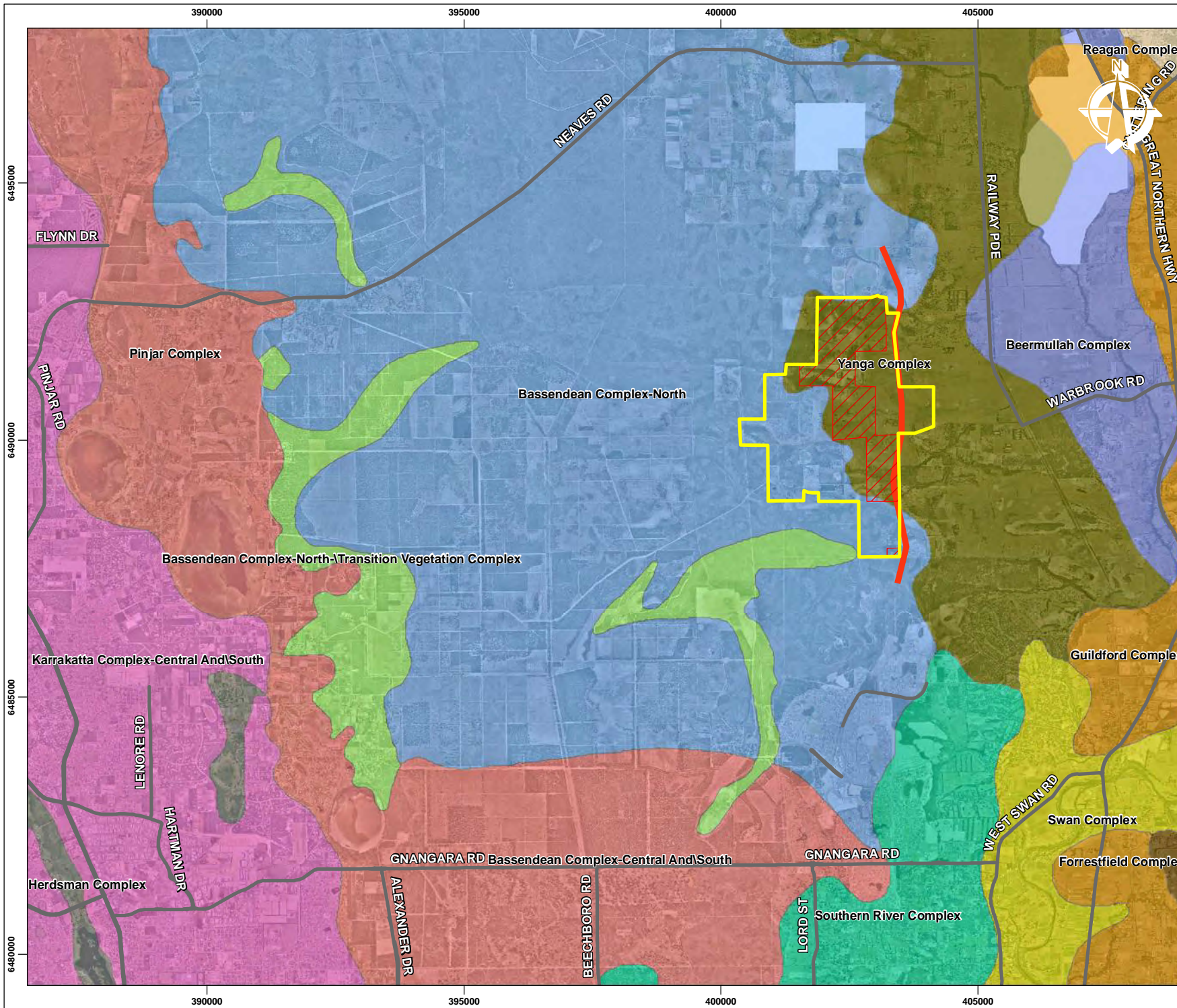
More recently, an alternative analysis of the plant assemblages on the Swan Coastal Plain south of Gingin Brook was carried out using a floristic approach (Gibson *et al.*, 1994) and was extended in 2000. This work identified 66 floristic community types in four floristic 'Super Groups' for the southern Swan Coastal Plain. These units are defined at a similar level of synthesis to that of Heddle *et al.* (1980) (Trudgen, 1999). The four 'super groups' of sites correlate closely with the major geomorphological elements on the Swan Coastal Plain (and also to rainfall), with the exception of one group which contained the seasonal wetlands, which includes sites across all geomorphological groups (Gibson *et al.*, 1994).

2.2.1.2 Rare Vegetation: Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)

The Department of Environment and Conservation (previously the Department of Environmental Protection, Department of Conservation and Land Management) has developed a procedure for identifying 'Threatened Ecological Communities' (Department of Environmental Protection 2000b; English and Blythe 1997). Threatened Ecological Communities (TECs) are assigned to one of four categories: 'Presumed Totally Destroyed'; 'Critically Endangered'; 'Endangered' or 'Vulnerable' (Department of Environmental Protection, 2000b).

On the Swan Coastal Plain, twenty four Threatened Ecological Communities have been confirmed (Department of Environmental Protection 2000b). Sixteen of these Threatened Ecological Communities are Floristic Community Types as identified by Gibson *et al.* (1994).

Priority Ecological Communities (PECs) include 'possible threatened ecological communities that do not meet survey criteria or are not adequately defined' (DEC, unpublished). These are added to the DEC's PEC list under Priorities 1, 2 and 3. Priority 4 status is given to "Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. Conservation Dependent ecological communities are placed in Priority 5 (DEC, unpublished). The list of PECs (DEC, unpublished) includes some that are Floristic Community Types (FCTs) as identified by Gibson *et al.* (1994).



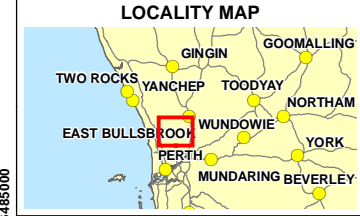
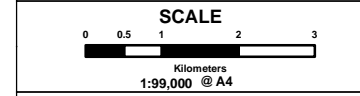
Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Major Roads
- Perth-Darwin Highway

Vegetation Complexes

- Bassendean Complex-Central And\South
- Bassendean Complex-North
- Bassendean Complex-North-Transition Vegetation Complex
- Beermullah Complex
- Darling Scarp Complex
- Forrestfield Complex
- Guildford Complex
- Herdsman Complex
- Karrakatta Complex-Central And\South
- Pinjar Complex
- Reagan Complex
- Southern River Complex
- Swan Complex
- Yanga Complex

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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Complexes
 Figure 2

A search of the Department of Environment and Conservation's TEC and PEC database found that there were a number of TECs and PECs recorded within a radius of approximately 7.5 kilometres of the survey area (Figure 3):

- TEC SCP Mound Springs (Critically Endangered): 'Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)';
- TEC Muehea Limestone (Endangered): 'Shrublands and woodlands on Muehea Limestone';
- TEC SCP15 (Vulnerable): 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain';
- PEC SCP22 (Priority 2): '*Banksia ilicifolia* woodlands, southern Swan Coastal Plain (type 22)';
- PEC SCP21c (Priority 3): 'Low lying *Banksia attenuata* woodlands or shrublands (type 21c)';
- PEC SCP23b (Priority 3): '*Banksia attenuata* – *Banksia menziesii* woodlands (type 23b)'; and
- PEC SCP25 (Priority 3): '*Eucalyptus gomphocephala* – *Agonis flexuosa* woodlands (type 25)'

PEC SCP22, PEC SCP21c and PEC SCP22 were located closest to the survey area.

2.2.1.3 BushForever Sites

The North Ellenbrook survey area is bounded by Bush Forever (BF) site 399 on its western side and BF site 300 on its southern side (Figure 4). Two small areas of BF site 399 lie in the western part of the North Ellenbrook survey area. In addition, BF site 298 covers a wetland vegetation area in the western-central part of the survey area (Figure 4). These BF sites are (DEC 2000a):

- BF site 298: Della Road South Bushland, Bullsbrook. Location of conservation category wetland;
- BF site 300: Maralla Road bushland, Anketell; and
- BF site 399: *Melaleuca* Park and adjacent bushland, Bullsbrook/Lexia.

2.2.1.4 Vegetation Linkages

It is generally accepted that large consolidated areas are the best options for viable conservation of natural ecosystems and populations (DEC, 2000b). In the Perth Metropolitan Region, there are few large areas available for conservation, with most areas being relatively small in size (less than 100 hectares) and isolated from other conservation areas (DEC, 2000b). Consequently, the consideration of proximity to other natural areas and connectivity with them is important in assessing the significance of natural areas.

Linkages have been categorized as follows (DEC, 2000b):

- Regionally significant contiguous corridors of bushland/wetland areas;
- Regionally significant fragmented bushland/wetland areas; and
- Regionally significant potential bushland/wetland areas.

A map of existing and potential bushland/wetland linkages in the Perth Metropolitan Area shows that 'contiguous or largely contiguous corridor of bushland/wetland areas' have been mapped in the bushland to the west and through the bushland to the south of the survey area, including the bushland in Property 11 (DEC, 2000b).

2.2.2 Rare Flora

Thirty two rare flora have been previously recorded in the North Ellenbrook survey area locality (within 10 kilometre radius from North Ellenbrook site coordinate), including seven (7) DRF species and twenty five (25) Priority species (Figure 3; Table 1).

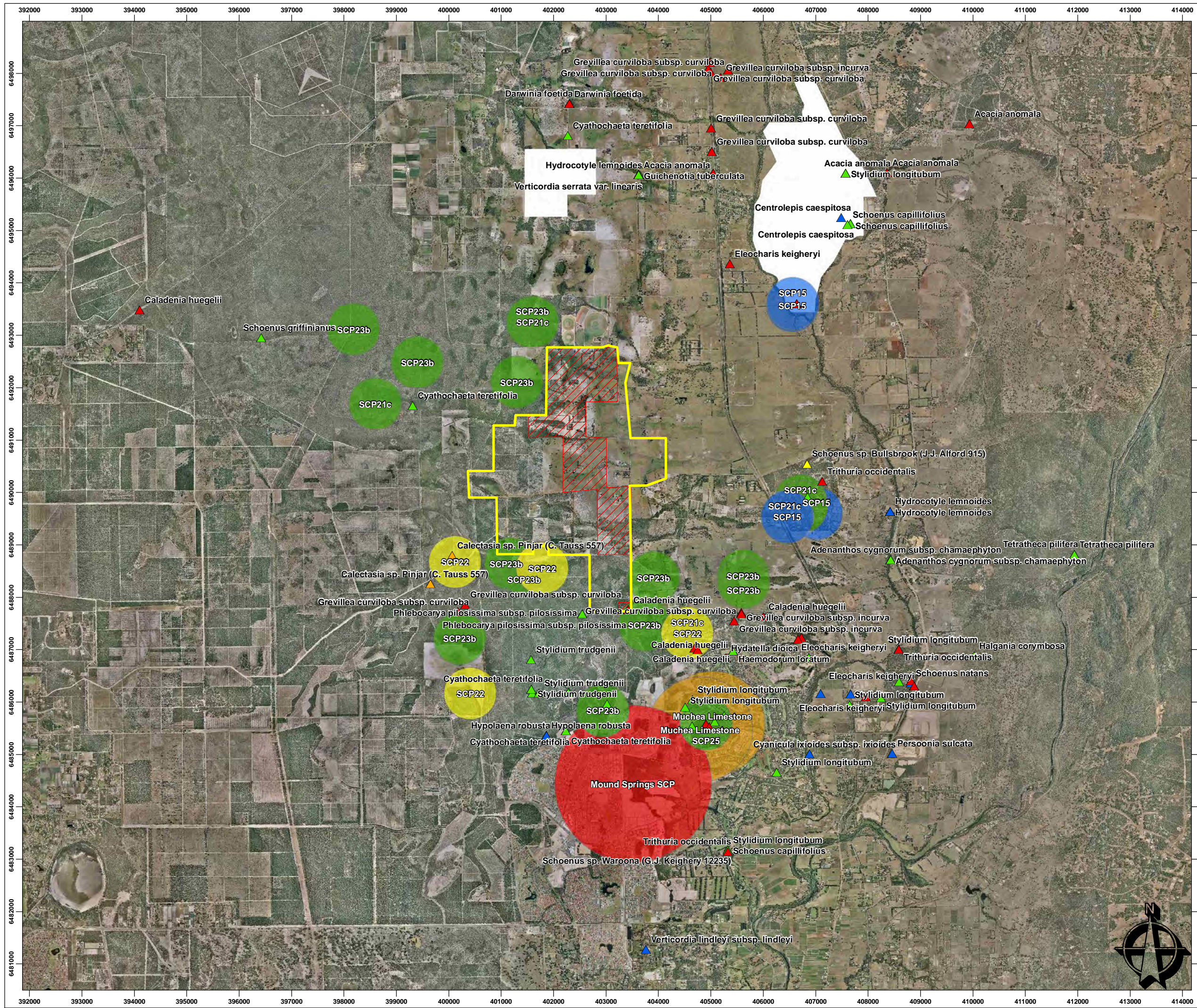
Table 1. Declared Rare and Priority Flora previously recorded within a 10 kilometre radius of the North Ellenbrook survey area (from DEC DEFL and WAHERB database searches, November 2011).

| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|--|---------|---|--|
| <i>Acacia anomala</i> | T | Low | Recorded on lateritic soils. Recorded east of the survey area. |
| <i>Caladenia huegelii</i> | T | High | Banksia woodland on dune slopes is suitable habitat and <i>C. huegelii</i> has been recorded just south and south-east of the survey area. |
| <i>Darwinia foetida</i> | T | Low to Moderate | Recorded at three locations near Muchea. Occurs in seasonal damplands. (Australian Gvt 'Threatened Species and Communities/Recovery Plans' webpage). |
| <i>Eleocharis keigheryi</i> | T | Low | Sedge, growing on clay, sandy loam. Emergent in freshwater: creeks, claypans (DEC FloraBase, February 2012). Soils in survey area are sandy. |
| <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Moderate | Prostrate to erect shrub. Grey sand. Winter-wet heath (DEC FloraBase, February 2012). |
| <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | Moderate | On sand, or clay; occupying winter wet flats (DEC FloraBase, February 2012). |
| <i>Trithuria occidentalis</i> (= <i>Hydatella dioica</i>) | T | Low | Aquatic herbs (DEC FloraBase, February 2012). No areas of free water in bushland in survey area. |
| <i>Calectasia</i> sp. Pinjar (C. Tauss 557) | 1 | Moderate to High | Gentle slopes, above damplands (DEC FloraBase, February 2012). |
| <i>Schoenus</i> sp. Bullsbrook (J.J. Alford 915) | 2 | ?Moderate | Grey peaty sand. Low-lying flats (DEC FloraBase, February 2012). |
| <i>Adenanthos cygnorum</i> subsp. <i>chamaephyton</i> | 3 | Low | Grey sand, lateritic gravel. Found east of survey area. |
| <i>Cyathochaeta teretifolia</i> | 3 | Moderate to High | Prefers grey sand, sandy clay. Swamps, creek edges. Limited suitable habitat in the survey area. |
| <i>Eryngium pinnatifidum</i> subsp. <i>palustre</i> | 3 | Low | Erect perennial, herb. Grows on clay and sandy clay on claypans and seasonally wet flats (DEC FloraBase, January 2012). Clay soil damplands not apparent in bushland in survey area. |

| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|---|---------|---|---|
| <i>Guichenotia tuberculata</i> | 3 | ?Moderate | |
| <i>Haemodorum loratum</i> | 3 | ?Moderate | Bulbaceous, perennial, herb. Grey or yellow sand, gravel (DEC FloraBase, January 2012). |
| <i>Halgania corymbosa</i> | 3 | Low | Gravelly soils, soils over granite (DEC FloraBase, January 2012). Soils not in survey area. |
| <i>Meionectes tenuifolia</i> (= <i>Haloragis tenuifolia</i>) | 3 | Low | Mostly occurs at damp or swampy places of the Darling Scarp (Marchant et al., 1987). |
| <i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i> | 3 | Moderate | Shortly rhizomatous, compactly tufted perennial, grass-like or herb. Grows on white or grey sand, lateritic gravel (DEC FloraBase, January 2012). Recorded just south of the survey area. |
| <i>Schoenus capillifolius</i> | 3 | Low | Found on brown mud claypans (DEC FloraBase, January 2012). No suitable habitat in survey area. |
| <i>Schoenus griffinianus</i> | 3 | Moderate | Small, tufted perennial; grass-like or herb (sedge). White sand (DEC FloraBase, January 2012). |
| <i>Schoenus</i> sp. Waroona (G.J. Keighery 12235) | 3 | Low to Moderate | Tufted annual, grass-like or herb (sedge). Clay or sandy clay; winter-wet flats (DEC FloraBase, January 2012). Soil not in survey area?? |
| <i>Stylidium longitubum</i> | 3 | Low to Moderate | Sandy clay, clay. Seasonal wetlands (DEC FloraBase, January 2012). Limited suitable soils (??) in the survey area. |
| <i>Stylidium trudgenii</i> | 3 | Moderate to High | Caespitose, perennial, herb. Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions (DEC FloraBase, January 2012). Found just south of the survey area. |
| <i>Tetratheca pilifera</i> | 3 | Low | Low, spreading shrub; gravelly soils (DEC FloraBase, January 2012). Eastern side of survey in hills? |
| <i>Verticordia serrata</i> var. <i>linearis</i> | 3 | Low | Shrub, to 1 m high. Recorded on white sand, gravel; open woodland |

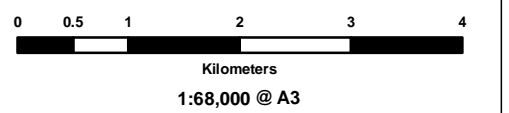
| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|--|---------|---|---|
| | | | (DEC FloraBase, January 2012). Found on scarp and base of scarp (?), east of survey area. |
| <i>Centrolepis caespitosa</i> | 4 | Low to Moderate | Tufted annual, herb (forming a rounded cushion up to 25 mm across). White sand, clay. Salt flats, wet areas (DEC FloraBase, January 2012). |
| <i>Cyanicula ixiooides</i> subsp. <i>ixiooides</i> | 4 | Low | Found mainly between York and Bindoon growing in lateritic soils (Brown et al., 2008). |
| <i>Drosera occidentalis</i> subsp. <i>occidentalis</i> | 4 | Moderate | Occurs on sandy & clayey soils and around swamps & wet depressions (DEC FloraBase, January 2012). |
| <i>Hydrocotyle lemnoides</i> | 4 | Low | Aquatic, floating annual, herb. Swamps (DEC FloraBase, January 2012). |
| <i>Hypolaena robusta</i> | 4 | Moderate | Rhizomatous, perennial, herb. White sand; sandplains Swamps (DEC FloraBase, January 2012). Recorded south of survey area. |
| <i>Persoonia sulcata</i> | 4 | Low | Erect, spreading to decumbent shrub. Lateritic or granitic soils (DEC FloraBase, January 2012). Recorded base of hilis south-east of the survey area. |
| <i>Schoenus natans</i> | 4 | Low | Aquatic annual, grass-like or herb (sedge); winter-wet depressions (DEC FloraBase, January 2012). Damplands unlikely to be wet enough. |
| <i>Verticordia lindleyi</i> subsp. <i>lindleyi</i> | 4 | Low to Moderate | Occurs on sand, sandy clay in winter-wet depressions (DEC FloraBase, January 2012). Recorded 6 km south of survey area. |

*The rare flora status classification definitions are set out in Appendix 1.



- Legend**
- North Ellenbrook Survey Area Boundary
 - Area Not Surveyed (No Access)
- DEC Declared Rare Flora**
- Conservation Code**
- ▲ Priority 1
 - ▲ Priority 2
 - ▲ Priority 3
 - ▲ Priority 4
 - ▲ Threatened
- Threatened & Priority Ecological Communities**
- Critically Endangered
 - Endangered
 - Vulnerable
 - Priority 2
 - Priority 3

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



| | | | |
|--|----------------------|---------------------------|----------------------|
| DRAWING ID EBS137.03 | | DATE 17/02/2012 | |
| HORIZONTAL DATUM AND PROJECTION | | | |
| GDA 1994 MGA Zone 50 | | | |
| CREATED TD | CHECKED AH | APPROVED AH | REVISION 0 |

North Ellenbrook

North Ellenbrook Level 2 Flora & Vegetation Survey
DEC Rare Flora & TEC/PEC Records for North Ellenbrook Locality

Figure 3

2.3 Wetlands

Western Australia's wetlands have been defined as 'areas of seasonally intermittently or permanently waterlogged soils or inundated land whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetland Advisory Committee 1977, quoted in DEP, 2000b).

There are over 9,600 wetlands covering over 25% of the Swan Coastal Plain land area (Balla, 1994). Semeniuk proposed a classification of wetlands for south-western Australia based on landform and water longevity (Hill *et al.*, 1996; Table 2).

Table 2. Wetland classification based on permanency of water and a global geomorphic classification system (reproduced from DEC, 2000b; after Semeniuk in Hill *et al.*, 1996).

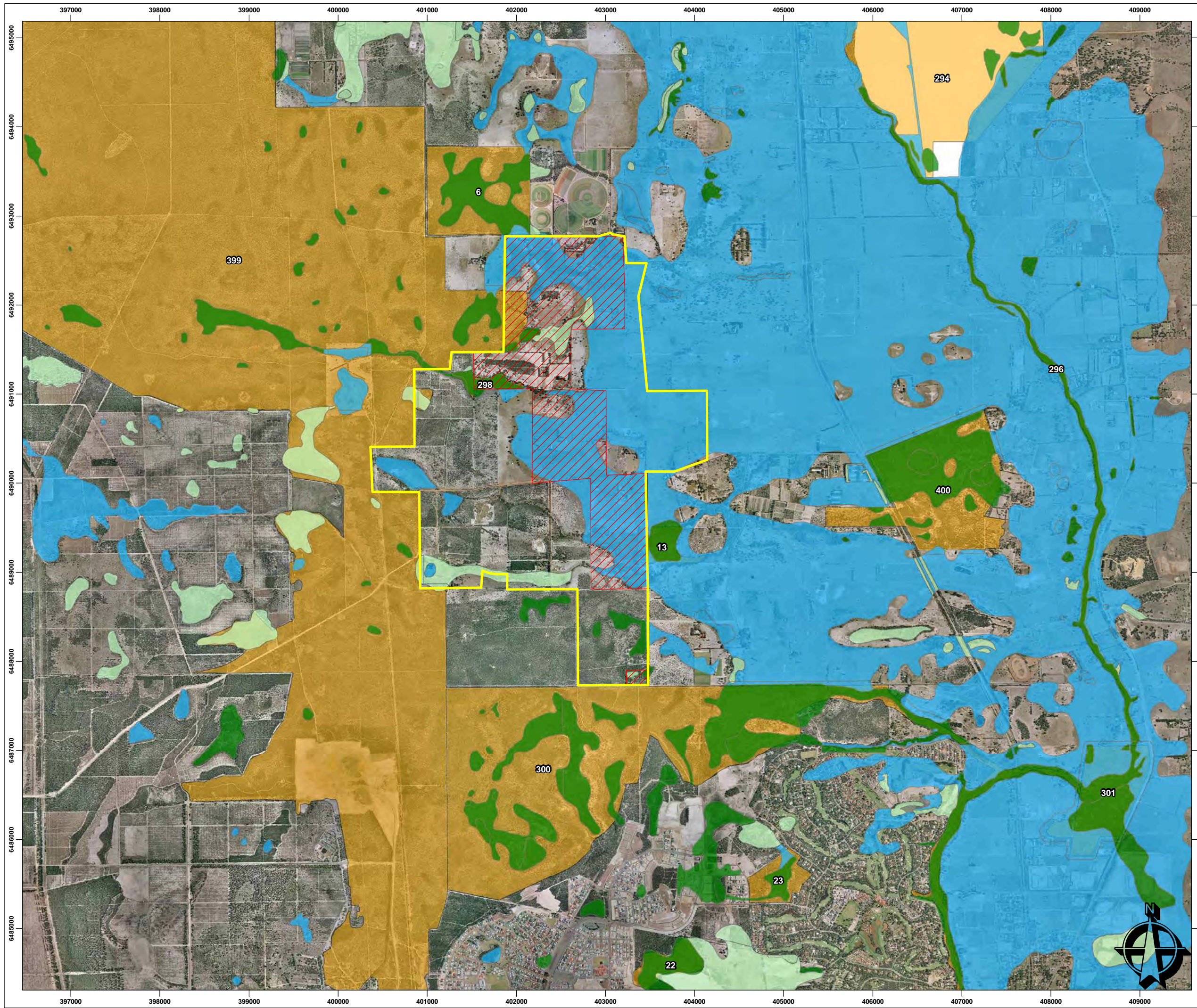
| WATER LONGEVITY | LANDFORM | | | | |
|-------------------------|----------|---------|------------|-----------|------------|
| | BASIN | CHANNEL | FLAT | SLOPE | HIGHLAND |
| Permanent inundation | lake | river | - | - | - |
| Seasonal inundation | sumpland | creek | floodplain | - | - |
| Intermittent inundation | playa# | wadi# | barlkarra# | - | - |
| Seasonal Waterlogging | dampland | trough# | palusplain | paluslope | palusmont# |

Not used on the Swan Coastal Plain in the Perth Metropolitan Region.

Management categories for wetlands in Western Australia have been described by the Water and Rivers Commission (DEP 2000b). They are:

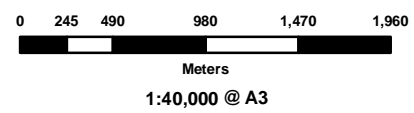
- Conservation wetlands: 95-100% vegetated; management objective of preserving their natural attributes and functions;
- Resource Enhancement: 10-94% vegetated; management for restoration and enhancement of natural attributes and functions; and
- Multiple Use: 0-9% vegetated; management for their use and development in the context of water, town and environmental planning.

Geomorphic wetlands have been mapped for the Swan Coastal Plain. Geomorphic wetlands and their management categories in the North Ellenbrook locality are shown in Figure 4. Large area of Multiple Use wetlands occur on the agricultural land in the eastern part of the survey area. A few smaller areas of Multiple Use wetlands occur in the western part of the survey area, which have suffered disturbances, such as part clearing, in the past. Three resource enhancement wetlands and four small Conservation wetlands also occur in the survey area.



- Legend**
- North Ellenbrook Survey Area Boundary
 - Area Not Surveyed (No Access)
 - Bush Forever Site
- Geomorphic Wetlands**
- Conservation
 - Resource Enhancement
 - Multiple Use
 - Not Assessed
 - Not Applicable

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



LOCALITY MAP



| | | | |
|--|----------------------|---------------------------|----------------------|
| DRAWING ID EBS137.04 | | DATE 17/02/2012 | |
| HORIZONTAL DATUM AND PROJECTION | | | |
| GDA 1994 MGA Zone 50 | | | |
| CREATED TD | CHECKED AH | APPROVED AH | REVISION 0 |

North Ellenbrook

**North Ellenbrook Level 2 Flora & Vegetation Survey
 Geomorphic Wetlands & Bushforever Sites**

Figure 4

3 Methods and Limitations

3.1 Flora Survey

3.1.1 Compilation of a Flora Species List – General Flora Survey Methods

The North Ellenbrook flora survey was mostly conducted between the 5 November and the 4 December 2010, with two quadrats recorded on the 10 December.

The flora in the study area was surveyed while describing the vegetation, while walking between the vegetation recording sites, while mapping the vegetation units and when conducting general traverses through the study area.

At each quadrat, all plant species present were recorded. At releve sites ('unbounded' sample sites) and mapping note sites (abbreviated relevés), dominant and subdominant species and some associated species were recorded. At all formal sites (quadrats, relevés and mapping note sites), where a plant species was not well known, a specimen was collected and allocated a specimen number.

Plant species were recorded elsewhere in the study area if they had not been recorded at a vegetation sample site or if they were of particular interest. Again, where a plant species was not well known, a specimen was collected and allocated a specimen number. GPS coordinates were recorded (using a Garmin 60CX hand held GPS unit) whenever it was considered there was a possibility that the plant species may be of special interest.

The specimens collected were pressed, dried and identified. The identifications were made by comparison to specimens in the reference and research collections of the Western Australian Herbarium, by the use of keys in various papers and books and by relevant experts on various groups of flora that occur on the Swan Coastal Plain.

The Department of Environment and Conservation Declared Rare and Priority Flora List (Smith, 2010; definitions in Appendix 1) was consulted as required to confirm the status of plant species in the survey area.

3.1.2 Limitations of the Flora Survey

The major limitation of the flora survey is that any such survey is a sampling procedure of a variable environment with plant populations of variable growth habit, life span and flowering season. Some species, including annuals, are only available for collection for part of the year. This means that to locate all species that grow in an area is a substantial task, the success of which is related to the time available and the size and diversity of habitat in the survey. Consequently, it is possible that there are species present in the survey area that were not recorded during this survey as they have only low abundance on the land, or were not flowering at the time of the survey.

Given the limitations of the flora survey, it is likely that this survey recorded more than 80% of the vascular flora in the survey area. That is, while the flora survey was relatively thorough, it was possible that some species occurring in the survey area were not recorded.

3.2 Vegetation Survey

3.2.1 Methods of the Vegetation Survey

Locations were selected for survey quadrats and relevés that were representative of observed variations in the vegetation and habitat. Suitable sites for the more detailed quadrats were limited to sites in Good or better condition, where a good suite of species representative of that vegetation type, were present.

Twenty two (22) 10 metre by 10 metre quadrats (CAQ1 to CAQ22) were marked out with a field measuring tape between fence dropper stakes driven into the ground at each corner, each fitted with a yellow plastic safety cap. The 10 metre by 10 metre quadrat dimensions were used firstly because a 100 m² sample area on the Swan Coastal Plain is considered to capture most species in a given plant community and secondly because that was the quadrat size used to collect data for the Gibson *et al.* (1994) Swan Coastal Plain study, with which the North Ellenbrook survey data set needed to be compatible for the purpose of analysis.

Each quadrat was photographed. A description of the quadrat location, the habitat, surface soil texture and colour were all recorded and the time since the site was last burnt was estimated. The vegetation structure was described using a modification of Specht's vegetation description table by Aplin (1979; Appendix 2). To obtain more representative data for the overstorey cover, the tree layer(s) cover was estimated over a larger area around the quadrats. The condition of vegetation in the quadrat was described using the Keighery classification outlined in Bush Forever (Department of Environmental Protection, 2000b; see Appendix 3). All plant species occurring in a quadrat were recorded, along with their height, percentage cover and specimen number if collected.

Twenty two relevés were also recorded to describe vegetation units. The composition of the relevé descriptions was similar to that of the quadrats, but the area described was 'open' (not a measured 10 m x 10 m space) and the data recorded not as detailed. Twelve mapping notes, abbreviated form of relevés descriptions, were also recorded.

3.2.2 Limitations of the Vegetation Survey

The cover estimate of each plant species recorded in the quadrats was based on estimating species projected canopy cover. The assumption was made that for most species, canopy cover and projected foliar cover are reasonably similar, or that the difference is less than the level of accuracy of the estimates.

There is a limit to the accuracy of the assignment of the different strata in the vegetation descriptions to structural units (for example, low open woodland, low

woodland, low open forest, open shrubland, shrubland etc.). Referral of a stratum to a structural category depends on assessment of its cover. Such estimation is imprecise and it is not unusual for different observers to give quite different estimates of the cover of a species, or stratum in a stand. However, descriptive exercises such as that carried out for this report require only a moderate level of accuracy.

3.3 Vegetation Mapping

3.3.1 Methods for Vegetation Mapping

Vegetation units were recorded generally between plant community and plant association level. The vegetation unit boundaries were drawn on a computer generated aerial photograph while traversing the study area, using GPS coordinate readings to locate actual boundary positions. Orthorectified aerial photography at 1:5,000 was used.

The vegetation mapping unit descriptions were based on the quadrat, releve and mapping note descriptions. The vegetation descriptions recorded in the field were later synthesized into vegetation units. Results of the ordination analysis (see below), which analysed floristic similarity of survey quadrats, were not available to consult at the time the vegetation units were finalised.

3.3.2 Wetland Vegetation Mapping

The identification and delineation of a wetland is dependent on an areas hydrology, hydric soils and wetland vegetation (Hill *et al.*, 1996). Obligate wetland species are considered reliable wetland indicators (Hill *et al.*, 1996).

The vegetation units recorded in the North Ellenbrook survey area were classified as wetland vegetation if a number of obligate wetland species were present in the units as dominants. Obligate wetland species were considered to be those that only occur in wetland sites and therefore appeared to require wetland conditions for growth. Table 3 shows a list of plant species that were considered to be obligate wetland species after reference to the literature and from the botanists' experience.

Table 3. List of plant species from the North Ellenbrook survey area considered to be obligate wetland species.

| WETLAND SPECIES | NOTES ^a |
|---|---|
| <i>Astartea scoparia</i> | Found on damp, sandy soils near watercourses, swamps or seasonally wet depressions. |
| <i>Banksia littoralis</i> (Swamp banksia) | Frequently occurs in swampy areas, but is not tolerant of inundation and prefers areas with short winter waterlogging or very shallow water table. |
| <i>Cyathochaeta teretifolia</i> | |
| <i>Eucalyptus rudis</i> subsp. <i>rudis</i> | Flooded gum is common fringing winter-wet depressions, lakes and watercourses on the SCP. It can tolerate prolonged periods of flooding and usually found in waterlogged areas. |
| <i>Hypolaena exsulca</i> | |
| <i>Lepidosperma longitudinale</i> | Sandy and peaty soils in winter-wet depressions and along watercourses. |
| <i>Melaleuca lateritia</i> | Fringes watercourses and in seasonally wet depressions. |
| <i>Melaleuca preissiana</i> | In waterlogged soils fringing rivers and swamps. Less tolerant of prolonged inundation than <i>Melaleuca raphiophylla</i> |
| <i>Melaleuca raphiophylla</i> | Tolerates periodic inundation, but prefers waterlogged sites. Found near both fresh and saline water, but is less adapted for saline water conditions than Saltwatre Paperbark. |
| <i>Schoenus efoliatus</i> | |
| <i>Taxandria linearifolia</i> | Fringes swamps and watercourses. |

a: Notes from Department of Conservation and Environment, 1997.

3.4 Floristic Community Types and Ordination Analysis of Vegetation Units

3.4.1 Introduction

The floristic analysis compared the similarity of species presence/absence data collected at the twenty two (22) North Ellenbrook quadrats with the data for 509 sites recorded across the Swan Coastal Plain in a broad survey by Gibson *et al.* (1994).

3.4.2 Data Preparation

To conduct the analysis on the North Ellenbrook quadrat data, it was first necessary to reconcile the names used in that survey with those used in the Gibson *et al.* (1994) dataset. This was done by determining, for each taxa on the North Ellenbrook survey list, the equivalent taxa name applied in the Gibson *et al.* (1994) study. This step was necessary because of changes in the nomenclature over the last ten years and the potential for survey specific variations in the application of names. The reconciliation involved reducing some infra-specific names to the relevant species name, combining some taxa where confusion is known to have occurred in field observations and identifications and omitting some names (mostly where a taxon had only been identified to genus).

The North Ellenbrook quadrat data was then added to the Gibson *et al.* (1994) Swan Coastal Plain site-species table for analysis.

Weed species were included in the analysis.

3.4.3 Data Compatibility

The North Ellenbrook data was reasonably compatible with the Gibson *et al.* (1994) data. Both datasets were based on data collected from quadrats of the same size (10 metres by 10 metres). However, the Gibson *et al.* (1994) quadrats were visited and recorded twice, including a Spring visit, compared to the single late Spring recording for the North Ellenbrook sites. Weed species were included in both the Gibson *et al.* (1994) and North Ellenbrook datasets.

3.4.4 PATN Analysis

Mr Chris Hancock conducted the North Ellenbrook quadrat analysis using Bray-Curtis ordination as applied by the computer program PC-ORD (MJM Software Design).

The details of the methods of the ordination analysis are set out in the report prepared by Mr Chris Hancock that is included in Appendix 8.

3.4.5 Limitations of the Floristic Analysis

A limitation in conducting an ordination analysis may arise depending on the degree of success in reconciling the two data sets. A further limitation may arise from any significant differences in data collection methods between the two surveys. However,

this is unlikely to have occurred in this case, as the collection methods were similar between the two surveys.

3.5 Identification of TECs and PECs

Once the North Ellenbrook quadrats were each assigned to a Floristic Community Type, a current table of Floristic Community Types on the Swan Coastal Plain and their TEC status (DEC website, 2011) was consulted to determine if any of the North Ellenbrook vegetation sites were TECs.

To determine if any of the North Ellenbrook FCTs were PECs, a list of PECs was consulted (DEC website, 2011).

3.6 Flora and Vegetation and Regional Significance

Regional significance of the North Ellenbrook flora and vegetation was assessed against the criteria for the determination of regional significance of natural areas set out in Guidance Statement No. 10 (EPA, 2006).

4 Flora of the North Ellenbrook Survey Area

4.1 Flora List for the Survey Area

One hundred and eighty (180) species of native flowering plants and one native cycad (the Zamia Palm, *Macrozamia riedlei*) were recorded in the North Ellenbrook survey area. In addition, forty five (45) non-native (introduced) species were recorded from the survey area, including a number of horticultural plants native to other parts of Western Australia. A list of species recorded in the North Ellenbrook survey area is presented in Appendix 4. The list of non-native species in the survey area is comprehensive, but probably not exhaustive.

The flowering plant families that were well represented by native species in the survey area were the Myrtaceae (eucalypt family) with twenty three (23) native species, Fabaceae (pea and *Acacia* family) with twenty (20) native species), the Asparagaceae family with twelve (12) native species and the Proteaceae (Banksia family), the Stylidiaceae family and the Ericaceae family, all with ten (10) native species.

The number of native species recorded in the North Ellenbrook survey area was probably a low number for size of the survey area. This was due mostly to the large part of the survey area that was cleared farmland or was degraded after conversion to other landuse purposes, including wildflower farming (Properties 64, 65 and 66(?)), horse grazing and sand mining. The dampland vegetation had been cleared in parts of a number of properties and probably also impacted by drawdown of the water table from bores. The timing of the survey in late Spring would also have contributed to a lower species count. However, the species counts in the Banksia woodlands suggest a reasonable species richness for that vegetation type (Table 4).

4.2 Significant Flora Recorded in the Survey Area

4.2.1 Declared Rare Flora (DRF) Recorded in the Survey Area

No Declared Rare Flora were recorded in the North Ellenbrook survey area.

4.2.2 Priority Flora Species Recorded from the Survey Area

One Priority 3 species, *Cyathochaeta teretifolia*, was recorded in the North Ellenbrook survey area (Figure 5; Appendix 5).

Table 4. North Ellenbrook survey quadrat species richness

| QUADRAT | SPECIES | SITE VEGETATION/HABITAT |
|---------|---------|---|
| NEQ1 | 50 | Banksia woodland, upper slope |
| NEQ2 | 21 | Regelia heath dampland |
| NEQ3 | 43 | Banksia woodland, upper slope |
| NEQ4 | 33 | <i>Banksia ilicifolia</i> low open woodland at base of dune |
| NEQ5 | 52 | Banksia woodland, mid-slope |
| NEQ6 | 13 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ7 | 60 | Banksia woodland, lower-mid slope |
| NEQ8 | 27 | Banksia woodland, lower slope |
| NEQ9 | 45 | Banksia woodland, crest of dune |
| NEQ10 | 52 | Banksia woodland in swale |
| NEQ11 | 46 | Banksia woodland, lower slope |
| NEQ12 | 55 | Banksia woodland, upper slope |
| NEQ13 | 19 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ14 | 34 | <i>Beaufortia elegans</i> heath |
| NEQ15 | 49 | Banksia woodland, upper slope |
| NEQ16 | 7 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ17 | 53 | Banksia woodland, upper slope |
| NEQ18 | 40 | Jarrah-Banksia woodland on flats |
| NEQ19 | 50 | Banksia woodland in swale |
| NEQ20 | 19 | <i>Melaleuca preissiana</i> low forest |
| NEQ21 | 18 | Marri-Jarrah woodland on flats |
| NEQ22 | 9 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |

4.2.2.1 *Cyathochaeta teretifolia* (P3)

Cyathochaeta teretifolia is a “rhizomatous, clumped, robust perennial, sedge” that grows to 2 metres high and 1 metre wide (Paczkowska and Chapman, 2000). It has been recorded growing on sand and sandy clay in swamps and along creek edges.

Cyathochaeta teretifolia was recorded in a number of damplands in the North Ellenbrook survey area (Figure 5; Appendix 5). The North Ellenbrook survey area is near the northern extent of the range of *Cyathochaeta teretifolia* (FloraBase, DEC website).

4.2.3 Other Species of Regional Significance Recorded in the Survey Area

Nine plant species recorded in the North Ellenbrook survey area were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum*, *Verticordia nitens* (Appendix 5).

4.2.3.1 *Burchardia bairdiae*

Burchardia bairdiae is a tuberous herb growing to between 0.3 and 1.5 metres high (Plate 1; Paczkowska and Chapman, 2000). It is found in winter wet depressions. It is considered regionally significant in the Perth Metropolitan area where it is near the southern limit of its geographic range (Department of Environmental Protection, 2000b).

Burchardia bairdiae was recorded from a dampland site on Property 14 in the western part of the survey area (Appendix 5).



Plate 1. *Burchardia bairdiae*. (Photograph sourced from the FloraBase, DEC website).

4.2.3.2 *Conostylis aculeata* subsp. *cygnorum*

Conostylis aculeata subsp. *cygnorum* is a small herbaceous plant growing to about 25 cm. It is considered regionally significant in the Perth Metropolitan area because it is endemic to the Swan Coastal Plain (Department of Environmental Protection, 2000b). It occurs mostly in the Perth Metropolitan area and the surrounding area.

It was recorded at one site near quadrat NEQ9 on Property 20 in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodland on a dune crest (Appendix 5). It is likely to be found in similar vegetation elsewhere in the survey area.

4.2.3.3 *Dielsia stenostachya*

Dielsia stenostachya is a small rush that grows to 20 to 90 cm in height and occurs on winter-wet damplands and around the edges of wetlands (Paczkowska and Chapman, 2000). It is considered regionally significant in the Perth Metropolitan area because it is endemic or nearly endemic to the Swan Coastal Plain (Department of Environmental Protection, 2000b). It occurs mostly in the Perth Metropolitan area and the surrounding area.

Dielsia stenostachya was found to occur at many of the damplands in the North Ellenbrook survey area, and was recorded at approximately 12 sites (Appendix 5).

4.2.3.4 *Hensmania turbinata*

Hensmania turbinata is a small, tufted perennial herb that grows to a height of about 20 cm. It is mostly restricted to the Swan Coastal Plain and is considered to be regionally significant in the Perth Metropolitan area where it is near the southern limit of its geographic range (Department of Environmental Protection, 2000b).

Hensmania turbinata was recorded from four locations in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodland on three dune slopes in three Properties (Appendix 5).

4.2.3.5 *Stachystemon axillaris*

Stachystemon axillaris is a shrub that grows to about 1.2 m high (Paczkowska and Chapman, 2000). The North Ellenbrook survey area is near the southern end of the range of *Stachystemon axillaris* and that together with its status as poorly reserved (at the time of the BushForever publication) would make it regionally significant in the Perth Metropolitan area (Department of Environmental protection, 2000b).

Stachystemon axillaris was recorded at one location in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodland on a dune slope in Property 20 (Appendix 5). It may occur elsewhere in that habitat-vegetation type in the survey area.

4.2.3.6 *Stylidium crosssocephalum*

Stylidium crosssocephalum is a small perennial herb growing to a height of about about 30 cm (Plate 2). It is considered regionally significant in the Perth Metropolitan area

where it is at the southern limit of its geographic range (Department of Environmental Protection, 2000b; FloraBase, DEC website 2012).

Stylidium crossocephalum was recorded at two locations in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus tottiana* woodland on a dune slope in Property 66 (Appendix 5). It may occur elsewhere in that habitat/vegetation type in the survey area.

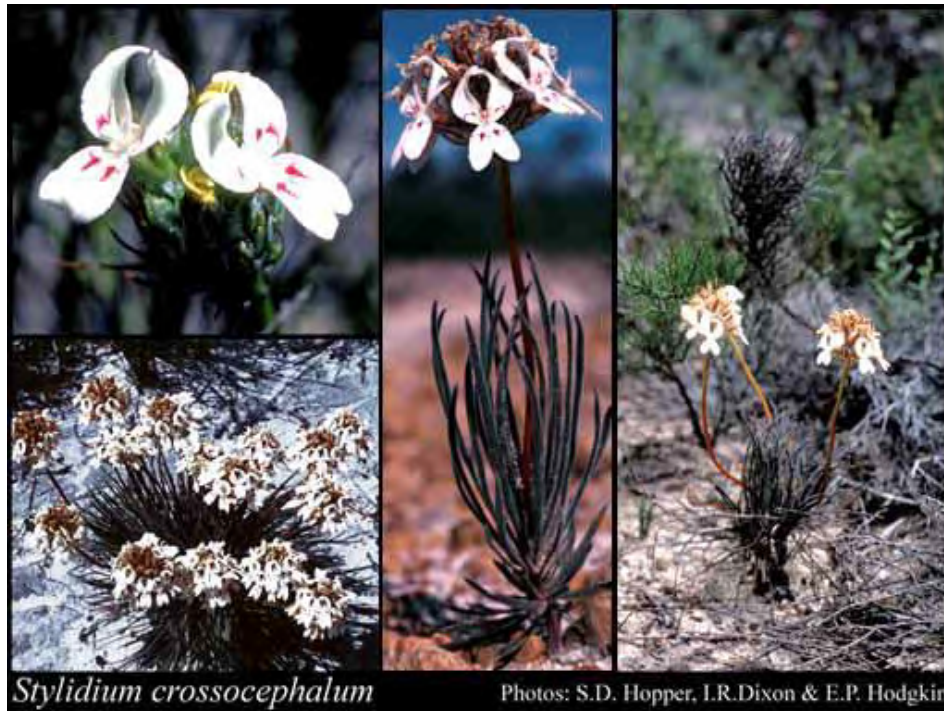


Plate 2. *Stylidium crossocephalum*. (Photograph sourced from the FloraBase, DEC website).

4.2.3.7 *Stylidium rigidulum*

Stylidium rigidulum is a 'stilted' perennial herb with rosette leaves. The North Ellenbrook survey area is at the southern end of its range, and it is therefore considered to be regionally significant in the Perth Metropolitan area.

It was recorded at two locations in the survey area, in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus tottiana* woodlands on dune slopes and flats (Properties 21 and 64) (Appendix 5). It probably occurs elsewhere in this vegetation type in the survey area.

4.2.3.8 *Stylidium utricularioides*

Stylidium utricularioides is a small herb that occurs on seasonal wetlands (Paczkowska and Chapman, 2000). It occurs across a large part of the Swan Coastal Plain, but was listed as regionally significant in the Perth Metropolitan area in 2000 (Department of Environmental Protection, 2000b).

Stylidium utricularioides was recorded at one location in the survey area, near quadrat NEQ6 in Property 64 in the western part of the survey area (Appendix 5).

4.2.3.9 *Verticordia nitens*

Verticordia nitens is a shrub that grows to between about 50 and 200 cm and occurs on sandy soils. It is mostly restricted to the Swan Coastal Plain and was considered to be regionally significant in the Perth Metropolitan area in 2000 due to the occurrence of significant populations (Department of Environmental Protection, 2000b)

Verticordia nitens was widespread and common in the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodlands on dune slopes in the North Ellenbrook survey area. Survey records of *Verticordia nitens* are listed in Appendix 5.

4.3 Other Species of Interest Recorded in the Survey Area

Agonis flexuosa was recorded at one site in the survey area, in the southern part of Property 11 near the boundary with Property 10. It is not likely to occur naturally in this area and has been treated as an introduced taxa to the survey area in this report.

4.4 Weeds Recorded in the Survey Area

Of the forty five (45) non-native (introduced) species recorded from the survey area, seven (7) were species native to Western Australia, but which had been introduced as horticultural plants (in the former wildflower farm area) or were amenity plantings or escapees. Of the other thirty eight (38) weed species in the survey area, three (3) were listed as Declared weeds (Agricultural Protection Board, 2011). These were:

- **Asparagus asparagoides* (Bridle creeper): 1 record in Property 67;
- **Moraea flaccida* (Cape Tulip (formerly *Homeria flaccida*)): 1 record along flow line in Property 21; and
- **Zantedeschia aethiopica* (Arum lily): 1 record in Property 65, in flowline area.

Other weed species of significance included:

- **Leptospermum laevigatum* (Victorian tea-tree): recorded at one location, on the south side of quadrat NEQ21, near the boundary with Property 10; and
- **Cortaderia selloana* (Pampus grass): recorded at two locations.

5 Vegetation of the Survey Area

5.1 Vegetation Description

5.1.1 Introduction to the Vegetation Descriptions

The vegetation units described are considered to be mostly described at the vegetation association level.

The vegetation unit codes that discriminate the mapped vegetation units are derived from the generic and species names of the more abundant genera or species in the different strata present in each unit (see Table 5). For example, the vegetation unit 'CcEm' has its code derived from two of the dominant upper strata species in that unit: 'Cc' (*Corymbia calophylla*) and 'Em' (*Eucalyptus marginata* subsp. *marginata*).

Table 5. Abbreviations for species names that were used in vegetation unit codes.

| CODE | SPECIES NAME | CODE | SPECIES NAME |
|------|---|------|--|
| As | <i>Astartea scoparia</i> | Er | <i>Eucalyptus rudis</i> |
| Ba | <i>Banksia attenuata</i> | Et | <i>Eucalyptus todtiana</i> |
| Be | <i>Beaufortia elegans</i> | Kg | <i>Kunzea glabrescens</i> |
| Bi | <i>Banksia ilicifolia</i> | Mp | <i>Melaleuca preissiana</i> |
| Bm | <i>Banksia menziesii</i> | Pe | <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> |
| Cc | <i>Corymbia calophylla</i> | Ri | <i>Regelia inops</i> |
| Em | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> | Xp | <i>Xanthorrhoea preissii</i> |
| Ep | <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | | |

5.1.2 Vegetation of the North Ellenbrook Survey Area

Fourteen vegetation units were described and mapped in the remnant bushland in the North Ellenbrook survey area (Figure 6). These were organised into the following three broad groupings:

- Banksia and Pricklybark woodlands on dune crests and slopes;
- Vegetation on the sandy parts of swales and flats; and
- Dampland vegetation.

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland covered the dune slopes and crests. The statistical analysis of the quadrat data suggested that this vegetation on the lower slopes may be floristically different, but further work would be needed to confirm this. The cover of *Eucalyptus todtiana* was greater on the

upper slopes and crests and it formed a low woodland in its own right in one small area of dune upper slope on Property 11.

Vegetation on the sandy parts of swales and flats included *Banksia ilicifolia* low woodlands and mixed low woodlands, *Corymbia calophylla* (Marri) woodlands on flats adjacent to damplands and a few small areas of *Eucalyptus marginata* subsp. *marginata* (Jarrah)- *Corymbia calophylla*- *Banksia ilicifolia* woodlands on sandy flats adjacent to damplands.

The dampland vegetation included *Melaleuca preissiana* scattered low trees to low woodlands over *Astartea scoparea* heaths and *Regelia inops* heaths, *Melaleuca preissiana* low closed forests and a small area of *Eucalyptus rudis* open forest dampland.

Most of the remnant vegetation in the survey area occurred in that part mapped as the Bassendean-North Vegetation Complex (Figures 2 and 6). Approximately all of that part of the survey area mapped as Yanga Vegetation Complex was cleared pasture paddocks.

Details of the quadrat, releve and mapping note vegetation sample sites referred to in the following section can be found in Appendices 6 and 7.

(i) **Banksia and Pricklybark woodlands on dune crests and slopes**

BaBmEt

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland over *Scholtzia involucrata* and *Beaufortia elegans* high shrublands over *Eremaea pauciflora* var. *pauciflora*, *Astroloma xerophyllum*, *Croninia kingiana* and *Leucopogon conostephioides* low shrublands.

Habitat and soil: Gentle slopes and crests of low dunes. Pale grey sand.

Notes: This vegetation was recorded at quadrats NEQ1, NEQ3, NEQ5, NEQ7, NEQ9, NEQ12, NEQ15, NEQ17, NEQ8 and NEQ11 and at releves NER1, NER4 and NER13 (Plates 3 to 6). *Eucalyptus todtiana* appeared to be more abundant on the upper slopes. The statistical analysis determined the lower slopes sites NEQ8 and NEQ11 to be floristically different from the other sites, but more work would be required to demonstrate that this was not a function of different recorders or limitations of the analysis. The northern part of Property 64 was on a low rise and had a higher cover of *Banksia ilicifolia* like unit BaBmBi, but the understory was structurally and floristically most like the BaBmEt unit.

Et

Eucalyptus todtiana low open woodland over *Adenanthos cygnorum* var. *cygnorum* scattered tall shrubs to high open shrubland over *Beaufortia elegans*, (*Verticordia nitens*) open heath and *Eremaea pauciflora* var. *pauciflora* low open shrubland

Habitat and soil: Crest of low dune. Pale grey sand.

Notes: This vegetation unit was recorded at releve site NER20 (Plate 7). It occurred in the northern part of Property 11. *Banksia attenuata* and *Banksia menziesii* were missing from the low woodland strata that occurred elsewhere on the hill. A few dead *Banksias* were present, but either few *Banksias* naturally grew in this area or more likely, *Banksias* had in the past died (drought or disease or burnt in previous fires) and been subsequently burnt out. Property 21 immediately to the north also had areas with few *Banksias*. *Eucalyptus todtiana* was naturally more abundant on the upper slopes of these dunes.



Plate 3. Vegetation unit BaBmEt at quadrat NEQ5 (Property 65).



Plate 4. Vegetation unit BaBmEt at quadrat NEQ1 (Property 20).



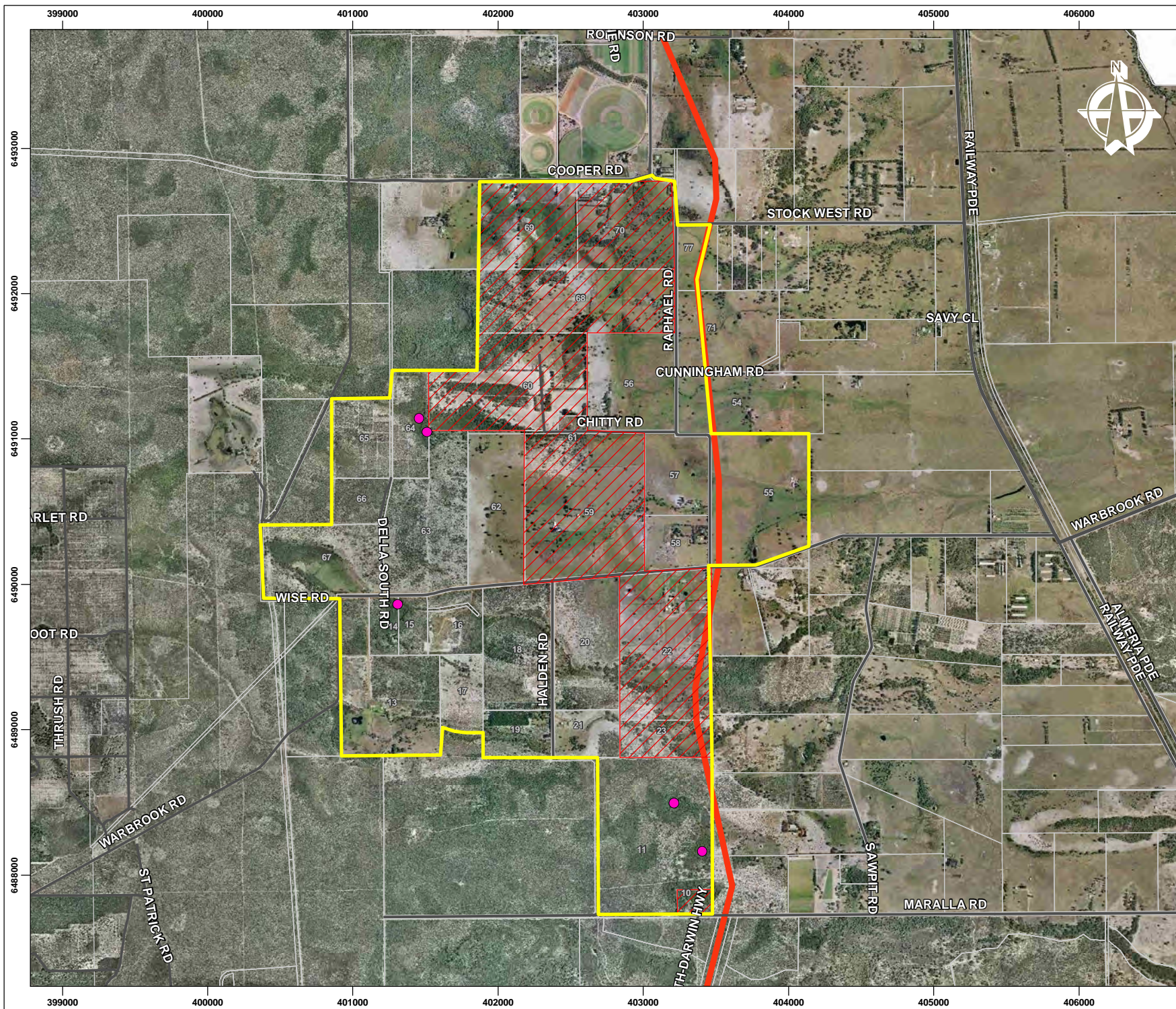
Plate 5. Vegetation unit BaBmEt on lower slopes at quadrat NEQ11, on Property 13.



Plate 6. Vegetation unit BaBmEt on a dune upper slope at quadrat NEQ15, on Property 11.



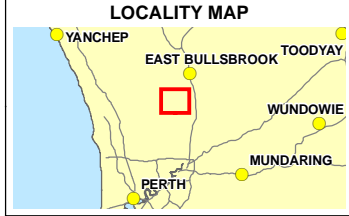
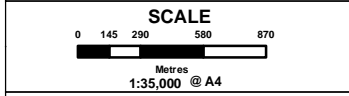
Plate 7. Vegetation unit Et on a dune crest at releve NER20, on Property 11.



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Cyathochaeta teretifolia* (Priority 3)
- Minor Roads
- Major Roads
- Perth-Darwin Highway

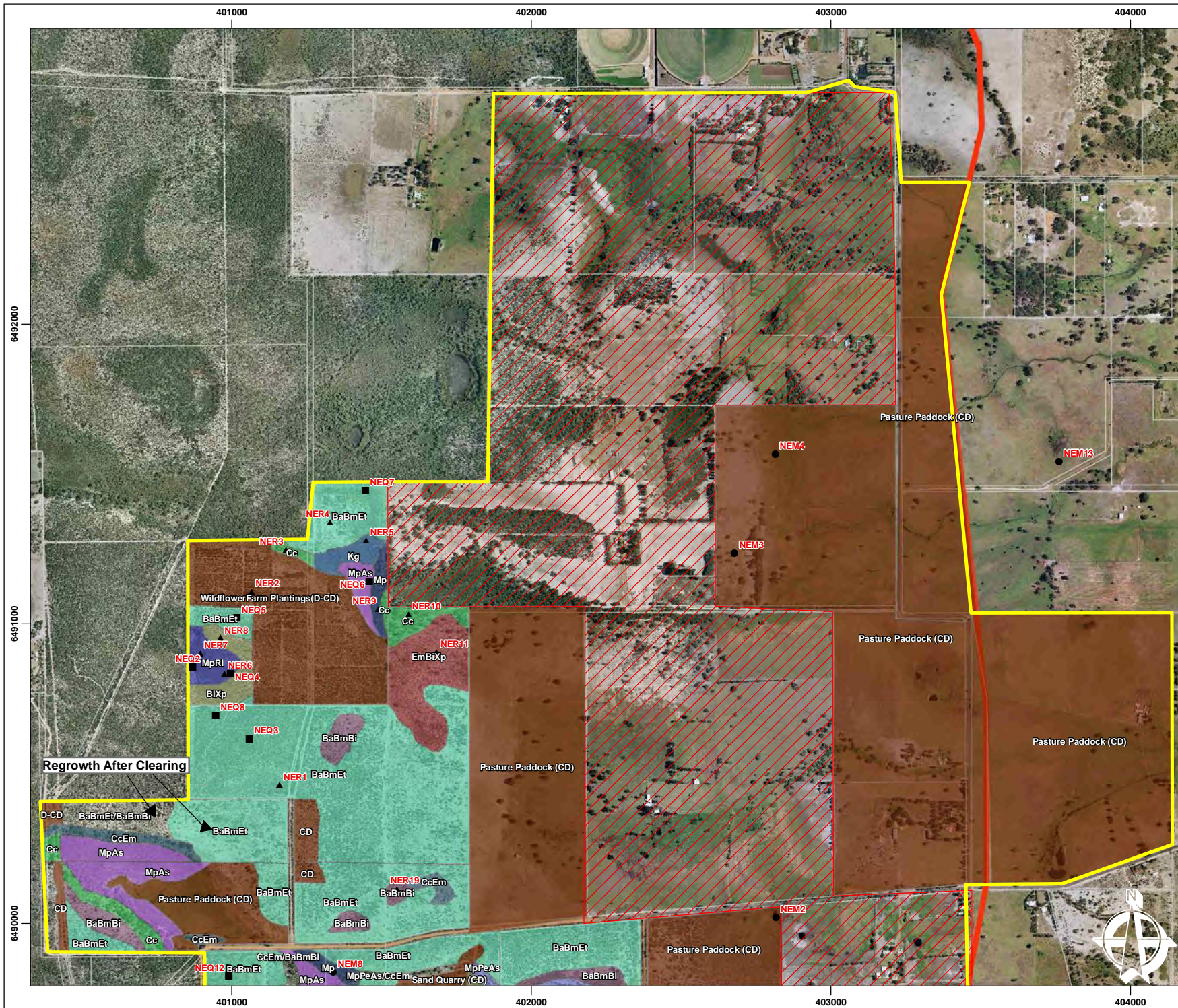
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



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| TD | AH | AH | |
| DATE | REVISION | DRAWING ID | |
| 27.02.12 | 2 | EBS137.08 | |

North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey. Declared Rare Flora and Priority Flora
 Figure 5



Legend

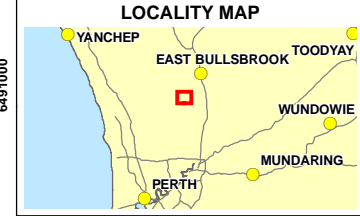
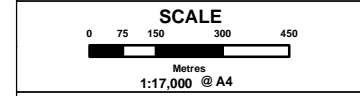
- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Minor Roads
- Major Roads
- Perth-Darwin Highway
- Mapping Notes
- Quadrats
- Relevés

Vegetation Units

- BaBmBi
- BaBmEt
- BeEp
- BiXp
- Cc
- CcEm
- EmBiXp
- Er
- Et
- Kg
- Mp
- MpAs
- MpPeAs
- MpRi
- Degraded (D)
- Completely Degraded (CD)

NB: combination units (e.g. CcEm/BaBmBi) indicate a patchy mosaic incorporating both of the nominated vegetation units.

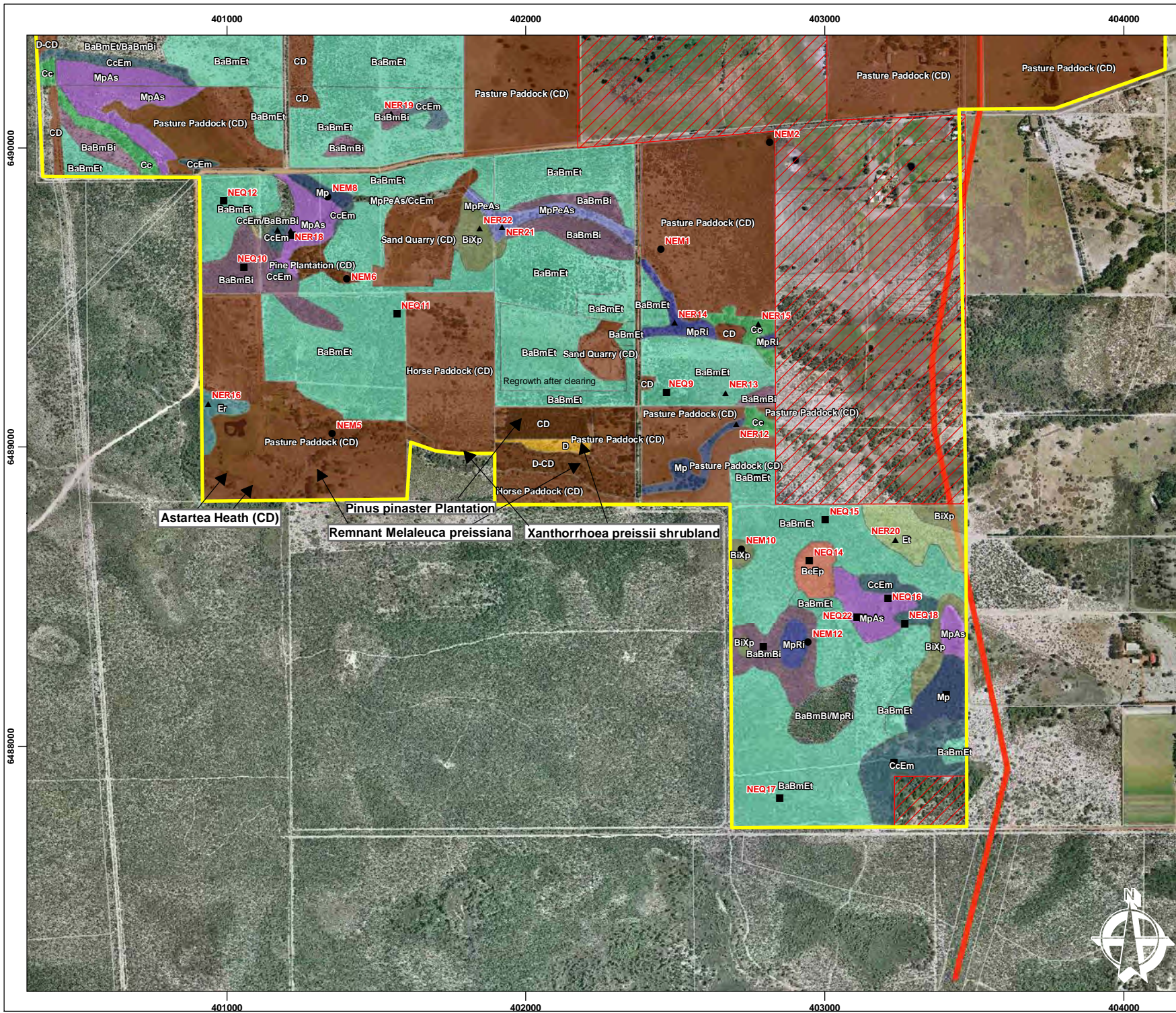
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Units - North
 Figure 6a



Legend

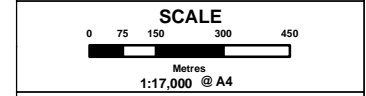
- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Minor Roads
- Major Roads
- Perth-Darwin Highway
- Mapping Notes
- Quadrats
- Relevés

Vegetation Units

- BaBmBi
- BaBmEt
- BeEp
- BiXp
- Cc
- CcEm
- EmBiXp
- Er
- Et
- Kg
- Mp
- MpAs
- MpPeAs
- MpRi
- Degraded (D)
- Completely Degraded (CD)

NB: combination units (e.g. CcEm/BaBmBi) indicate a patchy mosaic incorporating both of the nominated vegetation units.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Units - South
 Figure 6b

360 environmental

Legend for Figure 6 Vegetation Units.

(i) Banksia and Pricklybark woodlands on dune crests and slopes

BaBmEt *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus todtiana* low woodland over *Scholtzia involucreta* and *Beaufortia elegans* high shrublands over *Eremaea pauciflora* var. *pauciflora*, *Astroloma xerophyllum*, *Croninia kingiana* and *Leucopogon conostephioides* low shrublands.

Et *Eucalyptus todtiana* low open woodland over *Adenanthos cygnorum* var. *cygnorum* scattered tall shrubs to high open shrubland over *Beaufortia elegans*, (*Verticordia nitens*) open heath and *Eremaea pauciflora* var. *pauciflora* low open shrubland

(ii) Vegetation on the sandy parts of swales and flats

BaBmBi *Banksia attenuata*, *Banksia ilicifolia*, *Banksia menziesii* low woodland over *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Calytrix flavescens*, *Conostephium pendulum*, *Adenanthos obovatus*, *Eremaea pauciflora* var. *pauciflora* low open shrublands over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyogon bromeliifolius* low herblands.

BeEp *Beaufortia elegans* open heath over *Eremaea pauciflora* var. *pauciflora* low shrubland.

BiXp *Banksia ilicifolia* scattered low trees over *Xanthorrhoea preissii* shrubland over *Eremaea pauciflora* var. *pauciflora*, *Melaleuca seriata* low shrublands over *Lyginia barbata*, *Alexgeorgea nitens* open sedgeland.

Cc *Corymbia calophylla* woodland over *Xanthorrhoea preissii* scattered shrubs to open shrubland.

CcEm *Eucalyptus marginata* subsp. *marginata*, *Corymbia calophylla* scattered trees over *Banksia ilicifolia*, *Banksia attenuata* scattered low trees to low open woodland (patches) over *Xanthorrhoea preissii* shrublands over *Hypocalymma angustifolium* scattered low shrubs to low shrublands over *Hypolaena exsulca* open sedgeland.

EmBiXp *Eucalyptus marginata* subsp. *marginata* scattered trees over *Banksia attenuata*, *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Xanthorrhoea preissii* shrubland over *Dielsia stenostachya*, **Pentaschistis airoides* very open grassland/sedgeland.

(iii) Dampland vegetation

Er *Eucalyptus rudis* (Flooded Gum) open forest over *Xanthorrhoea preissii*, *Astartea scoparia* high open shrubland over *Lepidosperma longitudinale*, *Dielsia stenostachya* open sedgeland.

Kg *Kunzea glabrescens* closed scrub over *Aotus gracillima* open shrubland over *Schoenus efoliatus*, *Dielsia stenostachya* very open sedgeland.

Mp *Melaleuca preissiana*, (*Banksia littoralis*) low closed forest over *Xanthorrhoea preissii* open shrubland, *Astartea scoparia* and *Cyathochaeta teretifolia*, *Dielsia stenostachya*, *Lepidosperma longitudinale* open sedgeland.

MpAs *Melaleuca preissiana* low woodland over *Astartea scoparia* open heath over *Hypocalymma angustifolium* low open shrubland over *Dielsia stenostachya*, *Cyathochaeta teretifolia* sedgeland.

MpPeAs *Melaleuca preissiana* low woodland over open shrubland over *Pericalymma ellipticum* var. *ellipticum*, *Astartea scoparia*, *Regelia inops*, *Xanthorrhoea preissii* shrublands and *Hypocalymma angustifolium* low shrublands.

MpRi *Melaleuca preissiana* scattered low trees over *Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath.

(ii) Vegetation on the sandy parts of swales and flats

BaBmBi

Banksia attenuata, *Banksia ilicifolia*, *Banksia menziesii* low woodland over *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Calytrix flavescens*, *Conostephium pendulum*, *Adenanthos obovatus*, *Eremaea pauciflora* var. *pauciflora* low open shrublands over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyogon bromeliifolius* low herblands.

Habitat and soil: Flat (swale) between low dunes. Grey sand.

Notes: This unit was recorded at quadrats NEQ10 and NEQ19 (Plates 8 and 9) and releve NER19. This unit was characterised by the *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyogon bromeliifolius* low herblands. This unit was similar to the lower slopes unit BiXp, but still had the *Banksia attenuata*, *Banksia menziesii* elements in the low woodland, with a higher tree cover than the scattered *Banksia ilicifolia* low trees in the BiXp unit. In fact, BaBmBi was floristically similar to the BaBmEt unit more so than to the BiXp unit. Occasionally *Eucalyptus marginata* subsp. *marginata* appeared to be associated with stands of this vegetation.

BeEp

Beaufortia elegans open heath over *Eremaea pauciflora* var. *pauciflora* low shrubland.

Habitat and soil: Shallow depression on lower slope. Dry grey sand.

Notes: This heath unit was described at quadrat NEQ14 (Plate 10), on Property 11. It was recorded from one small area, a shallow depression on a lower slope.

BiXp

Banksia ilicifolia scattered low trees over *Xanthorrhoea preissii* shrubland over *Eremaea pauciflora* var. *pauciflora*, *Melaleuca seriata* low shrublands over *Lyginia barbata*, *Alexgeorgea nitens* open sedgeland.

Habitat and soil: Lower slopes of dune, adjacent to flat. Pale grey sand.

Notes: This unit was described at its main occurrence at quadrat NEQ4 and releve NER8 (Plate 11) on Property 65, on lower slopes adjacent to a *Regelia inops* scrub dampland.



Plate 8. Vegetation unit BaBmBi in a swale at releve NEQ10, on Property 13.



Plate 9. Vegetation unit BaBmBi in a swale at releve NEQ19, on Property 11.



Plate 10. Vegetation unit BeEp in a depression near quadrat NEQ14, on Property 11.



Plate 11. Vegetation unit BiXp along lower slopes at releve NER8, on Property 65.

Cc

Corymbia calophylla woodland over *Xanthorrhoea preissii* scattered shrubs to open shrubland.

Habitat and soil: Slight depression on flat plain. Pale grey sand.

Notes: This unit was recorded at relevés NER10, NER15 and NER3 (Plate 12). This vegetation typically occurred on the flats adjacent to damplands. Areas of this vegetation were typically degraded with high weed cover due to past grazing, as they were typically in a habitat suitable for farming. The degraded condition of the vegetation is why a quadrat was not located in this unit. Associated species included *Nuytsia floribunda*, *Jacksonia furcellata*, *Jacksonia sternbergiana* and *Dielsia stenostachya*.



Plate 12. Vegetation unit Cc (Degraded) on flats at releve NER15, on Property 20.

CcEm

Eucalyptus marginata subsp. *marginata*, *Corymbia calophylla* scattered trees over *Banksia ilicifolia*, *Banksia attenuata* scattered low trees to low open woodland (patches) over *Xanthorrhoea preissii* shrublands over *Hypocalymma angustifolium* scattered low shrubs to low shrublands over *Hypolaena exsulca* open sedgelands.

Habitat and soil: Gentle slopes and elevated flats adjacent to dampland depressions. Grey sand.

Notes: This vegetation occurred occasionally around some edges of damplands. It was described at quadrats NEQ18 and NEQ21 and at releve NER17. There is some uncertainty as to whether *Corymbia calophylla* is a consistent associate of this unit, but it is assumed that it is on the limited evidence from this survey. Associated

species include *Dasypogon bromeliifolius*, *Regelia inops*, *Pultenaea reticulata* and *Adenanthos obovatus*.

EmBiXp

Eucalyptus marginata subsp. *marginata* scattered trees over *Banksia attenuata*, *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Xanthorrhoea preissii* shrubland over *Dielsia stenostachya*, **Pentaschistis airoides* very open grassland/sedgeland.

Habitat and soil: Flat plain. Grey-brown sand.

Notes: This unit was recorded at releve NER11 on a sandy flat plain on Property 63. It may be related to unit BaBmBi, but its degraded condition made it difficult to determine what its structure might have been prior to disturbance.

(iii) Dampland vegetation

Er

Eucalyptus rudis open forest over *Xanthorrhoea preissii*, *Astartea scoparia* high open shrubland over *Lepidosperma longitudinale*, *Dielsia stenostachya* open sedgeland.

Habitat and soil: Flat at base of low dune.

Notes: This vegetation was recorded in the south-western part of Property 13 at releve NER16 (Plate 13). It occurred in one small area in the survey area. Associated species included *Melaleuca preissiana*, *Acacia saligna*, *Melaleuca lateritia* and *Gastrolobium ebracteolatum*.



Plate 13. Vegetation unit 'Er' on flats at releve NER15, on Property 13.

Kg

Kunzea glabrescens closed scrub over *Aotus gracillima* open shrubland over *Schoenus efoliatus*, *Dielsia stenostachya* very open sedgeland.

Habitat and soil: Flat plain. Dark grey sand.

Notes: This unit was recorded at releve NER5 (Plate 14). It occurred in one small area on Property 64.

Mp

Melaleuca preissiana, (*Banksia littoralis*) low closed forest over *Xanthorrhoea preissii* open shrubland, *Astartea scoparia* and *Cyathochaeta teretifolia*, *Dielsia stenostachya*, *Lepidosperma longitudinale* open sedgelands.

Habitat and soil: Dampland flats. Dry grey brown peaty sand.

Notes: This unit was broadly mapped in parts of Property 11 and 14. It was described at quadrat NEQ20, releve NER12 and site NEM8. It probably occurred in other parts of unit MpAs in the survey area, but was not separated from that related unit. It was distinguished by its high cover of *Melaleuca preissiana* (closed forest) and more open understory. Associated species included *Aotus gracillima*, *Gastrolobium ebracteolatum*, *Lobelia anceps*, *Baumea articulata*, *Taxandria linearifolia* and *Centella asiatica*.



Plate 14. Vegetation unit 'Kg' on flats at releve NER5, on Property 64.

MpAs

Melaleuca preissiana low woodland over *Astartea scoparia* open heath over *Hypocalymma angustifolium* low open shrubland over *Dielsia stenostachya*, *Cyathochaeta teretifolia* sedgelands.

Habitat and soil: Flat depression between low dunes. Black peaty sand.

Notes: This vegetation was described at quadrats NEQ6, NEQ13, NEQ16 and NEQ22 and relevés NER9 and NER18 (Plate 15). It was probably the most common form of dampland vegetation in the survey area and was recorded on Properties 11, 14, 15, 64 and 67. It varied from areas of *Astartea scoparia* heath with occasionally scattered and fringing *Melaleuca preissiana* low trees (NEQ6 and NEQ13) to *Melaleuca preissiana* low woodlands over *Astartea scoparia* heaths. Some large areas of the unit on different properties appeared to be regrowth after past clearing (Properties 64 and 67 and possibly 14). Associated species included *Aotus gracillima*, *Leucopogon australis*, *Pericalymma ellipticum* var. *ellipticum*, *Taxandria linearifolia*, *Calothamnus lateralis*.

MpPeAs

Melaleuca preissiana low woodland over open shrubland over *Pericalymma ellipticum* var. *ellipticum*, *Astartea scoparia*, *Regelia inops*, *Xanthorrhoea preissii* shrublands and *Hypocalymma angustifolium* low shrublands.

Habitat and soil: Flow line between low dunes. Dark grey sand.

Notes: This vegetation was recorded along a linear flowline at releve NER21 on Property 18. It represents the thin unit of *Melaleuca preissiana* low woodland that grows along the linear flow lines in this area, but which was difficult to reliably sample and describe because of its typically narrow occurrence and mostly degraded condition (often high weed cover and modified by past physical disturbance). The *Melaleuca preissiana* low woodland vegetation in this habitat is likely to be very variable in composition. Associated species included *Acacia saligna*, *Acacia pulchella*, *Melaleuca seriata*, *Mesomelaena graciliceps*, *Phlebocarya ciliata*, *Dasyogon bromeliifolius*.

MpRi

Melaleuca preissiana scattered low trees over *Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath.

Habitat and soil: Broad depression on valley floor between low dunes. Grey sand.

Notes: This vegetation occurred in a few damplands and flow areas and was recorded at quadrat NEQ2, releves NER6 (Plate 16), NER7 and NER14 and at mapping note site NEM12. Some areas of this unit could be considered to be '*Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath', where the *Melaleuca preissiana* was sparsely scattered or absent in parts. Associated species included *Hypocalymma angustifolia* low shrublands over *Dasyogon bromeliifolius*, *Phlebocarya ciliata*, *Lyginia ?imberbis*. One small area of this unit on Property 65 (releve NER7) included a small group of exceptionally tall *Xanthorrhoea preissii* shrubs that grew to a height of between 5 and 6 metres (Plate 17).



Plate 15. Vegetation unit 'MpAs' at quadrat NEQ22, on Property 11.



Plate 16. Vegetation unit 'MpRi' at releve NER6, on Property 65.



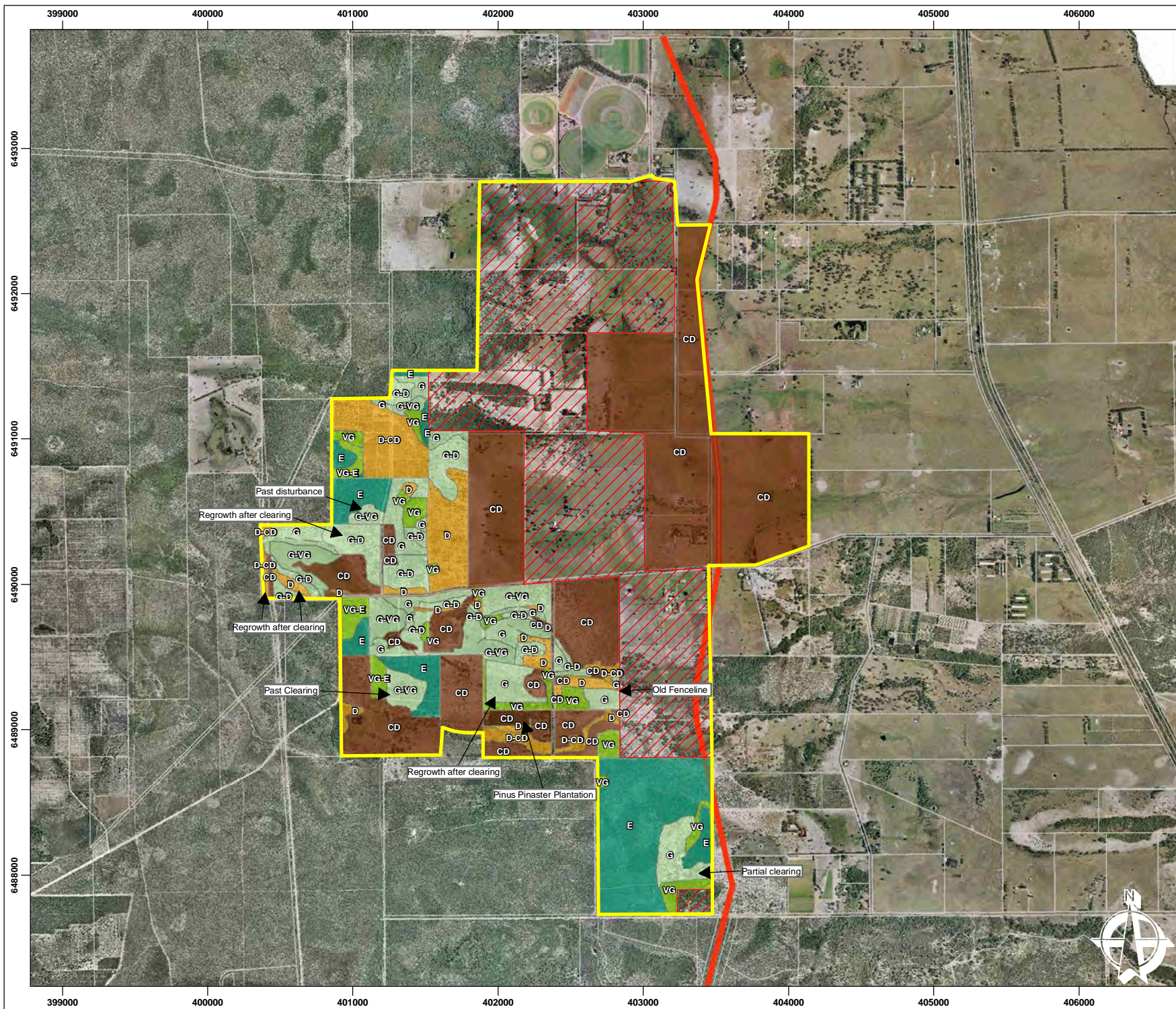
Plate 17. Small area of exceptionally tall *Xanthorrhoea preissii* shrubs (up to about 5 to 6 metres high) at releve NER7 in vegetation unit MpRi, on Property 65.

5.2 Vegetation Condition

5.2.1 Vegetation Condition

Large parts of the North Ellenbrook survey area were cleared pasture paddocks (Figure 7; Plates 18 to 23). Almost all of that part of the survey area that was mapped as Yanga Vegetation Complex (Figure 2) was cleared farmland, with patches of sedge regrowth in the paddocks (Plate 22).

Large areas of the remnant bushland in the survey area had been impacted by past human activities, including grazing, sand mining, clearing (sometimes partial(?)) and extraction of bore water from under the damplands (Plates 24 to 27).



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Perth-Darwin Highway
- Major Roads
- Minor Roads

Vegetation Condition

- P - Pristine
- E - Excellent
- VG - Very Good
- G - Good
- D - Degraded
- CD - Completely Degraded

NB: ranges of vegetation condition (e.g. G-VG) indicates the vegetation condition in that area varies between the indicated classes

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
 - LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE

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 Metres
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LOCALITY MAP

YANCHEP EAST BULLSBROOK TOODYAY
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North Ellenbrook

North Ellenbrook Level 2 Flora & Vegetation Survey

Vegetation Condition

Figure 7

360 environmental



Plate 18. Scattered *Eucalyptus tottiana* low trees over **Ehrharta calycina* (Perennial Veldt Grass) grassland in a cleared paddock (Property 56) (Completely Degraded).



Plate 19. Dampland flats cleared to pasture paddocks with scattered *Melaleuca preissiana* on Property 56 (Completely Degraded).



Plate 20. The cleared paddocks of Property 55 (Completely Degraded).



Plate 21. Lupin crop in paddock on Property 58 (Completely Degraded).



Plate 22. Degraded regrowth sedgeland in a pasture paddock on Property 57.



Plate 23. Pasture paddock on Property 76 in the north-eastern part of the survey area.



Plate 24. Old sand mine on Property 16.



Plate 25. Regrowth in a cleared Banksia woodland area in northern part of the former wildflower farm, on Property 64.



Plate 26. Regrowth amongst the remains of ****Chamelaucium uncinatum** (Geraldton Wax) plantings on the former wildflower farm, Property 65).



Plate 27. Remnant *Melaleuca preissiana* low woodland (Degraded to Completely Degraded) along a flowline in a cleared paddock on Property 19. **Carpobrotus edulis* (Pigface) is an aggressive weed on the cleared flats.

5.2.2 Dieback (*Phytophthora* sp.)

Patches of *Banksia* spp. deaths were recorded across at least 8 properties with remnant vegetation in the North Ellenbrook survey area (Plates 28). Groups of up to 20 dead *Banksia*'s were recorded.

The deaths and decline of *Banksia* trees may indicate the presence of the Dieback fungus *Phytophthora cinnamomi*. However, other agents such as fire and drought (including falling water tables), as well as other pathogens, may also be responsible for *Banksia* tree deaths. To determine if Dieback is present, a dieback survey by accredited 'dieback interpreters' would be required.



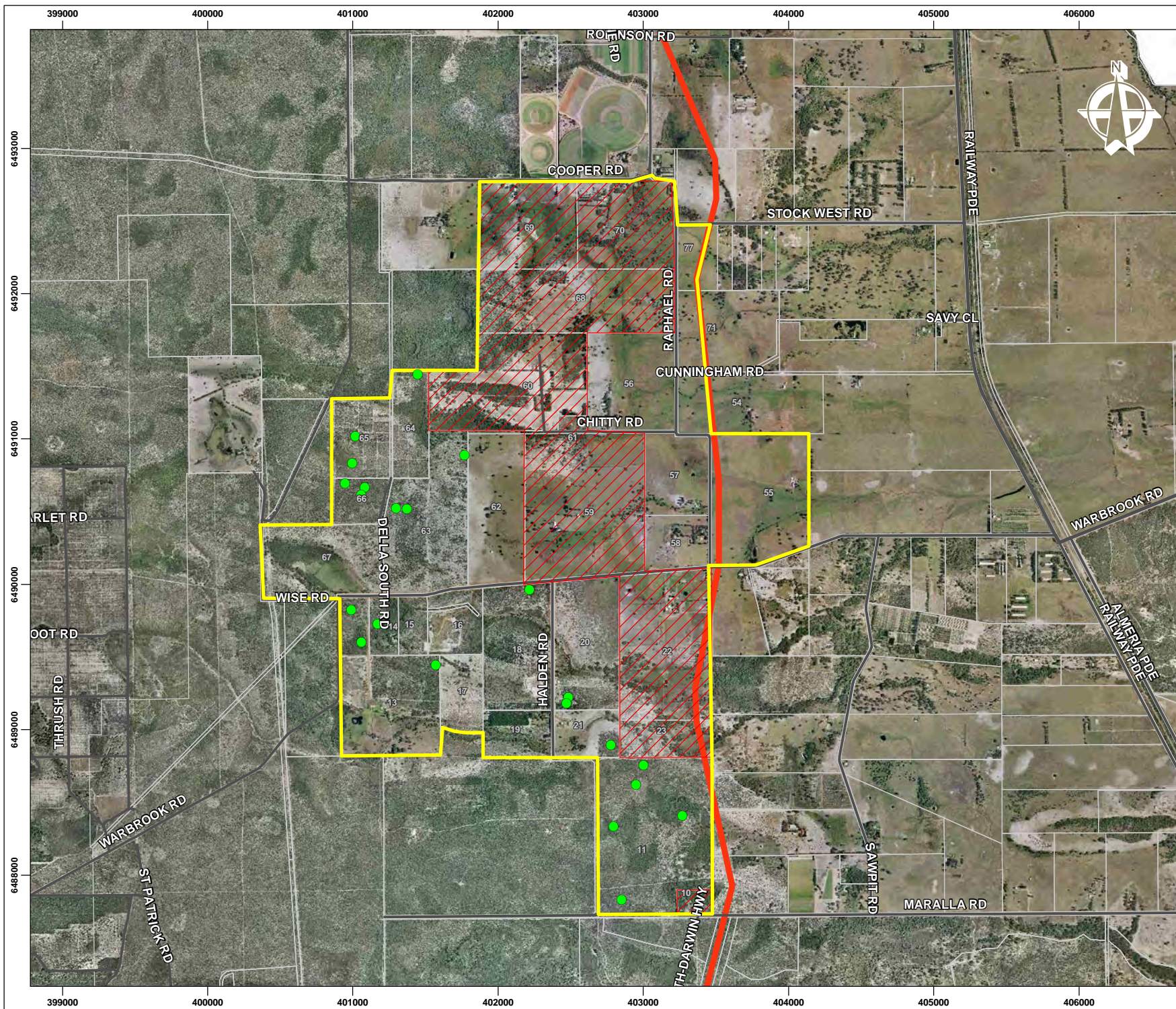
Plate 28. A patch of *Banksia* spp. deaths on Property 63.

5.4 *Lomandra hermaphrodita* Occurrence: Host Plant of the Graceful Sun Moth

The Graceful Sun Moth (*Synemon gratiosa*, Family Castniidae) is endemic to Western Australia, and is currently considered restricted to the Swan Coastal Plain. The Graceful Sun Moth is listed under the *Environment Protection and Biodiversity Conservation Act 1999* and is also currently listed on Schedule 1 (fauna that is rare or is likely to become extinct) of the Western Australian *Wildlife Conservation Act 1950*.

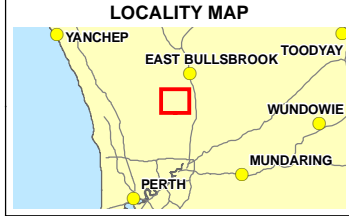
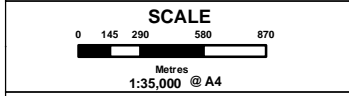
The Graceful Sun Moth is thought to breed exclusively on *Lomandra* species, probably *L. hermaphrodita*. Two known food plants for the Graceful Sun Moth are *Lomandra hermaphrodita* and *L. maritima* (McNamara 2009, cited on Department of Sustainability, Environment, Water, Population and Communities website).

Lomandra maritima was not recorded in the North Ellenbrook survey area. However, *Lomandra hermaphrodita* plants were recorded opportunistically at 22 locations in the survey area (Figure 8). It was recorded in most parts of the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodlands in the survey area and is probably scattered throughout that vegetation type.



- ### Legend
- North Ellenbrook Survey Area Boundary
 - Area Not Surveyed (No Access)
 - *Lomandra hermaphrodita* Locations
 - Minor Roads
 - Major Roads
 - Perth-Darwin Highway

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Lomandra hermaphrodita Locations
 Figure 8

6 FCTs, TECs and PECs

This section outlines the results of the floristic analysis conducted by Mr Chris Hancock using the 2011 North Ellenbrook survey data and the Gibson *et al.* (1994) Swan Coastal Plain data set. It is based on a report prepared by Mr Chris Hancock, which is attached in full in Appendix 8.

6.1 Floristic analysis

6.1.1 Determination of Floristic Community Types (FCT) by classification

The results of the ordination analysis are presented in Table 6 (see also Appendix 8). This shows that the North Ellenbrook sites appeared to belong to several FCTs: 4, 11, 12, 13, 21c, 23a and 23b.

Table 6. Floristic Community Types (FCTs) estimated from the ordination analysis and their status.

| | UPGMA | FEXIBLE BETA | SUMMARY FCT _A | STATUS _B |
|-------|-------------|--------------|-----------------------------|---------------------|
| NEQ1 | 23a | | 23a | |
| NEQ2 | 4 | 4 | 4 | |
| NEQ3 | 23a | | 23a | |
| NEQ4 | 21c | 4 or 6 | 21c | PEC3 |
| NEQ5 | 23a | | 23a | |
| NEQ6 | 11 or 4 | 11 | 11 | |
| NEQ7 | 23b or 23a | 23a | 23a | |
| NEQ8 | 23b or 23a | 23b | 23b | PEC3 |
| NEQ9 | 23a | | 23a | |
| NEQ10 | 23b or 23a | 23a | 23a | |
| NEQ11 | 23b | | 23b | PEC3 |
| NEQ12 | 23a | | 23a | |
| NEQ13 | 11 | | 11 | |
| NEQ14 | 6 | 21c | 21c | PEC3 |
| NEQ15 | 23a | | 23a | |
| NEQ16 | 11,12,13 | 12 | 12 | |
| NEQ17 | 23a | | 23a | |
| NEQ18 | 21a,23b,23a | 23b | 23b | PEC3 |
| NEQ19 | 23a | | 23a | |
| NEQ20 | 21C or 5 | 14 or 11 | doesn't fit | |
| NEQ21 | 11 or 25 | 6 | doesn't fit | |
| NEQ22 | 13 or 4 | 13 or 4 | 13 | |

a FCT: Floristic Community Type

b PEC: Priority Ecological Community

The *Banksia*-Pricklybark low woodlands on the dune slopes were FCTs 23a (upper slopes and crests) and 23b (lower slopes(?)) while the *Banksia illicifolia* low open woodlands on the lower slopes and flats were FCT21c. The Jarrah-Marri open woodland on the lower slopes adjacent to the dampland (NEQ18) was also found to belong to FCT23b. The *Regelia inops* heath dampland site was FCT4 while the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation was found to be FCTs 11, 12 and 13 (sites NEQ6, 13, 16 and 22). In fact, the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation might be expected to belong to the same FCT and the range of FCTs for this vegetation type might have resulted from the low species richness (and therefore perhaps greater sensitivity to presence/absence of a few species) and seasonal sampling affects. It is also possible that the *Melaleuca preissiana* low woodlands and the *Astartea scoparia* heath were floristically different.

Two quadrats could not be assigned an FCT. Quadrat NEQ20 was in *Melaleuca preissiana* low closed forest vegetation while NEQ21 was in a very small area of Marri-Jarrah forest on the flats adjacent to the damplands. The limited occurrence of these vegetation types in Good or better condition and their occurrence as generally small patches of vegetation, limited the number of quadrats that could be located in them. The *Melaleuca preissiana* low closed forest (NEQ20) would be expected to belong to the same FCT or group of FCTs as the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation, probably FCT4 ('*Melaleuca preissiana* damplands') or FCT11 ('Wet forests and woodlands'). The Marri-Jarrah vegetation (NEQ21) would be more difficult to assign to a FCT. It was assigned, all be it with some reservation, to the same mapping unit (CcEm) as NEQ18 and would therefore most likely be FCT23b.

6.2 North Ellenbrook Survey Area Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)

The status of the North Ellenbrook vegetation Floristic Community Types (FCTs) is shown in Table 6. This suggests that the *Banksia* woodland vegetation on the lower slopes (NEQ8 and NEQ11) may be the Priority 3 PEC SCP23b 'Swan Coastal Plain *Banksia attenuata*-*Banksia menziesii* woodlands', as would the Jarrah-Marri open woodland on the lower slopes adjacent to the dampland. The analysis also suggests that some of the lower slope *Banksia illicifolia* vegetation (NEQ4, NEQ8) and dry heaths (NEQ14) are Priority 3 PEC SCP21c 'Low lying *Banksia attenuata* woodlands or shrublands'.

7 Regional Significance Assessment

Flora and vegetation values in the North Ellenbrook survey area were assessed for regional significance (Table 7) using the criteria for determination of regional significance of natural areas set out in Bush Forever (DEP, 2000a) and the EPA Guidance Statement No. 10 (EPA, 2006).

The North Ellenbrook survey area was assessed as regionally significant for flora and vegetation on the following grounds (see Table 7):

- General criteria for the protection of Conservation Category Wetland (DEP, 2000b).

The North Ellenbrook survey area includes Conservation Category Wetlands and therefore has regional significance for these. The Conservation Category Wetland areas occur on two of the surveyed properties: in the BushForever 298 damplands area on Property 64 and on Property 11 (Excellent condition).

The North Ellenbrook survey area was also considered to have moderate to high values for 'contiguous or largely contiguous corridor of bushland/wetland areas' linkages, and moderate values for both representation of ecological communities and diversity.

It was considered that the North Ellenbrook survey area rarity values for flora could not be fully assessed because of the late season of the survey relative to the flowering time of some of the Threatened and Priority flora occurring in the general locality (e.g. *Caladenia huegelii*).

Table 7. Regional Significance Assessment: North Ellenbrook

Note bold sections are used to highlight the summaries of the table.

| CRITERION | COMMENT |
|--|--|
| (i) Representation of ecological communities | |
| Vegetation complexes | (System6+part System 1: Bassendean Complex – North: 72.0% of pre-1750 extent; 27.5% in reserve; Yanga Complex: 18.7% of pre-1750 extent; 1.0% in reserve (EPA, 2006)). Yanga Complex all or almost all cleared. |
| Floristic community types | Affinity to 7 FCTs (more likely 5 FCTs). |
| Size and shape | Large area of remnant vegetation in western part of area, but discontinuity between areas in Very Good condition or better due to different land uses on different properties. |
| Vegetation condition | North-eastern part Completely Degraded pasture paddocks. Condition in western and southern part varied greatly between properties, with Properties 11, 13 and 66 having large areas in Excellent condition. |
| Conclusion | Yanga Complex all or almost all cleared (Completely Degraded pasture paddocks). Remnant vegetation in Bassendean Complex – North – not regionally significant. Vegetation in >Very Good/Excellent condition limited to a few properties. Lot of Completely Degraded farmland and degraded remnant. Moderate values for representation of ecological communities. |
| (ii) Diversity | |
| Vegetation Complexes | Two Complexes, although one (Yanga) has been cleared for farming. |
| FCT's | Vegetation units mainly group with 7 (more likely 5) FCT's. |
| Vegetation units | Fourteen vegetation units (some only over very small areas). 6 wetland vegetation units. Moderate number for size of survey area. |
| Flora | 181 native plant species recorded. Low to Moderate number for size of area. Species richness: dampland quadrats had low species richness. Banksia units had moderate to high species richness (43-60). |
| Conclusion | Moderate values for diversity. |
| (iii) Rarity | |
| Flora | No DRF; one Priority species (Priority 3). Nine other species of regional significance. Difficult to assess due to poor seasonal conditions. |
| Vegetation :TEC's | No TECs recorded. Five vegetation units grouped with two Priority 3 |

| CRITERION | COMMENT |
|--|---|
| | PECs: Community Types 21c and 23b. These PECs occurred on lower slopes and small areas on edge of damplands. |
| Conclusion: | Flora rarity status needs confirming in good season. Otherwise, low to moderate values for rare vegetation. |
| (iv) Maintaining ecological processes | |
| Linkage | 'Contiguous or largely contiguous corridor of bushland/wetland areas' link bushland to the west (BF399) with bush to the south (BF300) and pass through the bushland to the south of the survey area, including the bushland in Property 11. |
| Size of areas in natural condition | Natural condition areas are large in the western part, but with a lot of disturbance in parts, resulting in somewhat fragmented distribution of remnant vegetation in Good or better condition. |
| Creepline/river/estuary | Limited flow line areas and they tended to be disturbed. Numerous dampland areas in western part, with some in Excellent condition (especially Property 11), but others degraded. Extensive damplands in eastern part are now cleared farmland paddocks (Completely Degraded). BF298 covers Conservation category wetland on Property 64. |
| Conclusion: | Moderate to high values for maintaining ecological processes, particularly for linkages (although fragmented natural areas) and vegetated dampland areas in western part of survey area. |
| (v) Scientific or evolutionary importance | Moderate. |
| (vi) General criteria for protection of wetland, streamline, estuarine | Conservation category wetlands on Property 64 (BF298) and in Excellent condition on Property 11. Resource Enhancement wetlands in south-western part of survey area has been cleared and grazed and is Degraded or Completely Degraded. Multiple Use wetland on Property 67 is Completely Degraded in parts, but good regrowth after clearing in parts. |
| Conclusion: | Regionally significant for Conservation Category Wetlands |
| Summary: | <u>Regionally significant, for</u> <ul style="list-style-type: none"> • general criteria for protection of conservation Category Wetlands |

8 Conclusions and Recommendations

8.1 Conclusion

One hundred and eighty one (181) native plant species were recorded in the area surveyed. This number of native species was probably a low number for the size of the survey area. This was attributed to the large part of the survey area that was cleared farmland (pasture paddocks) or which was remnant bushland degraded from other activities (including wildflower farming, grazing, horse paddocks and sand mining). Areas of dampland had also been cleared or partially cleared in the past (now mostly regrowth) and appeared to have been impacted by drawdown of the water table, likely from bores. The timing of the survey in late Spring would also have contributed to a low species count as some species would have passed their flowering period.

No Threatened flora were recorded in the North Ellenbrook survey area. One Priority 3 species, *Cyathochaeta teretifolia* (Perennial grass-like sedge), was recorded in the North Ellenbrook survey area. Nine other recorded plant species were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum* and *Verticordia nitens*. It was concluded that a full assessment for rare flora values could not be made for the North Ellenbrook survey area because of the late season of the survey relative to the flowering time of Threatened flora that could possibly occur in the area.

The North Ellenbrook survey area has been mapped as Bassendean Complex-North in the western and southern parts and Yanga Complex in the north-eastern part. While large areas of remnant vegetation remain in the Bassendean Complex-North area, the survey area corresponding to Yanga Complex was Completely Degraded farmland (pasture paddocks). No Threatened Ecological Communities (TECs) were recorded in the North Ellenbrook survey area. However, two Priority Ecological Communities (PEC21c and PEC23b) were recorded at several sample sites on lower slopes.

The condition of the remnant vegetation in the western and southern part of the North Ellenbrook survey area was quite varied, with large parts in Good to very Good condition and some notable areas in Excellent condition. In contrast some substantial areas were Completely Degraded or Degraded due to past clearing for grazing, native cut flower growing and other rural activities. As mentioned above, the north-eastern parts of the survey area was Completely Degraded farmland.

Conservation Category Wetlands occurred on two of the survey properties and the survey area was assessed as regionally significant for the 'general criteria for the protection of Conservation Category Wetlands'. One of these wetland areas is the BushForever 298 site.

The North Ellenbrook survey area was considered to have moderate to high values for linkages of 'contiguous or largely contiguous corridor of bushland/wetland areas'.

Lomandra hermaphrodita, a host plant for the Graceful Sun Moth, was opportunistically recorded as scattered over a wide area of *Banksia* woodland in the North Ellenbrook survey area.

Patches of *Banksia* deaths were recorded in remnant vegetation across at least eight properties. These deaths may indicate the presence of the Dieback fungus, *Phytophthora cinnamomi*.

8.2 Implications of Findings on the Development Proposal

Drainage and ground water quality would appear to be the main issues in the areas of cleared farmland in the north-eastern part of the survey area (Yanga land unit).

Management of Conservation Category Wetlands and bushland linkage values (between BushForever areas to the west and south of the survey area) were important vegetation issues highlighted from the 2011 survey. While rare flora values cannot be finalised without an early/mid Spring follow-up survey, no Threatened flora issues were identified during the survey work to date. Additional survey works are included in the recommendations below.

Larger areas of bushland in excellent condition (particularly property 11) would have higher values and may have more significant implications for the project.

Although it has not been directly recorded, the survey has suggested there may be *Phytophthora* Dieback management requirements, and Graceful Sun-moth and Black Cockatoo habitat issues for the development proposal. Further survey work is required to determine the potential impact.

8.3 Recommendations

The following recommendations are made after considering the flora and vegetation survey results and conclusions:

- It is recommended a second phase be conducted in late September/ early October to check for the presence of Threatened flora, particularly *Caladenia huegelii* (Grand Spider Orchid). This would allow a more appropriate assessment for rare flora in the survey area to be made. It is also recommended that the quadrats be re-recorded to improve the quadrat data for the survey area.
- It is recommended that management plans be developed for the areas of Conservation Category Wetlands should the development proposal proceed.

- It is recommended that consideration be given to the retention of parts of the remnant bushland (especially parts in Excellent condition) and maintenance of linkages in development plans.
- It is recommended that a dieback survey by accredited 'dieback interpreters' be undertaken to determine the Dieback status in the survey area.
- It is recommended that a Black Cockatoo survey of the site be undertaken by a Black Cockatoo expert to determine the presence of significant foraging and breeding habitat. The site contains suitable habitat for Black Cockatoo species.
- It is recommended that a Graceful Sun Moth survey be undertaken in March for the site survey area. This is due to the presence of *Lomandra hermaphrodita* in the survey area (widely scattered), a host plant of the Graceful Sun Moth.

9 Acknowledgements

Brian Morgan was responsible for completing the field work, identifications and authoring this report.

Chris Hancock assisted with the field work.

Plant identifications were undertaken by Brian Morgan and Eleanor Bennett. Allen Lowry identified the *Stylidium* and *Drosera* taxa and Mike Hislop assisted with the Ericaceae identifications and offered some advice.

Mr Chris Hancock ran the PCOrd analysis and reported the results (Appendix 8).

Tim Donohue, 360 Environmental, prepared the GIS maps used in this report.

10 References

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APPENDIX ONE

The Department of Environment and Conservation Declared
Rare Flora and Priority Flora Categories (from Smith, 2010)

Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

Declared Rare Flora - Presumed Extinct Flora

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

Priority One - Poorly Known Taxa.

Taxa which are known from one or a few (generally < 5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

Priority Two - Poorly Known Taxa.

Taxa which are known from one or a few (generally < 5) populations, at least some of which are not believed to be under immediate threat (ie. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

Priority Three - Poorly Known Taxa.

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally > 5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further study.

Priority Four - Rare Taxa.

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

APPENDIX TWO

Vegetation structural table of Trudgen based on Aplin's (1979) modification of
Specht's classification

| LIFE FORM AND HEIGHT OF TALLEST STRATUM | PROJECTIVE FOLIAGE COVER OF TALLEST STRATUM AS % | DESCRIPTION |
|---|--|--|
| Trees over 30 metres | 70-100 30-70 10-30 2-10 Under 2 | High closed forest High open forest High woodland High open woodland Scattered tall trees |
| Trees 10 - 30 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed forest Open forest Woodland Open woodland Scattered trees |
| Trees under 10 metres | 70-100 30-70 10-30 2-10 Under 2 | Low closed forest Low open forest Low woodland Low open woodland Scattered low trees |
| Shrubs over 2 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed scrub Open scrub High shrubland High open shrubland Scattered tall shrubs |
| Shrubs 1 - 2 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed heath Open heath Shrubland Open shrubland Scattered shrubs |
| Shrubs under 1 metre | 70-100 30-70 10-30 2-10 Under 2 | low closed heath low open heath low shrubland Low open shrubland Low scattered shrubs |
| Herbs/Sedges/Grasses | 70-100 30-70 10-30 2-10 Under 2 | Closed herb, sedge, grassland Herb, sedge, grassland Open herb, sedge, grassland Very open herb, sedge, g'land Scattered herbs sedges, grasses |

Grasslands then divided into:

- Tussock grasslands (perennial tussock species, e.g. Eragrostis species);
- Hummock grasslands (Triodia and Plectrachne species that form hummocks)
- Curly spinifex grassland (Plectrachne pungens, which does not form hummocks) (follows J.S. Beard).
- Annual tussock grassland (e.g. annual Sorghum species)

APPENDIX THREE

Vegetation condition scale and descriptions

(from Keighery 1994, reproduced in Department of Environmental
Protection 2000b)

Pristine (1):

Pristine or nearly so, no obvious signs of disturbance

Excellent (2):

Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good (3):

Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4):

Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded (5):

Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded (6):

The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

APPENDIX FOUR

Flora list for the North Ellenbrook survey area

Notes:

1. Plant families are listed in alphabetical order within plant kingdom Divisions.
2. An asterisk (*) beside the taxon name indicates an introduced species exotic to Western Australia (weed).
3. The 'status' column shows the conservation status of significant flora species on the list. DRF = Declared Rare Flora; P1 to P4 = Priority 1 to Priority 4 (see definitions in Appendix 1); RS = other regionally significant flora.

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|---|--|---------------|-----------------|
| GYMNOSPERMAE | | | |
| Class CYCADOPSIDA (Cycads) | | | |
| ZAMIACEAE | Macrozamia riedlei | | |
| | | | |
| Class PINOPSIDA (conifers) | | | |
| PINACEAE | *Pinus pinaster | Pinaster Pine | |
| | | | |
| ANGIOSPERMAE (flowering plants) | | | |
| AIZOACEAE | Carpobrotus edulis | | |
| ANARTHRIACEAE | Lyginia barbata | | |
| | Lyginia imberbis | | |
| APIACEAE | Centella asiatica | | |
| | Homalosciadium homalocarpum | | |
| | Xanthosia huegelii | | |
| ARACEAE | *Zantedeschia aethiopica | Arum lily | |
| ARALIACEAE | Trachymene pilosa | | |
| | Trachymene coerulea subsp. coerulea | | |
| ASPARAGACEAE | *Asparagus asparagoides | | |
| | Laxmannia grandiflora subsp. grandiflora | | |
| | Laxmannia ramose subsp. ramose | | |
| | Lomandra caespitosa | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------------|---|----------------|-----------------|
| | Lomandra hermaphrodita | | |
| | Lomandra nigricans | | |
| | Lomandra odora | | |
| | Lomandra preissii | | |
| | Lomandra suaveolens | | |
| | Thysanotus arbuscula | | |
| | Thysanotus manglesianus/patersonii | | |
| | Thysanotus sparteus | | |
| | Thysanotus thyrsoideus | | |
| ASTERACEAE | *Arctotheca calendula | | |
| | *Hypochaeris glabra | | |
| | *Lactuca serriola | | |
| | Lagenophora huegelii | | |
| | Millotia tenuifolia | | |
| | Podotheca chrysantha | | |
| | Podotheca gnaphalioides | | |
| | Quinetia urvillei | | |
| | Siloxerus humifusus | | |
| | *Sonchus asper | | |
| | *Sonchus oleraceus | | |
| | *Ursinia anthemoides subsp. anthemoides | | |
| BIGNONIACEAE | Jacaranda mimosifolia | Blue Jacaranda | |
| CAMPANULACEAE | Lobelia anceps | | |
| | Lobelia rhytidosperma | | |
| | *Wahlenbergia capensis | | |
| | Wahlenbergia preissii | | |
| CARYOPHYLLACEAE | *Minuartia mediterranea | | |
| CASUARINACEAE | Allocasuarina fraseriana | | |
| | Allocasuarina humilis | | |
| CENTROLEPIDACEAE | Centrolepis drummondiana | | |
| | Centrolepis mutica | | |
| COLCHICACEAE | Burchardia bairdiae | | RS |
| | Burchardia congesta | | |
| CRASSULACEAE | Crassula colorata var. colorata | | |
| CYPERACEAE | Baumea articulata | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-----------------------|--|--------------|-----------------|
| | Cyathochaeta teretifolia | | P3 |
| | *Isolepis marginata | | |
| | Lepidosperma longitudinale | | |
| | Lepidosperma pubisquameum | | |
| | Lepidosperma sp. | | |
| | Mesomelaena graciliceps | | |
| | Schoenus curvifolius | | |
| | Schoenus efoliatus | | |
| DASYPOGONACEAE | Dasyopogon bromeliifolius | | |
| DILLENIACEAE | Hibbertia hypericoides | | |
| | Hibbertia sp. Gnangara (J.R. Wheeler 2329) | | |
| | Hibbertia spicata subsp. spicata | | |
| | Hibbertia stellaris | | |
| | Hibbertia subvaginata | | |
| DROSERACEAE | Drosera erythrorhiza | | |
| | Drosera macrantha | | |
| | Drosera menziesii subsp. penicillaris | | |
| ERICACEAE | Andersonia heterophylla | | |
| | Astroloma xerophyllum | | |
| | Conostephium minus | | |
| | Conostephium pendulum | | |
| | Conostephium preissii | | |
| | Croninia kingiana | | |
| | Leucopogon australis | | |
| | Leucopogon conostephioides | | |
| | Leucopogon oldfieldii | | |
| | Leucopogon squarrosus subsp. squarrosus | | |
| EUPHORBIACEAE | Beyeria viscosa | | |
| | Monotaxis occidentalis | | |
| | Stachystemon axillaris | | RS |
| FABACEAE | Acacia huegelii | | |
| | Acacia pulchella | | |
| | Acacia saligna | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|----------------------|---|-------------------------|-----------------|
| | <i>Acacia sessilis</i> | | |
| | <i>Aotus gracillima</i> | | |
| | <i>Bossiaea eriocarpa</i> | | |
| | * <i>Chamaecytisus palmensis</i> | | |
| | <i>Daviesia physodes</i> | | |
| | <i>Daviesia triflora</i> | | |
| | <i>Euchilopsis linearis</i> | | |
| | <i>Gastrolobium capitatum</i> | | |
| | <i>Gastrolobium ebracteolatum</i> | | |
| | <i>Gompholobium confertum</i> | | |
| | <i>Gompholobium tomentosum</i> | | |
| | <i>Hovea trisperma</i> | | |
| | <i>Jacksonia floribunda</i> | | |
| | <i>Jacksonia furcellata</i> | | |
| | <i>Jacksonia sternbergiana</i> | | |
| | <i>Kennedia prostrata</i> | | |
| | <i>Latrobea tenella</i> | | |
| | * <i>Lotus</i> sp. | | |
| | <i>Pultenaea reticulata</i> | | |
| | * <i>Trifolium arvense</i> var. <i>arvense</i> | | |
| FUMARIACEAE | * <i>Fumaria capreolata</i> | Whiteflower Fumitory | |
| GOODENIACEAE | <i>Dampiera linearis</i> | | |
| | <i>Lechenaultia floribunda</i> | | |
| | <i>Scaevola repens</i> | | |
| HAEMODORACEAE | <i>Anigozanthos humilis</i> | | |
| | <i>Anigozanthos manglesii</i> | | |
| | <i>Anigozanthos pulcherrimus</i> | | |
| | <i>Anigozanthos rufus</i> | | |
| | <i>Conostylis aculeata</i> subsp. <i>aculeata</i> | | |
| | <i>Conostylis aculeata</i> subsp. <i>cygnorum</i> | | RS |
| | <i>Conostylis juncea</i> | | |
| | <i>Conostylis serrulata</i> | | |
| | <i>Haemodorum paniculatum</i> | | |
| | <i>Haemodorum spicatum</i> | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------|---|---|-----------------|
| | <i>Phlebocarya ciliata</i> | | |
| HALORAGACEAE | <i>Gonocarpus cordiger</i> | | |
| HEMEROCALLIDACEAE | <i>Arnocrinum preissii</i> | | |
| | <i>Dianella revoluta</i> var. <i>divaricata</i> | | |
| | <i>Hensmania turbinata</i> | | RS |
| | <i>Tricoryne elatior</i> | | |
| | <i>Tricoryne tenella</i> | | |
| IRIDACEAE | * <i>Gladiolus caryophyllaceus</i> | | |
| | * <i>Moraea flaccida</i> | One-leaf Cape Tulip (formerly <i>Homeria flaccida</i>) | |
| | <i>Patersonia occidentalis</i> var. <i>angustifolia</i> | | |
| | <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | | |
| JUNCACEAE | <i>Juncus pallidus</i> | | |
| LAMIACEAE | <i>Hemiandra glabra</i> | | |
| | <i>Hemiandra pungens</i> | | |
| LAURACEAE | <i>Cassytha flava</i> | | |
| | <i>Cassytha glabella</i> forma <i>casuarinae</i> | | |
| | <i>Cassytha racemosa</i> forma <i>pilosa</i> | | |
| | <i>Cassytha racemosa</i> forma <i>racemosa</i> | | |
| LOGANIACEAE | <i>Phyllangium paradoxum</i> | | |
| LORANTHACEAE | <i>Nuytsia floribunda</i> | | |
| MOLLUGINACEAE | <i>Macarthuria australis</i> | | |
| MYRTACEAE | <i>Agonis flexuosa</i> | | |
| | <i>Astartea scoparia</i> | | |
| | <i>Beaufortia elegans</i> | | |
| | <i>Calothamnus lateralis</i> | | |
| | <i>Calytrix flavescens</i> | | |
| | <i>Calytrix fraseri</i> | | |
| | <i>Chamelaucium uncinatum</i> | | |
| | <i>Corymbia calophylla</i> | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-----------------------|--|--------------|-----------------|
| | Eremaea pauciflora var. pauciflora | | |
| | Eucalyptus marginata subsp. marginata | | |
| | Eucalyptus rudis | Flooded gum | |
| | Eucalyptus todtiana | | |
| | Hypocalymma angustifolium | | |
| | Kunzea glabrescens | | |
| | *Leptospermum laevigatum | | |
| | Melaleuca lateritia | | |
| | Melaleuca preissiana | | |
| | Melaleuca raphiophylla | | |
| | Melaleuca seriata | | |
| | Melaleuca viminea subsp. viminea | | |
| | Pericalymma ellipticum var. ellipticum | | |
| | Regelia inops | | |
| | Scholtzia involucrate | | |
| | Taxandria linearifolia | | |
| | Verticordia grandis | | |
| | Verticordia nitens | | RS |
| | Verticordia ovalifolia | | |
| ORCHIDACEAE | Caladenia flava subsp. flava | | |
| | Caladenia sp. | | |
| | *Disa bracteata | | |
| | Pterostylis nana complex | | |
| | Pterostylis sanguinea | | |
| | Pyrorchis nigricans | | |
| PHYLLANTHACEAE | Poranthera microphylla | | |
| PINACEAE | *Pinus pinaster | | |
| POACEAE | *Aira caryophyllea | | |
| | Amphipogon turbinatus | | |
| | Austrodanthonia occidentalis | | |
| | Austrostipa compressa | | |
| | Austrostipa flavescens | | |
| | *Avena barbata | Bearded oat | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|---------------|--------------------------------------|--------------------|-----------------|
| | *Briza maxima | | |
| | *Briza minor | | |
| | *Bromus diandrus | | |
| | *Cortaderia seloana | | |
| | *Cynodon dactylon | | |
| | *Ehrarta brevifolia | | |
| | *Ehrarta calycina | | |
| | *Ehrharta longiflora | Annual veldt grass | |
| | *Ehrarta sp. | | |
| | *Pennisetum clandestinum | | |
| | *Pentaschistis airoides | | |
| | *Vulpia bromoides | | |
| | *Vulpia myuros forma myuros | | |
| POLYGALACEAE | Comesperma calymega | | |
| PORTULACACEAE | Calandrinia liniflora | | |
| PRIMULACEAE | *Lysimachia arvensis | | |
| PROTEACEAE | Adenanthos cygnorum subsp. cygnorum | | |
| | Adenanthos obovatus | | |
| | Banksia attenuata | | |
| | Banksia hookeriana | | |
| | Banksia ilicifolia | | |
| | Banksia littoralis | | |
| | Banksia menziesii | | |
| | Conospermum acerosum subsp. acerosum | | |
| | Hakea francisiana | | |
| | Persoonia saccata | | |
| | Petrophile linearis | | |
| | Stirlingia latifolia | | |
| RESTIONACEAE | Alexgeorgea nitens | | |
| | Chordifex microdon | | |
| | Desmocladus flexuosus | | |
| | Dielsia stenostachya | | RS |
| | Hypolaena exsulca | | |
| | Meeboldina coangustata | | |
| RUTACEAE | Boronia ramosa subsp. | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------------|---|--------------|-----------------|
| | anethifolia | | |
| | Philotheca spicata | | |
| | Philotheca spicata subsp. Moore River National Park (G. & D. Woodman Op 47) | | |
| SOLANACEAE | *Solanum nigrum | | |
| STYLIDIACEAE | Levenhookia pusilla | | |
| | Levenhookia stipitata | | |
| | Stylidium brunonianum | | |
| | Stylidium crossocephalum | | RS |
| | Stylidium repens | | |
| | Stylidium rigidulum | | |
| | Stylidium saxifragoides | | |
| | Stylidium scariosum | | |
| | Stylidium schoenoides | | |
| | Stylidium utricularioides | | RS |
| XANTHORRHOEACEAE | Xanthorrhoea brunonis subsp. brunonis | | |
| | Xanthorrhoea preissii | | |
| ZAMIACEAE | Macrozamia riedlei | | |

APPENDIX FIVE

Significant flora recorded in the North Ellenbrook survey area

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|--|--------|---------|----------|-----------|--------------|---------------------------------|
| <i>Cyathochaeta teretifolia</i> | P3 | 401511 | 6491046 | sedgeland | NEGB54 | NER9, Property 64 |
| <i>Cyathochaeta teretifolia</i> | P3 | 401310 | 6489860 | 2 | | Property 67 |
| <i>Cyathochaeta teretifolia</i> | P3 | 401458 | 6491141 | 1% cover | | NEQ6, Property 64 |
| <i>Cyathochaeta teretifolia</i> | P3 | 403212 | 6488494 | 15% cover | | NEQ16, Property 11 |
| <i>Cyathochaeta teretifolia</i> | P3 | 403406 | 6488163 | 25% cover | | NEQ20, Property 11 |
| <i>Burchardia bairdiae</i> | RS | 401214 | 6489725 | | NER18-1 | NER18, Property 14 |
| <i>Conostylis aculeata subsp. cygnorum</i> | RS | 402775 | 6488895 | | NEQ9-X2 | Just outside NEQ9, Property 20. |
| <i>Dielsia stenostachya</i> | RS | 401180 | 6491247 | | NER3-1,3 | NER3 |
| <i>Dielsia stenostachya</i> | RS | 401449 | 6491278 | | NER5-2 | |
| <i>Dielsia stenostachya</i> | RS | 401489 | 6491049 | | NER9-4 | |
| <i>Dielsia stenostachya</i> | RS | 401589 | 6491030 | | | NER10 |
| <i>Dielsia stenostachya</i> | RS | 401683 | 6490905 | | | NER11 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|---------------------------------|--------|---------|----------|--------|--------------|-------------|
| <i>Dielsia stenostachya</i> | RS | 402499 | 6489415 | | NER14-2 | |
| <i>Dielsia stenostachya</i> | RS | 400938 | 6489145 | | NER16-1 | |
| <i>Dielsia stenostachya</i> | RS | 401214 | 6489725 | | NER18 | |
| <i>Dielsia stenostachya</i> | RS | 401458 | 6491140 | | | NEQ6 |
| <i>Dielsia stenostachya</i> | RS | 401218 | 6489707 | | | NEQ13 |
| <i>Dielsia stenostachya</i> | RS | 403406 | 6488172 | | | NEQ20 |
| <i>Dielsia stenostachya</i> | RS | 403108 | 6488431 | | | NEQ22 |
| <i>Hensmania turbinata</i> | RS | | | | NEGB3 | |
| <i>Hensmania turbinata</i> | RS | 402754 | 6488112 | 2 | NEGB91 | Property 11 |
| <i>Hensmania turbinata</i> | RS | 401570 | 6489444 | | NEQ11-12 | Property 13 |
| <i>Hensmania turbinata</i> | RS | 400989 | 6489822 | | NEQ12-21 | Property 13 |
| <i>Stachystemon axillaris</i> | RS | 402471 | 6489182 | | NEQ9-10 | Property 64 |
| <i>Stylidium crossocephalum</i> | RS | 401058 | 6490614 | | NEQ3-X2 | Property 66 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|----------------------------------|--------|---------|----------|--------|--------------|-------------------|
| <i>Stylidium crossocephalum</i> | RS | 402775 | 6488895 | | NER1-1 | Property 66 |
| <i>Stylidium utricularioides</i> | RS | 401465 | 6491123 | | NEGB32 | Property 64 |
| <i>Stylidium rigidulum</i> | RS | 401336 | 6491355 | | NEGB37 | Property 64 |
| <i>Stylidium rigidulum</i> | RS | 402775 | 6488895 | | NEQ1-20 | NEQ1; Property 21 |
| <i>Verticordia nitens</i> | RS | 401017 | 6491020 | | | NEQ5 |
| <i>Verticordia nitens</i> | RS | 401446 | 6491443 | | | NEQ7 |
| <i>Verticordia nitens</i> | RS | 401058 | 6489600 | | NEQ10-1 | NEQ10 |
| <i>Verticordia nitens</i> | RS | 401570 | 6489444 | | NEQ11-3 | NEQ11 |
| <i>Verticordia nitens</i> | RS | 402949 | 6488620 | | | NEQ14 |
| <i>Verticordia nitens</i> | RS | 403002 | 6488755 | | | NEQ15 |
| <i>Verticordia nitens</i> | RS | 402850 | 6487826 | | | NEQ17 |
| <i>Verticordia nitens</i> | RS | 401159 | 6490461 | | NER1-5 | NER1 |
| <i>Verticordia nitens</i> | RS | 400995 | 6490831 | | | NER4 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|---------------------------|--------|---------|----------|--------|--------------|----------|
| <i>Verticordia nitens</i> | RS | 401218 | 6489707 | | | NER13 |
| <i>Verticordia nitens</i> | RS | 403406 | 6488172 | | | NER20 |

APPENDIX SIX

Quadrat descriptions and species lists for the North Ellenbrook survey area

| NORTH ELLENBROOK: NEQ1 | | | | | |
|------------------------|--|-----------|------------|--------------|-------------------|
| Described by | BRM | Date | 8/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property #21 | | | | |
| MGA Zone | 50 | 332566 mE | 6617450 mN | 115.973686 E | -31.731136 S |
| Habitat | Gentle, north-facing upper slope of low dune. | | | | |
| Soil | Pale grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia menziesii, Banksia attenuata, Eucalyptus tottiana low woodland over Eremaea pauciflora var. pauciflora low open shrubland over Desmodium flexuosus, Lyginia barbata open sedgld. | | | | |
| Veg Condition | (BF) Very Good (low weed cover but some Banksia deaths and prob. Past grazing in area – open areas, apparent disturbance) | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | Pegged: 4x forpers with caps | | | | |

| SPECIES LIST: NEQ1 | | | | |
|--------------------------|-------------|--------|----------------------|-----------------------------------|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 30cm | NEQ1-19 | Acacia huegelii |
| Acacia pulchella | 1% | 170cm | NEQ1-14 | Acacia pulchella |
| Anigozanthos humilis | + | 15cm | Anigozanthos humilis | |
| Arctotheca calendula | + | 15cm | Capeweed | |
| Astroloma xerophyllum | + | 70cm | NEQ1-16 | Conostephium sht stinpy(?) flr |
| Austrostipa compressa | + | 70cm | NEQ1-3 | Austrostipa |
| Banksia attenuata | 15% | 700cm | | Bank atten |
| Banksia menziesii | 25% | 650cm | | Bank menz |
| Beaufortia elegans | + | 130cm | NEQ1-11 | ?Melaleuca |
| Bossiaea eriocarpa | + | 30cm | | Bossiaea eriocarpa |
| Briza maxima | + | 35cm | | Briza max |
| Calytrix flavescens | + | 20cm | (=NEQ5-) | Calytrix flav |
| Carpobrotus edulis | + | 4cm | | Carpobrotus |
| Centrolepis drummondiana | + | 4cm | NEQ1-10 | Centrolepis |
| Chordifex microcodon | + | 25cm | NEQ1-17 | Rush |
| Conostephium | + | 10cm | NEQ1-21 | ?Conostephium |

| | | | | |
|---|------|-------|------------|---------------------------------|
| pendulum | | | | |
| Conostylis juncea | + | 15cm | NEQ1-22 | Conostylis hairy lf |
| Crassula colorata var. colorata | + | 4cm | (=NEQ7-) | Crassula col |
| Dasyopogon bromeliifolius | 2-3% | 60cm | | Dasyopogon brom |
| Desmocladus flexuosus | 8% | 10cm | NEQ1-2 | Desmocladus flex |
| Drosera menziesii subsp. penicillaris | + | 40cm | NEQ1-15 | Drosera climber |
| Ehrharta calycina | + | 60cm | | Ehr calycina |
| Eremaea pauciflora var. pauciflora | 4-5% | 70cm | (=NEQ7-) | Eremaea pauc |
| Eucalyptus todtiana | 5% | 600cm | | Euc tod (not rooted in quadrat) |
| Gastrolobium capitatum | + | 40cm | | Gastrolobium cap |
| Gladiolus caryophyllaceus | + | 12cm | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 6cm | | Gom tom (juv) |
| Gonocarpus cordiger | + | 20cm | NEQ1-13,18 | Codonocarpus |
| Hibbertia hypericoides | + | 40cm | | Hibbertia hyp |
| Hibbertia subvaginata | + | 30cm | | Hib subvag |
| Hypochaeris glabra | + | 2cm | | Hypochaeris |
| Isolepis marginata | + | 3cm | (=NEQ7-) | Isolepis marg |
| Leucopogon conostephioides | + | 4cm | NEQ1-8,9 | Epacrid shiny long lf |
| Lomandra caespitosa | + | 25cm | NEQ1-4 | Lomandra caespitosa |
| Lomandra hermaphrodita | + | 30cm | NEQ1-7 | Lomandra herm (6) |
| Lyginia barbata | 2-3% | 40cm | | Lyginia (clumped) |
| Patersonia occidentalis var. occidentalis | 1-2% | 45cm | | Patersonia occid |
| Pentaschistis airoides | + | 10cm | NEQ1-5 | Prostrate grass |
| Petrophile linearis | + | 10cm | | Petroph lin |
| Podotheca gnaphalioides | + | 30cm | (=) | Podotheca tall tgt heads |
| Schoenus curvifolius | + | 30cm | (=NEQ3-) | Schoenus curvifolius |
| Scholtzia involucreta | + | 20cm | NEQ1-6 | ?Scholtzia involucre |
| Stirlingia latifolia | + | 45cm | | Stirlingia lat |
| Stylidium repens | + | 6cm | (NEQ7-) | Stylid repens |

| | | | | |
|---|---|------|---------|------------------------------|
| Stylidium rigidulum | + | 12cm | NEQ1-20 | Stylid long frts, linear lvs |
| Thysanotus arbuscula | + | 35cm | NEQ1-1 | Tricoryne elat |
| Trachymene pilosa | + | 15cm | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 30cm | | Ursinnia art |
| Wahlenbergia capensis | + | 15cm | | Wahlenbergia capensis |
| Wahlenbergia preissii | + | 20cm | NEQ1-12 | Wahlenbergia ?preissii |

| NORTH ELLENBROOK: NEQ2 | | | | | |
|------------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 400868 mE | 6490854 mN | 115.953757 E | -31.71330 S |
| Habitat | Flats west of regelia thicket. | | | | |
| Soil | Dark grey sand - moist below surface. | | | | |
| Rock Type | na | | | | |
| Vegetation | Regelia inops open srub over Hypocalymma angustifolium low shrubland over Hypolaena exsulca scatted sedges and Dasypogon bromeliifolius open herbland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | About 4 years since fire. | | | | |
| Notes | 1.7m - 50% 1m - 40% To the west is Mel preissii and Xanth preissii over Regelia (very tall X preissii to 6m worth preserving)!! Pegged: Y Search intensity: really dedicated. | | | | |

| SPECIES LIST: | | | | |
|-------------------------------------|---------------|--------|-----------|---------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos cygnorum subsp. cygnorum | 1 | 200cm | | Adenanthos cygnorum |
| Austrostipa compressa | + | 20cm | (=NEQ4-4) | Austrostipa flav |
| Chordifex microcodon | 1 | 20cm | NEQ2-4 | Chaetanthus |

| | | | | |
|--|----|-------|------------|--------------------------------|
| <i>Crassula colorata</i> var. <i>colorata</i> | + | 10cm | (=NEQ4-2) | <i>Crassula colorata</i> |
| <i>Dasypogon bromeliifolius</i> | 15 | 40cm | | <i>Dasypogon brom</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 35cm | | <i>Gladiolus caryophylla</i> |
| <i>Hypocalymma angustifolium</i> | 15 | 100cm | (=NEQ6-3) | <i>Hypocalymma angust</i> |
| <i>Hypolaena exsulca</i> | 1 | 30cm | | <i>Hypolaena exsulca</i> |
| <i>Lechenaultia floribunda</i> | + | 30cm | NEQ2-3 | <i>Lechenaultia floribunda</i> |
| <i>Levenhookia stipitata</i> | + | 5cm | NEQ2-5 | <i>Levenhookia chan</i> |
| <i>Pentaschistis airoides</i> | + | 15cm | (=NEQ4-16) | <i>Pentachistis</i> |
| <i>Phyllangium paradoxum</i> | + | 5cm | (=NEQ4-14) | <i>Phyllangium</i> |
| <i>Podotheca gnaphalioides</i> | + | 20cm | (=NEQ4-3) | <i>Podotheca gnaph</i> |
| <i>Pultenaea reticulata</i> | 1 | 60cm | NEQ2-2 | <i>Pultenea</i> |
| <i>Regelia inops</i> | 50 | 170cm | NEQ2-1 | <i>Regelia</i> |
| <i>Schoenus efoliatus</i> | + | 30cm | (=NEQ6-8) | <i>Schoenus rigens</i> |
| <i>Stylidium repens</i> | + | 10cm | (=NEQ4-8) | <i>Stylidium creeping</i> |
| <i>Trachymene pilosa</i> | + | 15cm | | <i>Trachmene pilosa</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30cm | | <i>Ursinniea anthemoides</i> |
| <i>Wahlenbergia capensis</i> | + | 20cm | | <i>Wahlenberga capensis</i> |
| <i>Xanthorrhoea preissii</i> | 1 | 150cm | | <i>Xanthorrhoea presissii</i> |

| NORTH ELLENBROOK: NEQ3 | | | | | |
|------------------------|--|-----------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401058 mE | 6490614 mN | 115.955738 E | -31.715483 S |
| Habitat | Gentle, north-facing upper slope of low dune. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana low open woodland (regrowth after fire?) over Adenanthos cygnorum subsp. Cygnorum, Scholtzia involucrata open scrub over Astroloma xerophyllum, Leucopogon conostephioides low shrubland over Alexgeorgea nitens, Lyginia barbata very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent (probably hot fire in area and other general activity). | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | | | | | |

| SPECIES LIST: NEQ3 | | | | |
|-------------------------------------|---------------|-----------|------------|-------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos cygnorum subsp. cygnorum | 20 | 350 | | Aden cyg |
| Alexgeorgea nitens | 3 | 12 | (=) | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | (=) | Amphipogon turb |
| Astroloma xerophyllum | 8 | 50 | NEQ3-10 | Conostephium sht stumpy |
| Austrostipa compressa | + | 25 | NEQ3-12(=N | Vulpia |
| Banksia attenuata | 4 | (250) 600 | | Bank atten |
| Banksia menziesii | + | 300 | | Banksia menz (overhang) |
| Boronia ramosa subsp. anethifolia | + | 20 | (=) | Boronia 3 or 5 palmate |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |

| | | | | |
|--|-----|-------|-----------|---|
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 25 | NEQ3-4 | Burch congest |
| Caladenia flava subsp. flava | + | 20 | NEQ3-8 | Caladenia orchid |
| Caladenia sp. | + | 15 | NEQ3-7 | Orchid narrow lf |
| Calytrix flavescens | + | 20 | (=NEQ5-) | Calytrix flav |
| Chordifex microcodon | + | 60 | NEQ3-14 | ?Meeboldina |
| Conostephium pendulum | + | 50 | NEQ3-5 | Conosteph ?pendul |
| Conostylis juncea | + | 25 | NEQ3-18 | Conostylis sht flr terete |
| Crassula colorata var. colorata | + | 3 | (=) | Crassula |
| Dampiera linearis | + | 20 | | Dampiera linearis |
| Dasypogon bromeliifolius | + | 30 | | Dasypogon brom |
| Desmocladus flexuosus | + | 10 | NEQ3-15 | Desmocladus |
| Drosera erythrorhiza | + | 2 | | Drosera erythrrhy |
| Eremaea pauciflora var. pauciflora | + | 30 | NEQ3-17 | Small shrub |
| Eucalyptus todtiana | 20 | 700cm | | Euc tod (scattered in broader area) |
| Gladiolus caryophyllaceus | + | 60 | | Gladiolus cary |
| Gompholobium tomentosum | + | 20 | | Gom tom |
| Hibbertia subvaginata | + | 20 | | Hibbertia subvag |
| Hypolaena exsulca | + | 50 | NEQ3-11 | Rush |
| Jacksonia furcellata | + | 160 | | Jacksonia furc |
| Laxmannia grandiflora subsp. grandiflora | + | 15 | NEQ3-3 | Laxmania |
| Leucopogon conostephioides | 4 | 40 | NEQ3-2 | Epacrid |
| Lomandra caespitosa | + | 30 | NEQ3-6,16 | Lomandra linear flat |
| Lomandra hermaphrodita | + | 20 | NEQ3-13 | Lom hermaph (10) |
| Lyginia barbata | 1 | 30 | | Lyginia |
| Macrozamia riedlei | + | 90 | | Zamia |
| Patersonia occidentalis var. occidentalis | 2-3 | 40 | | Patersonia occid |
| Pentaschistis airoides | + | 12 | (=NEQ5-) | Pentaschistis |
| Petrophile linearis | + | 35 | | Petroph linearis |
| Schoenus curvifolius | + | 40 | NEQ3-9 | Schoenus curv |

| | | | | |
|---|----|-----|-----------|---------------------|
| Scholtzia involucreta | 14 | 210 | NEQ3-1 | ?Scholtzia invol |
| Stylidium repens | + | 6 | (=NEQ7-) | Stylid repens |
| Trachymene pilosa | + | 10 | | Trachmene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 30 | | Ursinnia art |

| NORTH ELLENBROOK: NEQ4 | | | | | |
|------------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 400995 mE | 6490831 mN | 115.955095 E | -31.713520 S |
| Habitat | Gently sloping ground at margin of wet heath. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia ilicifolia low woodland over Xanthorrhoea preissii shrubland over Desmocladius flexuosus, Lyginia barbata open sedgeland with Dasypogon bromeliifolius, Trachymene pilosa herbland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | Greater than 5 years since fire. | | | | |
| Notes | Pegged: Y 4.5m - 30%, 1.8m - 15%, 0.6m - 50% | | | | |

| SPECIES LIST: NEQ4 | | | | |
|--|------------------|--------|----------|---------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Alexgeorgea nitens | 1 | 15 | NEQ4-10 | Alexgeorgea grey |
| Austrostipa compressa | 2 | 60 | NEQ4-4 | Austrostipa flav |
| Banksia ilicifolia | 30 | 450 | | Banksia ilicifolia |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Carpobrotus edulis | + | 20 | | Carpobrotus edulis |
| Centrolepis mutica | + | 4 | NEQ4-15 | Centrolepis awnless |
| Conostylis aculeata subsp. aculeata | + | 30 | NEQ4-7 | Conostylis broad |
| Crassula colorata var. | + | 10 | NEQ4-2 | Crassula colorata |

| | | | | |
|--|----|-----|------------|------------------------|
| colorata | | | | |
| Dasypogon bromeliifolius | 15 | 30 | | Dasypogon brom |
| Desmocladius flexuosus | 5 | 20 | NEQ4-17 | Desmocladius flex |
| Ehrharta calycina | 1 | 40 | | Ehrharta calycina |
| Gladiolus caryophyllaceus | + | 40 | | Gladiolus |
| caryophyllaceus | | | | |
| Gompholobium tomentosum | + | 20 | | Gompholobium |
| tomentosum | | | | |
| Haemodorum spicatum | + | 80 | NEQ4-6 | Haemodorum spicata |
| Hypochaeris glabra | 1 | 25 | | Hypochaeris glabra |
| Isolepis marginata | + | 5 | NEQ4-12 | Isolepis marg |
| Levenhookia stipitata | + | 4 | NEQ4-13 | Levenhookia dubius |
| Lomandra hermaphrodita | + | 20 | | Lomandra hermaphrodita |
| Lyginia barbata | 4 | 25 | NEQ4-9 | Lyginia short |
| Lysimachia arvensis | + | 10 | | Anayallis arvensis |
| Melaleuca seriata | + | 120 | NEQ4-11 | Melaleuca serata |
| Pentaschistis airoides | + | 15 | NEQ4-16,18 | Pentaschistis |
| Petrophile linearis | + | 30 | | Petrophile linearis |
| Phyllangium paradoxum | + | 3 | NEQ4-14 | Phyllangium |
| Podotheca gnaphalioides | + | 20 | NEQ4-3 | Podotheca gnaph |
| Stylidium repens | + | 15 | NEQ4-8 | Stylidium creeping |
| Thysanotus thyrsoideus | + | 60 | NEQ4-5 | Thysanotus thyrsoideus |
| Trachymene pilosa | 25 | 15 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | 1 | 30 | | Ursinnia anthemoides |
| Wahlenbergia capensis | + | 35 | | Wahlenbergia capensis |
| Wahlenbergia preissii | + | 15 | NEQ4-1 | Wahlenbergia presissii |
| Xanthorrhoea preissii | 15 | 180 | | Xanthor preissii |

NORTH ELLENBROOK: NEQ5

| | | | | | |
|---------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401017 mE | 6491020 mN | 115.955346 E | -31.711817 S |
| Habitat | Gentle, south-facing lower to mid slope of low dune. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |

| | |
|----------------------|--|
| Vegetation | Banksia attenuata, Banksia menziesii, (Eucalyptus todtiana) low woodland over Adenanthos cygnorum subsp. cygnorum scattered tall shrubs over Hibbertia hypericoides, Eremaea pauciflora, Astroloma xerophyllum, Leucopogon conostephioides low shrubland over Lyginea barbata, Alexgeorgea nitens, Desmocladius flexuosus very open sedgeland. |
| Veg Condition | (BF) Very Good (disturbance upslope (north site) and east site. 6 dead Banksia's present.) |
| Fire Age | Greater than 7 years since fire. |
| Notes | |

SPECIES LIST: NEQ5

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------------------------|---------------|----------|-----------|---------------------------------|
| Acacia pulchella | + | (10) 170 | | Acacia pulchella |
| Adenanthos cygnorum subsp. cygnorum | | 220 | | Adenanthos cyg |
| Alexgeorgea nitens | | 12 | (=) | Alexgeorgea |
| Arnocrinum preissii | + | 35 | NEQ5-5 | Agrostocr |
| Astroloma xerophyllum | | 45 | NEQ5-11 | Conostephium sht stumpy |
| Austrostipa compressa | + | 70 | NEQ5-1 | Austrostipa |
| Banksia attenuata | | 450 | | B atten |
| Banksia menziesii | | 600 | | B menz |
| Boronia ramosa subsp. anethifolia | + | 30 | NEQ5-4 | Boronia 5 palmate |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Briza maxima | + | 25 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congest |
| Calytrix flavescens | + | 25 | NEQ5-6,7 | Calytrix flavenum |
| Calytrix fraseri | + | 45 | (=NEQ7-) | ?Calytrix fraseri |
| Carpobrotus edulis | + | 5 | (=) | Carpobrotus (prob ylw flowered) |
| Conostylis aculeata subsp. aculeata | + | 35 | NEQ5-17 | Conostylis acul |
| Conostylis juncea | + | 20 | (=NEQ7-) | Conostylis sht flr |
| Crassula colorata var. colorata | + | 3 | (=NEQ7-) | Crassula |
| Dampiera linearis | + | 30 | | Dampiera linearis |
| Desmocladius flexuosus | | 12 | NEQ5-8 | Desmocladius flex |

| | | | | |
|--|---|-----|-----------|------------------------------|
| <i>Drosera erythrorhiza</i> | + | 1 | | Dros erythrorhiza |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 35 | NEQ5-12 | <i>Drosera</i> climber |
| <i>Ehrharta calycina</i> | + | 40 | | Ehr calyc |
| <i>Ehrharta</i> sp. | + | 15 | NEQ5-16 | Amphipogons |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | | 45 | (=NEQ7-) | <i>Eremaea</i> pauc |
| <i>Eucalyptus todtiana</i> | | 600 | | Euc tod |
| <i>Gladiolus caryophyllaceus</i> | + | 20 | | <i>Gladyolis</i> caryoph |
| <i>Gompholobium tomentosum</i> | + | 30 | | Gom tom |
| <i>Hibbertia hypericoides</i> | | 40 | | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 25 | | Hib subvag |
| <i>Hypochaeris glabra</i> | + | 10 | | Hyp glab |
| <i>Isolepis marginata</i> | + | 3 | NEQ5-2 | <i>Isolepis</i> |
| <i>Lagenophora huegelii</i> | + | 6 | | <i>Lagenophora</i> |
| <i>Lepidosperma pubisquameum</i> | + | 40 | NEQ5-18 | <i>Lepidosperma</i> |
| <i>Leucopogon conostephioides</i> | | 40 | NEQ5-9 | Epacrid sht triangle lf |
| <i>Lomandra hermaphrodita</i> | + | 20 | NEQ5-13 | <i>Lomandra</i> hermaph |
| <i>Lomandra preissii</i> | + | 40 | NEQ5-15 | <i>Lomandra</i> preissii |
| <i>Lyginia barbata</i> | | 40 | | <i>Lyginia</i> |
| <i>Patersonia occidentalis</i> | + | 35 | | <i>Patersonia</i> occid |
| <i>Pentaschistis airoides</i> | + | 15 | NEQ5-3 | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petrophile</i> linearis |
| <i>Podotheca chrysantha</i> | + | 20 | NEQ5-18a | <i>Podotheca</i> |
| <i>Podotheca gnaphalioides</i> | + | 20 | NEQ5-14 | <i>Podotheca</i> gnaph |
| <i>Pyrorchis nigricans</i> | + | 2 | | <i>Pyrorchis</i> nigricans |
| <i>Schoenus curvifolius</i> | + | 20 | NEQ5-10 | <i>Schoenus</i> ?curv |
| <i>Scholtzia involucrata</i> | | 80 | (=) | <i>Scholtzia</i> invol |
| <i>Sonchus oleraceus</i> | + | 12 | | <i>Sonchus</i> olerac |
| <i>Stirlingia latifolia</i> | + | 30 | | <i>Stirlingia</i> lat |
| <i>Trachymene pilosa</i> | + | 10 | | <i>Trachymene</i> pilosa |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinia</i> |
| <i>Verticordia nitens</i> | + | 170 | (=) | Vert ?nitens |
| <i>Wahlenbergia capensis</i> | + | 35 | | <i>Wahlenbergia</i> capensis |

NORTH ELLENBROOK: NEQ6

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401458 mE | 6491140 mN | 115.960012 E | -31.710772 S |
| Habitat | Seasonally wet flats. | | | | |
| Soil | Dark brown sandy peat (slightly moist). | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana scattered low trees over Astartea scoparia closed scrub over Dielsia stenostachya, Schoenus efoliatus closed sedgeland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | Greater than 5 years since fire. | | | | |
| Notes | Pegged: Y 3m - 3%, 1.7m - 90%, 0.5m - 95% | | | | |

SPECIES LIST: NEQ6

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|---|---------------|--------|----------|--------------------------|
| Aotus gracillima | 4 | 160 | NEQ6-2 | Sphaerolobium |
| Astartea scoparia | 85 | 170 | NEQ6-1 | Astarteal |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Cassytha racemosa forma pilosa | + | C?? | NEQ6-10 | Cassytha racemosa |
| Cyathochaeta teretifolia | 1 | 60 | NEQ6-9 | Cyathochaeta teretifolia |
| Dielsia stenostachya | 85 | 30 | NEQ6-4 | |
| Hypocalymma angustifolium | 1 | 50 | NEQ6-3 | Hypocalymma angust |
| Leucopogon australis | 1 | 150 | NEQ6-6 | Leucopogon australis |
| Melaleuca preissiana | 3 | 300 | | Melaleuca preissiana |
| Patersonia occidentalis var. angustifolia | 1 | 45 | NEQ6-7 | Patersonia thin swamp |
| Schoenus efoliatus | 9 | 30 | NEQ6-8 | Schoenus rigens |
| Taxandria linearifolia | 1 | 50 | NEQ6-5 | Taxandria linear |
| Xanthorrhoea preissii | 1 | 100 | | Xanth preissii |

NORTH ELLENBROOK: NEQ7

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401446 mE | 6491443 mN | 115.959916 E | -31.708038 S |
| Habitat | Very gentle, south-facing lower slope of low rise. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Kunzea glab scattered tall shrubs over Xanthorrhoea preissii open shrubland to shrubland over Melaleuca seriata, Eremaea pauciflora var. pauciflora low shrubland over Alexgeorgea nitens, Hypolaena exsula, Lyginia barbata very open sedgeland. | | | | |
| Veg Condition | BF) Excellent (considerable surrounding disturbance (clearing of tracks/fire brk, farm plantgs; low weed cover). | | | | |
| Fire Age | More than 7 years since fire. | | | | |
| Notes | Pegged: 4 x f dps with caps Only a couple of Jarrah's seen in this area. | | | | |

| SPECIES LIST: NEQ7 | | | | |
|---------------------------|---------------|---------|------------|-------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 20 | NEQ7-18 | Acacia ?huegelii |
| Acacia pulchella | + | 25 | | Acacia pulchella |
| Adenanthos obovatus | + | 60 | (=NEGB35) | Adenanthos obovata |
| Alexgeorgea nitens | + | | (=) | ?Alexgeorgea |
| Astroloma xerophyllum | 1-2 | | NEQ7-7 | Conostephium sht stumpy |
| Banksia attenuata | 30-35 | 500-600 | | B attenuata |
| Banksia ilicifolia | 6 | 700 | | B ilicifolia |
| Banksia menziesii | + | (30) | | Banksia menz |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | NEQ7-24 | ?Calytrix flav |
| Calytrix fraseri | + | 35 | NEQ7-8 | Cayltrix ?fraseri |
| Conostephium pendulum | + | 5 | NQ7-4,5,32 | Astroloma |
| Conostylis juncea | + | 20 | (=NEGB6) | Conostylis sht flr |
| Dampiera linearis | + | 20 | | Dampiera linearis |
| Dasyopogon bromeliifolius | 2 | 20 | | Dasyopogon brom |

| | | | | |
|--|---|-----|------------|---|
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythrorhiza</i> (dessicated) |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 35 | NEQ7-14 | <i>Drosera</i> climber pk flr |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 5 | 50 | NEQ7-2 | <i>Eremaea</i> pauc |
| <i>Gastrolobium capitatum</i> | + | 20 | NEQ7-26 | <i>Nemcia</i> capitata |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus</i> cary |
| <i>Gompholobium tomentosum</i> | + | 10 | , =NEGB34 | Gom tom |
| <i>Gonocarpus cordiger</i> | + | 20 | NEQ7-29 | <i>Codonocarpus</i> |
| <i>Hibbertia spicata</i> subsp. <i>spicata</i> | + | 15 | NEQ7-13 | <i>Hibbertia</i> sht linear lf |
| <i>Hibbertia subvaginata</i> | + | 20 | NEQ7-17 | <i>Hibbertia</i> subvag |
| <i>Hovea trisperma</i> | + | 15 | NEQ7-21 | ? <i>Hovea</i> trisperma |
| <i>Hypochaeris glabra</i> | + | 2 | | <i>Hypochaeris</i> glabra |
| <i>Hypolaena exsulca</i> | 1 | 35 | | <i>Hypolaena</i> exsula |
| <i>Isolepis marginata</i> | + | 4 | NEQ7-27 | <i>Isolepis</i> |
| <i>Jacksonia floribunda</i> | + | 50 | NEQ7-19 | <i>Jacksonia</i> furc |
| <i>Kunzea glabrescens</i> | 4 | 300 | | <i>Kunzea</i> glab |
| <i>Lepidosperma</i> <i>pubisquameum</i> | + | 40 | NEQ7-28 | <i>Lepidospera</i> narrow flat |
| <i>Lepidosperma</i> sp. | | | NEQ7-28b | |
| <i>Leucopogon conostephioides</i> | + | 30 | NEQ7-1 | ? <i>Epacrid</i> |
| <i>Lomandra hermaphrodita</i> | + | 30 | NEQ7-6,9 | <i>Lomandra</i> herm x1 |
| <i>Lomandra nigricans</i> | + | 30 | NEQ7-22 | <i>Lomandra</i> ? <i>nigricans</i> |
| <i>Lomandra preissii</i> | + | 35 | NEQ7-12,36 | <i>Lomandra</i> preissii |
| <i>Lyginia barbata</i> | + | 45 | NEQ7-15 | <i>Lyginia</i> |
| <i>Melaleuca seriata</i> | 9 | 80 | NEQ7-3 | <i>Melaleuca</i> ? <i>sereata</i> pk |
| <i>Nuytsia floribunda</i> | + | 120 | | <i>Nuytsia</i> flor |
| orchid sp. | + | 15 | NEQ7-10 | Orchid |
| <i>Patersonia occidentalis</i> | 1 | 45 | | <i>Patersonia</i> occid |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petroph</i> linearis |
| <i>Philothea spicata</i> | + | | | <i>Philothea</i> spicata |
| <i>Phlebocarya ciliata</i> | 3 | 40 | | <i>Phlebocarya</i> ciliata flat leaf |
| <i>Phyllangium paradoxum</i> | + | 4 | NEQ7-31 | <i>Phyllangium</i> |
| <i>Pterostylis nana</i> complex | + | 2 | NEQ7-33 | <i>Pterostylis</i> ? <i>nana</i> |
| <i>Pterostylis sanguinea</i> | + | 30 | NEQ7-23 | <i>Pterostylis</i> |
| <i>Schoenus curvifolius</i> | + | 25 | NEQ7-35 | <i>Schoenus</i> ? <i>curvifolius</i> |
| <i>Stylidium repens</i> | + | 6 | NEQ7-16 | <i>Stylidium</i> ? <i>repens</i> |
| <i>Stylidium saxifragoides</i> | + | 15 | NEQ7-25 | <i>Stylid</i> cil rosette |

| | | | | |
|--|----|-----|------------|--------------------------------|
| Thysanotus arbuscula | + | 45 | NEQ7-34,20 | Thysanotus erect ?sparteus |
| Thysanotus manglesianus/patersonii | + | 45 | | Thysanotus mang/pat(not flrng) |
| Trachymene pilosa | + | 12 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 15 | | Ursinnia art |
| Verticordia nitens | + | 170 | (=NEGB) | Verticordia ?nitens |
| Wahlenbergia preissii | + | 30 | NEQ7-30 | Wahlenbergia tall |
| Xanthorrhoea preissii | 16 | 170 | | Xanth preis |
| Xanthosia huegelii | + | 15 | NEQ7-11 | Xanthosia palmate |

NORTH ELLENBROOK: NEQ8

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401458 mE | 6491140 mN | 115.960012 E | -31.710772 S |
| Habitat | Seasonally wet flats. | | | | |
| Soil | Dark brown sandy peat (slightly moist). | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana scattered low trees over Astartea scoparia closed scrub over Dielsia stenostachya, Schoenus efoliatus closed sedgeland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | Greater than 5 years since fire. | | | | |
| Notes | Pegged: Y 3m - 3%, 1.7m - 90%, 0.5m - 95% | | | | |

SPECIES LIST: NEQ8

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------------------------|---------------|--------|------------|------------------------|
| Adenanthos cygnorum subsp. cygnorum | 2 | 250 | | Adenanthos cygnorum |
| Alexgeorgea nitens | 2 | 15 | (=NEQ4-10) | Alexgeorgea grey |
| Andersonia heterophylla | 3 | 35 | NEQ8-8 | Andersonia small white |
| Arnocrinum preissii | + | 45 | NEQ8-2 | Arnocrinum |
| Astroloma xerophyllum | 4 | 90 | NEQ8-7 | Conostephium sharp |
| Austrostipa compressa | + | 30 | | Austrostipa flav |

| | | | | |
|---|----|-----|-----------|------------------------|
| Banksia attenuata | 15 | 500 | | Banksia attenuata |
| Banksia menziesii | 1 | 250 | | Banksia menziesii |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | NEQ8-3 | Calytrix flav |
| Cassytha flava | + | 6 | NEQ8-4 | Cassytha heads |
| Conostephium minus | 1 | 50 | NEQ8-6 | Conostephium blunt |
| Crassula colorata var. colorata | + | 5 | (=NEQ4-2) | Crassula colorata |
| Ehrharta brevifolia | + | 30 | NEQ8-12 | Ehrorta small |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryophyllum |
| Hibbertia subvaginata | 2 | 20 | NEQ8-1 | Hibbertia subvaginata |
| Isolepis marginata | + | 4 | NEQ8-9 | Bulbostylis |
| Leucopogon conostephioides | + | 45 | NEQ8-10 | Leucopogon short sharp |
| Lomandra hermaphrodita | + | 25 | | Lomandra hermaphrodita |
| Lyginia barbata | 5 | 35 | (=NEQ4-9) | Lyginiea short |
| Patersonia occidentalis var. occidentalis | + | 40 | NEQ8-11 | Patersonia occ |
| Pentastichis airoides | + | 20 | | Pentastichis |
| Petrophile linearis | + | 30 | | Petrophile linearis |
| Phyllangium paradoxum | + | 5 | | Phyllangium |
| Scholtzia involucreta | 20 | 20 | NEQ8-5 | Baeckea tall |
| Stylidium repens | + | 10 | | Stylidium creeping |
| Ursinia anthemoides subsp. anthemoides | 1 | 35 | | Ursinnia anthenoides |

NORTH ELLENBROOK: NEQ9

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 8/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 402471 mE | 6489182 mN | 115.970506 E | -31.728522 S |
| Habitat | Crest of dune. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Eucalyptus todtiana, Banksia menziesii, Banksia attenuata low woodland over Jacksonia floribunda scattered tall shrubs over Eremaea pauciflora var. pauciflora low shrubland over Desmodcladus flexuosus, Lyginia barbata open sedgld. | | | | |
| Veg Condition | (BF) Very Good (probably grazed in part; old fenceline near quadrat; stumps of old cut trees; low weed cover). | | | | |

| | |
|-----------------|-------------------------------|
| Fire Age | More than 7 years since fire. |
| Notes | Pegged: 4 x f dps and caps |

| SPECIES LIST: NEQ9 | | | | |
|------------------------------------|---------------|---------|------------|--------------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Alexgeorgea nitens | + | 12 | NEQ9-2 | Alexgeorgea cpr base |
| Anigozanthos manglesii | + | 20 | NEQ9-14 | Anigozanthos mang (no flrs) |
| Arnocrinum preissii | + | 60 | (=NEQ1-X2) | Agrostocrinium |
| Astroloma xerophyllum | | 45 | (=NEQ1-16) | Conostephium sht stumpy flr |
| Austrostipa compressa | + | 50 | (=NEQ1-3) | Austrostipa |
| Banksia menziesii | 17 | 550 | | Bank menz |
| Bossiaea eriocarpa | + | 15 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 35 | | Burchardia congesta |
| Calytrix flavescens | 1 | 20 | | Calytrix flav |
| Carpobrotus edulis | + | 5 | | Carpobrotus edulis (???) |
| Cassytha flava | + | 40 | NEQ9-9 | Cassytha |
| Conostephium pendulum | + | 40 | NEQ9-12 | Conostephium glauc |
| Conostylis juncea | + | 20 | NEQ9-1 | Conostylis sht flr, hry terete |
| Dampiera linearis | + | 25 | | Dampiera linearis |
| Dasyogon bromeliifolius | 1 | 20 | | Dasyogon bromel |
| Daviesia triflora | + | 40 | NEQ9-6 | Leafless (Acac/daviesia) |
| Desmocladus flexuosus | 14 | 10-12 | (=NEQ1-2) | Desmocladus |
| Drosera erythrorhiza | + | 1 | | Drosera eryth (dessicated) |
| Ehrharta calycina | + | 40 | | Ehr calycinus |
| Eremaea pauciflora var. pauciflora | 25-30 | 80-170 | | Eremaea pauciflora |
| Eucalyptus todtiana | 7 | 500-600 | | Euc tod overhang |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 80 | | Gomph tomentosum |
| Haemodorum paniculatum | + | 80 | NEQ9-13 | Haemodorum spicata |
| Hibbertia hypericoides | + | 35 | Hib hyp | |
| Hibbertia subvaginata | + | 25 | NEQ9-8 | Hib subvag |

| | | | | |
|---|---|--------|-----------|------------------------------|
| Jacksonia floribunda | + | 140 | | Jacksonia floribunda |
| Leucopogon conostephioides | + | 35 | NEQ9-5 | Epacrid sht triangle lf |
| Lomandra caespitosa | + | 35 | NEQ9-4 | Lomandra caespitosa |
| Lomandra hermaphrodita | + | 25 | NEQ9-3 | Lomandra hermaph (16) |
| Lyginia barbata | 2 | 35 | NEQ9-7 | Lyginia rhizomes |
| Patersonia occidentalis var. occidentalis | 1 | 35 | | Patersonia occid |
| Pentaschistis airoides | + | 15 | NEQ9-15 | Pentaschistis |
| Persoonia saccata | 1 | 190 | NEQ9-11 | Persoonia |
| Petrophile linearis | + | 40 | | Petroph linearis |
| Podotheca gnaphalioides | + | 12 | (=) | Podotheca tall tght hd |
| Pyrorchis nigricans | + | 2 | | Pyrorchis nigrican leaf only |
| Scaevola repens | + | 10 | | Scaevola repens |
| Schoenus curvifolius | + | 30 | | Schoenus curv |
| Stachystemon axillaris | + | 35(70) | NEQ9-10 | Herb erect |
| Stirlingia latifolia | + | 35 | | Stirlingia elat |
| Stylidium repens | + | 12 | (=NEQ7-) | Stylid repens |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 30 | | Ursinnia art |

NORTH ELLENBROOK: NEQ10

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 401058 mE | 6489600 mN | 115.955635 E | -31.724630 S |
| Habitat | Flat (swale) between low dunes. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Regelia inops scattered tall shrubs over Xanthorrhoea preissii open shrubland over Calytrix flavescens, Conostephium pendulum, Adenanthos obovatus low open shrubland over Hypolaena exsulca scattered sedges with Phlebocarya ciliata, Patersonia occidentalis, Dasyopogon bromeliifolius open herbland to herbland. | | | | |
| Veg Condition | (BF) Very Good (past logging and past clearing in adjacent areas). | | | | |
| Fire Age | Greater than 10 years since fire. | | | | |

| | |
|--------------|---|
| Notes | Pegged: 4 f dps and 4 caps One old Jarrah stump seen in area. |
|--------------|---|

| SPECIES LIST: NEQ10 | | | | |
|---|---------------|--------|------------|--|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos obovatus | 2 | 70 | | Adenanthos obovates |
| Aira caryophyllea | + | 12 | NEQ10-17 | Pentaschistis |
| Alexgeorgea nitens | + | 10 | NEQ10-19 | Alexgeorgea |
| Astroloma xerophyllum | + | 35 | NEQ10-13 | Short triangle lf Epacrid |
| Austrostipa compressa | + | 35 | NEQ10-8 | Austrostipa |
| Banksia attenuata | 14 | 600 | | Banksia attenuata (1 dead just outside quadrat, overhanging) |
| Banksia ilicifolia | 15 | 600 | | Banksia ilicifolia (1 dead) |
| Banksia menziesii | 1-2 | 400 | | Banksia menz |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Calytrix flavescens | 1 | 20 | | Calytrix flaves |
| Centrolepis drummondiana | + | 3 | NEQ10-2 | Centrolepis drummondii |
| Conostephium pendulum (accumbent leaf) | 1 | 20 | NEQ10-9 | Conostephium |
| Conostephium preissii | + | 30 | NEQ10-31 | ?Conostephium obtuse lf |
| Conostylis juncea | + | 20 | NEQ10-10 | Conostylis sht flr splu |
| Dampiera linearis | + | 15 | NEQ10-23 | Dampiera linearis |
| Dasyogon bromeliifolius | 3 | 30 | | Dasyogon brom |
| Disa bracteata | + | 20 | | Weed orchid |
| Drosera macrantha | + | 40 | NEQ10-28 | Drosera climber |
| Eremaea pauciflora var. pauciflora | + | 45 | NEQ10-6 | ??Eremaea pauc/ Melaleuca |
| Gladiolus caryophyllaceus | + | 70 | | Gladiolus cary |
| Hovea trisperma | + | 12 | NQ10-20,21 | Hovea trisperma/ Bos ariata |
| Hypochaeris glabra | + | 12 | | Hypochaeris glab |
| Hypolaena exsulca | + | 15 | NEQ10-18 | Hypolaena exsulca (male) |
| Isolepis marginata | + | 3 | NEQ10-3 | Isolepis marg |
| Lepidosperma pubisquamum | + | 35 | NEQ10-16 | Lepidosperma pubi |

| | | | | |
|---|-------|------------|----------|--|
| <i>Lomandra hermaphrodita</i> | + | 25 | NEQ10-25 | <i>Lomandra hermaph</i> >10 |
| <i>Lomandra odora</i> | + | 20 | NEQ10-5 | <i>Lomandra nigrican/preissii</i> |
| <i>Lomandra suaveolens</i> | + | 30 | NEQ10-14 | <i>Lomandra caespitosa</i> |
| <i>Macrozamia riedlei</i> | + | 50-60(200) | | <i>Zamia</i> |
| <i>Melaleuca seriata</i> | + | 30 | NEQ10-22 | <i>Melaleuca serata</i> pk flr |
| <i>Monotaxis occidentalis</i> | + | 4 | NEQ10-30 | Herb |
| <i>Patersonia occidentalis</i> | 9-10 | 60 | | <i>Patersonia occid</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petrophile linearis</i> |
| <i>Philotheca spicata</i> | + | 35 | | <i>Philotheca spicata</i> |
| <i>Phlebocarya ciliata</i> | 11-12 | 35 | | <i>Phlebocarya cil</i> (flat linear lf 5mm wide) |
| <i>Phyllangium paradoxum</i> | + | 3 | (=) | <i>Phyllangium</i> (dessicated) |
| <i>Podotheca gnaphalioides</i> | + | 8 | NEQ10-27 | <i>Podotheca</i> |
| <i>Regelia inops</i> | <1 | 180 | NEQ10-7 | <i>Regelia</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Sonchus oleraceus</i> | + | 10 | | <i>Sonchus olerac</i> |
| <i>Stylidium repens</i> | + | 10 | NEQ10-12 | <i>Stylid repens</i> |
| <i>Stylidium saxifragoides</i> | + | 1 | NEQ10-4 | <i>Stylid ciliate</i> rosette |
| <i>Thysanotus arbuscula</i> | + | 45 | NEQ10-26 | <i>Thysanotus erect</i> |
| <i>Trachymene pilosa</i> | + | 15 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne elatior</i> | + | 30 | | <i>Tricoryne elator</i> |
| <i>Tricoryne tenella</i> | + | 12 | NEQ10-15 | Hib? |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 20 | | <i>Ursinnia art</i> |
| <i>Verticordia nitens</i> | 3-4 | 110-130 | NEQ10-1 | <i>Verticordia nitens</i> |
| <i>Vulpia bromoides</i> | + | 12 | NEQ10-29 | <i>Vulpia</i> |
| <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> | 5 | 80-90 | NEQ10-11 | <i>Xanthor ?brunonianus/preis</i> (spindly tussocks) |
| <i>Xanthorrhoea preissii</i> | 7-9 | 160 | | <i>Xanthorrhoea preissii</i> |

NORTH ELLENBROOK: NEQ11

| | | | | | |
|---------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 22/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 401570 mE | 6489444 mN | 115.961023 E | -31.726081 S |
| Habitat | Gentle, south-facing lower slope of low dune. | | | | |
| Soil | Grey sand. | | | | |

| | |
|----------------------|---|
| Rock Type | na |
| Vegetation | Banksia attenuata, Banksia menziesii (not in quadrat), Eucalyptus todtiana low woodland over Adenanthos cygnorum subsp. cygnorum scattered tall shrubs to high shrubland (patchy) over Beaufortia elegans shrubland over Eremaea pauciflora var. pauciflora, Astroloma xerophyllum, Hibbertia hypericoides low shrubland over Desmocladius flexuosus, Lyginia barbata, Schoenus curvifolius scattered sedges. |
| Veg Condition | (BF) Excellent (low weed cover, little disturbance; horse paddock boundary 20m to east) |
| Fire Age | More than 7-10years since fire. |
| Notes | Caretaker Ray questioned about pegs - said OK Elevation: 58m Pegged: 4 x fd and caps Search intensity: thorough |

SPECIES LIST: NEQ11

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------------------------|---------------|--------|------------|------------------------|
| Adenanthos cygnorum subsp. cygnorum | | 300 | | Andenathos cygnorum |
| Astroloma xerophyllum | 1-2 | 40 | NEQ11-14 | Conostegium sht frt |
| uprgt | | | | |
| Banksia attenuata | 27 | 700 | | Banksia attenuata |
| Beaufortia elegans | 9-10 | 180 | NEQ11-2 | Regelia |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 40 | | Briza max |
| Burchardia congesta | + | 40 | | Burch congesta |
| Calytrix flavescens | + | 35 | | Calytrix flavescens |
| Carpobrotus edulis | + | 5 | NEQ11-8 | Carpobrotus |
| Cassytha flava | + | 30 | NEQ11-22 | Cassytha hairy |
| Cassytha glabella forma casuarinae | + | 50 | NEQ11-20 | Cassytha glabrous |
| Centrolepis drummondiana | + | 5 | NEQ11-10 | Centrolepis drummondii |
| Chordifex microcodon | + | 40 | NEQ11-13 | Rush |
| Conostephium pendulum | + | 35 | NEQ11-18 | Conosteph ?precissie |
| Conostylis juncea | + | 30 | NEQ11-7,19 | Conostylis sht flr |
| Crassula colorata var. colorata | + | 3 | NEQ11-5 | Herb |
| Dasypogon bromeliifolius | + | 30 | | Dasypogon brom |

| | | | | |
|--|-------|-------|----------|--|
| <i>Desmocladus flexuosus</i> | 1-2 | 15-20 | NEQ11-1 | Desmoclad flax |
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythorhya</i> (dessicated) |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 12 | NEQ11-21 | <i>Drosera</i> |
| <i>Ehrharta calycina</i> | + | 70 | | <i>Ehr calycinus</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 17-20 | 45 | | <i>Eremaea pauciflora</i> |
| <i>Eucalyptus todtiana</i> | 10-11 | 600 | | Euc tod (not rooted in quad, just outside) |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus car</i> (not flg - prob common pk) |
| <i>Hensmania turbinata</i> | + | 30 | NEQ11-12 | <i>Hensmania</i> |
| <i>Hibbertia hypericoides</i> | + | 30 | | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ11-15 | <i>Hibbertia subvag</i> |
| <i>Hypochaeris glabra</i> | + | 30 | | <i>Hypochaeris glab</i> |
| <i>Isolepis marginata</i> | + | 3 | NEQ11-9 | <i>Isolepis marg</i> |
| <i>Leucopogon conostephioides</i> | + | 40 | NEQ11-17 | Epacrid sht lves |
| <i>Lomandra hermaphrodita</i> | + | 25 | | <i>Lomandra hermaph</i> (9) |
| <i>Lyginia barbata</i> | + | 40 | | <i>Lyginia long rhizomes</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | Pat occid |
| <i>Pentaschistis airoides</i> | + | 20 | NEQ11-23 | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petroph linearis</i> |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | <i>Phyllangium ?paradox</i> (funked?? Flrg) |
| <i>Podotheca gnaphalioides</i> | + | 20 | NEQ11-11 | <i>Podolepis gnaph</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Scholtzia involucrata</i> | 2-3 | 30 | (=) | <i>Scholtzia involucra</i> |
| <i>Stylidium repens</i> | + | 10 | NEQ11-4 | <i>Stylid repens</i> |
| <i>Thysanotus sparteus</i> | + | 40 | NEQ11-16 | <i>Thysanotus unrgt dy ???</i> |
| <i>Trachymene pilosa</i> | + | 10 | | <i>Trachymene pilosa</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 35 | | <i>Ursinnia art</i> |
| <i>Verticordia nitens</i> | 1 | 190 | NEQ11-3 | <i>Verticordia nitens</i> |
| <i>Wahlenbergia capensis</i> | + | 35 | | <i>Wahlenbergia capensis</i> |
| <i>Wahlenbergia preissii</i> | + | 45 | NEQ11-24 | <i>Wahlenbergia</i> |

NORTH ELLENBROOK: NEQ12

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 400989 mE | 6489822 mN | 115.954929 E | -31.722621 S |
| Habitat | Gentle, north-facing, upper slope of low dune. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii low woodland over Jacksonia floribunda scattered shrubs over Calytrix flavescens, Scholtzia involucrata, Leucopogon conostephioides low open shrubland to low shrubland over Alexgeorgea nitens open sedgeland. | | | | |
| Veg Condition | (BF) Very Good to Excellent (moderate weed cover < 1% Ehr calyc; some nearby Banksia deaths; water table impacts?) | | | | |
| Fire Age | More than 10 years since fire. | | | | |
| Notes | Pegged: 4 fdps and 4 caps Elevation: 60m | | | | |

| SPECIES LIST: | | | | |
|------------------------------|---------------|--------|------------|---|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 20 | (=) | Acacia ?hueg |
| Acacia sessilis | + | 70 | NEQ12-24 | ?Persoonia suceaa prickly linear lf shb |
| Aira caryophyllea | + | 15 | (=NEQ10-17 | Pentaschistis |
| Alexgeorgea nitens | 10-11 | 12 | NEQ12-4 | Alexgeorgea copper base |
| Amphipogon turbinatus | + | 30 | NEQ12-1 | Amphipogon |
| Andersonia heterophylla | + | 30 | NEQ12-7 | Leucopogon wte flr sht triangle leaf |
| Anigozanthos manglesii | + | 12 | NEQ12-19 | Anigozanthos ?humilis |
| Arnocrinum preissii | + | 30 | | Agrostocrinum |
| Austrodanthonia occidentalis | + | 30 | NEQ12-20 | Austrodanthonia |
| Austrostipa flavescens | + | 30-60 | NEQ12-26 | Austrostipa |
| Banksia attenuata | 9 | 550 | | B attenuata |
| Banksia menziesii | 12-15 | 550 | | B menziesii |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 40 | | Burch congesta |
| Caladenia flava subsp. flava | + | 12 | NEQ12-17 | Caladenia flava |

| | | | | |
|--|------|--------|-------------|---|
| <i>Calytrix flavescens</i> | 6-7 | 30 | NEQ12-5 | <i>Calytrix flav ylw</i> |
| <i>Calytrix fraseri</i> | + | 30(90) | NEQ12-23 | ? <i>Calytrix fraseri</i> |
| <i>Carpobrotus edulis</i> | + | 3 | | Pig face |
| <i>Cassytha racemosa</i> | + | 35 | NEQ12-6 | <i>Cassytha</i> |
| <i>Centrolepis drummondiana</i> | + | 3 | (=NEQ10-2) | <i>Centrolepis drum</i> |
| <i>Conostephium pendulum</i> | + | 40 | NEQ12-16 | <i>Conostephium preiss</i> (<i>accuminate</i> Lf) |
| <i>Conostylis aculeata</i> subsp. <i>aculeata</i> | + | 40 | NEQ12-15 | <i>Conostylis aculeata</i> |
| <i>Conostylis juncea</i> | + | 20 | NEQ12-9 | <i>Conostylis sht hry terete</i> lef |
| <i>Dampiera linearis</i> | + | 30 | (=NEQ10-23) | <i>Dampiera linears</i> |
| <i>Desmocladus flexuosus</i> | 1 | 15-20 | NEQ12-13 | <i>Desmocladus</i> |
| <i>Drosera erythrorhiza</i> | + | 3 | | <i>Drosera erythor</i> (<i>dessicated</i>) |
| <i>Ehrharta calycina</i> | <1 | 80-90 | | <i>Ehr calycinus</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | + | 35 | NEQ12-14 | <i>Eremaea pauc</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 40-70 | | <i>Gladiolus cal</i> |
| <i>Gompholobium tomentosum</i> | + | 20 | | <i>Gom tom</i> |
| <i>Hensmania turbinata</i> | + | 20 | NEQ12-21 | <i>Hensmania</i> |
| <i>Hibbertia hypericoides</i> | + | 45 | | <i>Hibb hyp</i> |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ12-11 | <i>Hibb ?subvag</i> |
| <i>Isolepis marginata</i> | + | 4 | NEQ12-2 | <i>Isolepis</i> |
| <i>Jacksonia floribunda</i> | + -1 | 170 | | <i>Jack floribunda</i> |
| <i>Lechenaultia floribunda</i> | + -1 | 30 | NEQ12-8 | <i>Lechenaultia ?flor</i> |
| <i>Leucopogon conostephioides</i> | 2 | 30 | NEQ12-10 | <i>Epacrid sht triangle lf</i> |
| <i>Lomandra hermaphrodita</i> | + | 25 | NEQ12-12 | <i>Lomandra hermaph</i> (6) |
| <i>Lyginia barbata</i> | + | 40 | | <i>Lyginia clump sprdg</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | <i>Patersonia occid</i> |
| <i>Persoonia saccata</i> | + | 45 | NEQ12-27 | <i>Persoonia</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petroph linearis</i> |
| <i>Phlebocarya ciliata</i> | 1 | 40 | | <i>Phlebocarya cil</i> |
| <i>Phyllangium paradoxum</i> | + | 10 | (=) | <i>Phyllangium</i> |
| <i>Podotheca gnaphalioides</i> | + | 20 | NEQ12-18 | <i>Podotheca</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Scholtzia involucrata</i> | 2-3 | 110 | NEQ12-3 | <i>Scholtzia involucre</i> |
| <i>Stylidium repens</i> | + | 5 | (=NEQ10-12) | <i>Stylidium repens</i> |
| <i>Thysanotus arbuscula</i> | + | 5 | NEQ12-22 | <i>Herb</i> |

| | | | | |
|--|---|----|----------|----------------------------------|
| Thysanotus manglesianus/patersonii | + | 40 | | Thysanotus mang/pat (dessicated) |
| Tricoryne elatior | + | 30 | | Tricoryne elator |
| Ursinia anthemoides subsp. anthemoides | 1 | 30 | | Ursinnia |
| Wahlenbergia capensis | + | 20 | NEQ12-28 | Wahlenbergia cap |
| Wahlenbergia preissii | + | 20 | NEQ12-25 | Wahlenbergia p |

NORTH ELLENBROOK: NEQ13

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 14 | | | | |
| MGA Zone | 50 | 401218 mE | 6489707 mN | 115.957334 E | -31.723678 S |
| Habitat | Narrow (?flow) depression on plain, between low dunes. | | | | |
| Soil | Dark grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Taxandria linearifolia, Astartea scoparia open scrub over Aotus gracillima, Hypocalymma angustifolium open heath over Dielsia stenostachya, Lepidosperma longitudinale very open sdgld. | | | | |
| Veg Condition | (BF) Very Good (probably human caused changes in water table) | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps Dampland very dry. | | | | |

SPECIES LIST: NEQ13

| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
|----------------------------------|-------------|---------|----------|-----------------|
| Aotus gracillima | 10 | 160 | NEQ13-2 | small ylw pea |
| Astartea scoparia | 40 | 140-220 | NEQ13-10 | Astartea |
| Briza maxima | + | 30 | | Briza max |
| Bromus diandrus | + | 40 | NEQ13-9 | Grass |
| Calothamnus lateralis | 1-2 | 140 | | Calothamnus lat |
| Carpobrotus edulis | + | 5 | | Pigface |
| Cassytha flava | + | 40 | NEQ13-8 | Cassytha flrg |
| Cassytha racemosa forma racemosa | + | 140 | NEQ13-1 | Cassytha glab |

| | | | | |
|-----------------------------------|-------|---------|---------|---|
| <i>Dielsia stenostachya</i> | 5-10 | 25 | NEQ13-4 | Squiggly rush |
| <i>Gastrolobium ebracteolatum</i> | + | 90 | NEQ13-7 | Canocolata(?) pea |
| <i>Hypocalymma angustifolium</i> | 50% | 120 | | <i>Hypocalymma angust</i> |
| <i>Hypochaeris glabra</i> | + | 1 | | Hypoch glab |
| <i>Lepidosperma longitudinale</i> | 1-2 | 40 | NEQ13-3 | Lepidosp longitud |
| <i>Lysimachia arvensis</i> | + | 5 | | Anagallis arv (orge flr) |
| <i>Melaleuca preissiana</i> | 3-4 | (110)45 | | Mel preiscana |
| <i>Phyllangium paradoxum</i> | + | 4 | | Phyllangium ?paradox not flg (finished) |
| <i>Siloxerus humifusus</i> | + | 2 | NEQ13-5 | Siloxerus |
| <i>Taxandria linearifolia</i> | 10-15 | 230 | | Taxandra lin |
| <i>Xanthosia huegelii</i> | + | 10 | NEQ13-6 | Xanthosia |

NORTH ELLENBROOK: NEQ14

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 3/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 402949 mE | 6488620 mN | 115.975495 E | -31.733632 S |
| Habitat | (?) Shallow depression on lower slope. | | | | |
| Soil | Dry grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Beaufortia elegans open heath over Eremaea pauciflora var. pauciflora low shrubland over Lyginea barbata very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y 1.5m - 70%, 0.3m - 10% | | | | |

SPECIES LIST: NEQ14

| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
|---|-------------|--------|------------|--------------------------------|
| <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> | + | 150 | | <i>Adenanthos cygnorum</i> |
| <i>Alexgeorgea nitens</i> | + | 15 | (=NEQ4-10) | <i>Alexgeorgea</i> grey |
| <i>Allocaeusuarina humilis</i> | 1 | 140 | | <i>Allocaeusuarina humilis</i> |
| <i>Arnocrinum preissii</i> | + | 60 | NEQ14-6 | <i>Arnocrinum</i> purple |

| | | | | |
|---|----|-------|-----------|---------------------------------------|
| <i>Astroloma xerophyllum</i> | 1 | 45 | NEQ14-9 | <i>Leucopogon styphelia</i> |
| <i>Austrostipa compressa</i> | + | 30 | (=NEQ4-4) | <i>Austrostipa flav</i> |
| <i>Banksia attenuata</i> | + | 10 | | <i>Banksia attenuata</i> seedlings |
| <i>Beaufortia elegans</i> | 50 | 140 | NEQ14-1 | <i>Regelia beaufortia</i> |
| <i>Bossiaea eriocarpa</i> | + | 25 | | <i>Bossiaea eriocarpa</i> |
| <i>Briza maxima</i> | + | 20 | | <i>Briza maxima</i> |
| <i>Carpobrotus edulis</i> | + | 20 | | <i>Carpobrotus edulis</i> |
| <i>Cassytha flava</i> | + | C(??) | NEQ14-4 | <i>Cassytha furry</i> fruit |
| <i>Centrolepis mutica</i> | + | 5 | NEQ14-11 | <i>Centrolepis awnless</i> |
| <i>Crassula colorata</i> var. <i>colorata</i> | + | 5 | | <i>Crassula colorata</i> |
| <i>Croninia kingiana</i> | + | 50 | NEQ14-5 | <i>Leucopogon ruscifolia</i> |
| <i>Dasyogon bromeliifolius</i> | 1 | 25 | | <i>Dasyogon bromclifolius</i> |
| <i>Desmocladus flexuosus</i> | 1 | 15 | NEQ14-8 | <i>Desmocladus hairy</i> |
| <i>Ehrharta calycina</i> | 1 | 40 | | <i>Ehrarta calycina</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 15 | 80 | NEQ14-2 | <i>Eremaea pauciflora</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus caryophyllareu</i> |
| <i>Gompholobium tomentosum</i> <i>tomentosum</i> | + | 20 | | <i>Gompholobium</i> |
| <i>Isolepis marginata</i> | + | 5 | NEQ14-12 | <i>Isolepis marginata</i> |
| <i>Laxmannia grandiflora</i> subsp. <i>grandiflora</i> | + | 15 | NEQ14-3 | <i>Laxmannia dry</i> |
| <i>Lomandra hermaphrodita</i> | + | 20 | | <i>Lomandra hermaphrodita</i> |
| <i>Lyginia barbata</i> | 3 | 40 | NEQ14-7 | <i>Lyginia barbata</i> |
| <i>Patersonia occidentalis</i> | + | 35 | | <i>Patersonia occidentalis</i> |
| <i>Pentaschistis airoides</i> | + | 25 | | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petrophile linearis</i> |
| <i>Phyllangium paradoxum</i> | + | 5 | | <i>Phyllangium sp</i> |
| <i>Podotheca gnaphalioides</i> | + | 20 | | <i>Podotheca gnaphalliodes</i> |
| <i>Thysanotus sparteus</i> | + | 70 | NEQ14-10 | <i>Thysanotus scabru</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 23 | | <i>Ursinnea anthemoides</i> |
| <i>Verticordia nitens</i> | + | 120 | | <i>Verticordia nitens</i> |
| <i>Wahlenbergia preissii</i> | + | 15 | NEQ14-13 | <i>Wahlenbergia small hairy</i> |

NORTH ELLENBROOK: NEQ15

| | | | | | |
|---------------------|-----|-------------|-----------|-------------|-------------------|
| Described by | BRM | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
|---------------------|-----|-------------|-----------|-------------|-------------------|

| | | | | | |
|----------------------|--|-----------|------------|--------------|--------------|
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403002 mE | 6488755 mN | 115.976068 E | -31.732419 S |
| Habitat | Gentle, south-facing upperslope of low dune. | | | | |
| Soil | Grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana (not in quad) low woodland over Beaufortia elegans, Verticordia nitens open heath over Eremaea pauciflora var. pauciflora low shrubland over Schoenus curvifolius, Lyginia barbata scattered sedges. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps Veget unit heath layer in area opens up to scattered Beaufortia elegans, Vert nitens open shbld over Eremaea pauc low shrubland to low open heath. | | | | |

| SPECIES LIST: NEQ15 | | | | |
|--------------------------------------|------------------|---------|------------|--------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia pulchella | + | 110 | NEQ15-15 | Acacia pulchella |
| Adenanthos cygnorum subsp. cygnorum | + | 90 | NEQ15-18 | Adenanthos cyg |
| Alexgeorgea nitens | + | 10 | (=NEQ12-) | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | NEQ15-4 | Amphipogon |
| Arnocrinum preissii | + | 50 | (=) | Agrostocrinum |
| Astroloma xerophyllum triangle lf | 1-2 | 70 | NEQ15-12 | Epacrid sht frt flr long |
| Austrostipa compressa | + | 40 | NEQ15-22 | Austrostipa |
| Austrostipa flavescens | + | 35 | NEQ15-17 | Grass |
| Banksia attenuata | 4 | 600 | | B attenuata |
| Banksia menziesii | 20 | 600 | | B menziesii |
| Beaufortia elegans | 50 | 120-160 | NEQ15-1 | Regelia sml frt |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 30 | (=NEQ12-) | Calytrix flav |
| Cassytha flava | + | 40 | NEQ15-6 | Cassytha hairy |
| Centrolepis drummondiana | + | 5 | (=) | Centrolepis drum |

| | | | | |
|--|-----|-------|-------------------|-------------------------------|
| <i>Conostylis juncea</i> | + | 25 | NEQ15-14 | Conostylis |
| <i>Croninia kingiana</i> | + | 150 | (=NEGB64) | Conostephium tall |
| <i>Dasypogon bromeliifolius</i> | + | 20 | Dasypogon brom | |
| <i>Daviesia triflora</i> | + | 35 | NEQ15-21 | Leafless glabrous |
| <i>Desmocladus flexuosus</i> | + | 12-35 | NEQ15-2 | Desmocladus flex |
| <i>Drosera erythrorhiza</i> | + | 3 | | Drosera eryth (dessicated) |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 6-8 | 50 | | Eremaea pauc |
| <i>Gladiolus caryophyllaceus</i> | + | 45 | | Gladiolus carve |
| <i>Gompholobium tomentosum</i> | + | 40 | | Gom tom |
| <i>Hibbertia hypericoides</i> | + | 45 | NEQ15-13 | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 25 | NEQ15-9 | Hibbertia ?subvag |
| <i>Hypolaena exsulca</i> | + | 45 | NEQ15-11 | Rush |
| <i>Isolepis marginata</i> | + | 6 | NEQ15-7 | Isolepis marg |
| <i>Jacksonia floribunda</i> | + | 180 | (=NEGB84) | Jacksonia floribunda |
| <i>Leucopogon conostephioides</i> | | 35-50 | NEQ15-10 | Epacrid sht triangle lf |
| <i>Lomandra caespitosa</i> | + | 35 | NEQ15-3 | Lomandra ?caespitosa |
| <i>Lomandra hermaphrodita</i> | + | 20 | (=) | Lomandra herm |
| <i>Lomandra preissii</i> | + | 35 | NEQ15-5 | Lomandra preissii |
| <i>Lyginia barbata</i> | + | 30 | | Lyginia |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | Patersonia occidentalis |
| <i>Petrophile linearis</i> | + | 40 | | Petroph linearis |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | Phyllangium |
| <i>Schoenus curvifolius</i> | + | 35 | | Schoenus curvifolia |
| <i>Scholtzia involucreta</i> | + | 40 | (=NEQ12-) | Scholtzia involucre |
| <i>Stirlingia latifolia</i> | + | 60 | | Stirlingia latifolia |
| <i>Stylidium brunonianum</i> | + | 35 | NEQ15-19 | Stylid |
| <i>Stylidium repens</i> | + | 6 | (=NEQ12-) | Stylid repens |
| <i>Thysanotus sparteus</i> | + | 45 | NEQ15-20 | Thysanotus upright |
| <i>Trachymene pilosa</i> | + | 5-10 | | Trachymene pilosa |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 20 | | Ursinnia art |
| <i>Verticordia nitens</i> | 4-5 | 200 | (=) | Verticordia nitens |
| <i>Wahlenbergia preissii</i> | + | 30 | NEQ15-8 | Wahlenbergia |

NORTH ELLENBROOK: NEQ16

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | P | | | | |
| Location | | | | | |
| MGA Zone | 50 | 403212 mE | 6488494 mN | 115.978259 E | -31.734791 S |
| Habitat | Dampland flats. | | | | |
| Soil | Dry grey-brown loam. | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana low open forest over Astartea scoparia closed scrub over Cyathochaeta teretifolia open sedgeland. | | | | |
| Veg Condition | (BF) Pristine. | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y 11m - 40%, 2.3m - 95%, 1m - 15% | | | | |

SPECIES LIST: NEQ16

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|--------------------------|------------------|--------|-----------|--------------------------|
| Astartea scoparia | 95 | 230 | (=NEQ6-1) | Astartea |
| Carpobrotus edulis | + | 10 | | Carpobrotus edulis |
| Cyathochaeta teretifolia | 15 | 120 | (=NEQ6-9) | Cyathochaeta teretifolia |
| Leucopogon australis | + | 35 | NEQ6-6 | Leucopogon australis |
| Lobelia anceps | + | 25 | NEQ16-1 | Lobelia anceps |
| Meeboldina coangustata | + | 50 | NEQ16-2 | Meeboldina |
| Melaleuca preissiana | 40 | 1100 | | Mel preissiana |

NORTH ELLENBROOK: NEQ17

| | | | | | |
|---------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 402850 mE | 6487826 mN | 115.974371 E | -31.740786 S |
| Habitat | Gentle, east-facing upper slope of low dune. | | | | |
| Soil | Grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana low woodland over Beaufortia elegans, Verticordia nitens shrubland over Eremaea pauciflora var. pauciflora, Astroloma xerophyllum low shrubland over Schoenus curvifolius, Lyginia barbata scattered sedges. | | | | |

| | |
|----------------------|--|
| Veg Condition | (BF) Excellent. |
| Fire Age | More than 7-10 years since fire. |
| Notes | Pegged: 4 f dps and 4 caps Search intensity: thorough |

| SPECIES LIST: | | | | |
|--------------------------|--------------|---------|------------|--|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia pulchella | + | (4)300 | (=NEQ15-) | Ac pulch |
| Alexgeorgea nitens | + | 20 | | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | NEQ17-8 | Amphipogon |
| Anigozanthos manglesii | + | 15-20 | NEQ17-6 | ??? Anigozanthos |
| Arnocrinum preissii | + | 45 | NEQ17-14 | Agrostocrinum |
| Astroloma xerophyllum | 5 | 80 | NEQ17-5 | Epacrid sht frt flr, long triangle lf |
| Austrostipa compressa | + | 40 | NEQ17-11 | Austrostipa |
| Banksia attenuata | 20 | 600-650 | | Bank attenuata |
| Banksia menziesii | 6 | 700 | | Bank menziesii |
| Beaufortia elegans | 11-12 | 120-190 | (=NEQ15-1) | Regelia |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | (=NEQ12-) | Calytrix flav |
| Calytrix flavescens | + | 35 | NEQ17-18 | Calytrix fraseri |
| Cassytha flava | + | 20 | (=NEQ15-6) | Cassytha hry |
| Chordifex microcodon | + | 30 | NEQ17-3 | Rush (male) |
| Conostephium pendulum | +Astrol o | 35 | NEQ17-2 | Conostephium accumata ma xerophyl lum |
| Conostylis juncea | + | 20 | NEQ17-12 | Conostylis sht flr terete |
| Croninia kingiana | + | 110 | (=NEGB64) | Tall Euc/Conosteph |
| Dampiera linearis | + | 30 | | Dampiera linearis |
| Dasypogon bromeliifolius | + | 30 | | Dasypogon brom |
| Daviesia triflora | + | 50 | NEQ17-16 | Leafless |
| Drosera sp. | + | 30 | NEQ17-1 | Drosera climber dessicated |
| Eremaea pauciflora var. | 4-5 | 90 | | Eremaea pauc |

| | | | | |
|---|---|--------|-------------|-----------------------------|
| pauciflora | | | | |
| Eucalyptus todtiana | 4 | 500 | | Euc tod (not rooted in qdt) |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 60 | | Gom tom |
| Gonocarpus cordiger | + | 25 | NEQ17-4 | Herb ylw flr |
| Hibbertia hypericoides | 1 | 60 | Hib hyp | |
| Hibbertia subvaginata | + | 35 | NEQ17-10 | Hib subvag |
| Isolepis marginata | + | 3 | (=NEQ15-7) | Isolepis |
| Jacksonia furcellata | + | 140 | | Jacksonia furcelata |
| Laxmannia ramosa subsp. ramosa | + | 12 | NEQ17-7 | Laxmannia |
| Leucopogon conostephioides | + | 5 | NEQ17-15 | Astroloma |
| Leucopogon conostephioides | + | 30 | (=NEQ15-10) | Epacrid sht triangle lf |
| Lomandra caespitosa | + | 25 | NEQ17-19 | Lomandra caesalp |
| Lomandra hermaphrodita | + | 40 | NEQ17-20 | Lomandra |
| Lomandra hermaphrodita | + | 30 | NEQ17-9 | Lomandra hermaph |
| Lomandra preissii | + | 45 | NEQ17-17 | Lomandra preissii |
| Lyginia barbata | + | 40 | | Lyginia herb long rhizomes |
| Macrozamia riedlei | + | 45 | | Zamia |
| Patersonia occidentalis var. occidentalis | + | 45 | | Patersonia occid (wide lf) |
| Petrophile linearis | + | 45 | | Petroph lin |
| Philothea spicata | + | 70 | | Philothea spicata |
| Phyllangium paradoxum | + | 4 | (=) | Phyllangium |
| Schoenus curvifolius | + | 20 | | Schoenus curvifolius |
| Scholtzia involucrata | 1 | 110 | NEQ17-13 | Scholtzia invol |
| Stirlingia latifolia | + | 45 | | Stirlingia lat |
| Stylidium brunonianum | + | 30 | (=NEQ15-19) | Stylid pk |
| Stylidium repens | + | 10 | (=NEQ12-) | Stylid repens |
| Stylidium repens | | | NEQ17-7B | |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 20 | | Ursinnia art |
| Verticordia nitens | 3 | 90-180 | (=) | Vert nitens |
| Wahlenbergia capensis | + | 35 | (=NEQ15- | Wahlenbergia capensis |

| | | | | |
|-----------------------|---|----|------------|--------------|
| | | | 16 | |
| Wahlenbergia preissii | + | 30 | (=NEQ15-8) | Wahlenbergia |

| NORTH ELLENBROOK: NEQ18 | | | | | |
|-------------------------|--|-----------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | | | | | |
| MGA Zone | 50 | 403268 mE | 6488409 mN | 115.978841 E | -31.735562 S |
| Habitat | Low flats adjacent to dampland flats. | | | | |
| Soil | Dry grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Eucalyptus marginata subsp. marginata open woodland over Banksia attenuata, Banksia ilicifolia low woodland over Hypocalymma angustifolium, Adenanthos obovatus low open shrubland over Hypolaena exsulca very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y Search intensity: intense 10m - 20%, 2m - 20%, <1m - 30% | | | | |

| SPECIES LIST: NEQ18 | | | | |
|--------------------------|---------------|--------|------------|---------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos obovatus | 2 | 100 | NEQ18-2 | Adenanthos obovatus |
| Aira caryophyllea | + | 10 | | Aira |
| Alexgeorgea nitens | + | 15 | | Alexgeorgea grey |
| Austrostipa compressa | + | 25 | NEQ18-17 | Austrostipa small |
| Banksia attenuata | 15 | 1000 | | Banksia attenuata |
| Banksia ilicifolia | 2 | 900 | | Banksia ilicifolia |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Carpobrotus edulis | + | 15 | | Carpobrotus edulis |
| Centrolepis drummondiana | | | NEQ18-3b | |
| Centrolepis mutica | + | 5 | (=NEQ14-11 | Centrolepis awnless |

| | | | | |
|---|----|------|------------|----------------------------------|
| <i>Comesperma calymega</i> | + | 45 | NEQ18-5 | <i>Comesperma calycina</i> |
| <i>Conostephium pendulum</i> | + | 25 | NEQ18-13 | <i>Brachyloma wide</i> |
| <i>Conostephium preissii</i> | 1 | 45 | NEQ18-15 | <i>Brachyloma small</i> |
| <i>Corymbia calophylla</i> | + | 150 | | <i>Corymbia calophylla</i> |
| <i>Dasypogon bromeliifolius</i> | 2 | 25 | | <i>Dasypogon bromeliifolius</i> |
| <i>Daviesia physodes</i> | 1 | 150 | NEQ18-16 | <i>Daviesia preissii</i> |
| <i>Eucalyptus marginata</i> subsp. <i>marginata</i> | 3 | 1000 | | <i>Euc marginata</i> |
| <i>Gonocarpus cordiger</i> | + | 30 | NEQ18-7 | <i>Stackhousia</i> |
| <i>Hibbertia hypericoides</i> | + | 40 | | <i>Hibbertia hypericoides</i> |
| <i>Hibbertia subvaginata</i> | 1 | 30 | NEQ18-10 | <i>Hibbertia subvag grey</i> |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ18-11 | <i>Hibbertia subvag green</i> |
| <i>Hypocalymma angustifolium</i> | 7 | 50 | | <i>Hypocalymma angustifolium</i> |
| <i>Hypolaena exsulca</i> | 1 | 30 | | <i>Hypolaena exsulca</i> |
| <i>Isolepis marginata</i> | + | 5 | (=NEQ14-12 | <i>Isolepis marginata</i> |
| <i>Leucopogon conostephioides</i> | 1 | 20 | NEQ18-14 | <i>Leucopogon styphelia</i> |
| <i>Lomandra caespitosa</i> | + | 20 | NEQ18-4 | <i>Lomandra caespitosa</i> |
| <i>Lomandra hermaphrodita</i> | + | 10 | | <i>Lomandra hermaphrodita</i> |
| <i>Lomandra preissii</i> | + | 45 | NEQ18-6 | <i>Lomandra sanders</i> |
| <i>Patersonia occidentalis</i> | 7 | 40 | | <i>Patersonia occidentalis</i> |
| <i>Petrophile linearis</i> | + | 35 | | <i>Petrophile linearis</i> |
| <i>Philothea spicata</i> | + | 40 | NEQ18-12 | <i>Philothea spicata</i> |
| <i>Phyllangium paradoxum</i> | + | 5 | NEQ18-1 | <i>Phyllangium sp</i> |
| <i>Poranthera microphylla</i> | + | 5 | NEQ18-3 | <i>Poranthera</i> |
| <i>Pultenaea reticulata</i> | 2 | 80 | NEQ18-9 | <i>Prteneae</i> |
| <i>Quinetia urvillei</i> | + | 5 | | <i>Quinetia urvillei</i> |
| <i>Trachymene pilosa</i> | + | 5 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne tenella</i> | + | 20 | NEQ18-8 | <i>Tricoryne tenella</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinia anthemoides</i> |
| <i>Wahlenbergia preissii</i> | + | 10 | | <i>Wahlenbergia small hairy</i> |
| <i>Xanthorrhoea preissii</i> | 20 | 200 | | <i>Xanthorrhoea preissii</i> |

NORTH ELLENBROOK: NEQ19

| | | | | | |
|---------------------|-------------|-------------|-----------|-------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |

| | | | | | |
|----------------------|--|-----------|------------|--------------|--------------|
| MGA Zone | 50 | 402795 mE | 6488333 mN | 115.973841 E | -31.736208 S |
| Habitat | Flat (swale) between low dunes. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Jacksonia furcellata scattered tall shrubs over Xanthorrhoea preissii, ?Xanthorrhoea brunonis subsp. brunonis shrubland over Eremaea pauciflora var. pauciflora, Calytrix flavescens, Astroloma xerophyllum low open shrubland over Lyginia barbata scattered sedges with Dasypogon bromeliifolius, Patersonia occidentalis var. occidentalis very open herbland. | | | | |
| Veg Condition | (BF) Excellent (some weeds, but low cover). | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 fdps and 4 caps Elevation: 45m | | | | |

| SPECIES LIST: | | | | |
|---------------------------------|------------------|--------|------------|--------------------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 15 | NEQ19-15 | Acacia huegelii |
| Acacia pulchella | + | 10 | (=NEQ15-) | Ac pulchella |
| Aira caryophyllea | + | 12 | NEQ19-4 | Aira |
| Alexgeorgea nitens | + | 6 | | Alexgeorgea |
| Astroloma xerophyllum | 3 | 120 | (=NEQ17-5) | Epacrid sht fat flr long triangle lf |
| Austrostipa compressa | + | 40 | NEQ19-9 | Austrostipa |
| Banksia attenuata | 20-22 | 700 | | B attenuata |
| Banksia ilicifolia | 7 | 650 | | Bank ilicifolia |
| Banksia menziesii | + | 180 | | Banksia menz |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Calytrix flavescens | 2-3 | 20 | | Calytrix flav |
| Carpobrotus edulis | + | 3 | | Pigface |
| Cassytha flava | + | 20 | (=NEQ15-) | Cassytha hry |
| Conostephium minus | + | 30 | NEQ19-20 | Epacrid obtuse lf |
| Conostephium pendulum | + | 20 | NEQ19-6 | Conostephium acuminate |
| Conostylis juncea | + | 25 | NEQ19-13 | Conostylis sht flr |
| Crassula colorata var. colorata | + | 4 | NEQ19-17 | Crassula colorata |

| | | | | |
|--|-------|---------|------------|--|
| <i>Dasypogon bromeliifolius</i> | 6 | 20-30 | | <i>Dasypogon brom</i> |
| <i>Desmocladus flexuosus</i> | 1 | 10 | NEQ19-18 | <i>Desmocladus flex</i> |
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythrorhiza</i> dessicated |
| <i>Ehrharta calycina</i> | + | 40 | | <i>Ehr calycina</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 2-3 | 30-60 | | <i>Eremaea pauc</i> |
| <i>Gastrolobium ebracteolatum</i> | + | 35 | NEQ19-8 | <i>Hovea trisperma</i> |
| <i>Gompholobium tomentosum</i> | + | 30 | | <i>Gom tom</i> |
| <i>Hibbertia subvaginata</i> | + | 15 | NEQ19-10 | <i>Hibbertia ?subvag</i> |
| <i>Hypochaeris glabra</i> | + | 15 | | <i>Hypochaeris</i> |
| <i>Isolepis marginata</i> | + | | NEQ19-3 | <i>Isolepis</i> |
| <i>Jacksonia furcellata</i> | 1-2 | 170-280 | NEQ19-1 | <i>Jacksonia furc</i> |
| <i>Lepidosperma pubisquameum</i> | + | 20-40 | NEQ19-14 | <i>Lepidosperma publi</i> |
| <i>Leucopogon squarrosus</i> subsp. <i>squarrosus</i> | + | 40 | NEQ19-12 | <i>Leucopogon smll ovate</i> leaf |
| <i>Lomandra hermaphrodita</i> | + | 15 | NEQ19-2 | <i>Lomandra hermaph</i> |
| <i>Lomandra odora</i> | + | 35 | NEQ19-5 | <i>Lomandra caes</i> |
| <i>Lyginia barbata</i> | + | 10 | | <i>Lyginia</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | 1-2 | 45 | | <i>Patersonia occid wide lf</i> |
| <i>Pentaschistis airoides</i> | + | 15 | | <i>Pentaschistis (lost)</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petroph linearis</i> |
| <i>Philothea spicata</i> subsp. Moore River National Park (G. & D. | + | 35 | NEQ19-11 | <i>Philothea spicata</i> Woodman Op 47) |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | <i>Phyllangium</i> |
| <i>Scholtzia involucrata</i> | + | 40 | NEQ19-16 | <i>Scholtzia invol</i> |
| <i>Sonchus oleraceus</i> | + | 12 | | <i>Sonchus olerac</i> |
| <i>Stylidium repens</i> | + | 6 | (=) | <i>Stylid repens</i> |
| <i>Stylidium saxifragoides</i> | + | 1 | NEQ19-21 | <i>Stylid ciliate rosette</i> |
| <i>Trachymene pilosa</i> | + | 12 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne elatior</i> | + | 40 | | <i>Tricoryne elator</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinnia</i> |
| <i>Vulpia myuros</i> forma <i>myuros</i> | + | 15 | NEQ19-19 | <i>Vulpia</i> |
| <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> | 10-12 | | (=NEQ10-) | <i>Xanthor brunonis</i> |
| <i>Xanthorrhoea preissii</i> | 10-12 | 130 | | <i>Xanth preissii</i> |

| NORTH ELLENBROOK: NEQ20 | | | | | |
|-------------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403406 mE | 6488172 mN | 115.980274 E | -31.737712 S |
| Habitat | Dampland flats. | | | | |
| Soil | Dry grey brown peaty sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana, Banksia littoralis open to closed low forest over Xanthorrhoea preissii open shrubland over Cyathochaeta teretifolia, Dielsia stenostachya sedgeland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | More than 5 years since fire. | | | | |
| Notes | Pegged: Y 10m - 80%, 1m - 50% | | | | |

| SPECIES LIST: NEQ20 | | | | |
|----------------------------|---------------|--------|------------|-----------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Aotus gracillima | + | 50 | NEQ20-2 | Sphaerolobium leaflet |
| Astartea scoparia | 1 | 100 | (=NEQ6-1) | Astartea |
| Banksia littoralis | 5 | 900 | | Banksia littoralis |
| Carpobrotus edulis | + | 15 | | Carpobrotus |
| Cyathochaeta teretifolia | 25 | 100 | | Cyathochaeta |
| Dielsia stenostachya | 15 | 25 | (=NEQ6-4) | Turbastes like |
| Ehrharta brevifolia | + | 25 | NEQ20-3 | Ehrharta brevifolia |
| Hibbertia subvaginata | + | 20 | NEQ20-4 | Hibbertia swamp |
| Hypochaeris glabra | 1 | 20 | | Hypochaeris glabra |
| Kunzea glabrescens | + | 60 | | Kunzea glabrescens |
| Melaleuca preissiana | 75 | 1000 | | Melaleuca preissiana |
| Pentaschistis airoides | + | 15 | | Pentaschistis ateroid |
| Phyllangium paradoxum | + | 5 | (=NEQ18-1) | Phyllangium sp |
| Podotheca gnaphalioides | + | 15 | | Podotheca gnaphalia |
| Solanum nigrum | + | 15 | NEQ20-1 | Solanum |
| Sonchus asper | + | 90 | | Sonchus asper |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. | + | 20 | | Ursinnia anthemoides |

| | | | |
|-----------------------|---|-----|--------------|
| anthemoides | | | |
| Xanthorrhoea preissii | 3 | 110 | Xanthorrhoea |

| NORTH ELLENBROOK: NEQ21 | | | | | |
|-------------------------|--|-----------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403233 mE | 6487945 mN | 115.978426 E | -31.739745 S |
| Habitat | Flat adjacent to dampland. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Corymbia calophylla (Marri), Eucalyptus marginata subsp. marginata (Jarrah) open forest over Banksia attenuata scattered low trees over Xanthorrhoea preissii shrubland over Hypolaena exsulca scattered sedges and Dasypogon bromeliifolius open herbl. | | | | |
| Veg Condition | (BF) Very Good (a lot of past partial clearing in general area and probably past grazing). | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps | | | | |

| SPECIES LIST: | | | | |
|---------------------------------------|---------------|-----------|----------|-------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Banksia attenuata | 4% | (180)600 | | Banksia attenuata |
| Briza maxima | + | 20 | | Briza max |
| Conostephium pendulum | + | 25 | NEQ21-5 | Conostephium |
| Corymbia calophylla | 50-60 | 1200 | | Marri |
| Dasypogon bromeliifolius | 20 | 30 | | Dasypogon brom |
| Daviesia physodes | + | 30 | NEQ21-6 | Daviesia physodes (juv) |
| Eucalyptus marginata subsp. marginata | 11 | (450)1400 | | Jarrah |
| Hibbertia subvaginata | + | 20 | NEQ21-7 | Hibbertia |

| | | | | |
|---------------------------|-------|----------|---------|--------------------------|
| Hypolaena exsulca | + | 20 | NEQ21-3 | Hypolaena exsulca (male) |
| Lactuca serriola | + | 45 | NEQ21-2 | Sonchus |
| Lepidosperma pubisquameum | + | 30 | NEQ21-4 | Lepidosperma pubi |
| Macrozamia riedlei | + | 20 | | Zamia (juv) |
| Melaleuca preissiana | 1 | 450 | | Mel preisiana |
| Patersonia occidentalis | + | 35 | | Patersonia occid |
| Pinus pinaster | + | 450 | | Pinus 2 needle folllice, |
| rooted just outside qdt | | | | |
| Pinus pinaster | + | 10 | | Pigface edulis |
| Pterostylis sp. | + | 30 | NEQ21-1 | Pterostylis |
| Trachymene pilosa | + | 12 | | Trachymene pilosa |
| Xanthorrhoea preissii | 11-12 | 180(260) | | Xanth preis |

NORTH ELLENBROOK: NEQ22

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 10/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403108 mE | 6488431 mN | 115.977155 E | -31.735350 S |
| Habitat | Flat depression between low dunes. | | | | |
| Soil | Black peaty sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Mealeucal preissiana low woodland over Astartea scoparia open heath over Hypocalymma angustifolium low open shrubland over Dielsia stenostachya open to closed sedgeland. | | | | |
| Veg Condition | (BF) Excellent (no obvious signs of disturbance) | | | | |
| Fire Age | Greater than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps | | | | |

SPECIES LIST: NEQ22

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------|---------------|---------|----------|---------------------------|
| Aotus gracillima | 1 | 110-190 | NEQ22-4 | Shrub (?pea) |
| Astartea scoparia | 40-50 | 150 | NEQ22-1 | Astartea |
| Burchardia sp. | + | 40 | | Burchardia sp (no old flr |

| | | | | |
|--|-------|-------|---------|--------------------|
| | | | | spike??) |
| Cassytha racemosa forma racemosa | + | 120 | NEQ22-6 | Cassytha |
| Dielsia stenostachya | 60-70 | 40 | NEQ22-2 | Club sedge |
| Hypocalymma angustifolium | 5-8 | 110 | | Hypocalymma angust |
| Leucopogon australis | 2-3 | 45-90 | NEQ22-3 | Leucopogon |
| Melaleuca preissiana | 17-20 | 450 | | Mel preisiana |
| Pericalymma ellipticum var. ellipticum | + | 110 | NEQ22-5 | Perycalymma(??) |

APPENDIX SEVEN

Releve descriptions and species lists for the North Ellenbrook survey area

| NORTH ELLENBROOK SITE: NER1 | |
|-----------------------------|--|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 66 |
| Photo: | BM100:54, 55 |
| AMG: | Zone 50 401159mE, 6490461mN (WGS84) |
| Habitat: | Gentle, east-facing upper slope of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Eucalyptus todtiana</i> scattered low trees over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high shrubland over <i>Beaufortia elegans</i> , <i>Regelia inops</i> open shrubland over <i>Astroloma xerophyllum</i> scattered low shrubs over <i>Alexgeorgia nitens</i> open sedgeland. |
| Assoc. species: | <i>Lyginia barbata</i> , <i>Cassyltha flava</i> , <i>Dampiera linearis</i> , <i>Verticordia nitens</i> (1.5m), <i>Stylidium crossocephalum</i> , <i>Burchardia congesta</i> , <i>Gompholobium tomentosum</i> , <i>Patersonia occidentalis</i> , <i>Lechenaultia floribunda</i> , <i>Macarthuria australis</i> , <i>Conospermum acerosum</i> subsp. <i>acerosum</i> (130cm), <i>Melaleuca seriata</i> (30cm). |
| Veg Condition | (BF): Good – appears to have previously been a Banksia woodland, which has been cleared or had the Banksia's cleared. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK SITE: NER2 | |
|-----------------------------|---|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:56, 57 |
| AMG: | Zone 50 401065mE, 6491107mN (WGS84) |
| Habitat: | Gentle, north-east facing slope of low dune. |
| Soil: | Grey-brown sand. |
| Vegetation: | <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high open shrubland to high shrubland over <i>Chamelaucium uncinatum</i> , <i>Scholtzia involucreta</i> shrubland over <i>Conostephium pendulum</i> (40cm), <i>Stirlingia latifolia</i> (40cm) scattered low shrubs to low open shrubland over <i>Lyginia barbata</i> scattered sedges. |
| Assoc. species: | |
| Veg Condition | (BF): Degraded – regrowth in old native cut flower farm cultivation area. |
| Fire Age: | More than 7 years since fire. |
| Notes: | Old native cut flower farm cultivation area. Would have been Banksia woodland prior to clearing for wildflower farm. |

| NORTH ELLENBROOK - SITE: NER3 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:58, 59 |
| AMG: | Zone 50 401180mE, 6491247mN (WGS84) |
| Habitat: | Flow line on valley floor/flat at base of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) scattered trees over <i>Melaleuca preissiana</i> scattered low trees over <i>Kunzea glabrescens</i> scrub over <i>Astartea scoparia</i> scattered shrubs over <i>Hypocalymma angustifolium</i> scattered low shrubs (to low heath in patches) over <i>Dielsia stenostachya</i> (35cm) very open sedgeland. |
| Assoc. species:. | <i>Acacia saligna</i> , <i>Zantedeschia aethiopica</i> (Arum lily) x1, <i>Dasypogon bromelifolius</i> , <i>Kennedia prostrata</i> , <i>Trachymene pilosa</i> , <i>Jacksonia furcellata</i> , <i>Gompholobium tomentosum</i> |
| Veg Condition | (BF): G – disturbed area with some apparent old earthwork's, ?past clearing, rubbish. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER4 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:60-63 |
| AMG: | Zone 50 401328mE, 6491339mN (WGS84) |
| Habitat: | Broad low rise (low dune). |
| Soil: | Pale grey sand. |
| Vegetation:. | <i>Banksia menziesii</i> , <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> low open woodland (regeneration after clearing for horticulture) over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high open shrubland to high shrubland over <i>Verticordia nitens</i> open shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Scholtzia involucrata</i> low shrubland |
| Assoc. species: | <i>Jacksonia furcellata</i> , <i>Podothea gnaphaloides</i> , <i>Austrostipa ?compressa</i> . |
| Veg Condition (BF): | Good to Degraded – regrowth after past clearing; signs of old tractor tracks, by open areas ite?? Weed cover mostly low). |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER5 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:64 |
| AMG: | Zone 50 401449mE, 6491278mN (WGS84) |
| Habitat: | Flat plain. |
| Soil: | Dark grey sand. |
| Vegetation: | <i>Kunzea glabrescens</i> closed scrub over <i>Aotus gracillima</i> scattered shrubs to open shrubland over <i>Schoenus efoliatus</i> , <i>Dielsia stenostachya</i> very open sedgeland. |
| Assoc. species: | <i>Homalosciadium homalocarpum</i> , <i>Phyllangium paradoxum</i> , <i>Austrostipa compressa</i> , <i>Hypolaena exsulca</i> , <i>Hypocalymma angustifolium</i> . |
| Veg Condition (BF): | Good – regeneration after clearing for horticulture – native cut flower farming. |
| Fire Age: | Greater than 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER6 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:79-81 |
| AMG: | Zone 50 400975mE, 6490834mN (WGS84) |
| Habitat: | Broad depression on valley floor between low dunes. |
| Soil: | Grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Regelia inops</i> (170cm), (<i>Xanthorrhoea preissii</i>) closed heath over <i>Dasypogon bromeliifolius</i> , <i>Phlebocarya ciliata</i> , <i>Lyginia ?imberbis</i> (tussock) herbland/sedgeland. |
| Assoc. species: | <i>Trachymene pilosa</i> , <i>Wahlenbergia capensis</i> , <i>Hypochaeris glabra</i> , <i>Gompholobium tomentosum</i> , <i>Austrostipa compressa</i> , <i>Ursinnia anthemoides</i> , <i>Crassula colorata</i> , <i>*Isolepis marginata</i> , <i>Lomandra caespitosa</i> . |
| Veg Condition (BF): | Excellent – probably affected by water table draw down in past; disturbance of farm tracks etc nearby; low weed cover. |
| Fire Age: | More than 7 years since fire. |
| Notes: | Chris H's quad NEQ2 in disturbed area with little <i>Regelia</i> heath at west end of area. |

| NORTH ELLENBROOK - SITE: NER7 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 66 |
| Photo: | BM100:82-86 |
| AMG: | Zone 50 400894mE, 6490901mN (WGS84) |
| Habitat: | Broad depression (flats) between low dunes. |
| Soil: | Grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Xanthorrhoea preissii</i> high open shrubland over <i>Regelia inops</i> closed scrub over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> scattered shrubs over <i>Lyginia imberbis</i> (tussocks) scattered sedges. |
| Assoc. species: | <i>Pterostylis nana</i> complex, <i>Trachymene pilosa</i> , <i>Wahlenbergia preissii</i> , * <i>Hypochaeris glabra</i> , * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , <i>Dasypogon bromeliifolius</i> , <i>Phlebocarya ciliata</i> . |
| Veg Condition (BF): | ~Pristine – low weed cover, no signs of disturbance. |
| Fire Age: | Greater than 7 years since fire. |
| Notes: | Exceptional <i>Xanthorrhoea preissii</i> shrubs in this area (to 5 to 6 metres high!). |

| NORTH ELLENBROOK - SITE: NER8 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:87-89 (looking East) |
| AMG: | Zone 50 400962mE, 6490953mN (WGS84) |
| Habitat: | Lower slopes of dune, adjacent to flat. |
| Soil: | Pale grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Banksia ilicifolia</i> scattered low trees over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> scattered tall shrubs over <i>Xanthorrhoea preissii</i> open shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> (40-80cm) low shrubland over <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> open sedgeland. |
| Assoc. species: | <i>Patersonia occidentalis</i> , <i>Dasypogon bromeliifolius</i> , <i>Macrozamia riedlei</i> , <i>Tricoryne elatior</i> , <i>Haemodorum spicatum</i> , <i>Nuytsia floribunda</i> , <i>Burchardia congesta</i> . |
| Veg Condition (BF): | Excellent – low weed cover (<2%) of * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> and * <i>Ehrharta brevifolia</i> . |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER9 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:90-92 |
| AMG: | Zone 50 401489mE, 6491049mN (WGS84) |
| Habitat: | Depression between dunes. |
| Soil: | Dark grey (humic) sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low open forest over <i>Taxandria linearifolia</i> , <i>Astartea scoparia</i> high shrubland to open scrub over <i>Aotus gracillima</i> scattered shrubs over <i>Cyathochaeta teretifolia</i> , <i>Dielsia stenostachya</i> sedgeland. |
| Assoc. species: | <i>Cassutha racemosa forma pilosa</i> , <i>Burchardia congesta</i> (60-90cm), <i>Leucopogon australis</i> . |
| Veg Condition (BF): | Pristine – very low weed cover. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER10 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 63 |
| Photo: | BM100:93-94 |
| AMG: | Zone 50 401589mE, 6491030mN (WGS84) |
| Habitat: | Slight depression on flat plain. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) open woodland to woodland over <i>Melaleuca raphiophylla</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Kunzea glabrescens</i> high shrubland over <i>Xanthorrhoea preissii</i> scattered shrubs to open shrubland over <i>Dielsia stenostachya</i> open sedgeland. |
| Assoc. species: | <i>Jacksonia furcellata</i> , <i>Jacksonia sternbergiana</i> , <i>Austrostipa compressa</i> , <i>Podotheca gnaphalioides</i> , <i>Kennedia prostrata</i> . |
| Veg Condition (BF): | Good – probably past grazing, quite a lot of disturbance, quite good native vegetation cover in parts. |
| Fire Age: | About 7 or more years since last fire. |

| NORTH ELLENBROOK - SITE: NER11 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 63 |
| Photo: | BM100:95-98 (looking East) |
| AMG: | Zone 50 401683mE, 6490905mN (WGS84) |
| Habitat: | Flat plain. |
| Soil: | Grey-brown sand. |
| Vegetation: | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah) scattered trees over <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> shrubland over <i>Dielsia stenostachya</i> , * <i>Pentaschistis airoides</i> very open grassland/sedgeland. |
| Assoc. species: | <i>Patersonia occidentalis</i> , * <i>Carpobrotus edulis</i> , * <i>Briza maxima</i> , <i>Podotrochea chrysantha</i> (open hds), <i>Dasypogon bromeliifolius</i> , <i>Jacksonia furcellata</i> , * <i>Ehrharta calycina</i> . |
| Veg Condition (BF): | Good to Degraded – a lot of a few native taxa; very weedy between <i>Xanthorrhoea preissii</i> shrubs. |
| Fire Age: | More than about 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER12 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 8/11/2011 |
| Location: | Property #21 |
| Photo: | BM100:102, 103 |
| AMG: | Zone 50 402704mE, 6489076mN (WGS84) |
| Habitat: | Flow line between low dunes. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low closed forest over * <i>Ehrharta longiflora</i> closed grassland. |
| Assoc. species: | * <i>Arctotheca calendula</i> (Capeweed), <i>Xanthorrhoea preissii</i> , <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , * <i>Hypochaeris glabra</i> , <i>Astartea scoparia</i> , * <i>Jacaranda mimosifolia</i> (Blue Jacaranda), <i>Pinus pinaster</i> (Pinaster Pine) (at stone causeway). |
| Veg Condition (BF): | Degraded to Completely Degraded – too many <i>M. preissiana</i> trees to call it CD, but only weed grassland/herbland understory. |
| Fire Age: | More than about 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER13 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 8/11/2011 |
| Location: | Property #20 |
| Photo: | BM100:105, 106, 107 (looking North East from site) |
| AMG: | Zone 50 402668mE, 6489181mN (WGS84) |
| Habitat: | Gentle, east-facing mid to lower slope of dune. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Banksia menziesii</i> , <i>Banksia attenuata</i> scattered low trees over <i>Jacksonia floribunda</i> scattered tall shrubs over <i>Beaufortia elegans</i> (110-120cm), <i>Eremaea pauciflora</i> low shrubland to low open heath over <i>Lyginia barbata</i> open sedgeland. |
| Assoc. species: | <i>Nuytsia floribunda</i> , <i>Verticordia nitens</i> , * <i>Ursinnia anthemoides</i> subsp. <i>anthemoides</i> (2-5%). |
| Veg Condition (BF): | Good to Very Good (regrowth?) – although <i>Banksia</i> 's probably cleared or burnt out, low weed cover and low heath in good condition. |
| Fire Age: | Greater than 7 years since fire. |
| Notes: | |

| NORTH ELLENBROOK - SITE: NER14 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property #21 |
| Photo: | BM100:118, 119 |
| AMG: | Zone 50 402499mE, 6489415mN (WGS84) |
| Habitat: | Linear depression over/flow line at base of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland to low open forest over <i>Regelia inops</i> high open shrubland over <i>Xanthorrhoea preissii</i> open shrubland over <i>Hypocalymma angustifolium</i> scattered low shrubs over <i>Dielsia stenostachya</i> sedgeland. |
| Assoc. species: | <i>Podotheca gnaphalioides</i> , <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> , <i>Trachymene pilosa</i> , * <i>Fumaria capreolata</i> , * <i>Hypochaeris glabra</i> , * <i>Ehrharta longiflora</i> , * <i>Briza minor</i> , * <i>Briza maxima</i> , * <i>Solanum nigrum</i> , * <i>Moraea flaccida</i> (Cape tulip), <i>Nuytsia floribunda</i> , <i>Astartea scoparia</i> . |
| Veg Condition (BF): | Good to Degraded (in parts) – quite weedy in parts, past grazing, change in water table(s). |
| Fire Age: | More than about 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER15 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property 20 |
| Photo: | BM100:123, 124 |
| AMG: | Zone 50 402778mE, 6489411mN (WGS84) |
| Habitat: | Flats adjacent to flow line. |
| Soil: | Grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) open forest over <i>Xanthorrhoea preissii</i> scattered shrubs to open shrubland (some parts) over <i>Ehrarta calycina</i> closed grassland. |
| Assoc. species:. | * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , * <i>Hypochaeris glabra</i> , <i>Melaleuca seriata</i> , <i>Jacksonia sternbergiana</i> , <i>Nuytsia floribunda</i> |
| Veg Condition (BF): | Degraded to Completely Degraded – understorey is a weed grassland. |
| Fire Age | : ? More than about 7 years since fire. |
| Notes: | Similar vegetation to site R10. <i>Melaleuca preissiana</i> along wetter edges of this unit. |

| NORTH ELLENBROOK - SITE: NER16 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 22/11/2011 |
| Location: | Property #13 |
| Photo: | BM100:91 |
| AMG: | Zone 50 400938mE, 6489145mN (WGS84) |
| Habitat: | Flat at base of low dune. |
| Vegetation: | <i>Eucalyptus rudis</i> (Flooded gum) open forest over <i>Melaleuca preissiana</i> , <i>Acacia saligna</i> scattered low trees over <i>Xanthorrhoea preissii</i> , <i>Astartea scoparia</i> high open shrubland over <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> open sedgeland with * <i>Bromus diandrus</i> , * <i>Pennisetum clandestinum</i> (Kikuyu), * <i>Briza maxima</i> , * <i>Avena barbata</i> open grassland. |
| Assoc. species: | <i>Gastrolobium ebracteolatum</i> (250cm), <i>Melaleuca raphiophylla</i> , * <i>Carpobrotus edulis</i> (Pigface), <i>Melaleuca lateritia</i> . |
| Veg Condition (BF): | Degraded – high weed cover. |
| Notes: | Areas of NER16 in grazing paddock (NW corner), have a * <i>Cynodon dactylon</i> (couch), <i>Centella asiatica</i> grassland/herbland. |

| NORTH ELLENBROOK - SITE: NER17 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 1/12/2011 |
| Location: | Property #14 |
| Photo: | BM100:173, 174 |
| AMG: | Zone 50 401170mE, 6489727mN (WGS84) |
| Habitat: | Gentle slopes adjacent to dampland depression. |
| Soil: | Grey sand. |
| Vegetation: | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah), <i>Corymbia calophylla</i> (Marri) scattered trees over <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> scattered low trees to low open woodland (patches) over <i>Regelia inops</i> , <i>Xanthorrhoea preissii</i> , <i>Pultenaea reticulata</i> shrubland over <i>Hypocalymma angustifolium</i> scattered low shrubs over <i>Hypolaena exsulca</i> open sedgeland with <i>Dasypogon bromeliifolius</i> very open herbland. |
| Assoc. species: | <i>Macrozamia riedlei</i> , * <i>Briza maxima</i> , <i>Lomandra hermaphrodita</i> , <i>Trachymene pilosa</i> , <i>Tricoryne elator</i> , <i>Patersonia occidentalis</i> . |
| Veg Condition (BF): | ?Good – appears to have been grazed in past → open area and big pile of uprooted <i>Melaleuca preissiana</i> pushed up. |
| Fire Age: | Greater than 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER18 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 1/12/2011 |
| Location: | Property #14 |
| Photo: | BM100:178 |
| AMG: | Zone 50 401214mE, 6489725mN (WGS84) |
| Habitat: | Linear depression between low dunes. |
| Soil: | Dark grey sand (organic) surface. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Astartea scoparia</i> open shrubland over <i>Hypocalymma angustifolium</i> low heath over <i>Dielsia stenostachya</i> very open sedgeland. |
| Assoc. species: | <i>Xanthorrhoea preissii</i> , <i>Taxandria linearifolia</i> , <i>Burchardia bairdiae</i> (60cm). |
| Veg Condition (BF): | Very Good – low weed cover, but possibly past disturbance to drainage/water tables. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER19 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property #63 |
| Photo: | BM100:194 |
| AMG: | Zone 50 401550mE, 6490115mN (WGS84) |
| Habitat: | Small swale between dunes. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Banksia ilicifolia</i> , <i>Banksia menziessi</i> low open woodland over <i>Xanthorrhoea preissii</i> open shrubland over <i>Eremaea pauciflora</i> , <i>Scholtzia involucreta</i> , <i>Melaleuca seriata</i> low shrubland over <i>Alexgeorgea nitens</i> , <i>Lyginia barbata</i> (rhizome) open sedgeland with <i>*Ehrarta calycina</i> very open grassland. |
| Assoc. species: | <i>Conostephium pendulum</i> , <i>Petrophile linearis</i> , <i>*Ehrarta sp.</i> , <i>Podotheca gnaphalioides</i> , <i>Patersonia occidentalis</i> , <i>Dasypogon bromeliifolius</i> , <i>Macrozamia riedlei</i> , <i>Jacksonia furcellata</i> , <i>*Pentaschistis airoides</i> , <i>*Gladiolus caryophyllaceus</i> , <i>*Ursinia anthemoides</i> , <i>Dampiera linearis</i> . |
| Veg Condition (BF): | Very Good. |
| Notes: | Similar to vegetation at quadrat NEQ10? |

| NORTH ELLENBROOK - SITE: NER20 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 4/12/2011 |
| Location: | Property #11 |
| Photo: | BM100:207, 208 |
| AMG: | Zone 50 403237mE, 6488691mN (WGS84) |
| Habitat: | Crest of low dune. |
| Soil: | Pale grey sand. |
| Elevation: | 47m |
| Vegetation: | <i>Eucalyptus todtiana</i> low open woodland over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> scattered tall shrubs to high open shrubland over <i>Beaufortia elegans</i> , (<i>Verticordia nitens</i>) open heath over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> low open shrubland over <i>Schoenus curvifolius</i> , <i>Lyginia ? barbata</i> scattered sedges. |
| Assoc. species: | <i>Dasyopogon bromeliifolius</i> , <i>Calytrix flavescens</i> , <i>Conostylis serrulata</i> , * <i>Ursinia anthemoides</i> , <i>Jacksonia floribunda</i> , <i>Astroloma xerophyllum</i> , dead <i>Banksias</i> , a few <i>Allocasuarina fraseriana</i> in general area. |
| Veg Condition (BF): | Excellent? – very low weed cover but probably past <i>Banksia</i> deaths. |
| Fire Age: | Greater than 7-10 years since fire. |
| Notes: | Elevation: 47m, NB: probably = NEQ15 but old dead <i>Banksia</i> sts??? |

| NORTH ELLENBROOK - SITE: NER21 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 10/12/2011 |
| Location: | Property #18 |
| Photo: | BM100:27, 28 |
| AMG: | Zone 50 401921mE, 6489736mN (WGS84) |
| Habitat: | Flow line between low dunes. |
| Soil: | Dark grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Xanthorrhoea preissii</i> high open shrubland over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> , <i>Astartea scoparia</i> , <i>Regelia inops</i> open shrubland over <i>Melaleuca seriata</i> , <i>Hypocalymma angustifolium</i> low open shrubland over <i>Phlebocarya ciliata</i> , <i>Dasypogon bromeliifolius</i> herbland to closed herbland. |
| Assoc. species: | <i>Acacia saligna</i> , <i>Ehrarta calycina</i> , <i>Mesomelaena graciliceps</i> , <i>Wahlenbergia capensis</i> , <i>Acacia pulchella</i> . |
| Veg Condition (BF): | Very Good – areas of higher weed cover, but generally moderate cover; impacts from water bores. |
| Fire Age: | Greater than 7-10 years since fire. |

| NORTH ELLENBROOK - SITE: NER22 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 10/12/2011 |
| Location: | Property #16 |
| Photo: | BM100:30 |
| AMG: | Zone 50 401846mE, 6489730mN (WGS84) |
| Habitat: | Flats adjacent to flow line. |
| Soil: | Grey sand |
| Vegetation: | <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> , <i>Regelia inops</i> scattered shrubs to open shrubland (patches of <i>Regelia inops</i> heath) over <i>Beaufortia elegans</i> , <i>Eremaea pauciflora</i> , <i>Xanthorrhoea brunonis</i> low shrubland over <i>Lyginia</i> spp. scattered sedges with <i>Dasypogon bromeliifolius</i> , <i>Patersonia occidentalis</i> , <i>Phlebocarya ciliata</i> herbland. |
| Assoc. species: | <i>Adenanthos obovatus</i> , <i>Eucalyptus todtiana</i> , <i>Banksia ilicifolia spicatum</i> . (same unit 50m away), <i>Bossiaea eriocarpa</i> , <i>Calytrix flavescens</i> , <i>Hypolaena exsulca</i> , * <i>Ehrarta calycina</i> , * <i>Ursinia anthemoides</i> , * <i>Pentaschistis airoides</i> , <i>Haemodorum</i> |
| Veg Condition (BF): | Good – lot of old disturbance, with partial(?) clearing; hard to know how genuine veg unit is). |

Mapping Notes

| NORTH ELLENBROOK - SITE: NEM1 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property 20 |
| Photo: | BM100:120, 121 (looking East) |
| AMG: | Zone 50 402452mE, 6489660mN (WGS84) |
| Habitat: | Low rise on very gently undulating plain. |
| Soil: | Grey sand. |
| Vegetation: | <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> , ? <i>Xanthorrhoea brunonis</i> scattered shrubs over * <i>Carpobrotus edulis</i> , <i>Podotheca gnaphalioides</i> , * <i>Pentaschistis airoides</i> herbland/grassland. |
| Assoc. species: | * <i>Ehrarta calycina</i> (scattered), <i>Crassula colorata</i> var. <i>colorata</i> . |
| Veg Condition (BF): | Completely Degraded – pasture paddock |
| | Notes: A flat occupies the northern end of the paddock and has <i>Xanthorrhoea preissii</i> , ? <i>Xanthorrhoea brunonis</i> scattered shrubs to open shrubland over * <i>Carpobrotus edulis</i> , <i>Lupinus</i> sp., * <i>Bromus diandrus</i> , * <i>Cynodon dactylon</i> (Couch) herbland/grassland (Completely Degraded). |

| NORTH ELLENBROOK - SITE: NEM2 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property #20 |
| Photo: | BM100:122 |
| AMG: | Zone 50 402817mE, 6490018mN (WGS84) |
| Habitat: | Man-made soak (hole) at north-east corner of property. |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Astartea scoparia</i> closed heath over <i>Juncus pallidus</i> scattered sedges. |
| Assoc. species: | |
| Veg Condition (BF): | Degraded to Completely Degraded – banks beyond <i>Astartea</i> are * <i>Cynodon dactylon</i> (Couch), * <i>Carpobrotus edulis</i> herbland/grassland. |

| NORTH ELLENBROOK - SITE: NEM3 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 15/11/2011 |
| Location: | Property #56 |
| Photo: | BM100:1 |
| AMG: | Zone 50 402678mE, 6491234mN (WGS84) |
| Habitat: | low rise |
| Soil: | Grey sand |
| Vegetation: | <i>Eucalyptus todtiana</i> scattered (sparsely) low trees over * <i>Ehrarta calycina</i> closed grassland. |
| Veg Condition (BF): | Completely Degraded |
| Notes: | Pasture paddock. |

| NORTH ELLENBROOK - SITE: NEM4 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 15/11/2011 |
| Location: | (Property 56) |
| Photo: | BM100:2 |
| AMG: | Zone 50 402814mE, 6491564mN (WGS84) |
| Habitat: | Depression on plain. |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Juncus pallidus</i> open sedgeland over * <i>Lotus</i> sp. closed herbl. |
| Veg Condition (BF): | Completely Degraded – pasture paddock. |

| NORTH ELLENBROOK - SITE: NEM5 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 22/11/2011 |
| Location: | Property #13 (southern end) |
| Photo: | BM100:88-90 (South East corner looking East) |
| AMG: | Zone 50 401353mE, 6489044mN (WGS84) |
| Habitat: | Broad flats between dunes. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri), * <i>Pinus pinaster</i> scattered trees to woodland over <i>Melaleuca preissiana</i> scattered low trees over <i>Xanthorrhoea preissii</i> scattered shrubs (parts) over * <i>Ehrarta calycina</i> , * <i>Pentaschistis airoides</i> , * <i>Hypochaeris glabra</i> , * <i>Ursinia anthemoides</i> closed grassland/herbland. |
| Assoc. species: | <i>Haemodorum spicatum</i> , <i>Jacksonia furcellata</i> , <i>Astartea scoparia</i> (large patch in SW approx???), weed orchid??? |
| Veg Condition (BF): | Completely Degraded – remnant <i>Melaleuca preissiana</i> and <i>Corymbia calophylla</i> on pasture paddocks. |
| Notes: | Pasture paddocks. |

| NORTH ELLENBROOK - SITE: NEM8 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 2/12/2011 |
| Location: | (Property 14/15) |
| Photo: | BM100: |
| AMG: | Zone 50 401338mE, 6489836mN (WGS84) |
| Habitat: | Depression between dunes. |
| Vegetation: | <i>Melaleuca preissiana</i> closed low forest over <i>Gastrolobium ebracteolatum</i> scattered tall shrubs over <i>Astartea scoparia</i> scattered shrubs over <i>Lepidosperma longitudinale</i> very open sedgeland. |
| Assoc. species: | <i>Lobelia anceps</i> , <i>Baumea articulata</i> , <i>Taxandria linearifolia</i> , <i>Centella asiatica</i> . |
| Veg Condition (BF): | Good – quite a lot of weeds. |
| Notes: | Similar to NEQ20. |

| NORTH ELLENBROOK - SITE: NEM9 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property #63 |
| Photo: | BM100:192 |
| AMG: | Zone 50 401353mE, 6490615mN (WGS84) |
| Habitat: | Swale between dunes. |
| Soil: | Grey sand. |
| Vegetation: | <i>Banksia attenuata</i> , <i>Banksia menziessii</i> low woodland over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> scattered tall shrubs over <i>Xanthorrhoea presissii</i> open shrubland over <i>Leucopogon conostephioides</i> , <i>Bossiaea eriocarpa</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> scattered low shrubs over <i>Alexgeorgea nitens</i> open sedgeland with * <i>Ehrarta calycina</i> , * <i>Pentaschistis airoides</i> very open grassland and <i>Patersonia occidentalis</i> , <i>Dasyogon bromeliifolius</i> very open herbland. |
| Assoc. species: | <i>Burchardia congesta</i> , <i>Dampiera linearis</i> , <i>Petrophile linearis</i> , <i>Gompholobium tomentosum</i> . |
| Veg Condition (BF): | Very Good? Regrowth after past (old) partial or full clearing. |
| Notes: | Similar vegetation to NEQ10. |

| NORTH ELLENBROOK - SITE: NEM10 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property 11 |
| Photo: | BM100:195 |
| AMG: | Zone 50 402722mE, 6488658mN (WGS84) |
| Habitat: | Small swale between dunes. |
| Soil: | Pale grey-white sand. |
| Vegetation: | <i>Banksia ilicifolia</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Beaufortia elegans</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> low shrubs to low open heath over <i>Austrostipa compressa</i> , <i>Lyginia ?barbata</i> scattered grasses/sedges, <i>Phlebocarya ciliata</i> , <i>Dasyogon bromeliifolius</i> herbland. |
| Assoc. species: | |
| Veg Condition (BF): | Excellent – but lot of dead <i>Banksia</i> 's around edge of swale (drought?) |

| NORTH ELLENBROOK - SITE: NEM12 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 4/12/2011 |
| Location: | Property 11 |
| Photo: | BM100: |
| AMG: | Zone 50 402945mE, 6488347mN (WGS84) |
| Habitat: | Depression between low dunes. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Regelia inops</i> closed scrub over <i>Lepidosperma longitudinale</i> very open sedgeland. |
| Assoc. species: | <i>Astartea scoparia</i> , <i>Trachymene coerulea</i> subsp. <i>coerulea</i> , <i>Dianella revoluta</i> var. <i>divaricata</i> , <i>Hibbertia stellaris</i> , <i>Nuytsia floribunda</i> . |
| Veg Condition (BF): | Excellent. |

| NORTH ELLENBROOK - SITE: NEM13 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 13/12/2011 |
| Location: | Property 71 |
| Photo: | BM100:57 (looking North) |
| AMG: | Zone 50 403762mE, 6491540mN (WGS84) |
| Habitat: | Shallow depression on plain. |
| Soil: | |
| Rock Type: | |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Juncus pallidus</i> open sedgeland with * <i>Lolium</i> sp., * <i>Vulpia</i> sp., * <i>Hypochaeris glabra</i> , * <i>Lotus</i> sp closed grassland/herbland. |
| Assoc. species: | |
| Veg Condition (BF): | Completely Degraded – cleared pasture paddock with few remnant <i>Melaleuca preissiana</i> . |
| Fire Age: | |
| Notes: | |

APPENDIX EIGHT

Reproduction of the statistical analysis for North Ellenbrook by Mr Chris Hancock

Data analysis

Groups

To test the alliances of the native plant communities in the context of the southern Swan Coastal Plain, the floristic data from the North Ellenbrook spring survey were amalgamated with the original data set used by Gibson et al. (1994) in their floristic survey of the southern Swan Coastal Plain. The entire data set (presence-absence data) was then re-analyzed using Bray-Curtis ordination based on the Sørensen similarity coefficient (Sørensen 1948) and the unweighted pair-group mean average (UPGMA) fusion method (Sneath and Sokal 1973) using the computer program PC-ORD (MJM Software Design). The positions of the North Ellenbrook quadrats within the output dendrogram were then used to allocate each quadrat to the community types defined by Gibson et al. (1994). As multiple additional sites tend to cluster together and disrupt the original Gibson et al. (1994) groupings, the North Ellenbrook quadrats were added to the Gibson dataset and analysed one at a time.

Occasionally UPGMA grouped a North Ellenbrook quadrat with quadrats from two or more Gibson et al. (1994) community types. In these cases the analysis was repeated using the flexible beta method of hierarchical grouping using the Sørensen distance measure with $\beta = -0.25$. This is one of two methods recommended by McCune and Grace (2002) as a way of avoiding space distortion and chaining among samples. The quadrats were also appraised in terms of the general descriptions given in Appendix 1 of Gibson et al. (1994). These methods enabled all but two of the North Ellenbrook quadrats to be allocated to the most appropriate southern Swan Coastal Plain community type. Quadrats NEQ20 and NEQ21, which were located in dampland and lowland country, did not show meaningful similarities with any of the Gibson et al. (1994) community types. Presumably these particular vegetation types were not sampled in the 1994 survey.

Results

| | UPGMA | FEXIBLE BETA | BEST GUESS |
|-------|-------------|--------------|-------------|
| NEQ1 | 23a | | 23a |
| NEQ2 | 4 | 4 | 4 |
| NEQ3 | 23a | | 23a |
| NEQ4 | 21c | 4 or 6 | 21c |
| NEQ5 | 23a | | 23a |
| NEQ6 | 11 or 4 | 11 | 11 |
| NEQ7 | 23b or 23a | 23a | 23a |
| NEQ8 | 23b or 23a | 23b | 23b |
| NEQ9 | 23a | | 23a |
| NEQ10 | 23b or 23a | 23a | 23a |
| NEQ11 | 23b | | 23b |
| NEQ12 | 23a | | 23a |
| NEQ13 | 11 | | 11 |
| NEQ14 | 6 | 21c | 21c |
| NEQ15 | 23a | | 23a |
| NEQ16 | 11,12,13 | 12 | 12 |
| NEQ17 | 23a | | 23a |
| NEQ18 | 21a,23b,23a | 23b | 23b |
| NEQ19 | 23a | | 23a |
| NEQ20 | 21C or 5 | 14 or 11 | doesn't fit |
| NEQ21 | 11 or 25 | 6 | doesn't fit |
| NEQ22 | 13 or 4 | 13 or 4 | 13 |

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APPENDIX B

Database Search Results

| Sheet | NameID | Taxon | Cons_Code | Plant_Desc | Site | Vegetation | Frequency | Notes | Locality | Geo_Method | Precloation | Date |
|---------|--------|---|-----------|---|--|--|--|---|--|------------|-------------|----------|
| 723223 | 3219 | <i>Acacia anomala</i> | T | Suffrutex caespitose, 30 - 45 cm alt; fl. luteis. | In gravel. | | | | Near Bullsbrook, Darling Range | MAN | 3 | /09/1966 |
| 723630 | 3219 | <i>Acacia anomala</i> | T | Herb; 20 - 30 cm. Flowers bright yellow - styles turn brown and stamens (i.e. filaments). | Gravel pit, laterite over clay. | | | | East Bullsbrook | MAN | 3 | 29473 |
| 5551323 | 3219 | <i>Acacia anomala</i> | T | Grass-like, 0.5 m high. Multiple stems of grass-like shrub. | Hillside. Laterite. | Jarrah/Marri forest over scrub. | | | Jenkin's Road, Bullsbrook. | AUTO | 3 | / |
| 6843697 | 14129 | <i>Acacia oenophylla</i> subsp. <i>oenophylla</i> | 3 | Single stemmed shrub to 1.8 m senescent. | On rocky clay. | With <i>Hakea leucosperma</i> , <i>Casuarina humilis</i> . | | | Susannah Brook, end of Padbury Road, Upper Swan | UNK | 3 | 29467 |
| 7132832 | 11336 | <i>Adenanthos cynagnum</i> subsp. <i>chamaephyton</i> | 3 | Prostrate shrub 10 cm high x 1.5 m wide. | Swale. Grey sand. | Low woodland. <i>Banksia attenuata</i> , <i>B. menziesii</i> , <i>Eucalyptus marginata</i> subsp. <i>thalassica</i> . | population of 30 plants. | | Road verge on Jenkins Road opposite Lot 41, Bushplan Site 291 | UNK | 3 | 36294 |
| 8497257 | 11957 | <i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i> | 4 | In flower. | Crest - upper slope with grey sand. | Associated species: <i>Pinus pinaster</i> , <i>Eucalyptus todtiana</i> , <i>Adenanthos cynagnum</i> , <i>Nuytsia floribunda</i> , <i>Alexgeorgea nitens</i> , <i>Hibbertia subvaginata</i> , <i>Scholtzia involucrata</i> . | | Condition of population: healthy. Potential threats: mining. | Ngangara pine plantation | GPS | 1 | 38611 |
| 8772584 | 11957 | <i>Anigozanthos humilis</i> subsp. <i>chrysanthus</i> | 4 | Perennial herb, 0.3 m high x 0.2 m wide. Flowers yellow. | Slope with white to grey sand. Underlying geology: Bassendean Dune System. | <i>Eucalyptus todtiana</i> isolated mid mallee trees over <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Nuytsia floribunda</i> sparse low woodland over <i>Verticordia nitens</i> , <i>Beaufortia elegans</i> , <i>Jacksonia floribunda</i> . | 2 plants. | | W of St Patrick Road, Ellenbrook | GPS | 1 | 41906 |
| 8617767 | 45757 | <i>Calectasia elegans</i> | 2 | Erect perennial subshrub to c. 45 cm high. Typical purple flower with red anthers; still roots present; plants in full flower. | Flat plain with deep grey sand. Long unburnt area. | Low <i>Banksia</i> woodland with moderately dense vegetation. Associated species: <i>Banksia</i> spp., <i>Stirlingia latifolia</i> , <i>Melaleuca</i> spp., <i>Eremaea</i> spp., <i>Hibbertia</i> spp., <i>Leucopogon</i> spp. | several populations in this vicinity of 2 or 3 plants. | | Melaleuca State Forest, ca 380 m W of powerline track, ca 2.7 km S from the intersection of Neaves and Gallagher Roads | GPS | 1 | 39707 |
| 8617740 | 45757 | <i>Calectasia elegans</i> | 2 | Erect perennial subshrub to c. 45 cm high. Typical purple flower with red anthers; still roots present; plants in full flower. | Flat plain with deep grey sand. Long unburnt area. | Low <i>Banksia</i> woodland with moderately dense vegetation. Associated species: <i>Banksia</i> spp., <i>Stirlingia latifolia</i> , <i>Melaleuca</i> spp., <i>Eremaea</i> spp., <i>Hibbertia</i> spp., <i>Leucopogon</i> spp. | several populations in this vicinity of 2 or 3 plants. | | Melaleuca State Forest, ca 170 m W of powerline track, ca 800 m S from the intersection of Neaves and Gallagher Roads | GPS | 1 | 39707 |
| 8008140 | 45757 | <i>Calectasia elegans</i> | 2 | Small shrub. | Grey sand. | Associated species: <i>Adenanthos cynagnum</i> subsp. <i>cynagnum</i> , <i>Jacksonia floribunda</i> to 2.5 m, 20% cover, <i>Beaufortia elegans</i> to 1.7 m, 15% cover, <i>Eremaea pauciflora</i> subsp. <i>pauciflora</i> , <i>Leucopogon conostephoides</i> , <i>Nuytsia floribunda</i> to 0.9 m, 10% cover. | uncommon. | | Ngangara - Moore River State Forest, Melaleuca Block, 10 m W of Walton Road, 190 m N from intersection of corner of Warbrook and Walton Road, 10.3 km SW from Bullsbrook, GSS site PCTC | GPS | 1 | 39702 |
| 8008132 | 45757 | <i>Calectasia elegans</i> | 2 | Small shrub. | Grey sand. | Associated species: <i>Banksia attenuata</i> , <i>Nuytsia floribunda</i> to 5 m, 10% cover, <i>Jacksonia floribunda</i> , <i>Adenanthos cynagnum</i> subsp. <i>cynagnum</i> to 1.6 m, 5% cover, <i>Verticordia nitens</i> to 1.5 m, 2% cover. | uncommon. | | Ngangara - Moore River State Forest, Melaleuca Block, 130 m E of St Patrick Road, 25 m S from intersection of corner of Warbrook Road and St Patrick Road, 11 km SW of Bullsbrook, GSS site PCA4 | GPS | 1 | 39702 |
| 256935 | 13626 | <i>Cyanicula ixoides</i> subsp. <i>ixoides</i> | 4 | | | | | | Upper Swan | MAN | 3 | /09/1913 |
| 8122342 | 16245 | <i>Cyathochaeta teretifolia</i> | 3 | | Sandy loam. | <i>Melaleuca preissiana</i> to 7.0 m, 10% cover, over <i>Xanthorrhoea preissii</i> , <i>Banksia ilicifolia</i> to 5.0 m, 20% cover, over <i>Pultenaea reticulata</i> , <i>Astatsea scoparia</i> to 1.8 m, 10% cover, over <i>Hypocalymma angustifolium</i> to 0.7 m, 10% cover, over <i>Mixed</i> to 0.2 m, 10% co | | | Ngangara-Moore River State Forest, Melaleuca Block, 130 m W of a point 320 m N of intersection of Quicke Road and St Patrick Road, Bullsbrook, 13.8 km ENE of Wanneroo, GSS site 195 | GPS | 1 | 39747 |
| 6529887 | 16245 | <i>Cyathochaeta teretifolia</i> | 3 | Sedge, 0.6-1.6 m. | Lower part of floor of dampland complex. | <i>Melaleuca preissiana</i> , <i>Banksia littoralis</i> low open woodland over <i>Melaleuca teretifolia</i> high open shrubland over <i>Melaleuca lateralis</i> , <i>Astatsea aff. fascicularis</i> shrubland to health over <i>Lepidosperma longitudinale</i> , <i>Baumea rubiginosa</i> dense sedge/land. Dominant | | | Site ML29, N of Ngangara Road, NE section of Lot 47 Lexia Avenue, locality of Ellenbrook | GPS | 1 | 36303 |
| 6570240 | 16245 | <i>Cyathochaeta teretifolia</i> | 3 | Tufted perennial herb to 1.5 m. | Edge of seasonal wetland, gentle slope, north aspect, dark brown loam over red sand with limestone, well drained. | Associated species: <i>Eucalyptus calophylla</i> . | | | Cardinal Drive Bushland (Bush Forever Site 23) approx. 200 m N Bordeaux Road (adjacent to System 6 Update quadrat vines01) Ellenbrook Bushland | GPS | 1 | 35006 |
| 6527930 | 16245 | <i>Cyathochaeta teretifolia</i> | 3 | Sedge. | Site description: gently sloping to flat area. | <i>Melaleuca preissiana</i> , <i>Banksia littoralis</i> , low woodland to low open forest (patchy) over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> heath to closed heath over sedges. | | | Site ML36M, N of Ngangara Road, SW side of Lot 47 Lexia Avenue, locality of Ellenbrook | GPS | 1 | 36409 |
| 6527914 | 16245 | <i>Cyathochaeta teretifolia</i> | 3 | Sedge. | Site description: a thin strip at a change in slope where there has probably been seepage. Soil: has a deep humus layer. | <i>Corymbia calophylla</i> over <i>Agonis linearifolia</i> high open shrubland over <i>Xanthorrhoea preissii</i> open shrubland. <i>Zantedeschia aethiopica</i> (young) established here. | | | Site ML44A, N of Ngangara Road, SE side of Lot 47 Lexia Avenue, locality of Ellenbrook | MAN | 2 | 36431 |
| 8429227 | 34773 | <i>Darwinia foetida</i> | T | Low, spreading shrubs to 0.6m x 1m, the leaves somewhat glaucous. Inflorescences inclined to nodding; bracts glaucous green tinged pinkish. | Moist flat, dark grey sand. | <i>Melaleuca raphiophylla</i> , <i>Hypocalymma angustifolium</i> , <i>Acacia pulchella</i> shrubland beneath marri, with invasion by blackberry, brazilian peppertrees, weedy grasses. | frequent - hundreds of plants. | | Private property in corner of Neaves Road and Bingham Road, Bullsbrook | GPS | 1 | 40475 |
| 8863857 | 34773 | <i>Darwinia foetida</i> | T | Low spreading shrub, 0.3 m x 0.3 m and 0.2 m high. Crowded angular leaves to 5 mm long, green. Terminal inflorescences, many flowered head, pale pink within pale green bracts. | | | frequent in a 70 m linear area. | Some very large sprawling plants in this population. Love and Veldt grasses are invading entire area. | C. 100 m N of Rutland Road, Bullsbrook, along unmade Almeria Parade Road Reserve, on the E side of the rail line | GPS | 1 | 42299 |
| 7887442 | 34773 | <i>Darwinia foetida</i> | T | Perennial, prostrate compact shrub 0.5 m high x 0.5 m wide. | Palaeoplain Multiple Use Wetland. Grey black soil. Burnt Spring 2005. | <i>Corymbia calophylla</i> , <i>Melaleuca raphiophylla</i> , <i>Hypocalymma angustifolium</i> . | 21-50 plants (25 alive, 22 dead) | Percentage of population in fruit 30%. | SW corner of Lot 200, Neaves Road, Bullsbrook | GPS | 1 | 39150 |
| 2386372 | 3115 | <i>Drosera occidentalis</i> | 4 | | Clayey sand soils. | | | | Rutland road and Great Northern Highway junction, Bullsbrook | AUTO | 3 | 32072 |
| 8728692 | 3115 | <i>Drosera occidentalis</i> | 4 | | Grows in peaty sand around the margins of swamps, winter wet depressions and watersheds in open areas. | | | | Ca 0.3 m E of the junction of Great Northern Highway and Rutland Road, near Bullsbrook | GPS | 1 | 33551 |
| 6352162 | 3115 | <i>Drosera occidentalis</i> | 4 | Pygmy. | White/yellow sand. Swamp. | | occasional. | | Great Northern Highway, Rutland Road, Bullsbrook | MAN | 3 | 30611 |
| 5812291 | 3115 | <i>Drosera occidentalis</i> | 4 | Small rosetted herb 3 mm high. Flowers 1-2 mm, several on erect stem 8-10 mm in length. | In moist sandy clay soil. Seasonally wet depressions. | Amongst sedges. Bordered by <i>Banksia</i> woodland associated plants include <i>Drosera nitidula</i> , <i>D. parvula</i> , <i>Pericalymma elliptica</i> , <i>Viminea juncea</i> , <i>Stirlingia latifolia</i> and <i>Lechenaultia floribunda</i> . | common. | | Great Northern Highway just N of Rutland Avenue in Bullsbrook East, just N of R.A.A.F. Pearce Aerodrome. | MAN | 3 | 31356 |
| 6512372 | 17605 | <i>Eleocharis keigheryi</i> | T | Erect annually renewed sedge; flowers green. | Sumpland (claypan); clay grey/brown. | | | | SW side of Pearce Airforce Base (System 6 Area M15, Bush Forever Site 294) opposite in town area to E of the boundary road | GPS | 1 | 34567 |
| 2266865 | 17605 | <i>Eleocharis keigheryi</i> | T | Tufted perennial herb, flowers inconspicuous. | Clay soil, under 6 inches water, dries in summer. | Sedges. | common. | | Ellen Brook Tortoise Reserve, 21 miles N of Perth. | MAN | 0 | 28782 |
| 7782020 | 17605 | <i>Eleocharis keigheryi</i> | T | Clumping grass-like sedge with height to 50 cm. Flowers green. | Seasonally inundated claypans with grey to brown clay. | Transitions from open clay pans comprised exclusively of <i>E. keigheryi</i> to vegetated clay pans. <i>Melaleuca</i> spp., <i>Verticordia</i> sp., <i>Chorizandra endosis</i> , herbs, <i>Avena fatua</i> and <i>Briza maxima</i> . | frequent. | Plants are located in seasonally inundated claypans scattered throughout S portion of reserve. | Ellen Brook Nature Reserve, W side of the Great N Highway, Upper Swan | GPS | 1 | 39305 |
| 7782047 | 17605 | <i>Eleocharis keigheryi</i> | T | Clumping grasslike sedge, green with yellow hairs. Height 20 - 30 cm. | Claypan with brown clay. Found in open water ponds. | | | | Ellen Brook Nature Reserve, upper avian | GPS | 1 | 39367 |
| 7782039 | 17605 | <i>Eleocharis keigheryi</i> | T | Clumping grass-like sedge to about 40 cm high. Green flowers with yellow hairs. | Seasonally inundated clay pan with brown clay. | <i>Chorizandra endosis</i> . Trees and shrubs 1.2 m. | | | RAAF Pearce Aerodrome, Bullsbrook, aviation located on SW side of the airforce base in an open clay pan | GPS | 1 | 39342 |
| 6512283 | 41801 | <i>Eryngium pinnatifidum</i> subsp. <i>Palustre</i> (G.J. Keighery 13459) | 3 | Erect annually renewed herb; flowers green/white/purple. | Dampland; grey sand. | <i>Cotula coronopifolia</i> , <i>Triglochin</i> sp., sedges and weed spp. | | | Wetland area to the N of quadrat Vines 01, W Vines residential area, Shire of Swan (Bush Forever Site 23) | GPS | 1 | 35006 |
| 8649707 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Perennial shrub, to 4 m high, to 10 m wide. | Riparian zone and within cleared paddock on low plain. Moist brown sand. | <i>Eucalyptus rudis</i> low forest over open scrub over very open low sedges. <i>Corymbia calophylla</i> , <i>Melaleuca raphiophylla</i> , <i>Jacksonia furcellata</i> , <i>Xanthorrhoea preissii</i> , <i>Hakea prostrata</i> , <i>Hibbertia hypericoides</i> , <i>Lepidosperma longitudinale</i> . | 7 clumps, clonal. | Degraded habitat. New population. | Lot 9500 Maralla Road, The Vines. Plants occur in the riparian zone at the SE end of the property, c. 100 m N of Muirfield Way | GPS | 1 | 39994 |
| 8526656 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Erect shrub, 1.5 m tall with white cream flowers. | Drainage line, slope. Moist soil. | Associated species: <i>Corymbia calophylla</i> , <i>Eucalyptus rudis</i> , <i>Xanthorrhoea preissii</i> and <i>Acacia saligna</i> . | 3 plants. | Vegetation condition: good. | Western bank of the Sawpit Gully Creek, Sawpit Gully Ellenbrook, c. 500 m N of the intersection of Roxburgh Drive and Tollandine Vista | GPS | 1 | 41533 |

| | | | | | | | | | | | | |
|---------|-------|--|---|---|--|--|---|--|------|--|---|----------|
| 5207002 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Spreading shrub with prostrate vegetative growth and flowerina/fruiting growth to 2 m. Bright green trifurcate foliage. | Low lying area of sandplain. Grey peaty sand over clay. | Cleared vegetation with weeds, grasses, <i>Hakea</i> sp., <i>Melaleuca</i> sp., <i>Acacia</i> sp. | | Corner of Rutland and Railway Roads, S of Muchea townsite, on road and rail reserve W side | GPS | | 1 | 36145 |
| 2415887 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | | | | | Bullsbrook, Swan River | AUTO | | 3 | 227 |
| 5414156 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Open, erect shrub 3+ m high x 2+ m wide. Old mature plants, appeared heavily grazed. No lower branches. No pods. | Winter wet creek line. Moist, grey sand. | Open Scrub (very old). Associated species: <i>Acacia saligna</i> , <i>Melaleuca rhamniphylla</i> , sedges, <i>Xanthorrhoea preissii</i> , <i>Banksia menziesii</i> . | common locally. | Maralla Road, Muchea, 7 km W from intersection with Railway Parade, S side of road. | TOPO | | 2 | 36047 |
| 6512936 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Spreading shrub to 1 m. | Edge of seasonal wetland, gentle slope, N aspect. Dark brown loam over red sand with limestone, well drained. | Associated species: <i>Eucalyptus calophylla</i> . | | Cardinal Drive Bushland (Bush Forever Site 23), c. 200 m N Bordeaux Road (adjacent to System 6 Update quadrat vines 01) Ellenbrook Bushland | GPS | | 1 | 35006 |
| 8008485 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Prostrate and erect shrub to 2 m. Flowers white. | Flats, Grey sand. | <i>Banksia</i> sp., <i>Melaleuca</i> sp., weeds. | | Occurs at the intersection of Brand Highway and Rutland Road, Muchea within the rail reserve. Plants occur on the NW and SE corners | GPS | | 1 | 39819 |
| 5492963 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Woody shrub to 3 m high. Erect branches. Mid pale green leaves, cream flowers. | Flat, near shallow seasonal creekline, Grey sand. | Shrubland/Sedgeland. Characteristic species: <i>Hakea varia</i> . | | Ellenbrook. | MAN | | 0 | 36571 |
| 8863768 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Spreading shrub to 1.6 m with pinnatifid leaves, in early flower bud stage. Juvenile growth prostrate with broader leaf lobes than the mature upright leaves. | Flat, grey sand to sandy-loam, highly disturbed bushland corridor on rail and unmade road reserve. | Open Tall Shrubland of <i>Acacia saligna</i> over Open Shrubland of <i>Xanthorrhoea preissii</i> and <i>Acacia</i> ? cochlearis over African love grass, perennial Veldt grass and <i>Cyathochaeta avenacea</i> . Occasional <i>Thysanotus</i> ? <i>patersonii</i> and <i>Hakea prostrata</i> . | c. 120 plants in sometimes dense local patches, over a 230 m length. | Canker evident on many shrubs. | GPS | | 1 | 42619 |
| 8649723 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Perennial shrub, to 4 m high, to 10 m wide. | Riparian zone and within cleared paddock on low plain. Moist brown sand. | <i>Eucalyptus rudis</i> low forest over open scrub over very open low sedges, <i>Corymbia calophylla</i> , <i>Melaleuca rhamniphylla</i> , <i>Jacksonia fuercellata</i> , <i>Xanthorrhoea preissii</i> , <i>Hakea prostrata</i> , <i>Hibbertia hypericoides</i> , <i>Lepidosperma longitudinale</i> . | 12 clumps, likely to be clonal. | Degraded habitat. New population. | GPS | | 1 | 39994 |
| 8649715 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Perennial shrub, to 4 m high, to 10 m wide. | Riparian zone and within cleared paddock on low plain. Moist brown sand. | <i>Eucalyptus rudis</i> low forest over open scrub over very open low sedges, <i>Corymbia calophylla</i> , <i>Melaleuca rhamniphylla</i> , <i>Jacksonia fuercellata</i> , <i>Xanthorrhoea preissii</i> , <i>Hakea prostrata</i> , <i>Hibbertia hypericoides</i> , <i>Lepidosperma longitudinale</i> . | 12 clumps, likely to be clonal. | Degraded habitat. New population. | GPS | | 1 | 39994 |
| 9068759 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Very large shrub over 2 m. White flowers. | Flat with dark brown loam. | Occasional <i>Xanthorrhoea preissii</i> and weeds including <i>Watsonia</i> , <i>Couch grass</i> , <i>love grass</i> , <i>veldt grass</i> . | occasional - 1 adult and 3 juveniles in area. | | GPS | | 1 | 40807 |
| 9068767 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Shrub with white flowers. | Well drained flat ground, degraded habitat. Grey sand. | Tall open scrub of <i>Acacia saligna</i> and <i>Jacksonia</i> sp.; over open heath of <i>Grevillea curviloba</i> subsp. <i>curviloba</i> with occasional <i>Xanthorrhoea preissii</i> ; over weeds of <i>Eragrostis curvula</i> , <i>Watsonia</i> sp. and <i>Poa</i> sp. | | | GPS | | 1 | 41151 |
| 9068775 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Shrub over 2 m high, in bud. Some plants prostrate. | Dark brown loam sand. | Tall open scrub of <i>Acacia saligna</i> with occasional <i>Banksia littoralis</i> , <i>B. sessilis</i> , <i>Hakea varia</i> ; over open heath of <i>Stirlingia latifolia</i> , <i>Dianella revoluta</i> and weeds of <i>Eragrostis curvula</i> , <i>Oxalis</i> sp., <i>Babiana</i> sp., <i>Asparagus</i> . | locally frequent. | | GPS | | 1 | 41138 |
| 9068813 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Large shrub to 2 m with white flowers. | Near drainage line. | Occasional <i>Banksia menziesii</i> ; over shrubland of <i>Grevillea curviloba</i> subsp. <i>curviloba</i> , <i>Xanthorrhoea preissii</i> , <i>Acacia saligna</i> ; over closed sedgeland of <i>Schoenus subfascicularis</i> ; over weeds. | occasional. | Leaves similar to <i>G. vestita</i> in this population, but leaf lobes sparsely tomentose with white hairs, not villous with rust coloured hairs as in <i>G. vestita</i> . Floral bracts deoculous, not persistent as in <i>G. vestita</i> . | GPS | | 1 | 40807 |
| 9068821 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Prostrate to erect shrub 1 - 2 m high. White flowers. | Drainage line with grey sand over clay. | Tall open shrubland of <i>Hakea varia</i> , over open heath of <i>Regelia ciliata</i> , over herbland and weeds. | abundant. | | GPS | | 1 | 41151 |
| 2415925 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Prostrate vegetative branches and erect leafy flowering branches: up to 2.5 m high. | In sand. | | | | AUTO | | 3 | 26577 |
| 1112821 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | Prostrate vegetative branches and erect leafy flowering branches: up to 2.5 m high. | In semi-disturbed area. Deep sand, with a high water-table. | With <i>Regelia ciliata</i> , <i>Conospermum triplinervium</i> . | | | MAN | | 3 | 27921 |
| 8816433 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | Upright shrub, to 2 m high. Variable width. White flowers. | Lower slope. Near to creekline. Flat. Grey loamy sand. | Occasional <i>Acacia saligna</i> over Shrubland of <i>Grevillea curviloba</i> and <i>Xanthorrhoea preissii</i> over Closed Grassland of mixed weed species dominated by <i>Agrostis curvula</i> and <i>Ehrharta calycina</i> . Associated species: <i>Corynothea micrantha</i> , <i>Burchardia congesta</i> , <i>Jac</i> . | ca 25 shrubs in one localised area. | Plants are in poor condition. Insects are having a secondary impact on the population which is stressed from weed competition and drying climate. | GPS | | 1 | 42299 |
| 9068740 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | Shrub to 2 m. White flowers starting to emerge. | In riparian vegetation. | Open woodland of <i>Melaleuca rhamniphylla</i> and <i>M. preissiana</i> ; over <i>Grevillea curviloba</i> subsp. <i>incurva</i> and <i>Microzamia riedlei</i> ; over closed sedgeland of <i>Schoenus subfascicularis</i> (riparian zone) and weeds. | occasional - 1 plant only. | | GPS | | 1 | 41138 |
| 2697246 | 16952 | <i>Guichenotia tuberculata</i> | 3 | Bulbous herb. Inflorescence to 2 m, flowers green/brown, scented. | | | | Near Bullsbrook, between New Norcia and Perth | AUTO | | 3 | /09/1902 |
| 1044567 | 1468 | <i>Haemodorum loratum</i> | 3 | Compact shrub to 40 cm high. Flowers blueish. | Latentic loam. | Wandoo woodland. | | 20 km ESE Muchea. | MAN | | 0 | 29903 |
| 1111167 | 6986 | <i>Halgania corymbosa</i> | 3 | Compact shrub to 40 cm high. Flowers blueish. | Latentic soil. | | | Susannah Brook, Millendon. | MAN | | 3 | 29467 |
| 1137654 | 6233 | <i>Hydrocotyle lemnoides</i> | 4 | | | | | Ellen Brook Nature Reserve | AUTO | | 3 | 32742 |
| 1048104 | 6233 | <i>Hydrocotyle lemnoides</i> | 4 | Corolla mauve. Leaves floating, stem rooted in clay. | Growing in fresh water, stem rooted in clay. | | | 15 km N of Midland on Great Northern Highway, Martyn Reserve | MAN | | 3 | 28040 |
| 3401332 | 6233 | <i>Hydrocotyle lemnoides</i> | 4 | | | | | 21 mile peg Reserve Great Northern Highway [10 km S of Bullsbrook East] | AUTO | | 3 | /09/1963 |
| 1048112 | 6233 | <i>Hydrocotyle lemnoides</i> | 4 | | Growing in shallow water over mud. | | | Short-necked Tortoise Reserve ca. 15 km N of Midland | MAN | | 4 | 31303 |
| 1048139 | 6233 | <i>Hydrocotyle lemnoides</i> | 4 | Leaves floating, stem rooted in clay. Corolla mauve. | Growing in fresh water, stem rooted in clay. | | | 15 km N of Midland on Great Northern Highway, Martyn Reserve | MAN | | 3 | 28040 |
| 8836647 | 11074 | <i>Hydrocotyle striata</i> | 1 | Spreading annual. Height: 5-10 cm. | Seasonally inundated depression within a Mound Spring. Moist, undulating slightly. Black peaty sand. Fire history: Autumn 1995. | Low Open forest of <i>Melaleuca preissiana</i> over <i>Pteridium esculentum</i> . With <i>Cyathochaeta teretifolia</i> (P3), <i>Hibbertia perfoliata</i> . | dense cover in localised ca 40 m x 30 m area. (Site not surveyed closely, plants maybe more widespread on Lot). | Collection made for identification as it had not been seen prior to removal of extremely dense cover of Blackberry initiated in 2012. Site is a Mound Spring of the Swan Coastal Plain threatened Ecological Community. | GPS | | 1 | 42690 |
| 6528333 | 17622 | <i>Hypolaena robusta</i> | 4 | Female. Rush, 40-65 cm. | Upper part of the crest of a quite tall dune. Soil: light greyish-brown sand with a pale grey surface in places and a thin litter layer elsewhere. | <i>Banksia attenuata</i> , <i>Banksia menziesii</i> low woodland over scattered <i>Adenanthos cygnorum</i> sp. <i>cygnorum</i> over <i>Conospermum stoehadae</i> , <i>Jacksonia densiflora</i> open shrubland over <i>Eriosema pauciflorum</i> sp. <i>pauciflorum</i> , <i>Stirlingia latifolia</i> , <i>Astroloma xerophyllum</i> , <i>Scho</i> | | Site ML35, N of Ganangara Road, S side of Lot 47 Lexia Avenue, locality of Ellenbrook | GPS | | 1 | 36404 |

| | | | | | | | | | | | | | |
|---------|-------|--|---|---|--|---|---|---|---|--|-----|-------|-------|
| 6528341 | 17622 | <i>Hypolaena robusta</i> | 4 | Male. Rush, 40-65 cm. | Upper part of the crest of a quite tall dune. Soil: light greyish-brown sand with a pale grey surface in places and a thin litter layer elsewhere. | <i>Banksia attenuata</i> , <i>Banksia menziesii</i> low woodland over scattered <i>Adenanthos cygnorum</i> ssp. <i>cygnorum</i> over <i>Cotoneaster atochoides</i> , <i>Jacksonia densiflora</i> open shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Stirlingia latifolia</i> , <i>Astelroloa xerophyllum</i> , <i>Scho</i> | | | Site ML35, N of Gnaragara Road, S side of Lot 47 Lexia Avenue, locality of Ellenbrook | GPS | 1 | 36404 | |
| 8772630 | 14337 | <i>Millettia tenuifolia</i> var. <i>laevis</i> | 2 | Annual herb, 0.05 m high x 0.01 m wide. Flowers yellow. | Upper slope with grey sand. Underlying geology: Bassendean Dune System. | <i>Banksia attenuata</i> and <i>Banksia menziesii</i> low woodland over <i>Eucalyptus todtiana</i> sparse mid mallee woodland over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> sparse tall shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> sparse mid shrubland over <i>Hibbertia hypericoid</i> | | | S of Maralla Road, Ellenbrook | GPS | 1 | 41906 | |
| 5991714 | 2278 | <i>Persoonia sulcata</i> | 4 | Decumbent shrub 0.2 m high with smooth, compact bark. Leaves spreading, slightly twisted, bright green. | Laterite. | <i>Eucalypt</i> woodland with low shrubby understorey. | three plants seen. | | Great Northern Highway, 102.6 km N of Perth GPO, 12.4 km N of turnoff to Toodyay. | MAN | 3 | 29573 | |
| 6498841 | 11557 | <i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i> | 3 | Herb 15 cm. | Gentle slope to S at edge of a seasonal dampland. Light greyish brown sand with a pale grey (whitish) surface, a thin litter layer over parts (>half). | <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> low open woodland to low woodland over <i>Regelia ciliata</i> open scrub to closed scrub over <i>Hypocalymma angustifolium</i> open shrubland to open heath over scattered herbs and sedge of <i>Dasyopogon bromelifolius</i> and <i>Hypolaena e</i> | | From site ML 18, Specimen ML18-12. | N of Gnaragara Road, NE corner of Lot 46 Maralla Road, locality of Ellenbrook | GPS | 1 | 36302 | |
| 6498868 | 11557 | <i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i> | 3 | Herb, 15 cm. | Gentle slope to S at edge of a seasonal dampland. Light greyish brown sand with a pale grey (whitish) surface, a thin litter layer over parts (>half). | <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> low open woodland to low woodland over <i>Regelia ciliata</i> open scrub to closed scrub over <i>Hypocalymma angustifolium</i> open shrubland to open heath over scattered herbs and sedge of <i>Dasyopogon bromelifolius</i> and <i>Hypolaena e</i> | | From site ML 18, Specimen ML18-13. | N of Gnaragara Road, NE corner of Lot 46 Maralla Road, locality of Ellenbrook | GPS | 1 | 36302 | |
| 6350178 | 42022 | <i>Poranthera moorokatta</i> | 2 | Erect annual herb, 1 cm. | Flat to very slight depression on a broad flat dampland floor. Soil: surface light grey to grey, set clay with some coarse sand, thick white sand cover in some places. Below surface light grey-grey clay with some sand. Some litter in patches around shrub | Dominants: <i>Melaleuca preissiana</i> 4-13 +/- 1-5% (varies); <i>Calothamnia lateralis</i> , <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> 0.5-1 m > 15%; <i>Astarea aff. fascicularis</i> 1-1.4 m < 5%. Associated species: The more abundant species for this site were <i>Phyllanthum parado</i> | | Specimen ML48-8. | Site ML48, N of Gnaragara Road, W part of Lot 47 Lexia Avenue, Locality of Ellenbrook | MAN | 2 | 36455 | |
| 8772606 | 42022 | <i>Poranthera moorokatta</i> | 2 | Annual herb, 0.05 m high x 0.05 m wide. | Dampland with brown / white peat / sand. Underlying geology: Bassendean Dune System. | <i>Melaleuca preissiana</i> mid woodland over <i>Banksia littoralis</i> sparse low woodland over <i>Xanthorrhoea preissii</i> and <i>Taxandria linearifolia</i> open tall shrubland over <i>Hypocalymma angustifolium</i> sparse low shrubland. | 1 plant. | | N of Fewson Turn, Ellenbrook | GPS | 1 | 41890 | |
| 8772622 | 42022 | <i>Poranthera moorokatta</i> | 2 | Annual herb, 0.05 m high x 0.05 m wide. | Slope with brown / white sand. Underlying geology: Bassendean Dune System. | <i>Eucalyptus todtiana</i> isolated mid mallee trees over <i>Banksia attenuata</i> , <i>Banksia menziesii</i> and <i>Nuytsia floribunda</i> sparse low-woodland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> sparse mid shrubland over <i>Hibbertia hypericoides</i> , <i>Hibbertia subvaginata</i> and <i>Scholtz</i> | 1 plant. | | NW of Fewson Turn, Ellenbrook | GPS | 1 | 41901 | |
| 6533388 | 980 | <i>Schoenus capillifolius</i> | 3 | Annual herb, flowers brown. | Seasonal Wetland, flat ground, brown clay, poor drainage, wet during winter/spring. | Low Scrub B, Associated species: <i>Kunzea littoralis</i> Ma, <i>Verticordia densiflora</i> . | | | Eastern side of Pearce Airforce Base near Singapore Airforce Training Centre, System 6 Area M15, in System 6 Update quadrat rpeae02 | GPS | 1 | 34507 | |
| 1278215 | 980 | <i>Schoenus capillifolius</i> | 3 | Annual herb, in fruit. | Clay pan dry - some mud in deeper sections with live plants. | | | | J. Martyn Reserve, 13 km N Midland | AUTO | 3 | 29539 | |
| 2239108 | 980 | <i>Schoenus capillifolius</i> | 3 | Aquatic herb. Growing submerged or on edges. | Winter wet claypan. | With <i>Glossostigma</i> sp., <i>Hydatella</i> sp. and <i>Trinithuria</i> sp. surrounded by regenerating heath B of <i>Melaleuca lateritica</i> . | | Abundance: several hundred plants. | Ellen Brook Nature Reserve, Upper Swan | MAN | 0 | 33179 | |
| 8893373 | 980 | <i>Schoenus capillifolius</i> | 3 | Small aquatic herb. | Seasonally wet poorly drained flat. Brown sandy clay. | <i>Melaleuca lateritia</i> , <i>Viminaria juncea</i> and <i>Kunzea micrantha</i> over herbs. | | Vegetation condition: very good. Claypan TEC, communities 7 & 8. | Plot Ellen 03, Ellenbrook Nature Reserve | GPS | 1 | 41206 | |
| 4526422 | 17806 | <i>Schoenus griffiniianus</i> | 4 | Perennial sedge. | Soil: White sand. Topography/drainage: Well drained gentle SW facing slope. Geomorphology: Bassendean sands over gulliford formation. | Vegetation: <i>Banksia attenuata</i> Open Low Woodland A over mixed Low Heath C over mixed Open Dwarf Scrub D over <i>Lynxia barbata</i> Very Open Low Sedges. | | | Melaleuca Park conservation area, N Cooper Rd, 12 km NE of Wanneroo (plot mela-8) | GPS | 1 | 34261 | |
| 7514271 | 1003 | <i>Schoenus natans</i> | 4 | Floating aquatic herb. | Flooded claypan. | <i>Melaleuca lateritia</i> shrubland over <i>Chorizanthe enodis</i> and aquatic herbs. | Common. | | Ellenbrook Nature Reserve | GPS | 1 | 36267 | |
| 4097610 | 16279 | <i>Schoenus</i> sp. <i>Bullsbrook</i> (J.J. Alford 915) | 2 | Delicate herb 15 cm high, flowers brown and green. | Low lying flat, grey peaty sand over 7 clay. | Herbs and low shrubs. | common. | | Twin Swamps Nature Reserve, 8 km S of Bullsbrook | MAN | 0 | 31716 | |
| 4750411 | 17731 | <i>Schoenus</i> sp. <i>Waroona</i> (G.J. Keighery 12235) | 3 | Annual 2-5 cm, flowers green. | Winter wet flats, dark brown loam clay over clay. | Burnt low heath. | common. | | J & B Martyn Reserve, 13 km N of Midland | MAN | 3 | 32447 | |
| 1631098 | 7756 | <i>Stylidium longitubum</i> | 4 | Annual herb, flowers pink, throat yellow. | Winter wet claypan. | <i>Melaleuca lateritia</i> shrubland; burnt. | abundant. | | J. & R. Martyn Reserve, 13 km N Midland | AUTO | 3 | 32419 | |
| 2694263 | 7756 | <i>Stylidium longitubum</i> | 4 | Erect leafless herb with red succulent stems and pink flowers. Erect single stemmed plant with pink petals, darker pink with white at centres. Height 50-12 cm. | Recently dried muddy depression in swamp. | | | | Twin Swamps Wildlife Sanctuary (Reserve No. A 27621) Ellen Brook - Bullsbrook area | TOPO | 2 | 26295 | |
| 8161119 | 7756 | <i>Stylidium longitubum</i> | 4 | Flat, clay pan. Moist grey clay. | | <i>Jacksonia</i> , <i>Acacia</i> , <i>Asteraceae</i> , <i>Villarsia</i> , weeds. | many plants but in an area of ca 25 m x 10 m. | | Ellen Brook Nature Reserve, Great Northern Highway, West Swan | GPS | 1 | 39780 | |
| 1643061 | 7756 | <i>Stylidium longitubum</i> | 4 | Annual herb. Flowers pink, and laterally paired. | Grows in clayey sand, in small winter-wet depressions. | Under and around shrubs. | | | In a paddock on the W side of Railway Parade, 0.5 km N of Apple Road, Upper Swan | AUTO | 3 | 32824 | |
| 3510042 | 7756 | <i>Stylidium longitubum</i> | 4 | | | | | | Ellenbrook area, west of Vines golf course | MAN | 0 | 33907 | |
| 8893101 | 7756 | <i>Stylidium longitubum</i> | 4 | Small annual herb. | Seasonally wet poorly drained flat. Brown sandy clay. | <i>Melaleuca lateritia</i> , <i>Viminaria juncea</i> and <i>Kunzea micrantha</i> over herbs. | | Vegetation condition: very good. Claypan TEC, communities 7 & 8. | Plot Ellen 03, Ellenbrook Nature Reserve | GPS | 1 | 41206 | |
| 7838204 | 25800 | <i>Stylidium paludicola</i> | 3 | Herb to 1 m tall. | Peat based mound spring. Permanently wet site with water oozing from entire surface. Dips and mounds occur in peat layer. | With forest - woodland of <i>Melaleuca preissiana</i> over dense shrubland of <i>Cyclosorus intermutus</i> , <i>Pteridium esculentum</i> , <i>Agonis linearifolia</i> , <i>Astarea fascicularis</i> , <i>Isolepis prolifera</i> , <i>Lobelia alata</i> , <i>Burchardia</i> sp. | occasional. | | ca 950 m W of western end of Gaston Road in Bullsbrook | GPS | 1 | 39412 | |
| 7855656 | 25800 | <i>Stylidium paludicola</i> | 3 | Reed-like perennial herb 35-80 cm high, numerous scapes per plant; corolla lobes laterally-paired, bright pink, darker pink in bud; labellum pale pink with a pink terminal appendage; throat white, yellow to inside, glandular; anthers greenish-red fading | Winter-wet flat; brown sandy-clay. | Open <i>Melaleuca preissiana</i> woodland with dense <i>Myrtaceae</i> shrubs. | localised patch | | Maralla Rd. E of Sawpit Road, Maralla Nature Reserve, N of Perth | GPS | 1 | 39021 | |
| 7282575 | 25800 | <i>Stylidium paludicola</i> | 3 | Multi-stemmed erect plant with pink flowers, white throat. Height to 90 cm. | Flat with moist grey sand. | With <i>Acacia</i> sp., <i>Melaleuca preissiana</i> and <i>Leptospermum</i> sp. | ca 50 plants. | | Maralla Nature Reserve, Maralla Road, The Vines, 200 m E of Sawpit Road then 100 m S of gate | GPS | 1 | 38670 | |
| 6499171 | 20603 | <i>Stylidium trudgenii</i> | 3 | Perennial herb, 4-5 cm | Dampland - wetland. Peat, soggy. | <i>Melaleuca preissiana</i> (1.8) 5-7 m 1-2%; <i>Astarea aff. fascicularis</i> 1-1.8 m +/- 30% (more out of 10 x 10 m; to > 70%); <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> 0.7 m < 5%; <i>Meeboldina scariosa</i> (ML49-1) 0.5-1 m < 5%. Associated species: <i>Stylidium mimeticum</i> , <i>Iso</i> | | From site ML49, Specimen ML49-11. | N of Gnaragara Road, SW section of Lot 46 Maralla Road, locality of Ellenbrook | GPS | 1 | 36455 | |
| 6529690 | 20603 | <i>Stylidium trudgenii</i> | 3 | Perennial herb. | Floor of a dampland/wetland complex. Seasonally inundated? (probably for short period at most this year). Soil: dark grey (pale surface) sandy (little) peat. | Scattered <i>Melaleuca preissiana</i> , <i>Banksia littoralis</i> (shrubs), over <i>Astarea aff. fascicularis</i> heath. Associated species: <i>Drosera pulchella</i> , <i>Drosera aff. pygmaea</i> , <i>Villarsia albiflora</i> , <i>Epibema grandiflorum</i> var. <i>grandiflorum</i> , <i>Comesperma virgatum</i> , patches of | | | Stylidium sp Ellenbrook (M.Trudgen 49-11) in a localised patch about 5 m across of about 21 clumps. | Site ML50A, N of Gnaragara Road, W part of Lot 47 Lexia Avenue, locality of Ellenbrook | GPS | 1 | 36495 |
| 6704832 | 20603 | <i>Stylidium trudgenii</i> | 3 | Caespitose perennial herb. Flowers cerise laterally paired. | In black peaty soil on a winter wet swamp margin. | | | Specimens grown on in cultivation until anthless then pressed for vouchers. | 5 km N of Ellen Brook Estate | GPS | 1 | 36822 | |

| | | | | | | | | | | | | |
|---------|-------|---|---|--|--|--|---|--|---|------|---|-------|
| 7337671 | 48297 | <i>Styphelia filifolia</i> | | Erect, well branched shrub to ca 50 cm high. White flowers. Mostly in bud. | Flat, slope. Dry, white sand. | <i>Banksia ilicifolia</i> , <i>B. menziesii</i> , <i>Nuytsia floribunda</i> , <i>Melaleuca</i> - paper bark trees and sandplain shrubs including <i>Schottzia involucrata</i> . | 10+ scattered plants. | | Warbrook Road, Bullsbrook, ca 200 m S from Wise Road then 100 m W | GPS | 1 | 38773 |
| 4864743 | 35581 | <i>Tetrasia</i> sp. <i>Chandala</i> (G.J. Keighery 17055) | | Rhizomatous herb 1.6 m high, 1 m wide; flowers brown; fruits brown. | Mound spring, black peat over clay & humic sand. | Assoc. vegn.: <i>Melaleuca raphiophylla</i> forest over sedges. | | Abundance: very common. | Property on W side of Neaves Road, Wanneroo | TOPO | 2 | 35465 |
| 2472635 | 32658 | <i>Trithuria occidentalis</i> | T | Annual herb, leaves red, flowers red, anthers purple-red. | In water, muddy open. | | common. | | J.R. & B. Martyn Reserve, Ellen Brook, 13 km N Midland | TOPO | 3 | 30251 |
| 2841886 | 32658 | <i>Trithuria occidentalis</i> | T | Reddish annual herb. | Slightly submerged clay pan, open. | | | Abundance: common | Warbrook Siding, Upper Swan | AUTO | 3 | 28781 |
| 2841851 | 32658 | <i>Trithuria occidentalis</i> | T | Small annual, reddish colour. | Drying pools, muddy claypan. | <i>Melaleuca laterite</i> scrub. | common. | | J.R. and B. Martyn Reserve, Ellen Brook, 13 km N Midland | MAN | 3 | 30251 |
| 7855885 | 32658 | <i>Trithuria occidentalis</i> | T | | Low-lying depression next to a low sand ridge covered by <i>Petrophile</i> sp. and <i>Eucalyptus</i> trees. Soil grey-brown clay, soft and damp to dry and hardening where higher. | Open shrubland of <i>Melaleuca laterite</i> to 1.5 m tall with open ground between shrubs, colourful with flowering herbs including <i>Villarsia capitata</i> , <i>Gratiola pubescens</i> , <i>Rhodanthe pyrethrum</i> , <i>Stylidium</i> sp., <i>Utricularia inaequalis</i> , <i>Aphelia drummondii</i> , <i>Lachnagr</i> | About 500 plants over an area 15 metres across. | Growing with <i>Trithuria bibracteata</i> and with <i>Trithuria submersa</i> about 50 metres away in a different depression. | Ellenbrook Nature Reserve (Reserve No A 27620), 15 km N of Midland | GPS | 0 | 39392 |
| 8640688 | 32658 | <i>Trithuria occidentalis</i> | T | Tiny annual ca 2 cm tall. | Low-lying depression. Grey-brown clay. | Open shrubland. With <i>Gratiola pubescens</i> , <i>Melaleuca laterite</i> , <i>Rhodanthe</i> sp., <i>Stylidium</i> sp., <i>Villarsia capitata</i> . | > 100. | | Ellenbrook Nature Reserve (Reserve No. A 27620), 15 km N of Midland | GPS | 1 | 41201 |
| 5795672 | 14714 | <i>Verticordia lindleyi</i> subsp. <i>lindleyi</i> | | Erect shrub 0.5 m high. | Winter wet depression. Damp, grey-brown clay-sand-humus. | Dense shrubs (tall) over sedges. <i>Melaleuca raphiophylla</i> , <i>Hypocalymma angustifolium</i> , <i>Juncus pallidus</i> , sedges. | occasional. | | Saunders Street (W end), Aboriginal Community, Henley Brook | MAN | 3 | 35409 |
| 2033720 | 12460 | <i>Verticordia serrata</i> var. <i>linearis</i> | | 3 80 cm high x 15 cm wide. Flowers golden yellow. | White sand and gravel on road verge. | Growing in association with <i>Adenanthos cyganorum</i> . | | This specimen was collected for painting. | N of Bullsbrook | AUTO | 3 | 32072 |

| PopId | NameId | Taxon | ConsStatus | WARank | PopNumber | SubPopCode | PopStatus | Location | District | Vaeting | Purposee1 | Purposee2 | CountDate | Method | MatureCoun | JuvenileCo | SeedlingCo | LiveTotal | PlantTypeC | AreaOccup | InFlower | Population | |
|--------|--------|--|------------|--------|-----------|------------|-----------|--|--------------|---------|-----------|-----------|-----------|--------|------------|-----------------|---------------|-----------|------------|-----------|----------|------------|----------|
| 86659 | 11336 | Adenanthos cygnorum subsp. chamaeaphyton | | 3 | | 19 | | Road verge on Jenkins Rd opposite Lot 41, Bushplan Site 291. | SWAN COASTAL | LGA | VER | | | 36294 | UNKNOWN | 0.0000000000 | | 30 | | | N | | |
| 84938 | 1596 | Caladenia huegelii | T | CR | | 25 | | SE enr of Lot 1452 Maralla Rd, Bullsbrook, ca 1.3km W from Sawpit/Maralla Rd T.jnc. N side of road. | SWAN COASTAL | PRI | | | | 35718 | ESTMT | 0.0000000000 | | 0 | | | N | | |
| 84940 | 1596 | Caladenia huegelii | T | CR | | 32 | U | ## Original discovery was not definitely identified as C. huegelii ## NE corner of Nature Reserve 46875 along Maralla Road, The Vines. | SWAN COASTAL | CC | OFF | | | 38259 | | 0.0000000000 | | 0 | | | N | | |
| 84941 | 1596 | Caladenia huegelii | T | CR | | 94 | U | *Species identification not confirmed* N of Chardonnay Dr and Vines Ave junction, The Vines. East of Chardonnay Park. | SWAN COASTAL | PRI | | | | | 38259 | ACT IND | 0.0000000000 | | 0 | | N | | |
| 84942 | 1596 | Caladenia huegelii | T | CR | | 35 | U | ## Original population never properly identified## Nature Reserve 46875 south of Maralla Road and north of Barbera Lane, The Vines. Habitat appears unsuitable. | SWAN COASTAL | CC | OFF | | | 38259 | ACT IND | 0.0000000000 | | 0 | | | N | | |
| 110514 | 1596 | Caladenia huegelii | T | CR | | 81 | | Lot 80 Maralla Road, Ellenbrook, Perth, WA. Bushland behind Rodsand Circuit, Ellenbrook (~40m). | SWAN COASTAL | PRI | | | | | 41906 | ESTMT | 1.0000000000 | | 0 | PLANTS | | Y | HEALTHY |
| 114949 | 1596 | Caladenia huegelii | T | CR | | 85 | | Lot 9508 Ellenbrook. Population is ca. 1km west of Sawpit Rd then ca. 2.5km south along the west edge of the clearing for the Perth to Darwin Highway, then ca. 825 m due west. | SWAN COASTAL | SPC | UNKNOWN | | | 43012 | ACT IND | 1.0000000000 | | 0 | PLANTS | | 0 | Y | HEALTHY |
| 93193 | 16245 | Cyathochaeta teretifolia | | 3 | | 1 | | Crown Reserve (49300). Sawpit Gully Conservation Area. 2 km S of the junction of Sawpit Rd and Maralla Rd, Bullsbrook, Swan. | SWAN COASTAL | CC | OFF | | | 35006 | | 0.0000000000 | | 0 | | | N | | |
| 93194 | 16245 | Cyathochaeta teretifolia | | 3 | | 10 | | Road Verge, Old West Rd, Bullsbrook, Swan. | SWAN COASTAL | LGA | VER | | | 39399 | ACT IND | 1.0000000000 | | 1 | | | N | | |
| 93197 | 16245 | Cyathochaeta teretifolia | | 3 | | 13 | | Reserve (49300), Cardinal Drive Bushland (Bush Forever Site 23) ca.200m N Bordeaux, Swan. | SWAN COASTAL | CC | OFF | | | 35006 | | 0.0000000000 | | 0 | | | N | | |
| 93205 | 16245 | Cyathochaeta teretifolia | | 3 | | 20 | | Private Property, Lot 47 Lexia Ave, Site ML36M, N of Gnaragara Rd, SW side Ellenbrook, Swan. | SWAN COASTAL | PRI | | | | | 36409 | | 0.0000000000 | | 0 | | N | | |
| 93206 | 16245 | Cyathochaeta teretifolia | | 3 | | 21 | | Private Property, Lot 47 Lexia Ave, Site ML29, N of Gnaragara Rd, NE section, Ellenbrook, Swan. | SWAN COASTAL | PRI | | | | | 36393 | | 0.0000000000 | | 0 | | N | | |
| 93208 | 16245 | Cyathochaeta teretifolia | | 3 | | 23 | | Private Property, Lot 47 Lexia Ave, Site ML44A, N of Gnaragara Rd, SE side, Ellenbrook, Swan. | SWAN COASTAL | PRI | | | | | 36431 | | 0.0000000000 | | 0 | | N | | |
| 96623 | 34773 | Darwinia foetida | T | EN | | 4 | | PP, Lot 200 Bingham Road, SW corner of property, Bullsbrook. | SWAN COASTAL | PRI | | | | | 39150 | ESTMT | 25.0000000000 | | 25 | | N | | |
| 113552 | 34773 | Darwinia foetida | T | EN | | 6 | A | Road Res. ca. 100m north of Rutland Rd, Bullsbrook along unmade Almeria Pde road reserve, on the east side of the rail line. | SWAN COASTAL | LGA | VER | | | 42299 | ACT IND | 10.0000000000 | 1.0000000000 | 0 | PLANTS | | 600 | Y | HEALTHY |
| 113554 | 34773 | Darwinia foetida | T | EN | | 6 | B | Rail reserve, Muchea South Rd, Bullsbrook, ca. 140m north of Rutland Rd along unmade Almeria Pde, on the east side of the rail line. | SWAN COASTAL | RAI | RRE | | | 42299 | ACT IND | 2.0000000000 | | 0 | PLANTS | | 70 | Y | HEALTHY |
| 93992 | 17605 | Eleocharis keigheryi | T | VU | | 1 | | Ellen Brook NR (R 27620). W side of Gt Northern Hwy, Upper Swan. Pop located in seasonally inundated clay pans scattered throughout S portion of NR, within fenced area. | SWAN COASTAL | CC | CFA | | | 39395 | ESTMT | 1000.0000000000 | | 1000 | | | Y | | |
| 94007 | 17605 | Eleocharis keigheryi | T | VU | | 7 | | RAAF Base Pearce, located on W side of Gt Northern Hwy, Bullsbrook. Pop located on SW side of airforce base in an open claypan. | SWAN COASTAL | COM | AIR | | | 39342 | ESTMT | 0.0000000000 | | 0 | | | Y | | |
| 102713 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 1 | A | Railway Reserve. East and west side of the railway line at the intersection of Rutland Rd and Railway Pde. North and south of Rutland Rd on the west side of the railway line, and south of Rutland Rd on both sides (Previously 1A and 1B). | SWAN COASTAL | RAI | RRE | | | 41584 | ACT IND | 0.0000000000 | | 289 | PLANTS | | N | | |
| 106261 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 1 | C | Un-made Road Reserve. Uncleared road reserve, east of the railway line at the intersection of Rutland Road and Railway Pde (Muchea South Rd), Bullsbrook. | SWAN COASTAL | LGA | VER | | | 40785 | ACT CLMP | 17.0000000000 | 0.0000000000 | 0 | CLUMPS | | 600 | | |
| 109321 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 1 | D | (Shire Road Reserve on Muchea South Road, approximately 65m south from the intersection of Rutland Road and Muchea South Road. Adjacent to Railway Reserve, on eastern side of road] | SWAN COASTAL | LGA | VER | | | 41584 | | 0.0000000000 | | 52 | | | N | | |
| 92200 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 2 | | Reserve 49300 @ Bordeaux Lane @ Nature Reserve, The Vines. From the SE corner of the Reserve the plants are 197m north along the track/drainage line of and 59-160m west into the bush, Bush Forever site 23. | SWAN COASTAL | CC | OFF | | | 40851 | ACT CLMP | 0.0000000000 | | 0 | CLUMPS | | 1300 | N | |
| 92201 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 3 | | Unnamed (' Maralla Rd' NR) R 46875, 500m south of Maralla Road on the north-south track 220m East of Sawpit Road. | SWAN COASTAL | CC | NRE | | | 40998 | ACT CLMP | 0.0000000000 | | 0 | CLUMPS | | 0 | | |
| 92202 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 4 | A | Unnamed (' Maralla Rd NR') R 46875, 18-60m S of Maralla Road, and 940-1030m E of Sawpit Rd just E of creekline. | SWAN COASTAL | CC | OFF | | | 40807 | ACT CLMP | 16.0000000000 | | 0 | CLUMPS | | 230 | Y | MODERATE |
| 92204 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 4 | B | Maralla Road Nature Reserve (CR46875), Ellenbrook. Plants occur 100-230m NW of the Dunnett Road Bridge, in two distinct groups, one either side of Sawpit Gully, approximately 100m apart. | SWAN COASTAL | CC | OFF | | | 42669 | ACT CLMP | 29.0000000000 | 3.0000000000 | 0 | CLUMPS | | Y | MODERATE | |
| 112129 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 4 | C | Private Property. Lot 9007 on Plan 407385, 85m northwest of Dunnett Road Bridge, new subdivision on northern side of Maralla Road Nature Reserve, Ellenbrook. Access to this population is off Maralla and Dunnett Roads. | SWAN COASTAL | PRI | UNKNOWN | | | 42639 | ACT CLMP | 69.0000000000 | 11.0000000000 | 0 | CLUMPS | | Y | HEALTHY | |
| 102719 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 5 | A | Railway Reserve. Railway Parade, Bullsbrook, eastern verge. 2 fenced areas, approx 70m south of West Road. Population extends along railway reserve for 100m from intersection southwards. | SWAN COASTAL | RAI | RRE | | | 42340 | ACT IND | 135.0000000000 | | 0 | PLANTS | | N | HEALTHY | |
| 102720 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 5 | B | Railway reserve along Railway Parade, E verge, 200m N of intersection with West Road, Bullsbrook. | SWAN COASTAL | RAI | RRE | | | 42340 | ACT IND | 198.0000000000 | | 0 | PLANTS | | N | HEALTHY | |
| 102721 | 14408 | Grevillea curviloba subsp. curviloba | T | CR | | 5 | C | Railway Parade, E verge. Opposite Strachan Road, west side of the railway line, Bullsbrook. | SWAN COASTAL | LGA | VER | | | 38233 | ACT IND | 2.0000000000 | | 5 | 7 | | Y | | |

| | | | | | | | | | | | | | | | | | | | | | | | |
|--------|-------|--|---|----|--|----|---|--|--|--------------|---------|-----|-----|-------|----------|-------------------|----------------|--|------|--------|------|---|---------|
| 102722 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 5 | D | | Railway reserve along Railway Parade, E verge. Opposite Strachan Road, west side of the railway line, Bullsbrook. | SWAN COASTAL | RAI | RRE | | 42340 | ACT IND | 0.000000000000 | | | 0 | | N | | |
| 109315 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 5 | E | | Railway Reserve, between Railway Parade and Almeria Parade, Bullsbrook. Plants occur on the Eastern side of the line between 230-340m south of the West Road railway crossing. | SWAN COASTAL | RAI | RRE | | 41151 | ESTMT | 44.000000000000 | | | 0 | CLUMPS | 1800 | Y | HEALTHY |
| 109316 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 5 | F | | Railway Reserve, between Railway Parade and Almeria Parade, Bullsbrook. Plants occur 400m south of the Strachen Rd Railway crossing, W of the railway and 700-850m S of the crossing on the E of the railway. | SWAN COASTAL | RAI | RRE | | 42341 | ACT IND | 165.000000000000 | | | 0 | PLANTS | | N | HEALTHY |
| 109318 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 5 | G | | Shire Road Verge, Almeria Pde western verge, Bullsbrook. Plants occur 700-850m S of the Strachen Road Railway crossing on the drain embankment, opposite House 1138. [85m south from the intersection of Dean Head St and Almeria Pde] | SWAN COASTAL | LGA | VER | | 41122 | ESTMT | 10.000000000000 | | | 0 | CLUMPS | 20 | Y | HEALTHY |
| 102716 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 10 | A | | Maralla Nature Reserve (CR 46875), The Vines. Plants occur in riparian zone SE end of NR, City of Swan | SWAN COASTAL | CC | CFF | NRE | 42132 | ACT IND | 0.000000000000 | 4.000000000000 | | 0 | PLANTS | 41 | N | HEALTHY |
| 102717 | 14408 | <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | CR | | 10 | B | | PP Lot 9007 Janselling Ave, The Vines. Shire managed park at the E end of Janselling Ave, S of Maralla NR, City of Swan | SWAN COASTAL | PRI | | | 42132 | ACT IND | 0.000000000000 | | | 0 | PLANTS | | N | |
| 92209 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | EN | | 17 | | | Nature Reserve (46875), Lot 12942, 1.1km east of Sawpit Road on Maralla Road, and 50m south, North of The Vines development. Just NE of the creekline in the riparian vegetation | SWAN COASTAL | CC | CFF | | 41138 | ACT CLMP | 1.000000000000 | | | 0 | CLUMPS | 6 | Y | |
| 110229 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | EN | | 19 | A | | Almeria Parade unmade road reserve, Bullsbrook. ~20m south of Neaves Rd on the eastern side of the rail line. Access is via a boundary track that runs south from Rutland Rd. | SWAN COASTAL | LGA | VER | | 42299 | ESTMT | 0.000000000000 | | | 10 | PLANTS | 150 | Y | POOR |
| 110231 | 14409 | <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | EN | | 19 | B | | Rail reserve, ~20m south of Neaves Rd on the eastern side of the rail line. Access is via a boundary track that runs south from Rutland Rd. | SWAN COASTAL | RAI | RRE | | 42299 | ESTMT | 0.000000000000 | | | 15 | PLANTS | 350 | Y | POOR |
| 84894 | 1469 | <i>Haemodorum loratum</i> | | | | 3 | 2 | | 20 km ESE of Muchea, Upper Swan. | SWAN COASTAL | UNKNOWN | | | 29903 | | 0.000000000000 | | | 0 | | | N | |
| 88387 | 6233 | <i>Hydrocotyle lemnoides</i> | | | | 4 | 1 | | Ellen Brook N.Res. Fresh water pools in S part of res. | SWAN COASTAL | CC | CFA | | 33179 | ESTMT | 4000.000000000000 | | | 4000 | | | Y | |
| 96547 | 33638 | <i>Meionectes tenuifolia</i> | | | | 3 | 4 | | Sawpit Conservation Area, Sawpit and Maralla Rd, Bullsbrook. Lot 3 Lexa Ave. | SWAN COASTAL | PRI | | | 35006 | | 0.000000000000 | | | 0 | | | N | |
| 84517 | 980 | <i>Schoenus capillifolius</i> | | | | 3 | 3 | | Ellen Brook Nature Reserve, Qt Northern Hwy 3.5 km N of Apple St Upper Swan. | SWAN COASTAL | CC | CFF | | 33179 | ESTMT | 0.000000000000 | | | 100 | | | Y | |
| 84520 | 980 | <i>Schoenus capillifolius</i> | | | | 3 | 6 | | Pearce Airbase, 0.75 km W of Great Northern Hwy at 0.3 km S from the junction with Chittinger Rd. | SWAN COASTAL | COM | AIR | | 34597 | | 0.000000000000 | | | 0 | | | N | |
| 89291 | 7756 | <i>Stylidium longitubum</i> | | | | 4 | 1 | | W side of Railway Parade, 0.5km N of Apple Rd, Upper Swan. | SWAN COASTAL | AGR | GVT | | 32824 | | 0.000000000000 | | | 0 | | | Y | |
| 89302 | 7756 | <i>Stylidium longitubum</i> | | | | 4 | 2 | | Twin Swamp Wildlife Sanctuary Ellen Brook. | SWAN COASTAL | CC | CFA | | 26295 | | 0.000000000000 | | | 0 | | | N | |
| 89307 | 7756 | <i>Stylidium longitubum</i> | | | | 4 | 3 | | Ellen Brook Nature Reserve, Lexia Ave. | SWAN COASTAL | CC | NRE | | 32419 | | 0.000000000000 | | | 0 | | | N | |
| 89308 | 7756 | <i>Stylidium longitubum</i> | | | | 4 | 4 | | West of Vines golf course, Ellenbrook area. | SWAN COASTAL | UNKNOWN | | | 33907 | | 0.000000000000 | | | 0 | | | N | |
| 96349 | 32658 | <i>Trithuria occidentalis</i> | T | CR | | 1 | | | Ellenbrook Nature Reserve (R27620). On the central eastern side ~100m due west of Great Northern Hwy. | SWAN COASTAL | CC | CFA | | 43396 | EXT GRQD | 0.000000000000 | | | 421 | PLANTS | 47 | N | HEALTHY |

| SoName | Source_Cod | DBNo | NameID | Family | Genus | Species | Subspecies | ComName | Kingdom | CLASS | Lieting | Certainty | ObservMeth | ObservType | SecSign | Breeding | NumSeen | LocName | Site | Resolution | Day | Month | Year |
|------------------------------|------------|-------|--------|------------|------------------|-------------|------------|--------------------|----------|-------|---------|-----------|-----------------|----------------|-----------------|----------|--------------------------|-----------------------------------|---------------------------------|------------|-----|-------|------|
| Calyptrorhynchus latirostris | TFALNA | 35614 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | ELLENBROOK | Belhus | 500 | 5 | 12 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 34428 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | BULLSBROOK | Bullbrook | 500 | 7 | 3 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 33022 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 3,000,000,000,000 | ELLENBROOK | Ellenbrook | 500 | 22 | 4 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 35287 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | BRIGADOON | Brigadoon | 500 | 27 | 9 | 2003 |
| Calyptrorhynchus latirostris | TFALNA | 33024 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | ELLENBROOK | Ellenbrook | 500 | 17 | 4 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 33023 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | ELLENBROOK | Ellenbrook | 500 | 20 | 4 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 32529 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 120,000,000,000,000 | UPPER SWAN | Great Northern Hwy, Ellen Brook | 1000 | 9 | 10 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 33527 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 9,000,000,000,000 | UPPER SWAN | Great Northern Hwy, Ellen Brook | 1000 | 16 | 11 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 33974 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 20,000,000,000,000 | BRIGADOON | Cathedral Ave, Brigadoon | 1000 | 1 | 12 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 32532 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 50,000,000,000,000 | BULLSBROOK | Great Northern Hwy, Bullbrook | 1000 | 3 | 12 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 34426 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | BULLSBROOK | Bullbrook | 500 | 18 | 1 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 33021 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000 | ELLENBROOK | Ellenbrook | 500 | 9 | 1 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 32526 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 2,000,000,000,000 | UPPER SWAN | Great Northern Hwy, Ellen Brook | 1000 | 20 | 11 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 21357 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 2000,000,000,000,000 | Ellenbrook | Ellenbrook | 1000 | 26 | 2 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 32211 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 500,000,000,000,000 | AVELEY | Henley Brook | 500 | 5 | 3 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 29769 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | HENLEY BROOK | Millendon | 500 | 23 | 9 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 33020 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | THE VINES | Ellenbrook | 500 | 26 | 2 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 32523 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara Road | 500 | 21 | 3 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 35624 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | ELLENBROOK | Belhus | 500 | 10 | 2 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 35623 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | ELLENBROOK | Belhus | 500 | 6 | 10 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 18851 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Not Sure | Monitoring | Secondary sign | Feathers | | 0,000,000,000,000,000 | GNANGARA | Gnangara Pine Plantation | 10000 | 1 | 5 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 35625 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | ELLENBROOK | Belhus | 500 | 1 | 10 | 2004 |
| Calyptrorhynchus latirostris | TFALNA | 33967 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 30,000,000,000,000,000 | BASKERVILLE | Cathedral Ave, Upper Swan | 1000 | 18 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33968 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | BASKERVILLE | Cathedral Ave, Upper Swan | 1000 | 19 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33969 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 7,000,000,000,000,000 | UPPER SWAN | Cathedral Ave, Millendon | 1000 | 23 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33968 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 7,000,000,000,000,000 | UPPER SWAN | Cathedral Ave, Millendon | 1000 | 23 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 32636 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 2489,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara Pine Plantation | 1000 | 9 | 4 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 23548 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 10,000,000,000,000,000 | Gnangara-Moore River State Forest | Melaleuca Park, Neaves Rd | 1000 | 26 | 3 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 32662 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 2,000,000,000,000,000 | BASKERVILLE | Cathedral Ave, Upper Swan | 1000 | 15 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33964 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 30,000,000,000,000,000 | BASKERVILLE | Cathedral Ave, Upper Swan | 1000 | 18 | 11 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 23587 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 11,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara PP | 1000 | 12 | 2 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 23552 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 1,000,000,000,000,000 | Gnangara-Moore River State Forest | Neaves Rd, Melaleuca Park | 1000 | 12 | 2 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 23534 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 25,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara | 1000 | 14 | 5 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 23618 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Targeted survey | Day sighting | | | 2,000,000,000,000,000 | Gnangara-Moore River State Forest | Cathedral Hill, Bullbrook | 1000 | 14 | 5 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33976 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 40,000,000,000,000,000 | BRIGADOON | Cathedral Ave, Brigadoon | 1000 | 12 | 11 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 33975 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 40,000,000,000,000,000 | BRIGADOON | Cathedral Ave, Brigadoon | 1000 | 16 | 11 | 2005 |
| Calyptrorhynchus latirostris | TFALNA | 11785 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | PINJAR | Site 1 | 1000 | 22 | 4 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 33977 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 20,000,000,000,000,000 | BRIGADOON | Cathedral Ave, Brigadoon | 1000 | 18 | 9 | 2006 |
| Calyptrorhynchus latirostris | TFALNA | 32631 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | LEXIA | Gnangara Pine Plantation | 500 | 12 | 3 | 2008 |
| Calyptrorhynchus latirostris | TFALNA | 35307 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 40,000,000,000,000,000 | UPPER SWAN | Brand Hwy, Brigadoon | 1000 | 15 | 11 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 32633 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | | 1,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara Pine Plantation | 50 | 12 | 3 | 2008 |
| Calyptrorhynchus latirostris | TFALNA | 32632 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | | 2,000,000,000,000,000 | Gnangara-Moore River State Forest | Gnangara Pine Plantation | 50 | 12 | 3 | 2008 |
| Calyptrorhynchus latirostris | TFALNA | 30558 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | Gnangara-Moore River State Forest | Lexia | 500 | 21 | 4 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 15210 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 2,000,000,000,000,000 | Muchea | Site 1 Old West Rd | 500 | 11 | 12 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 32923 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 134,000,000,000,000,000 | BRIGADOON | Cathedral Ave, Brigadoon | 1000 | 15 | 11 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 32589 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 24,000,000,000,000,000 | BULLSBROOK | Great Northern Hwy, Bullbrook | 1000 | 11 | 8 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 25990 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 20,000,000,000,000,000 | MILLENDON | Upper Swan | 500 | 22 | 9 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 25989 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | UPPER SWAN | Upper Swan | 500 | 22 | 9 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 30155 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 1,000,000,000,000,000 | ELLEN SWAN | Murray Reserve, Ellenbrook | 50 | 12 | 7 | 2007 |
| Calyptrorhynchus latirostris | TFALNA | 30154 | 24734 | Cacatuidae | Calyptrorhynchus | latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | 54,000,000,000,000,000 | UPPER SWAN | Murray Reserve, Ellenbrook | | | | |

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|--|--------|-------|-------|------------|--|-----------------------------|----------|------|----|--------------------|--------------------|----------------|-------------------|----------------|-----------------------------------|---|---|------|----|------|------|
| Calyptorhynchus latrostris | TFAUNA | 29383 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | BULLSBROOK | Near Maralla Road, Ellen Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 29382 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | BULLSBROOK | Near Maralla Road, Ellen Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 24385 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 286.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 7 | 1 | 2013 | |
| Calyptorhynchus latrostris | TFAUNA | 24384 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 200.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 6 | 1 | 2013 | |
| Calyptorhynchus latrostris | TFAUNA | 24387 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 20.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 7 | 4 | 2013 | |
| Calyptorhynchus latrostris | TFAUNA | 24386 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 850.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 4 | 3 | 2013 | |
| Calyptorhynchus latrostris | TFAUNA | 24383 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 41.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 7 | 4 | 2011 | |
| Calyptorhynchus latrostris | TFAUNA | 24382 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 80.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is SWAMLEXR001 | 1000 | 7 | 4 | 2011 | |
| Calyptorhynchus latrostris | TFAUNA | 24408 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 20.0000000000 | Marjilup | 2013 Site code is WANJANRR001 | 1000 | 7 | 4 | 2011 | |
| Calyptorhynchus latrostris | TFAUNA | 24408 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 16.0000000000 | Gnangara-Moore River State Forest | 2013 Site code is WANJANRR007 | 1000 | 7 | 4 | 2011 | |
| Calyptorhynchus latrostris | TFAUNA | 20100 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Secondary sign | | 0.0000000000 | Ellenbrook | | 1000 | 7 | 4 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 20095 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Secondary sign | | 0.0000000000 | | Centre Way Cnr Blackboy Rd (previously East of Silver Road North of Warbrook) | 1000 | 7 | 4 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 20176 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Day sighting | | 858.0000000000 | Marjilup | Timely Hostess Mews, Marjilup | 1000 | 10 | 4 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 20114 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Secondary sign | | 185.0000000000 | Gnangara-Moore River State Forest | Gnangara Road along Centre Road (powerline corridor) (possible roost) | 1000 | 7 | 4 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 32688 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara | 1000 | 1 | 1 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 32687 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara | 1000 | 1 | 1 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 20053 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Day sighting | | 500.0000000000 | Gnangara-Moore River State Forest | Between Galah & Krake Rd east of Mulga | 1000 | 7 | 4 | 2010 | |
| Calyptorhynchus latrostris | TFAUNA | 32689 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara | 1000 | 1 | 1 | 2010 | |
| Calyptorhynchus sp. white-tailed black cockatoo' | TFAUNA | 84674 | 0 | Cacatuidae | Calyptorhynchus sp. white-tailed black cockatoo' | white-tailed black cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Dusk sighting | | 21.0000000000 | THE VINES | SWAVINR003 | 1000 | 3 | 4 | 2016 | |
| Calyptorhynchus latrostris | TFAUNA | 89464 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Lexia | Drumpeller Drive, Lexia, Pine on E & W sides of road | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus sp. white-tailed black cockatoo' | TFAUNA | 84687 | 0 | Cacatuidae | Calyptorhynchus sp. white-tailed black cockatoo' | white-tailed black cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Dusk sighting | | 280.0000000000 | LEXIA | SWAELLR001 | 1000 | 3 | 4 | 2016 | |
| Calyptorhynchus sp. white-tailed black cockatoo' | TFAUNA | 84684 | 0 | Cacatuidae | Calyptorhynchus sp. white-tailed black cockatoo' | white-tailed black cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Dusk sighting | | 8.0000000000 | BULLSBROOK | SWABULR003 | 1000 | 3 | 4 | 2016 | |
| Calyptorhynchus latrostris | TFAUNA | 89461 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara SF, Gnangara Rd & Beechboro Rd | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 89460 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara SF opposite Gnangara Rd and Beechboro Rd North | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 89463 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara SF, opposite Gnangara Rd & Beechboro Rd North | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 89462 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara SF, opposite Gnangara Rd & Beechboro Rd North | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 89456 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Henley Brook | PP N & S of Henley St, extending N to 41 Andrea Dr | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 80680 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Community survey | Day sighting | | 71.0000000000 | Marjilup | Timely Hostess Mews | 1000 | 12 | 4 | 2015 | |
| Calyptorhynchus latrostris | TFAUNA | 89459 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Gnangara-Moore River State Forest | Gnangara SF opposite Gnangara Rd & Beechboro Rd North | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 89458 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Very Certain | Regular monitoring | Remote sensing | No other signs | Non-breeding | 1.0000000000 | Henley Brook | E side of Davot Rd, Henley Brook | 1000 | 21 | 6 | 2016 |
| Calyptorhynchus latrostris | TFAUNA | 80403 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Day sighting | | 480.0000000000 | Melaleuca | Between Galah & Krake Rd east of Mulga - new location NE of Silver & Warbrook Roads | 1000 | 6 | 4 | 2014 | |
| Calyptorhynchus latrostris | TFAUNA | 75855 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Survey | Day sighting | | 1.0000000000 | MILLENDON | CN Northern Highway (Baskerville) near Maisie St, 1km south of Baskerville | 1000 | 19 | 9 | 2013 | |
| Calyptorhynchus latrostris | TFAUNA | 80420 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Day sighting | | 14.0000000000 | Ellenbrook | In pine stand to west of Drumpeller Drive | 1000 | 6 | 4 | 2014 | |
| Calyptorhynchus latrostris | TFAUNA | 80414 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Day sighting | | 181.0000000000 | Lexia | Gnangara Road; along Centre Road (powerline corridor) (possible roost) | 1000 | 6 | 4 | 2014 | |
| Calyptorhynchus sp. white-tailed black cockatoo' | TFAUNA | 95986 | 0 | Cacatuidae | Calyptorhynchus sp. white-tailed black cockatoo' | white-tailed black cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Sighting | Heard/Call | Unknown | 50.0000000000 | HENLEY BROOK | 10901a West Swan Road. Site Code: SWAHENR002 | 1000 | 9 | 4 | 2017 |
| Calyptorhynchus sp. white-tailed black cockatoo' | TFAUNA | 95983 | 0 | Cacatuidae | Calyptorhynchus sp. white-tailed black cockatoo' | white-tailed black cockatoo | Animalia | BIRD | EN | Moderately Certain | Community survey | Sighting | Heard/Call | Unknown | 268.0000000000 | MELALEUCA | Between Galah & Krake Rd east of Mulga - new location NE of Silver & Warbrook Roads. Site Code: SWAMLEXR001 | 1000 | 9 | 4 | 2017 |
| Calyptorhynchus latrostris | TFAUNA | 32546 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 30.0000000000 | UPPER SWAN | Great Northern Highway Millendon | 1000 | 2 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32545 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 30.0000000000 | UPPER SWAN | Great Northern Highway Millendon | 1000 | 2 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32812 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | THE VINES | Golf Course, Ellenbrook | 1000 | 12 | 3 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32547 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 3.0000000000 | UPPER SWAN | Great Northern Highway Millendon | 1000 | 2 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32300 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 2.0000000000 | BASKERVILLE | Haddrill Road, Brigadoon | 1000 | 17 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32210 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | HENLEY BROOK | Henley Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32544 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 3.0000000000 | UPPER SWAN | Great Northern Highway Millendon | 1000 | 2 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32301 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 2.0000000000 | BASKERVILLE | Haddrill Road, Brigadoon | 1000 | 17 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 31142 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 4.0000000000 | AVLEY | Jon Haddrill & Great Northern Hwy | 1000 | 11 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 31141 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 15.0000000000 | BASKERVILLE | Jon Haddrill & Great Northern Hwy | 1000 | 12 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32155 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 200.0000000000 | BASKERVILLE | Herne Hill | 1000 | 15 | 8 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 31143 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 4.0000000000 | BASKERVILLE | Jon Haddrill & Great Northern Hwy | 1000 | 11 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 29765 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | AVLEY | Millhouse Road, Henley Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 29764 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | AVLEY | Millhouse Road, Henley Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 31140 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | 15.0000000000 | BASKERVILLE | Jon Haddrill & Great Northern Hwy | 1000 | 12 | 9 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 29766 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | AVLEY | Millhouse Road, Henley Brook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32997 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | ELLENBROOK | Ellenbrook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32996 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue | 1.0000000000 | ELLENBROOK | Ellenbrook | 1000 | 6 | 6 | 2008 | |
| Calyptorhynchus latrostris | TFAUNA | 32998 | 24734 | Cacatuidae | Calyptorhynchus latrostris | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Monitoring | Secondary sign | Feeding residue</ | | | | | | | | |

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|------------------------------|--------|-------|-------|------------|------------------------------|--|----------------------------------|----------|------|----|--------------------|----------------------|---------------|------------|---------|--|----------------|-----------------------------------|--|------|----|----|------|
| Calyptorhynchus latirostris | TFAUNA | 36474 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 20.0000000000 | Gnangara-Moore River State Forest | 8 km W Lake Jandabyte | 50 | 5 | 4 | 1977 |
| Calyptorhynchus latirostris | TFAUNA | 36887 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Historical (written) | Day sighting | | | | 1.0000000000 | BULLSBROOK | 2 miles N of Upper Swan | 50 | 15 | 10 | 1962 |
| Calyptorhynchus latirostris | TFAUNA | 26012 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | Twin Swamps Nature Reserve | Twin Swamps Reserve | 50 | 1 | 4 | 1978 |
| Calyptorhynchus latirostris | TFAUNA | 36573 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 28.0000000000 | Gnangara-Moore River State Forest | 6 km W Lake Jandabyte | 50 | 5 | 4 | 1977 |
| Calyptorhynchus banksii naso | TFAUNA | 95896 | 24731 | Cacatuidae | Calyptorhynchus banksii naso | | forest red-tailed black cockatoo | Animalia | BIRD | VJ | Moderately Certain | Community survey | Sighting | Heard/Call | Unknown | | 129.0000000000 | MELALEUCA | Between Galah & Krake Rd east of Mulga - new location NE of Silver & Warbrook Roads. Site Code: SWAMELR001 | 1000 | 9 | 4 | 2017 |
| Calyptorhynchus banksii naso | TFAUNA | 94673 | 24731 | Cacatuidae | Calyptorhynchus banksii naso | | forest red-tailed black cockatoo | Animalia | BIRD | VJ | Moderately Certain | Community survey | Dusk sighting | | | | 31.0000000000 | THE VINES | SWAVINR003 | 1000 | 3 | 4 | 2016 |
| Calyptorhynchus latirostris | TFAUNA | 36798 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Historical (written) | Day sighting | | | | 6.0000000000 | BULLSBROOK | 3 miles S of Bullsbrook | 500 | 1 | 8 | 1961 |
| Calyptorhynchus banksii naso | TFAUNA | 95870 | 24731 | Cacatuidae | Calyptorhynchus banksii naso | | forest red-tailed black cockatoo | Animalia | BIRD | VJ | Moderately Certain | Community survey | Sighting | Heard/Call | Unknown | | 5.0000000000 | THE VINES | Ellenbrook Golf Course, 16th fairway behind 22 pinot terrace. Site Code: SWAVINR003 | 1000 | 9 | 4 | 2017 |
| Calyptorhynchus latirostris | TFAUNA | 35620 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | | 500 | 10 | 10 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35619 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 20 | 10 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35622 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 7 | 10 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35621 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 9 | 10 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35616 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 11 | 11 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35615 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 4 | 12 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35618 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 22 | 10 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 35617 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Belhus | 500 | 10 | 11 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 34427 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | BULLSBROOK | Bullsbrook | 500 | 6 | 5 | 2004 |
| Calyptorhynchus latirostris | TFAUNA | 33025 | 24734 | Cacatuidae | Calyptorhynchus latirostris | | Carnaby's cockatoo | Animalia | BIRD | EN | Certain | Survey | Day sighting | | | | 1.0000000000 | ELLENBROOK | Ellenbrook | 500 | 5 | 2 | 2004 |

APPENDIX C

Flora Likelihood Table

Appendix C: Assessment of the Likely Occurrence of DRF and Priority Flora (as per DBCA and EPBC Database Searches) in the Survey Area

Closest record to Survey Area based on DBCA 2019. Likely = Suitable habitat present and records less than 5 km from the Survey Area, Possible = Suitable habitat present and records between 5 km and 10 km from the Survey Area, and Unlikely = No suitable habitat present and/or records greater than 10 km from the Survey Area. CR = Listed as Critically Endangered under the EPBC Act, EN = Listed as Endangered under the EPBC Act, VU = Listed as Vulnerable under the EPBC Act. Likelihood of Occurrence: based on knowledge of habitat within the Survey Area and knowledge gained from the survey effort during ground truthing.

| Species | Conservation Status | | Source | | | Distance to Nearest | Flowering Period | Preferred Habitat | Habitat occurs within the Survey | Likelihood of Occurrence |
|---|---------------------|------|-----------|------|------|---------------------|--------------------------|---|----------------------------------|--------------------------|
| | DBCA | EPBC | NatureMap | EPBC | DBCA | | | | | |
| <i>Caladenia huegelii</i> | T | CR | X | X | X | 1.49 | Sep to Oct | Grey or brown sand, clay loam. | Yes | High |
| <i>Darwinia foetida</i> | T | CR | | X | X | 7.4 | Oct-Nov | Drainage line. Brown sandy loam. | Yes | Medium |
| <i>Grevillea curviloba subsp. curviloba</i> | T | CR | X | X | X | 3.5 | Oct | Grey sand. Winter-wet heath. | Yes | High |
| <i>Synaphea sp. Fairbridge Farm (D. Papenfus 696)</i> | T | CR | | X | | - | Oct | Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses, The species has a restricted distribution south of Perth | No | Low |
| <i>Trithuria occidentalis</i> | T | CR | X | | X | 4 | Oct-Nov | Low-lying depression. Grey-brown clay. | No | Low |
| <i>Andersonia gracilis</i> | T | EN | | X | | 31.2 | Sep to Nov | White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps. | Yes | Low |
| <i>Chamelaucium sp. Gingin (N.G.Marchant 6)</i> | T | EN | | X | | - | Sept- Dec | Slope. Dry white/grey sand. Very restricted distribution in Gingin and chittering | Yes | Low |
| <i>Diplolaena andrewsii</i> | T | EN | | X | | 13.25 | Jul to Oct | Loam, clay. Granite outcrops & hillsides. | No | Low |
| <i>Diuris purdiei</i> | T | EN | | X | | 30.41 | Sep to Oct | Grey-black sand, moist. Winter-wet swamps. | Yes | Low |
| <i>Drakaea elastica</i> | T | EN | | X | | 37.91 | Oct to Nov | White or grey sand. Low-lying situations adjoining winter-wet swamps. | Yes | Low |
| <i>Eucalyptus x balanites</i> | T | EN | | X | | 49.1 | Oct to Dec or Jan to Feb | Sandy soils with lateritic gravel. | No | Low |
| <i>Grevillea christineae</i> | T | EN | | X | | 9.83 | Aug to Sep | Clay loam, sandy clay, often moist. | No | Low |
| <i>Grevillea curviloba subsp. incurva</i> | T | EN | X | X | X | 3.6 | Aug to Sep | Sand, sandy loam. Winter-wet heath. | Yes | High |
| <i>Lepidosperma rostratum</i> | T | EN | | X | | 30.12 | - | Peaty sand, clay. | No | Low |
| <i>Thelymitra dedmaniarum</i> | T | EN | | X | | 11.64 | Nov to Dec or Jan | Granite | No | Low |
| <i>Thelymitra stellata</i> | T | EN | | X | | 19.36 | Oct to Nov | Sand, gravel, lateritic loam. | No | Low |
| <i>Acacia anomala</i> | T | VU | | | X | 6 | Aug to Sep | Lateritic soils. Slopes. | No | Low |
| <i>Anigozanthos viridis subsp. terraspectans</i> | T | VU | | X | | 70 | Aug to Sep | Grey sand, clay loam. Winter-wet depressions. | Yes | Low |
| <i>Eleocharis keigheryi</i> | T | VU | X | X | X | 4.9 | Aug to Nov. | Clay, sandy loam. Emergent in freshwater: creeks, claypans. | No | Low |
| <i>Hydrocotyle striata</i> | P1 | | | | X | 8.1 | - | Clay, springs. | No | Low |
| <i>Calectasia elegans</i> | P2 | | X | | X | 3.2 | - | Flat to gentle slope. Grey - yellow sand. | Yes | High |
| <i>Millotia tenuifolia var. laevis</i> | P2 | | X | | X | 3 | Sep to Oct | Granite or laterite soils. | No | Low |
| <i>Poranthera moorokatta</i> | P2 | | X | | X | 3 | - | Dampland with brown / white peat / sand. | Yes | High |
| <i>Schoenus sp. Bullsbrook</i> | P2 | | X | | X | 3.9 | - | Grey peaty sand. Low-lying flats. | No | Low |
| <i>Tetraria sp. Chandala (G.J. Keighery 17055)</i> | P2 | | | | X | 7.9 | - | Grey brown peaty soil in a swamp. | No | Low |
| <i>Acacia oncinophylla subsp. oncinophylla</i> | P3 | | | | X | 9.6 | Aug to Oct | Granitic soils. | No | Low |
| <i>Adenanthos cygnorum subsp. chamaephyton</i> | P3 | | | | X | 5.6 | Jul or Sep to Dec or Jan | Grey sand, lateritic gravel. | No | Low |
| <i>Cyathochaeta teretifolia</i> | P3 | | X | | X | 3.9 | - | Grey sand, sandy clay. Swamps, creek edges. | Yes | High |
| <i>Eryngium pinnatifidum subsp. Palustre</i> | P3 | | X | | X | 4.1 | - | Depression in winter wet clay flat. | No | Low |
| <i>Guichenotia tuberculata</i> | P3 | | | | X | 6 | Aug to Oct | Sand clay over laterite, sand. | No | Low |
| <i>Haemodorum loratum</i> | P3 | | X | | X | 4 | Nov | Grey or yellow sand, gravel. | No | Low |
| <i>Halgania corymbosa</i> | P3 | | | | X | 7.8 | Aug to Nov | Gravelly soils, soils over granite. | No | Low |

| Species | Conservation Status | | Source | | | Distance to Nearest | Flowering Period | Preferred Habitat | Habitat occurs within the Survey | Likelihood of Occurrence |
|---|---------------------|------|-----------|------|------|---------------------|--------------------------|--|----------------------------------|--------------------------|
| | DBCA | EPBC | NatureMap | EPBC | DBCA | | | | | |
| <i>Meionectes tenuifolia</i> | P3 | | X | | X | 3 | - | Seasonally wet poorly drained flat. Grey sand. | Yes | High |
| <i>Phlebocarya pilosissima subsp. pilosissima</i> | P3 | | X | | X | 2.4 | Aug to Oct | White or grey sand, lateritic gravel. | No | Low |
| <i>Schoenus capillifolius</i> | P3 | | | | X | 5.1 | Oct to Nov | Brown mud. Claypans. | No | Low |
| <i>Schoenus sp. Waroona (G.J. Keighery 12235)</i> | P3 | | | | X | 7.3 | Oct to Nov | Clay or sandy clay. Winter-wet flats. | No | Low |
| <i>Stylidium paludicola</i> | P3 | | X | | X | 3.1 | Oct to Dec | Peaty sand over clay. Winter wet habitats. | No | Low |
| <i>Stylidium trudgenii</i> | P3 | | X | | X | 4.1 | - | Grey sand, dark grey to black sandy peat. Winter-wet swamps, depressions. | Yes | High |
| <i>Styphelia filifolia</i> | P3 | | X | | X | 2.5 | - | Flat sandplain, yellow sand. | No | Low |
| <i>Verticordia serrata var. linearis</i> | P3 | | | | X | 6 | Sep to Oct | White sand, gravel. Open woodland. | No | Low |
| <i>Anigozanthos humilis subsp. chrysanthus</i> | P4 | | | | X | 5.9 | Jul to Oct | Grey or yellow sand. | Yes | Medium |
| <i>Cyanicula ixiooides subsp. ixiooides</i> | P4 | | | | X | 6.4 | Aug to Oct | Laterite, gravel. | No | Low |
| <i>Drosera occidentalis</i> | P4 | | | | X | 6 | Oct to Dec or Jan. | In swampy flats, appears as a rash in the sand. White/black sand over yellow clay. | No | Low |
| <i>Hydrocotyle lemnooides</i> | P4 | | | | X | 5.1 | Aug to Oct | Swamps | Yes | Medium |
| <i>Hypolaena robusta</i> | P4 | | X | | X | 4.8 | Sep to Oct | White sand. Sandplains. | No | Low |
| <i>Persoonia sulcata</i> | P4 | | | | X | 7.5 | Sep to Nov | Lateritic or granitic soils. | No | Low |
| <i>Schoenus griffinianus</i> | P4 | | | | X | 7.1 | Sep to Oct | White sand. | No | Low |
| <i>Schoenus natans</i> | P4 | | | | X | 6.9 | Oct | Winter-wet depressions. | Yes | Medium |
| <i>Stylidium longitubum</i> | P4 | | X | | X | 3.8 | Oct to Dec | Sandy clay, clay. Seasonal wetlands. | No | Low |
| <i>Verticordia lindleyi subsp. lindleyi</i> | P4 | | | | X | 8.8 | May or Nov to Dec or Jan | Sand, sandy clay. Winter-wet depressions. | No | Low |

APPENDIX D

Flora Inventory

| Family | Species |
|-------------------------------|------------------------------------|
| Aizoaceae | * <i>Carpobrotus edulis</i> |
| Anacardiaceae | * <i>Schinus terebinthifolia</i> |
| Anarthriaceae | <i>Lyginia imberbis</i> |
| Araceae | * <i>Zantedeschia aethiopica</i> |
| Asteraceae | <i>Podotrochea gnaphalioides</i> |
| | * <i>Sonchus oleraceus</i> |
| | * <i>Ursinia anthemoides</i> |
| | * <i>Conyza bonariensis</i> |
| Cyperaceae | * <i>Cyperus tenuiflorus</i> |
| | <i>Daviesia triflora</i> |
| | <i>Lepidosperma longitudinale</i> |
| Dasygogonaceae | <i>Dasygogon bromeliifolius</i> |
| Dilleniaceae | <i>Hibbertia racemosa</i> |
| Ericaceae | <i>Astroloma</i> sp. |
| | <i>Croninia kingiana</i> |
| Fabaceae | * <i>Chamaecytisus palmensis</i> |
| | <i>Jacksonia furcellata</i> |
| Iridaceae | * <i>Gladiolus caryophyllaceus</i> |
| | <i>Patersonia occidentalis</i> |
| Juncaceae | <i>Juncus pallidus</i> |
| Myrtaceae | <i>Astartea scoparia</i> |
| | <i>Corymbia calophylla</i> |
| | <i>Eucalyptus todtiana</i> |
| | <i>Hypocalymma angustifolium</i> |
| | * <i>Leptospermum laevigatum</i> |
| | <i>Scholtzia involucrata</i> |
| | <i>Eremaea pauciflora</i> |
| | <i>Melaleuca preissiana</i> |
| <i>Taxandria linearifolia</i> | |
| Oleaceae | * <i>Olea europaea</i> |
| Phytolaccaceae | * <i>Phytolacca octandra</i> |
| Pinaceae | * <i>Pinus</i> sp. |
| Poaceae | * <i>Aira caryophyllea</i> |
| | * <i>Briza maxima</i> |
| | * <i>Poa annua</i> |
| Proteaceae | <i>Adenanthos cygnorum</i> |
| | <i>Banksia attenuata</i> |
| | <i>Banksia ilicifolia</i> |
| | <i>Banksia menziesii</i> |
| Restionaceae | <i>Petrophile linearis</i> |
| | <i>Dielsia stenostachya</i> |
| | <i>Desmocladus flexuosus</i> |

| Family | Species |
|------------------|------------------------------|
| Xanthorrhoeaceae | <i>Xanthorrhoea gracilis</i> |
| | <i>Xanthorrhoea preissii</i> |
| Zamiaceae | <i>Macrozamia riedlei</i> |

APPENDIX E

Flora Site Sheets

FLORA SITE SHEET - PRECINCT A, NORTH ELLENBROOK

Project Name 3248 Precinct A North Ellenbrook Flora, Vegetation and Black Cockatoo
Site: PAR01 **MGA** 50J **402892 mE** **6488876 mN**

Described by: CM, NW
Date: Tuesday, May 21, 2019
Type: Releve
Soil Colour: Grey
Soil Type: Sand
Habitat: Mid slope
Vegetation:



Low open woodland of *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus todtiana* low over open shrubland of *Scholtzia involucreta* over low open shrubland of *Eremaea pauciflora* var. *pauciflora*, *Croninia kingiana* and *Leucopogon conostephioides*.

Veg Condition: Degraded
Fire Age: > 10 Years **Fire Evidence:** -
Notes
Rock Type - **Rock Cover:** - % **Outcropping:** - %
Total PFC: 20 % **Bareground:** 75 % **Leaf Litter:** 5 % **Logs:** 0 %
Disturbance Type: Grazing Mid, Weeds

SPECIES LIST

| Name | Height | Cover | Notes |
|------------------------------------|--------|-------|-------|
| <i>Adenanthos cygnorum</i> | 2 | 4 | |
| * <i>Aira caryophyllea</i> | 0.3 | 2 | |
| <i>Astroloma</i> sp. | 0.2 | 0.5 | |
| <i>Banksia menziesii</i> | 3 | 5 | |
| * <i>Briza maxima</i> | 0.2 | 2 | |
| * <i>Carpobrotus edulis</i> | 0.1 | 7 | |
| <i>Croninia kingiana</i> | 1 | 0.1 | |
| <i>Dasyopogon bromeliifolius</i> | 0.6 | 1 | |
| <i>Daviesia triflora</i> | 0.6 | 25 | |
| <i>Eremaea pauciflora</i> | 1.3 | 3 | |
| <i>Eucalyptus todtiana</i> | 8 | 2 | |
| * <i>Gladiolus caryophyllaceus</i> | 0.1 | 0.5 | |
| <i>Hibbertia racemosa</i> | 0.15 | 1 | |
| <i>Lyginia imberbis</i> | 0.3 | 0.5 | |
| <i>Macrozamia riedlei</i> | 0.7 | 0.5 | |
| <i>Patersonia occidentalis</i> | 0.4 | 0.1 | |
| <i>Petrophile linearis</i> | 0.3 | 1 | |
| <i>Podotheca gnaphalioides</i> | 0.15 | 5 | |
| <i>Scholtzia involucreta</i> | 0.6 | 2 | |
| * <i>Ursinia anthemoides</i> | 0.15 | 2 | |
| <i>Xanthorrhoea preissii</i> | 0.5 | 1 | |

FLORA SITE SHEET - PRECINCT A, NORTH ELLENBROOK

Project Name 3249 Precinct A North Ellenbrook Flora, Vegetation and Black Cockatoo
Site: PAR02 **MGA** 50J **403221 mE** **6488897 mN**

Described by: CM, NW
Date: Tuesday, May 21, 2019
Type: Revele -
Soil Colour: Dark Grey
Soil Type: Sand
Habitat: Lower slope wetland
Vegetation:



Open forest of *Corymbia calophylla* and *Melaleuca preissiana* over shrubland of *Astartea scoparia* and *Xanthorrhoea gracilis* over sparse forbland of *Desmocladius flexuosus*, **Sonchus oleraceus*, **Poa annua* and **Carpobrotus edulis*.

Veg Condition: Good
Fire Age: > 10 Years **Fire Evidence:** Fire Scar
Notes
Rock Type - **Rock Cover:** - % **Outcropping:** - %
Total PFC: 70 % **Bareground:** 1 % **Leaf Litter:** 85 % **Logs:** 1 %
Disturbance Type: Weeds, Grazing Light

SPECIES LIST

| Name | Height | Cover | Notes |
|-------------------------------|--------|-------|-------|
| <i>Astartea scoparia</i> | 1.5 | 70 | |
| <i>*Carpobrotus edulis</i> | 0.15 | 1 | |
| <i>Corymbia calophylla</i> | 15 | 40 | |
| <i>Desmocladius flexuosus</i> | 0.1 | 10 | |
| <i>Melaleuca preissiana</i> | 8 | 30 | |
| <i>*Poa annua</i> | 0.1 | 2 | |
| <i>*Sonchus oleraceus</i> | 0.2 | 1 | |
| <i>Xanthorrhoea gracilis</i> | 0.8 | 0.5 | |

FLORA SITE SHEET - PRECINCT A, NORTH ELLENBROOK

Project Name 3250 Precinct A North Ellenbrook Flora, Vegetation and Black Cockatoo
Site: PAR03 **MGA** 50J **403146 mE** **6489075 mN**

Described by: CM, NW
Date: Tuesday, May 21, 2019
Type: Revele -
Soil Colour: Grey
Soil Type: Sand
Habitat: Lower slope with broad, shallow drainage line
Vegetation:



Open forest of *Corymbia calophylla* and *Melaleuca preissiana* over shrubland of *Astartea scoparia* and *Xanthorrhoea gracilis* over sparse forbland of *Desmocladius flexuosus*,
 **Sonchus oleraceus*, **Poa annua* and
 **Carpobrotus edulis*.

Veg Condition: Degraded
Fire Age: > 15 Years **Fire Evidence:** -
Notes
Rock Type - **Rock Cover:** - % **Outcropping:** - %
Total PFC: 40 % **Bareground:** 10 % **Leaf Litter:** 40 % **Logs:** 1 %
Disturbance Type: Weeds, Grazing Light

SPECIES LIST

| Name | Height | Cover | Notes |
|-----------------------------|--------|-------|-------|
| <i>Astartea scoparia</i> | 2 | 2 | |
| * <i>Carpobrotus edulis</i> | 10 | 25 | |
| <i>Corymbia calophylla</i> | 8 | 30 | |
| <i>Melaleuca preissiana</i> | 12 | 2 | |
| * <i>Olea europaea</i> | 3 | 1 | |
| * <i>Pinus sp.</i> | 15 | 2 | |

FLORA SITE SHEET - PRECINCT A, NORTH ELLENBROOK

Project Name 3251 Precinct A North Ellenbrook Flora, Vegetation and Black Cockatoo
Site: PAR04 **MGA** 50J **403068 mE** **6489331 mN**

Described by: CM, NW
Date: Tuesday, May 21, 2019
Type: Revele -
Soil Colour: Black
Soil Type: Sand
Habitat: Wetland
Vegetation:



Isolated clumps of trees of *Melaleuca preissiana* over closed shrubland of *Astartea scoparia* over open forbland of **Carpobrotus edulis*, **Cyperus tenuiflorus* and *Desmocladius flexuosus*.

Veg Condition: Very Good
Fire Age: > 15 Years **Fire Evidence:** -
Notes
Rock Type - **Rock Cover:** - % **Outcropping:** - %
Total PFC: 90 % **Bareground:** 1 % **Leaf Litter:** 90 % **Logs:** 0 %
Disturbance Type: Grazing Heavy, Weeds, Cattle tracks/scats

SPECIES LIST

| Name | Height | Cover | Notes |
|-------------------------------|--------|-------|-------|
| <i>Astartea scoparia</i> | 1.5 | 70 | |
| <i>*Carpobrotus edulis</i> | 0.2 | 20 | |
| <i>*Cyperus tenuiflorus</i> | 0.6 | 3 | |
| <i>Desmocladius flexuosus</i> | 0.15 | 2 | |
| <i>Melaleuca preissiana</i> | 12 | 5 | |

FLORA SITE SHEET - PRECINCT A, NORTH ELLENBROOK

Project Name 3252 Precinct A North Ellenbrook Flora, Vegetation and Black Cockatoo
Site: PAR05 **MGA** 50J **402244 mE** **6491063 mN**

Described by: CM, NW
Date: Tuesday, May 21, 2019
Type: Releve -
Soil Colour: Grey
Soil Type: Sand
Habitat: Drainage line
Vegetation:



Open forest of *Corymbia calophylla* and *Melaleuca preissiana* over open shrubland of *Astartea scoparia*, *Taxandria linearifolia* and *Xanthorrhoea preissii* over open sedgeland of *Lepidosperma longitudinale*, *Dielsia stenostachya* and *Dasyopogon bromeliifolius*.

Veg Condition: Excellent
Fire Age: > 10 Years **Fire Evidence:** -
Notes
Rock Type - **Rock Cover:** - % **Outcropping:** - %
Total PFC: 100 % **Bareground:** 1 % **Leaf Litter:** 15 % **Logs:** 0 %
Disturbance Type:

SPECIES LIST

| Name | Height | Cover | Notes |
|-----------------------------------|--------|-------|-------|
| <i>Astartea scoparia</i> | 1.5 | 15 | |
| * <i>Briza maxima</i> | 0.4 | 1 | |
| <i>Corymbia calophylla</i> | 14 | 20 | |
| <i>Dasyopogon bromeliifolius</i> | 0.5 | 3 | |
| <i>Dielsia stenostachya</i> | 0.4 | 35 | |
| <i>Lepidosperma longitudinale</i> | 0.4 | 45 | |
| <i>Melaleuca preissiana</i> | 7 | 15 | |
| <i>Taxandria linearifolia</i> | 1.2 | 4 | |
| <i>Xanthorrhoea preissii</i> | 1 | 4 | |

APPENDIX F

Black Cockatoo Evidence Raw Data

Black Cockatoo evidence

| DATE | EASTING | NORTHING | Species | Evidence Type | Foraging material | Number of individuals | Comment |
|------------|---------|----------|----------------------------------|---------------|-------------------|-----------------------|---------------------------------------|
| 21/05/2019 | 402978 | 6489281 | Forest Red-tailed Black Cockatoo | Foraging | Marri nuts | | |
| 21/05/2019 | 402875 | 6489477 | Carnaby's Black Cockatoo | Foraging | Pine cone | | No pine tree nearby |
| 21/05/2019 | 403256 | 6489052 | Carnaby's Black Cockatoo | Sighting | | 40 | Birds flew west to east over site |
| 21/05/2019 | 403105 | 6489124 | Carnaby's Black Cockatoo | Sighting | | 3 | Birds landed in tall tree within site |
| 28/05/2019 | 402102 | 6489058 | Carnaby's Black Cockatoo | Sighting | | 2 | |
| 28/05/2019 | 403006 | 6488864 | Carnaby's Black Cockatoo | Foraging | Banksia cone | | |
| 28/05/2019 | 403020 | 6488847 | Carnaby's Black Cockatoo | Foraging | E. todtiana nuts | | |
| 28/05/2019 | 403018 | 6488849 | Carnaby's Black Cockatoo | Foraging | Banksia cone | | |
| 28/05/2019 | 403098 | 6488820 | Carnaby's Black Cockatoo | Foraging | Banksia cone | | |
| 28/05/2019 | 403205 | 6488882 | Forest Red-tailed Black Cockatoo | Foraging | Marri nuts | | Fairly old |
| 28/05/2019 | 403233 | 6488841 | Forest Red-tailed Black Cockatoo | Foraging | Marri nuts | | Old |
| 28/05/2019 | 403325 | 6488837 | Carnaby's Black Cockatoo | Sighting | | 10 | Perched in marri |
| 28/05/2019 | 403285 | 6488903 | Carnaby's Black Cockatoo | Sighting | | 50+ | Flying east |
| 28/05/2019 | 403230 | 6489003 | Carnaby's Black Cockatoo | Sighting | | 40 | Foraging in pine |
| 28/05/2019 | 403104 | 6489009 | Carnaby's Black Cockatoo | Foraging | Pine cone | | |
| 28/05/2019 | 403126 | 6489072 | Forest Red-tailed Black Cockatoo | Foraging | Marri nuts | | |
| 28/05/2019 | 402893 | 6489030 | Forest Red-tailed Black Cockatoo | Foraging | Marri nuts | | Old |

APPENDIX G

Black Cockatoo Potential Breeding Trees Raw Data

Black Cockatoo potential breeding trees



| TREE ID | DATE | TAXA | EASTING | NORTHING | DBH (mm) | HEIGHT (m) | HOLLOWS | # HOLLOWS | SUITABLE FOR BC | COMMENTS | PHOTO REF |
|---------|------------|--|---------|----------|-----------|------------|---------|-----------|-----------------|---|-----------|
| 94 | 21/05/2019 | Stag | 403089 | 6489121 | 500-1000 | 15 | yes | 5 | yes | | 1 |
| 97 | 21/05/2019 | Stag | 403139 | 6489108 | 500-1000 | 15 | yes | 5 | yes | | 2 |
| 144 | 21/05/2019 | Jarrah (<i>Eucalyptus marginata</i>) | 403001 | 6488849 | 500-1000 | 13 | yes | 5 | yes | Galahs present, bark around hollow chewed | 3 |
| 101 | 21/05/2019 | Stag | 403227 | 6489080 | 500-1000 | 16 | yes | 4 | yes | Bees at base of tree | 4 |
| 106 | 21/05/2019 | Stag | 403344 | 6489065 | 500-1000 | 16 | yes | 4 | yes | | 5 |
| 93 | 21/05/2019 | Stag | 403117 | 6489123 | 500-1000 | 18 | yes | 2 | yes | | 6 |
| 143 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403235 | 6488854 | 500-1000 | 20 | yes | 2 | yes | | 7 |
| 155 | 21/05/2019 | Stag | 403284 | 6488829 | 500-1000 | 19 | yes | 2 | yes | | 8 |
| 134 | 21/05/2019 | Jarrah (<i>Eucalyptus marginata</i>) | 403058 | 6488937 | 500-1000 | 15 | yes | 1 | yes | | 9 |
| 150 | 21/05/2019 | Stag | 403397 | 6488840 | 500-1000 | 6 | yes | 1 | yes | | 10 |
| 157 | 21/05/2019 | Jarrah (<i>Eucalyptus marginata</i>) | 403377 | 6488824 | 500-1000 | 10 | yes | 1 | yes | | 11 |
| 123 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403108 | 6488998 | >2000 | 17 | yes | 3 | no | | |
| 84 | 21/05/2019 | Stag | 402922 | 6489358 | 1000-2000 | 16 | yes | 4 | no | Melaleuca | 12 |
| 90 | 21/05/2019 | Stag | 403306 | 6489224 | 500-1000 | 12 | yes | 4 | no | | 13 |
| 151 | 21/05/2019 | Stag | 403250 | 6488833 | 500-1000 | 16 | yes | 3 | no | | 14 |
| 81 | 21/05/2019 | Stag | 403232 | 6489423 | 500-1000 | 14 | yes | 2 | no | | 15 |
| 83 | 21/05/2019 | Stag | 403289 | 6489364 | 500-1000 | 8 | yes | 2 | no | Mel | 16 |
| 110 | 21/05/2019 | Stag | 403043 | 6489039 | 500-1000 | 15 | yes | 2 | no | | 17 |
| 87 | 21/05/2019 | Stag | 402974 | 6489274 | 500-1000 | 8 | yes | 1 | no | | 18 |
| 63 | 21/05/2019 | Powderbark (<i>Eucalyptus accedens</i>) | 402692 | 6490071 | Unknown | 18 | yes | 2 | no | | 19 |
| 60 | 21/05/2019 | Introduced Eucalypt | 403428 | 6490098 | 1000-2000 | 20 | no | | | | 20 |
| 62 | 21/05/2019 | Introduced Eucalypt | 403436 | 6490079 | 1000-2000 | 28 | no | | | | 21 |
| 61 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403222 | 6490087 | 500-1000 | 18 | no | | | Just inside property | |
| 65 | 21/05/2019 | Introduced Eucalypt | 403449 | 6490074 | 500-1000 | 28 | no | | | | 22 |
| 66 | 21/05/2019 | Introduced Eucalypt | 403463 | 6490030 | 500-1000 | 28 | no | | | | 23 |
| 67 | 21/05/2019 | Introduced Eucalypt | 403409 | 6490028 | 500-1000 | 24 | no | | | | 24 |
| 68 | 21/05/2019 | Introduced Eucalypt | 403147 | 6489824 | 500-1000 | 22 | no | | | | |
| 69 | 21/05/2019 | Flooded gum (<i>Eucalyptus rudis</i>) | 403145 | 6489815 | 500-1000 | 14 | no | | | Not 100% sure | |
| 70 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 403100 | 6489684 | 500-1000 | 12 | no | | | | |
| 71 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402867 | 6489599 | 500-1000 | 14 | no | | | | |
| 72 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403092 | 6489591 | 500-1000 | 14 | no | | | Forked at base, measured largest | |
| 73 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403068 | 6489551 | 500-1000 | 10 | no | | | | |
| 74 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402901 | 6489533 | 500-1000 | 12 | no | | | | |
| 75 | 21/05/2019 | Stag | 402967 | 6489507 | 500-1000 | 12 | no | | | Marri | |
| 76 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402882 | 6489498 | 500-1000 | 10 | no | | | | |
| 77 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402917 | 6489496 | 500-1000 | 18 | no | | | | |
| 78 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402872 | 6489488 | 500-1000 | 18 | no | | | | |
| 79 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403070 | 6489449 | 500-1000 | 16 | no | | | | |
| 80 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403023 | 6489423 | 500-1000 | 18 | no | | | | |
| 82 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402972 | 6489410 | 500-1000 | 16 | no | | | | |
| 85 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402951 | 6489330 | 500-1000 | 14 | no | | | | |
| 86 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402893 | 6489289 | 500-1000 | 16 | no | | | | |
| 88 | 21/05/2019 | Stag | 402980 | 6489263 | 500-1000 | 16 | no | | | Marri | |
| 89 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403031 | 6489230 | 500-1000 | 8 | no | | | | |
| 91 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403116 | 6489146 | 500-1000 | 18 | no | | | | |

Black Cockatoo potential breeding trees



| TREE ID | DATE | TAXA | EASTING | NORTHING | DBH (mm) | HEIGHT (m) | HOLLOWS | # HOLLOWS | SUITABLE FOR BC | COMMENTS | PHOTO REF |
|---------|------------|--|---------|----------|----------|------------|---------|-----------|-----------------|----------|-----------|
| 92 | 21/05/2019 | Stag | 403348 | 6489141 | 500-1000 | 13 | no | | | | |
| 95 | 21/05/2019 | Jarrah (<i>Eucalyptus marginata</i>) | 403041 | 6489118 | 500-1000 | 10 | no | | | | |
| 96 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403109 | 6489110 | 500-1000 | 16 | no | | | | |
| 98 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403337 | 6489101 | 500-1000 | 18 | no | | | | |
| 99 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403110 | 6489094 | 500-1000 | 18 | no | | | | |
| 100 | 21/05/2019 | Stag | 403167 | 6489089 | 500-1000 | 16 | no | | | | |
| 102 | 21/05/2019 | Stag | 403161 | 6489076 | 500-1000 | 16 | no | | | | |
| 103 | 21/05/2019 | Stag | 403125 | 6489072 | 500-1000 | 17 | no | | | | |
| 104 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403143 | 6489067 | 500-1000 | 17 | no | | | | |
| 105 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403083 | 6489064 | 500-1000 | 16 | no | | | | |
| 107 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402864 | 6489056 | 500-1000 | 8 | no | | | | |
| 108 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403109 | 6489055 | 500-1000 | 20 | no | | | | |
| 109 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402899 | 6489042 | 500-1000 | 15 | no | | | | |
| 111 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403009 | 6489035 | 500-1000 | 17 | no | | | | |
| 112 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403158 | 6489036 | 500-1000 | 16 | no | | | | |
| 113 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402886 | 6489033 | 500-1000 | 15 | no | | | | |
| 114 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403167 | 6489034 | 500-1000 | 18 | no | | | | |
| 115 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403168 | 6489033 | 500-1000 | 18 | no | | | | |
| 116 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403037 | 6489027 | 500-1000 | 18 | no | | | | |
| 117 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403159 | 6489023 | 500-1000 | 15 | no | | | | |
| 118 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403159 | 6489015 | 500-1000 | 17 | no | | | | |
| 119 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403104 | 6489012 | 500-1000 | 16 | no | | | | |
| 120 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403164 | 6489009 | 500-1000 | 18 | no | | | | |
| 121 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402959 | 6489005 | 500-1000 | 18 | no | | | | |
| 122 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403125 | 6489000 | 500-1000 | 18 | no | | | | |
| 124 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403063 | 6488993 | 500-1000 | 18 | no | | | | |
| 125 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403123 | 6488993 | 500-1000 | 17 | no | | | | |
| 126 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403359 | 6488985 | 500-1000 | 20 | no | | | | |
| 127 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402937 | 6488973 | 500-1000 | 14 | no | | | | |
| 128 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402969 | 6488967 | 500-1000 | 17 | no | | | | |
| 129 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402975 | 6488966 | 500-1000 | 17 | no | | | | |
| 130 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402975 | 6488965 | 500-1000 | 17 | no | | | | |
| 131 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403150 | 6488955 | 500-1000 | 17 | no | | | | |
| 132 | 21/05/2019 | Jarrah (<i>Eucalyptus marginata</i>) | 403058 | 6488942 | 500-1000 | 15 | no | | | | |
| 133 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403153 | 6488941 | 500-1000 | 16 | no | | | | |
| 135 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403154 | 6488935 | 500-1000 | 17 | no | | | | |
| 136 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403140 | 6488910 | 500-1000 | 16 | no | | | | |
| 137 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403150 | 6488906 | 500-1000 | 19 | no | | | | |
| 138 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403140 | 6488899 | 500-1000 | 18 | no | | | | |
| 139 | 21/05/2019 | Stag | 403190 | 6488882 | 500-1000 | 17 | no | | | | |
| 140 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403203 | 6488880 | 500-1000 | 16 | no | | | | |
| 141 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403206 | 6488878 | 500-1000 | 16 | no | | | | |
| 142 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403194 | 6488871 | 500-1000 | 16 | no | | | | |
| 145 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403257 | 6488850 | 500-1000 | 17 | no | | | | |
| 146 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 403020 | 6488846 | 500-1000 | 8 | no | | | | |

Black Cockatoo potential breeding trees

| TREE ID | DATE | TAXA | EASTING | NORTHING | DBH (mm) | HEIGHT (m) | HOLLOWS | # HOLLOWS | SUITABLE FOR BC | COMMENTS | PHOTO REF |
|---------|------------|--|---------|----------|----------|------------|---------|-----------|-----------------|----------|-----------|
| 147 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403249 | 6488848 | 500-1000 | 17 | no | | | | |
| 148 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 402895 | 6488840 | 500-1000 | 7 | no | | | | |
| 149 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 402881 | 6488839 | 500-1000 | 8 | no | | | | |
| 152 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403261 | 6488832 | 500-1000 | 18 | no | | | | |
| 153 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403260 | 6488830 | 500-1000 | 18 | no | | | | |
| 154 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 403100 | 6488828 | 500-1000 | 6 | no | | | | |
| 156 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403284 | 6488826 | 500-1000 | 18 | no | | | | |
| 1 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402291 | 6491033 | Unknown | 14 | no | | | | |
| 2 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402311 | 6491029 | Unknown | 0 | no | | | | |
| 3 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402518 | 6491030 | Unknown | 0 | no | | | | |
| 4 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402549 | 6491029 | Unknown | 0 | no | | | | |
| 5 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402585 | 6491029 | Unknown | 0 | no | | | | |
| 6 | 21/05/2019 | Stag | 402226 | 6491024 | Unknown | 12 | no | | | | |
| 7 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402767 | 6491029 | Unknown | 12 | no | | | | |
| 8 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402296 | 6491024 | Unknown | 12 | no | | | | |
| 9 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402707 | 6491027 | Unknown | 10 | no | | | | |
| 10 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402205 | 6491021 | Unknown | 18 | no | | | | |
| 11 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402684 | 6491025 | Unknown | 18 | no | | | | |
| 12 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402523 | 6491023 | Unknown | 0 | no | | | | |
| 13 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402568 | 6491022 | Unknown | 0 | no | | | | |
| 14 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402503 | 6491020 | Unknown | 0 | no | | | | |
| 15 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402534 | 6491015 | Unknown | 0 | no | | | | |
| 16 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402713 | 6491014 | Unknown | 18 | no | | | | |
| 17 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402581 | 6491012 | Unknown | 0 | no | | | | |
| 18 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402309 | 6491009 | Unknown | 0 | no | | | | |
| 19 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402607 | 6491009 | Unknown | 0 | no | | | | |
| 20 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402590 | 6491009 | Unknown | 0 | no | | | | |
| 21 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402550 | 6491006 | Unknown | 0 | no | | | | |
| 22 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402307 | 6491003 | Unknown | 14 | no | | | | |
| 23 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402519 | 6491004 | Unknown | 0 | no | | | | |
| 24 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402410 | 6491002 | Unknown | 0 | no | | | | |
| 25 | 21/05/2019 | Introduced Eucalypt | 402770 | 6491005 | Unknown | 18 | no | | | | |
| 26 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402339 | 6491000 | Unknown | 0 | no | | | | |
| 27 | 21/05/2019 | Introduced Eucalypt | 402785 | 6491000 | Unknown | 18 | no | | | | |
| 28 | 21/05/2019 | Stag | 402371 | 6490993 | Unknown | 0 | no | | | | |
| 29 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402730 | 6490980 | Unknown | 18 | no | | | | |
| 30 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402549 | 6490968 | Unknown | 0 | no | | | | |
| 31 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 403001 | 6490971 | Unknown | 18 | no | | | | |
| 32 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402300 | 6490963 | Unknown | 0 | no | | | | |
| 33 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402306 | 6490961 | Unknown | 14 | no | | | | |
| 34 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402458 | 6490958 | Unknown | 0 | no | | | | |
| 35 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402460 | 6490937 | Unknown | 0 | no | | | | |
| 36 | 21/05/2019 | Coastal blackbutt (<i>Eucalyptus todtiana</i>) | 402205 | 6490928 | Unknown | 10 | no | | | | |
| 37 | 21/05/2019 | Stag | 402642 | 6490909 | Unknown | 18 | no | | | | |
| 38 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402657 | 6490885 | Unknown | 0 | no | | | | |

Black Cockatoo potential breeding trees



| TREE ID | DATE | TAXA | EASTING | NORTHING | DBH (mm) | HEIGHT (m) | HOLLOWS | # HOLLOWS | SUITABLE FOR BC | COMMENTS | PHOTO REF |
|---------|------------|---|---------|----------|----------|------------|---------|-----------|-----------------|----------|-----------|
| 39 | 21/05/2019 | Tuart (<i>Eucalyptus gomphocephala</i>) | 402184 | 6490688 | Unknown | 24 | no | | | | |
| 40 | 21/05/2019 | Tuart (<i>Eucalyptus gomphocephala</i>) | 402183 | 6490685 | Unknown | 24 | no | | | | |
| 41 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402327 | 6490676 | Unknown | 14 | no | | | | |
| 42 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402476 | 6490590 | Unknown | 14 | no | | | | |
| 43 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402197 | 6490536 | Unknown | 8 | no | | | | |
| 44 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402207 | 6490505 | Unknown | 12 | no | | | | |
| 45 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402215 | 6490496 | Unknown | 14 | no | | | | |
| 46 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402238 | 6490488 | Unknown | 14 | no | | | | |
| 47 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402906 | 6490481 | Unknown | 22 | no | | | | |
| 48 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402217 | 6490474 | Unknown | 12 | no | | | | |
| 49 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402201 | 6490447 | Unknown | 14 | no | | | | |
| 50 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402335 | 6490440 | Unknown | 12 | no | | | | |
| 51 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402245 | 6490427 | Unknown | 12 | no | | | | |
| 52 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402312 | 6490415 | Unknown | 12 | no | | | | |
| 53 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402259 | 6490405 | Unknown | 14 | no | | | | |
| 54 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402259 | 6490380 | Unknown | 14 | no | | | | |
| 55 | 21/05/2019 | Introduced Eucalypt | 402388 | 6490382 | Unknown | 20 | no | | | | |
| 56 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402209 | 6490369 | Unknown | 14 | no | | | | |
| 57 | 21/05/2019 | Introduced Eucalypt | 402391 | 6490371 | Unknown | 14 | no | | | | |
| 58 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402245 | 6490256 | Unknown | 14 | no | | | | |
| 59 | 21/05/2019 | Marri (<i>Corymbia calophylla</i>) | 402271 | 6490222 | Unknown | 12 | no | | | | |
| 64 | 21/05/2019 | Flooded gum (<i>Eucalyptus rudis</i>) | 402664 | 6490068 | Unknown | 22 | no | | | | |



Photo Reference: 1



Photo Reference: 2



Photo Reference: 3



Photo Reference: 4



Photo Reference: 5

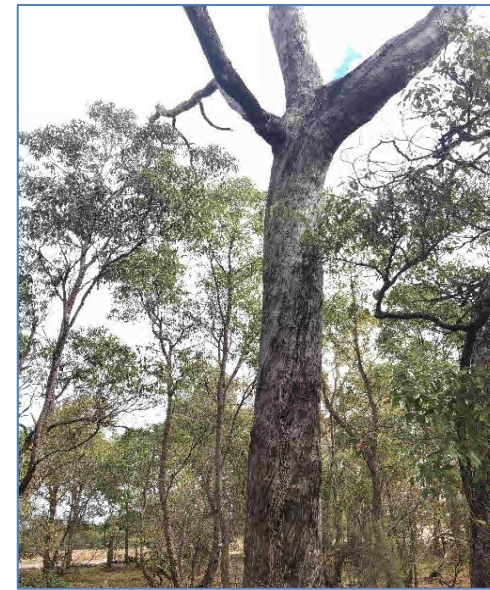


Photo Reference: 6

Black Cockatoo potential breeding trees

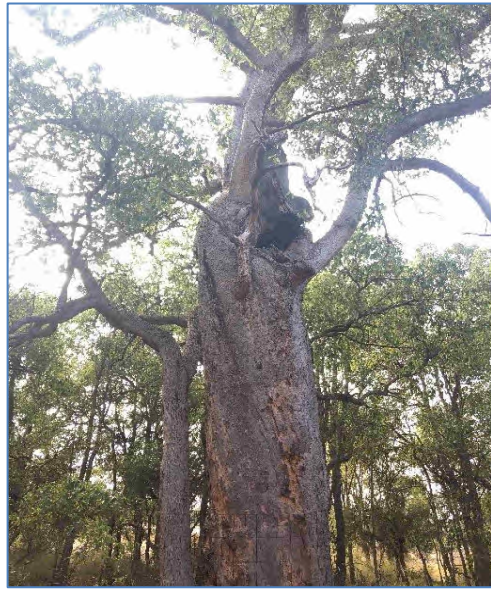


Photo Reference: 7



Photo Reference: 8

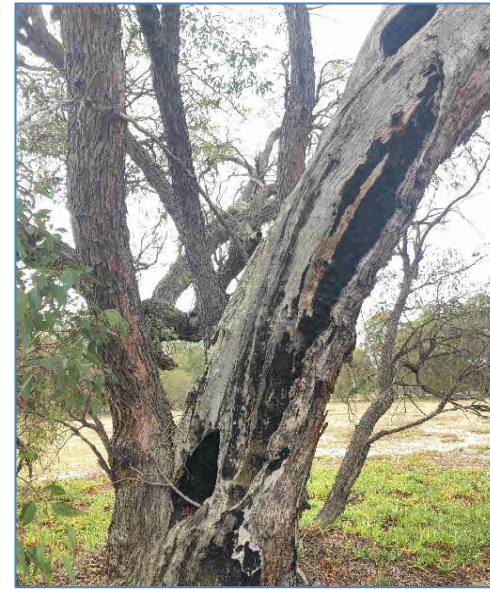


Photo Reference: 9



Photo Reference: 10



Photo Reference: 11

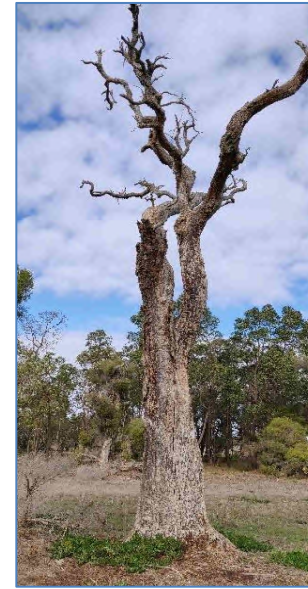


Photo Reference: 12



Photo Reference: 13



Photo Reference: 14



Photo Reference: 15



Photo Reference: 16



Photo Reference: 17

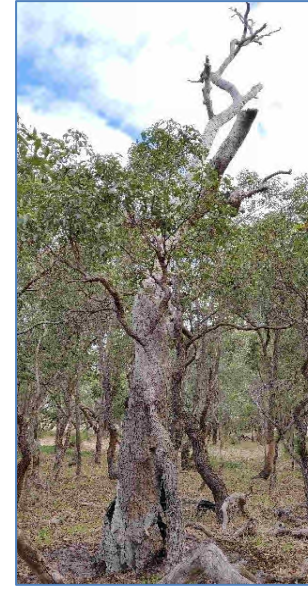


Photo Reference: 18

Black Cockatoo potential breeding trees



Photo Reference: 19

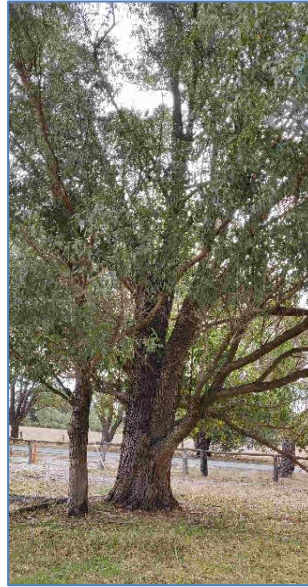


Photo Reference: 20



Photo Reference: 21



Photo Reference: 22

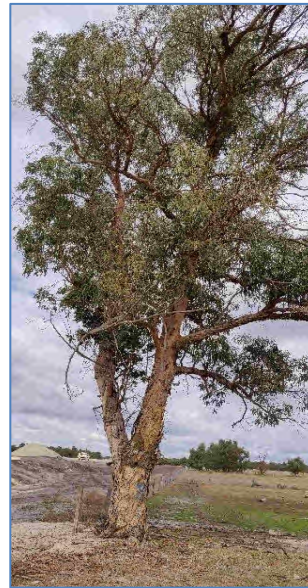


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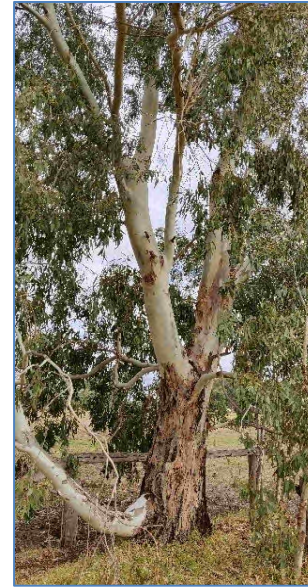


Photo Reference: 24



360

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● people ● planet ● professional

Appendix E

360 Environmental (2012) Level 2 Flora and Vegetation Survey



North Ellenbrook

Level 2 Flora and Vegetation Survey

Prepared for:

Greg Rowe and Associates

March 2012

● people ● planet ● professional

| Document Reference | Revision | Prepared by | Reviewed by | Submitted to Client | |
|--------------------|------------------|-------------|-------------|----------------------|----------|
| | | | | Copies | Date |
| EBS137AB | A INTERNAL DRAFT | BM | FD | - | 5/3/2012 |
| EBS137AB | B CLIENT DRAFT | AH | | 1 Electronic (email) | 6/3/2012 |

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Executive Summary

A Level 2 flora and vegetation survey was commissioned for a survey area that lay in the Warbrook Rd locality, mostly on the west side of the proposed Perth-Darwin Highway, south-west of Bullsbrook. The area actually surveyed ('North Ellenbrook') consisted of properties ('Lots') that were accessible within that area (7 properties could not be accessed during the survey).

The North Ellenbrook survey area lies across two Swan Coastal Plain geomorphological elements, the Yanga fluvial unit (northern units analogous to the Guilford unit) in the eastern part and the Bassendean Dune System in the western part. These correspond to two mapped vegetation complexes: the 'Bassendean Complex – North' in the western part and the Yanga Complex in the eastern part. A search of DEC records found that seven Threatened and Priority Ecological Communities (TECs and PECs) and thirty two Threatened and Priority taxa had been previously recorded within ten kilometres of the survey area. BushForever 298 and a small area of BushForever 399 lie within the survey area. Two conservation category wetland areas lie within the area surveyed.

The North Ellenbrook field survey was mostly conducted between the 5 November and 4 December 2011 (2 quadrats recorded after the 4 December).

One hundred and eighty one (181) native plant species were recorded in the North Ellenbrook survey area. This number of native species was probably a low number for size of the survey area. This was attributed to the large part of the survey area that was cleared farmland (pasture paddocks) or which was remnant bushland degraded from other activities (including wildflower farming (Properties 64, 65 and 66(?)), grazing, horse paddocks and sand mining). Areas of dampland had also been cleared or partially cleared in the past (now mostly regrowth) and had been impacted by drawdown of the water table from bores. The timing of the survey in late Spring would also have contributed to a lower species count.

No Threatened flora were recorded in the North Ellenbrook survey area. One Priority 3 species, *Cyathochaeta teretifolia*, was recorded in the North Ellenbrook survey area.

Nine other recorded plant species were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum*, *Verticordia nitens*.

Forty five (45) non-native (introduced) species were recorded from the survey area, including a few records of three (3) listed as Declared weeds: **Asparagus asparagoides* (Bridle creeper), **Moraea flaccida* (Cape Tulip (formerly *Homeria flaccida*)) and **Zantedeschia aethiopica* (Arum lily). Other weed species of note that were recorded in the survey area were **Leptospermum laevigatum* (Victorian tea-tree) and **Cortaderia selloana* (Pampus grass).

Fourteen vegetation units were described and mapped in the remnant bushland in the North Ellenbrook survey area. These were organised into the following three broad groupings:

- Banksia and Pricklybark woodlands on dune crests and slopes;
- Vegetation on the sandy parts of swales and flats; and
- Dampland vegetation;

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland covered the dune slopes and crests. The statistical analysis of the quadrat data suggested that this vegetation on the lower slopes may be floristically different (a PEC SCP23b), but further work would be needed to confirm this. Vegetation on the sandy flats included *Banksia ilicifolia* low woodlands, *Corymbia calophylla* (Marri) woodlands and a few small areas of *Eucalyptus marginata* subsp. *marginata* (Jarrah) - *Corymbia calophylla* (Marri) - *Banksia ilicifolia* woodlands. The dampland vegetation included *Melaleuca preissiana* scattered low trees to low woodlands over *Astartea scoparea* heaths and *Regelia inops* heaths, *Melaleuca preissiana* low closed forests and a small area of *Eucalyptus rudis* open forest.

Most of the remnant vegetation in the survey area occurred in that part mapped as the Bassendean-North Vegetation Complex. Approximately all of that part of the survey area mapped as Yanga Vegetation Complex was Completely Degraded pasture paddocks. Large areas of the remnant bushland in the survey area had been impacted by past human activities.

Groups of up to 20 dead *Banksia*'s were recorded in the survey area and *Banksia* spp. deaths were recorded across at least 8 properties with remnant vegetation. It is recommended that a dieback survey by accredited 'dieback interpreters' be undertaken to determine the Dieback status in the survey area.

Lomandra hermaphrodita plants were recorded opportunistically at 22 locations in the survey area, mostly in the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodlands. It is probably scattered throughout that vegetation type in the survey area. *Lomandra maritima* was not recorded (and would not be expected) in the survey area.

The ordination analysis found that the North Ellenbrook sites appeared to belong to seven FCTs: 4, 11, 12, 13, 21c, 23a and 23b. However, it is likely that further work would find that the number is more likely to be about 5 FCTs, with fewer FCTs than the 4 suggested for the damplands vegetation. The vegetation in two quadrats could not be assigned an FCT, but this is likely to be an anomaly of the seasonal sampling and the disturbed condition and small occurrence (possible boundary effects) of one of the vegetation areas.

Site in *Banksia* woodland vegetation on the lower slopes were found to be the Priority 3 PEC SCP23b 'Swan Coastal Plain *Banksia attenuata*-*Banksia menziesii* woodlands', as was the Jarrah-Marri open woodland on the lower slopes adjacent to the dampland. The

analysis also found that the lower slope *Banksia illicifolia* low open woodlands and one area of dry heaths were Priority 3 PEC SCP21c 'Low lying *Banksia attenuata* woodlands or shrublands'.

The North Ellenbrook survey area includes Conservation Category Wetlands and therefore has regional significance for these. The Conservation Category Wetland areas occur on two of the surveyed properties: in the BushForever 298 damplands area on Property 64 and on Property 11 (Excellent condition). The North Ellenbrook survey area was also considered to have moderate to high values for 'contiguous or largely contiguous corridor of bushland/wetland areas' linkages, and moderate values for both representation of ecological communities and diversity.

It was considered that the North Ellenbrook survey area rarity values for flora could not be fully assessed because of the late season of the survey relative to the flowering time of some of the Threatened and Priority flora occurring in the general locality (eg *Caladenia huegelii*).

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1 Introduction

1.1 Background

There is an interest in developing an area around Warbrook Road, south-east of Bullsbrook and mostly on the west side of the proposed Perth-Darwin Highway. This may involve a Metropolitan Region Scheme Amendment of the land to urban. 360 Environmental was commissioned to undertake a Level 2 flora and vegetation survey of the area to meet requirements for this process.

1.2 Purpose of the Study

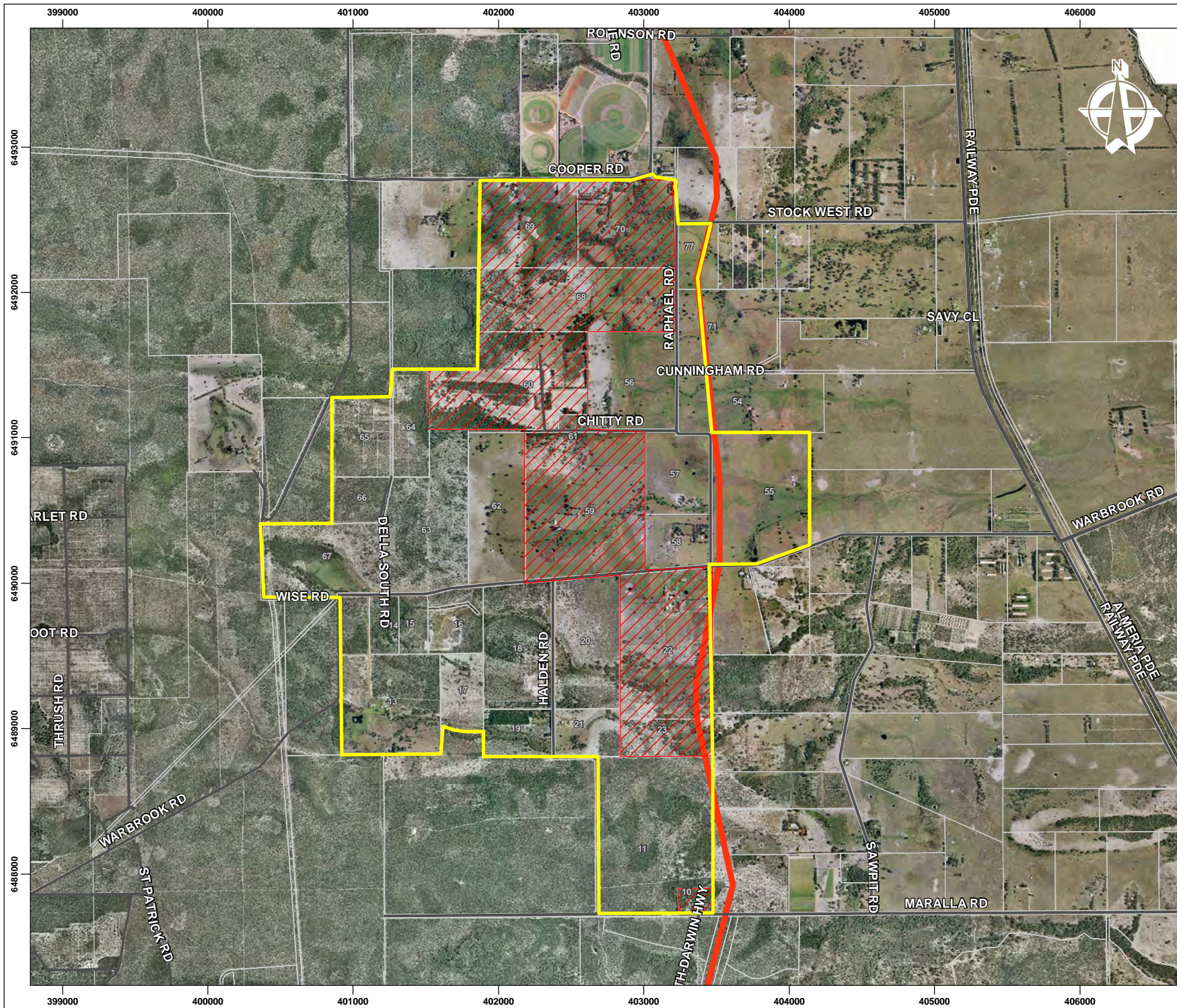
The purpose of the Level 2 flora and vegetation survey was to:

- Compile a list of the flora in the survey area, including any Significant flora;
- Map the vegetation and the vegetation condition in the survey area;
- Assess the flora and vegetation values in the survey area; and
- Report on the survey results.

1.3 The Survey Area

The survey area (here after referred to as the 'North Ellenbrook' survey area) consisted of properties ('Lots') that were accessible within a broader survey area that lay in the Warbrook Rd locality, mostly on the west side of the proposed Perth-Darwin Highway, south-west of Bullsbrook (Figure 1).

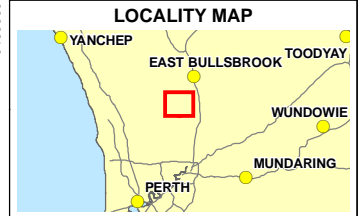
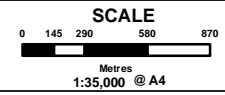
The over all survey area was approximately 1,000 ha in size.



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Minor Roads
- Major Roads
- Perth-Darwin Highway

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey Site Location
 Figure 1



2 Site Description and Background Information

2.1 Physical Environment

2.1.1 Climate

The Swan Coastal Plain, which includes the survey area, has a Mediterranean type climate with hot, dry summers and mild, wet winters.

2.1.2 Geomorphology of the Survey Area

The Swan Coastal Plain consists of a series of geomorphological elements which are sub-parallel to the present coastline (McArthur and Bettenay, 1960; Churchward and McArthur, 1980). Each of these geomorphic elements has distinctive geology, vegetation, topography and soils.

The North Ellenbrook survey area lies in across two of these elements, the Yanga fluviatile unit in the eastern part and the Bassendean Dune System in the western part (Churchward and McArthur, 1980). The Yanga unit is one of the northern units analogous to the Guilford unit, part of the alluvial terrain along the eastern edge of the Swan Coastal Plain and characterized by duplex soils. The Yanga unit is described as being “poorly drained plain with grey sandy benches and intervening swamps” (Churchward and McArthur, 1980). The Bassendean Dune System is the most eastern one of three main aeolian deposits on the Swan Coastal Plain that can be arranged in age sequence. The Bassenean Dune System consists of sand plains with low dunes and occasional swamps (Churchward and McArthur, 1980).

2.2 Flora and Vegetation Background

2.2.1 Vegetation

2.2.1.1 Regional Vegetation

Beard (1980) defined boundaries for botanical provinces, districts and subdistricts for Western Australia on the basis of his vegetation mapping of the State. In this framework, the survey area lies in the Drummond Botanical Subdistrict (more or less equivalent to the Swan Coastal Plain and part of the Dandaragan Plateau) of the Darling Botanical District of the South Western Botanical Province of Western Australia.

Hedde *et al.* (1980) mapped the vegetation of part of the Drummond Botanical Sub-district at a very broad scale, describing a series of vegetation complexes. These are related groups of vegetation associations found on particular landform-soil units (geomorphic elements, see above). They mapped a total of 38 vegetation complexes on the Swan Coastal Plain. The North Ellenbrook survey area corresponds to two mapped vegetation complexes: the ‘Bassendean Complex – North’ in the western part

and the Yanga Complex in the eastern part (Figure 2; Heddle *et al.*, 1980). The Bassendean Complex – North was described as ranging from 'low open forest and low woodland of *Banksia* spp.-*Eucalyptus todtiana* to a low woodland of *Melaleuca* spp. and sedgelands' on 'moister sites' (Heddle *et al.*, 1980). The Yanga Complex on low-lying flats has a low open forest of swamp Sheoak with patches of *Actinostrobus* and *Melaleuca* spp. while the vegetation on the drier sites reflects the adjacent Bassendean Complex with a mixture of *Banksia-Eucalyptus todtiana* low open forest and an open woodland of Marri-*Banksia* on moister low lying areas (Heddle *et al.*, 1980).

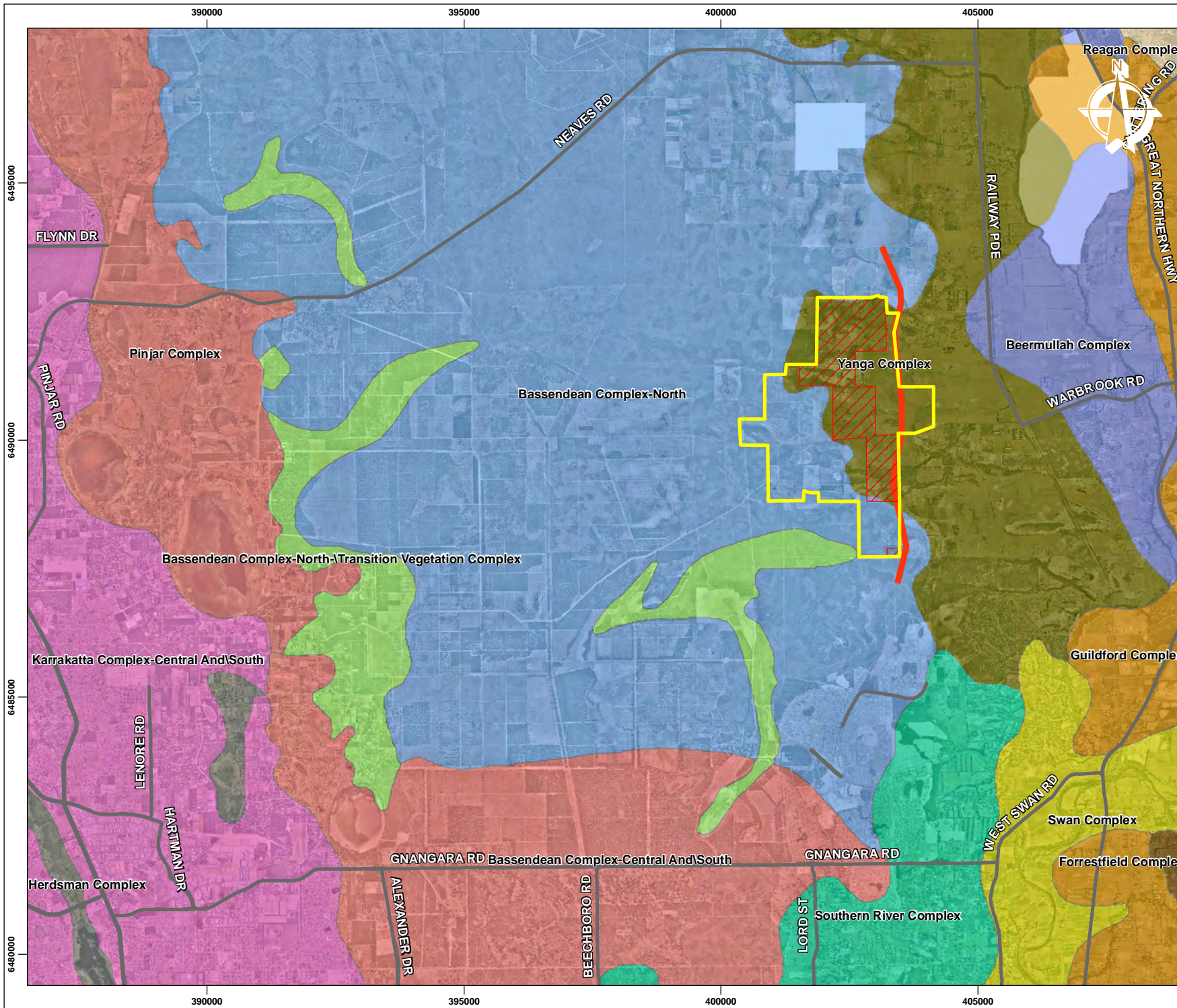
More recently, an alternative analysis of the plant assemblages on the Swan Coastal Plain south of Gingin Brook was carried out using a floristic approach (Gibson *et al.*, 1994) and was extended in 2000. This work identified 66 floristic community types in four floristic 'Super Groups' for the southern Swan Coastal Plain. These units are defined at a similar level of synthesis to that of Heddle *et al.* (1980) (Trudgen, 1999). The four 'super groups' of sites correlate closely with the major geomorphological elements on the Swan Coastal Plain (and also to rainfall), with the exception of one group which contained the seasonal wetlands, which includes sites across all geomorphological groups (Gibson *et al.*, 1994).

2.2.1.2 Rare Vegetation: Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)

The Department of Environment and Conservation (previously the Department of Environmental Protection, Department of Conservation and Land Management) has developed a procedure for identifying 'Threatened Ecological Communities' (Department of Environmental Protection 2000b; English and Blythe 1997). Threatened Ecological Communities (TECs) are assigned to one of four categories: 'Presumed Totally Destroyed'; 'Critically Endangered'; 'Endangered' or 'Vulnerable' (Department of Environmental Protection, 2000b).

On the Swan Coastal Plain, twenty four Threatened Ecological Communities have been confirmed (Department of Environmental Protection 2000b). Sixteen of these Threatened Ecological Communities are Floristic Community Types as identified by Gibson *et al.* (1994).

Priority Ecological Communities (PECs) include 'possible threatened ecological communities that do not meet survey criteria or are not adequately defined' (DEC, unpublished). These are added to the DEC's PEC list under Priorities 1, 2 and 3. Priority 4 status is given to "Ecological Communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. Conservation Dependent ecological communities are placed in Priority 5 (DEC, unpublished). The list of PECs (DEC, unpublished) includes some that are Floristic Community Types (FCTs) as identified by Gibson *et al.* (1994).



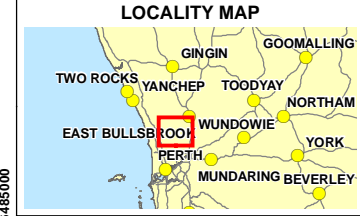
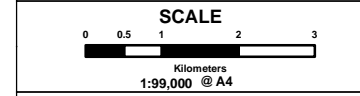
Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Major Roads
- Perth-Darwin Highway

Vegetation Complexes

- Bassendean Complex-Central And\South
- Bassendean Complex-North
- Bassendean Complex-North-Transition Vegetation Complex
- Beermullah Complex
- Darling Scarp Complex
- Forrestfield Complex
- Guildford Complex
- Herdsman Complex
- Karrakatta Complex-Central And\South
- Pinjar Complex
- Reagan Complex
- Southern River Complex
- Swan Complex
- Yanga Complex

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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Complexes
 Figure 2

A search of the Department of Environment and Conservation's TEC and PEC database found that there were a number of TECs and PECs recorded within a radius of approximately 7.5 kilometres of the survey area (Figure 3):

- TEC SCP Mound Springs (Critically Endangered): 'Communities of Tumulus Springs (Organic Mound Springs, Swan Coastal Plain)';
- TEC Muchea Limestone (Endangered): 'Shrublands and woodlands on Muchea Limestone';
- TEC SCP15 (Vulnerable): 'Forests and woodlands of deep seasonal wetlands of the Swan Coastal Plain';
- PEC SCP22 (Priority 2): '*Banksia ilicifolia* woodlands, southern Swan Coastal Plain (type 22)';
- PEC SCP21c (Priority 3): 'Low lying *Banksia attenuata* woodlands or shrublands (type 21c)';
- PEC SCP23b (Priority 3): '*Banksia attenuata* – *Banksia menziesii* woodlands (type 23b)'; and
- PEC SCP25 (Priority 3): '*Eucalyptus gomphocephala* – *Agonis flexuosa* woodlands (type 25)'.

PEC SCP22, PEC SCP21c and PEC SCP22 were located closest to the survey area.

2.2.1.3 BushForever Sites

The North Ellenbrook survey area is bounded by Bush Forever (BF) site 399 on its western side and BF site 300 on its southern side (Figure 4). Two small areas of BF site 399 lie in the western part of the North Ellenbrook survey area. In addition, BF site 298 covers a wetland vegetation area in the western-central part of the survey area (Figure 4). These BF sites are (DEC 2000a):

- BF site 298: Della Road South Bushland, Bullsbrook. Location of conservation category wetland;
- BF site 300: Maralla Road bushland, Anketell; and
- BF site 399: *Melaleuca* Park and adjacent bushland, Bullsbrook/Lexia.

2.2.1.4 Vegetation Linkages

It is generally accepted that large consolidated areas are the best options for viable conservation of natural ecosystems and populations (DEC, 2000b). In the Perth Metropolitan Region, there are few large areas available for conservation, with most areas being relatively small in size (less than 100 hectares) and isolated from other conservation areas (DEC, 2000b). Consequently, the consideration of proximity to other natural areas and connectivity with them is important in assessing the significance of natural areas.

Linkages have been categorized as follows (DEC, 2000b):

- Regionally significant contiguous corridors of bushland/wetland areas;
- Regionally significant fragmented bushland/wetland areas; and
- Regionally significant potential bushland/wetland areas.

A map of existing and potential bushland/wetland linkages in the Perth Metropolitan Area shows that 'contiguous or largely contiguous corridor of bushland/wetland areas' have been mapped in the bushland to the west and through the bushland to the south of the survey area, including the bushland in Property 11 (DEC, 2000b).

2.2.2 Rare Flora

Thirty two rare flora have been previously recorded in the North Ellenbrook survey area locality (within 10 kilometre radius from North Ellenbrook site coordinate), including seven (7) DRF species and twenty five (25) Priority species (Figure 3; Table 1).

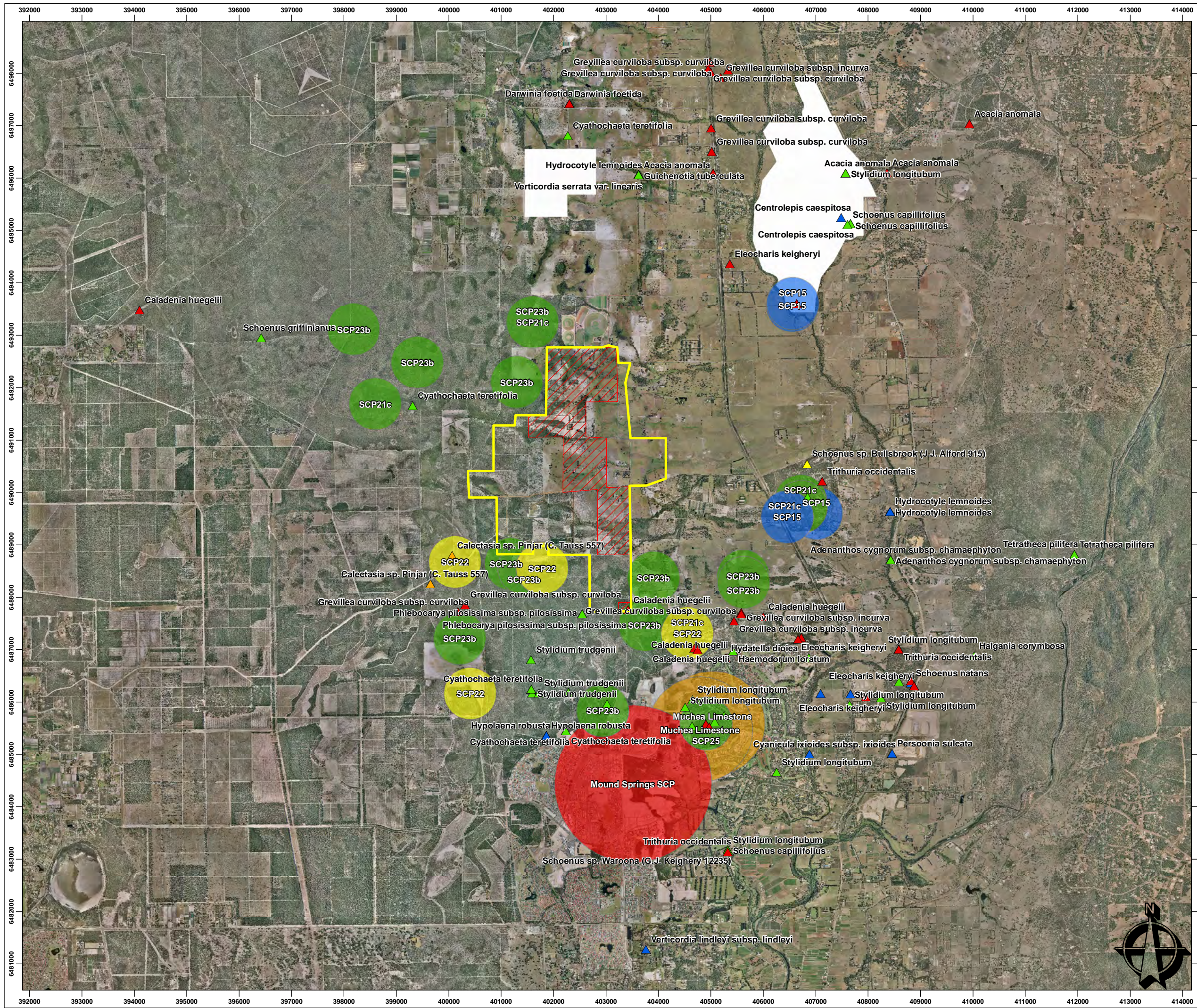
Table 1. Declared Rare and Priority Flora previously recorded within a 10 kilometre radius of the North Ellenbrook survey area (from DEC DEFL and WAHERB database searches, November 2011).

| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|--|---------|---|--|
| <i>Acacia anomala</i> | T | Low | Recorded on lateritic soils. Recorded east of the survey area. |
| <i>Caladenia huegelii</i> | T | High | Banksia woodland on dune slopes is suitable habitat and <i>C. huegelii</i> has been recorded just south and south-east of the survey area. |
| <i>Darwinia foetida</i> | T | Low to Moderate | Recorded at three locations near Muchea. Occurs in seasonal damplands. (Australian Gvt 'Threatened Species and Communities/Recovery Plans' webpage). |
| <i>Eleocharis keigheryi</i> | T | Low | Sedge, growing on clay, sandy loam. Emergent in freshwater: creeks, claypans (DEC FloraBase, February 2012). Soils in survey area are sandy. |
| <i>Grevillea curviloba</i> subsp. <i>curviloba</i> | T | Moderate | Prostrate to erect shrub. Grey sand. Winter-wet heath (DEC FloraBase, February 2012). |
| <i>Grevillea curviloba</i> subsp. <i>incurva</i> | T | Moderate | On sand, or clay; occupying winter wet flats (DEC FloraBase, February 2012). |
| <i>Trithuria occidentalis</i> (= <i>Hydatella dioica</i>) | T | Low | Aquatic herbs (DEC FloraBase, February 2012). No areas of free water in bushland in survey area. |
| <i>Calectasia</i> sp. Pinjar (C. Tauss 557) | 1 | Moderate to High | Gentle slopes, above damplands (DEC FloraBase, February 2012). |
| <i>Schoenus</i> sp. Bullsbrook (J.J. Alford 915) | 2 | ?Moderate | Grey peaty sand. Low-lying flats (DEC FloraBase, February 2012). |
| <i>Adenanthos cygnorum</i> subsp. <i>chamaephyton</i> | 3 | Low | Grey sand, lateritic gravel. Found east of survey area. |
| <i>Cyathochaeta teretifolia</i> | 3 | Moderate to High | Prefers grey sand, sandy clay. Swamps, creek edges. Limited suitable habitat in the survey area. |
| <i>Eryngium pinnatifidum</i> subsp. <i>palustre</i> | 3 | Low | Erect perennial, herb. Grows on clay and sandy clay on claypans and seasonally wet flats (DEC FloraBase, January 2012). Clay soil damplands not apparent in bushland in survey area. |

| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|---|---------|---|---|
| <i>Guichenotia tuberculata</i> | 3 | ?Moderate | |
| <i>Haemodorum loratum</i> | 3 | ?Moderate | Bulbaceous, perennial, herb. Grey or yellow sand, gravel (DEC FloraBase, January 2012). |
| <i>Halgania corymbosa</i> | 3 | Low | Gravelly soils, soils over granite (DEC FloraBase, January 2012). Soils not in survey area. |
| <i>Meionectes tenuifolia</i> (= <i>Haloragis tenuifolia</i>) | 3 | Low | Mostly occurs at damp or swampy places of the Darling Scarp (Marchant et al., 1987). |
| <i>Phlebocarya pilosissima</i> subsp. <i>pilosissima</i> | 3 | Moderate | Shortly rhizomatous, compactly tufted perennial, grass-like or herb. Grows on white or grey sand, lateritic gravel (DEC FloraBase, January 2012). Recorded just south of the survey area. |
| <i>Schoenus capillifolius</i> | 3 | Low | Found on brown mud claypans (DEC FloraBase, January 2012). No suitable habitat in survey area. |
| <i>Schoenus griffinianus</i> | 3 | Moderate | Small, tufted perennial; grass-like or herb (sedge). White sand (DEC FloraBase, January 2012). |
| <i>Schoenus</i> sp. Waroona (G.J. Keighery 12235) | 3 | Low to Moderate | Tufted annual, grass-like or herb (sedge). Clay or sandy clay; winter-wet flats (DEC FloraBase, January 2012). Soil not in survey area?? |
| <i>Stylidium longitubum</i> | 3 | Low to Moderate | Sandy clay, clay. Seasonal wetlands (DEC FloraBase, January 2012). Limited suitable soils (??) in the survey area. |
| <i>Stylidium trudgenii</i> | 3 | Moderate to High | Caespitose, perennial, herb. Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions (DEC FloraBase, January 2012). Found just south of the survey area. |
| <i>Tetratheca pilifera</i> | 3 | Low | Low, spreading shrub; gravelly soils (DEC FloraBase, January 2012). Eastern side of survey in hills? |
| <i>Verticordia serrata</i> var. <i>linearis</i> | 3 | Low | Shrub, to 1 m high. Recorded on white sand, gravel; open woodland (DEC FloraBase, January 2012). Found on scarp and base of scarp (?), |

| TAXON | STATUS* | LIKELIHOOD OF OCCURRENCE IN THE SURVEY AREA | COMMENTS |
|--|---------|---|---|
| | | | east of survey area. |
| <i>Centrolepis caespitosa</i> | 4 | Low to Moderate | Tufted annual, herb (forming a rounded cushion up to 25 mm across). White sand, clay. Salt flats, wet areas (DEC FloraBase, January 2012). |
| <i>Cyanicula ixioides</i> subsp. <i>ixioides</i> | 4 | Low | Found mainly between York and Bindoon growing in lateritic soils (Brown et al., 2008). |
| <i>Drosera occidentalis</i> subsp. <i>occidentalis</i> | 4 | Moderate | Occurs on sandy & clayey soils and around swamps & wet depressions (DEC FloraBase, January 2012). |
| <i>Hydrocotyle lemnoides</i> | 4 | Low | Aquatic, floating annual, herb. Swamps (DEC FloraBase, January 2012). |
| <i>Hypolaena robusta</i> | 4 | Moderate | Rhizomatous, perennial, herb. White sand; sandplains Swamps (DEC FloraBase, January 2012). Recorded south of survey area. |
| <i>Persoonia sulcata</i> | 4 | Low | Erect, spreading to decumbent shrub. Lateritic or granitic soils (DEC FloraBase, January 2012). Recorded base of hilis south-east of the survey area. |
| <i>Schoenus natans</i> | 4 | Low | Aquatic annual, grass-like or herb (sedge); winter-wet depressions (DEC FloraBase, January 2012). Damplands unlikely to be wet enough. |
| <i>Verticordia lindleyi</i> subsp. <i>lindleyi</i> | 4 | Low to Moderate | Occurs on sand, sandy clay in winter-wet depressions (DEC FloraBase, January 2012). Recorded 6 km south of survey area. |

*The rare flora status classification definitions are set out in Appendix 1.



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)

DEC Declared Rare Flora

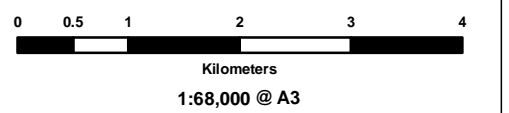
Conservation Code

- Priority 1
- Priority 2
- Priority 3
- Priority 4
- Threatened

Threatened & Priority Ecological Communities

- Critically Endangered
- Endangered
- Vulnerable
- Priority 2
- Priority 3

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



| | | | |
|--|----------------------|---------------------------|----------------------|
| DRAWING ID EBS137.03 | | DATE 17/02/2012 | |
| HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50 | | | |
| CREATED TD | CHECKED AH | APPROVED AH | REVISION 0 |

North Ellenbrook

North Ellenbrook Level 2 Flora & Vegetation Survey
DEC Rare Flora & TEC/PEC Records for North Ellenbrook Locality

Figure 3

2.3 Wetlands

Western Australia's wetlands have been defined as 'areas of seasonally intermittently or permanently waterlogged soils or inundated land whether natural or otherwise, fresh or saline, e.g. waterlogged soils, ponds, billabongs, lakes, swamps, tidal flats, estuaries, rivers and their tributaries (Wetland Advisory Committee 1977, quoted in DEP, 2000b).

There are over 9,600 wetlands covering over 25% of the Swan Coastal Plain land area (Balla, 1994). Semeniuk proposed a classification of wetlands for south-western Australia based on landform and water longevity (Hill *et al.*, 1996; Table 2).

Table 2. Wetland classification based on permanency of water and a global geomorphic classification system (reproduced from DEC, 2000b; after Semeniuk in Hill *et al.*, 1996).

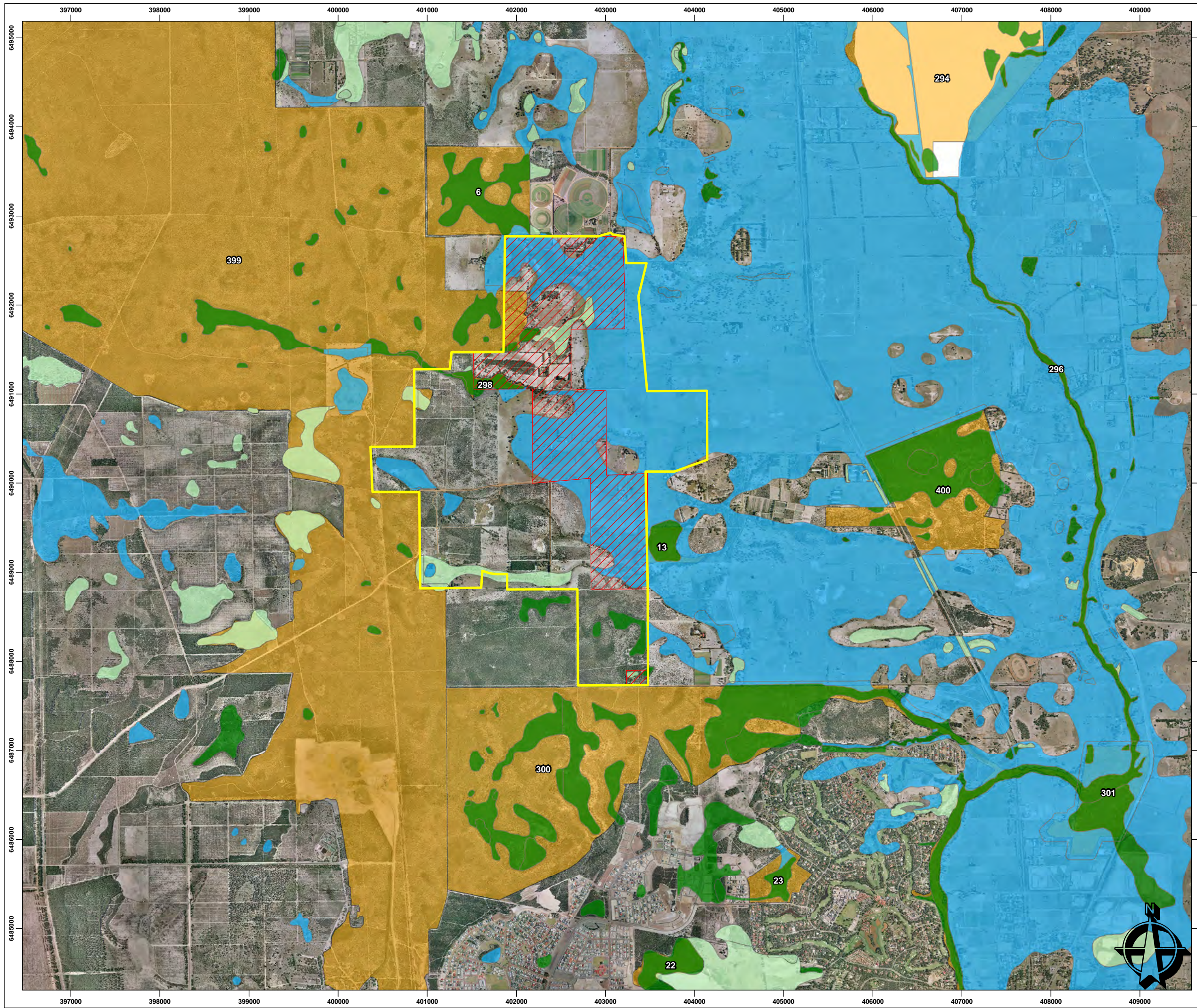
| WATER LONGEVITY | LANDFORM | | | | |
|-------------------------|----------|---------|------------|-----------|------------|
| | BASIN | CHANNEL | FLAT | SLOPE | HIGHLAND |
| Permanent inundation | lake | river | - | - | - |
| Seasonal inundation | sumpland | creek | floodplain | - | - |
| Intermittent inundation | playa# | wadi# | barlkarra# | - | - |
| Seasonal Waterlogging | dampland | trough# | palusplain | paluslope | palusmont# |

Not used on the Swan Coastal Plain in the Perth Metropolitan Region.

Management categories for wetlands in Western Australia have been described by the Water and Rivers Commission (DEP 2000b). They are:

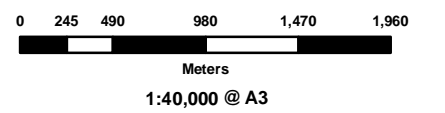
- Conservation wetlands: 95-100% vegetated; management objective of preserving their natural attributes and functions;
- Resource Enhancement: 10-94% vegetated; management for restoration and enhancement of natural attributes and functions; and
- Multiple Use: 0-9% vegetated; management for their use and development in the context of water, town and environmental planning.

Geomorphic wetlands have been mapped for the Swan Coastal Plain. Geomorphic wetlands and their management categories in the North Ellenbrook locality are shown in Figure 4. Large area of Multiple Use wetlands occur on the agricultural land in the eastern part of the survey area. A few smaller areas of Multiple Use wetlands occur in the western part of the survey area, which have suffered disturbances, such as part clearing, in the past. Three resource enhancement wetlands and four small Conservation wetlands also occur in the survey area.



- Legend**
- North Ellenbrook Survey Area Boundary
 - Area Not Surveyed (No Access)
 - Bush Forever Site
- Geomorphic Wetlands**
- Conservation
 - Resource Enhancement
 - Multiple Use
 - Not Assessed
 - Not Applicable

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2006



LOCALITY MAP



| | | | |
|--|----------------------|---------------------------|----------------------|
| DRAWING ID EBS137.04 | | DATE 17/02/2012 | |
| HORIZONTAL DATUM AND PROJECTION GDA 1994 MGA Zone 50 | | | |
| CREATED TD | CHECKED AH | APPROVED AH | REVISION 0 |

North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Geomorphic Wetlands & Bushforever Sites

Figure 4



3 Methods and Limitations

3.1 Flora Survey

3.1.1 Compilation of a Flora Species List – General Flora Survey Methods

The North Ellenbrook flora survey was mostly conducted between the 5 November and the 4 December 2010, with two quadrats recorded on the 10 December.

The flora in the study area was surveyed while describing the vegetation, while walking between the vegetation recording sites, while mapping the vegetation units and when conducting general traverses through the study area.

At each quadrat, all plant species present were recorded. At releve sites ('unbounded' sample sites) and mapping note sites (abbreviated releves), dominant and subdominant species and some associated species were recorded. At all formal sites (quadrats, releves and mapping note sites), where a plant species was not well known, a specimen was collected and allocated a specimen number.

Plant species were recorded elsewhere in the study area if they had not been recorded at a vegetation sample site or if they were of particular interest. Again, where a plant species was not well known, a specimen was collected and allocated a specimen number. GPS coordinates were recorded (using a Garmin 60CX hand held GPS unit) whenever it was considered there was a possibility that the plant species may be of special interest.

The specimens collected were pressed, dried and identified. The identifications were made by comparison to specimens in the reference and research collections of the Western Australian Herbarium, by the use of keys in various papers and books and by relevant experts on various groups of flora that occur on the Swan Coastal Plain.

The Department of Environment and Conservation Declared Rare and Priority Flora List (Smith, 2010; definitions in Appendix 1) was consulted as required to confirm the status of plant species in the survey area.

3.1.2 Limitations of the Flora Survey

The major limitation of the flora survey is that any such survey is a sampling procedure of a variable environment with plant populations of variable growth habit, life span and flowering season. Some species, including annuals, are only available for collection for part of the year. This means that to locate all species that grow in an area is a substantial task, the success of which is related to the time available and the size and diversity of habitat in the survey. Consequently, it is possible that there are species present in the survey area that were not recorded during this survey as they have only low abundance on the land, or were not flowering at the time of the survey.

Given the limitations of the flora survey, it is likely that this survey recorded more than 80% of the vascular flora in the survey area. That is, while the flora survey was relatively thorough, it was possible that some species occurring in the survey area were not recorded.

3.2 Vegetation Survey

3.2.1 Methods of the Vegetation Survey

Locations were selected for survey quadrats and relevés that were representative of observed variations in the vegetation and habitat. Suitable sites for the more detailed quadrats were limited to sites in Good or better condition, where a good suite of species representative of that vegetation type, were present.

Twenty two (22) 10 metre by 10 metre quadrats (CAQ1 to CAQ22) were marked out with a field measuring tape between fence dropper stakes driven into the ground at each corner, each fitted with a yellow plastic safety cap. The 10 metre by 10 metre quadrat dimensions were used firstly because a 100 m² sample area on the Swan Coastal Plain is considered to capture most species in a given plant community and secondly because that was the quadrat size used to collect data for the Gibson *et al.* (1994) Swan Coastal Plain study, with which the North Ellenbrook survey data set needed to be compatible for the purpose of analysis.

Each quadrat was photographed. A description of the quadrat location, the habitat, surface soil texture and colour were all recorded and the time since the site was last burnt was estimated. The vegetation structure was described using a modification of Specht's vegetation description table by Aplin (1979; Appendix 2). To obtain more representative data for the overstorey cover, the tree layer(s) cover was estimated over a larger area around the quadrats. The condition of vegetation in the quadrat was described using the Keighery classification outlined in Bush Forever (Department of Environmental Protection, 2000b; see Appendix 3). All plant species occurring in a quadrat were recorded, along with their height, percentage cover and specimen number if collected.

Twenty two relevés were also recorded to describe vegetation units. The composition of the relevé descriptions was similar to that of the quadrats, but the area described was 'open' (not a measured 10 m x 10 m space) and the data recorded not as detailed. Twelve mapping notes, abbreviated form of relevés descriptions, were also recorded.

3.2.2 Limitations of the Vegetation Survey

The cover estimate of each plant species recorded in the quadrats was based on estimating species projected canopy cover. The assumption was made that for most species, canopy cover and projected foliar cover are reasonably similar, or that the difference is less than the level of accuracy of the estimates.

There is a limit to the accuracy of the assignment of the different strata in the vegetation descriptions to structural units (for example, low open woodland, low

woodland, low open forest, open shrubland, shrubland etc.). Referral of a stratum to a structural category depends on assessment of its cover. Such estimation is imprecise and it is not unusual for different observers to give quite different estimates of the cover of a species, or stratum in a stand. However, descriptive exercises such as that carried out for this report require only a moderate level of accuracy.

3.3 Vegetation Mapping

3.3.1 Methods for Vegetation Mapping

Vegetation units were recorded generally between plant community and plant association level. The vegetation unit boundaries were drawn on a computer generated aerial photograph while traversing the study area, using GPS coordinate readings to locate actual boundary positions. Orthorectified aerial photography at 1:5,000 was used.

The vegetation mapping unit descriptions were based on the quadrat, releve and mapping note descriptions. The vegetation descriptions recorded in the field were later synthesized into vegetation units. Results of the ordination analysis (see below), which analysed floristic similarity of survey quadrats, were not available to consult at the time the vegetation units were finalised.

3.3.2 Wetland Vegetation Mapping

The identification and delineation of a wetland is dependent on an areas hydrology, hydric soils and wetland vegetation (Hill *et al.*, 1996). Obligate wetland species are considered reliable wetland indicators (Hill *et al.*, 1996).

The vegetation units recorded in the North Ellenbrook survey area were classified as wetland vegetation if a number of obligate wetland species were present in the units as dominants. Obligate wetland species were considered to be those that only occur in wetland sites and therefore appeared to require wetland conditions for growth. Table 3 shows a list of plant species that were considered to be obligate wetland species after reference to the literature and from the botanists' experience.

Table 3. List of plant species from the North Ellenbrook survey area considered to be obligate wetland species.

| WETLAND SPECIES | NOTES ^a |
|---|---|
| <i>Astartea scoparia</i> | Found on damp, sandy soils near watercourses, swamps or seasonally wet depressions. |
| <i>Banksia littoralis</i> (Swamp banksia) | Frequently occurs in swampy areas, but is not tolerant of inundation and prefers areas with short winter waterlogging or very shallow water table. |
| <i>Cyathochaeta teretifolia</i> | |
| <i>Eucalyptus rudis</i> subsp. <i>rudis</i> | Flooded gum is common fringing winter-wet depressions, lakes and watercourses on the SCP. It can tolerate prolonged periods of flooding and usually found in waterlogged areas. |
| <i>Hypolaena exsulca</i> | |
| <i>Lepidosperma longitudinale</i> | Sandy and peaty soils in winter-wet depressions and along watercourses. |
| <i>Melaleuca lateritia</i> | Fringes watercourses and in seasonally wet depressions. |
| <i>Melaleuca preissiana</i> | In waterlogged soils fringing rivers and swamps. Less tolerant of prolonged inundation than <i>Melaleuca raphiophylla</i> |
| <i>Melaleuca raphiophylla</i> | Tolerates periodic inundation, but prefers waterlogged sites. Found near both fresh and saline water, but is less adapted for saline water conditions than Saltwatre Paperbark. |
| <i>Schoenus efoliatus</i> | |
| <i>Taxandria linearifolia</i> | Fringes swamps and watercourses. |

a: Notes from Department of Conservation and Environment, 1997.

3.4 Floristic Community Types and Ordination Analysis of Vegetation Units

3.4.1 Introduction

The floristic analysis compared the similarity of species presence/absence data collected at the twenty two (22) North Ellenbrook quadrats with the data for 509 sites recorded across the Swan Coastal Plain in a broad survey by Gibson *et al.* (1994).

3.4.2 Data Preparation

To conduct the analysis on the North Ellenbrook quadrat data, it was first necessary to reconcile the names used in that survey with those used in the Gibson *et al.* (1994) dataset. This was done by determining, for each taxa on the North Ellenbrook survey list, the equivalent taxa name applied in the Gibson *et al.* (1994) study. This step was necessary because of changes in the nomenclature over the last ten years and the potential for survey specific variations in the application of names. The reconciliation involved reducing some infra-specific names to the relevant species name, combining some taxa where confusion is known to have occurred in field observations and identifications and omitting some names (mostly where a taxon had only been identified to genus).

The North Ellenbrook quadrat data was then added to the Gibson *et al.* (1994) Swan Coastal Plain site-species table for analysis.

Weed species were included in the analysis.

3.4.3 Data Compatibility

The North Ellenbrook data was reasonably compatible with the Gibson *et al.* (1994) data. Both datasets were based on data collected from quadrats of the same size (10 metres by 10 metres). However, the Gibson *et al.* (1994) quadrats were visited and recorded twice, including a Spring visit, compared to the single late Spring recording for the North Ellenbrook sites. Weed species were included in both the Gibson *et al.* (1994) and North Ellenbrook datasets.

3.4.4 PATN Analysis

Mr Chris Hancock conducted the North Ellenbrook quadrat analysis using Bray-Curtis ordination as applied by the computer program PC-ORD (MJM Software Design).

The details of the methods of the ordination analysis are set out in the report prepared by Mr Chris Hancock that is included in Appendix 8.

3.4.5 Limitations of the Floristic Analysis

A limitation in conducting an ordination analysis may arise depending on the degree of success in reconciling the two data sets. A further limitation may arise from any significant differences in data collection methods between the two surveys. However, this is unlikely to have occurred in this case, as the collection methods were similar between the two surveys.

3.5 Identification of TECs and PECs

Once the North Ellenbrook quadrats were each assigned to a Floristic Community Type, a current table of Floristic Community Types on the Swan Coastal Plain and their TEC status (DEC website, 2011) was consulted to determine if any of the North Ellenbrook vegetation sites were TECs.

To determine if any of the North Ellenbrook FCTs were PECs, a list of PECs was consulted (DEC website, 2011).

3.6 Flora and Vegetation and Regional Significance

Regional significance of the North Ellenbrook flora and vegetation was assessed against the criteria for the determination of regional significance of natural areas set out in Guidance Statement No. 10 (EPA, 2006).

4 Flora of the North Ellenbrook Survey Area

4.1 Flora List for the Survey Area

One hundred and eighty (180) species of native flowering plants and one native cycad (the Zamia Palm, *Macrozamia riedlei*) were recorded in the North Ellenbrook survey area. In addition, forty five (45) non-native (introduced) species were recorded from the survey area, including a number of horticultural plants native to other parts of Western Australia. A list of species recorded in the North Ellenbrook survey area is presented in Appendix 4. The list of non-native species in the survey area is comprehensive, but probably not exhaustive.

The flowering plant families that were well represented by native species in the survey area were the Myrtaceae (eucalypt family) with twenty three (23) native species, Fabaceae (pea and *Acacia* family) with twenty (20) native species, the Asparagaceae family with twelve (12) native species and the Proteaceae (Banksia family), the Stylidiaceae family and the Ericaceae family, all with ten (10) native species.

The number of native species recorded in the North Ellenbrook survey area was probably a low number for size of the survey area. This was due mostly to the large part of the survey area that was cleared farmland or was degraded after conversion to other landuse purposes, including wildflower farming (Properties 64, 65 and 66(?)), horse grazing and sand mining. The dampland vegetation had been cleared in parts of a number of properties and probably also impacted by drawdown of the water table from bores. The timing of the survey in late Spring would also have contributed to a lower species count. However, the species counts in the Banksia woodlands suggest a reasonable species richness for that vegetation type (Table 4).

4.2 Significant Flora Recorded in the Survey Area

4.2.1 Declared Rare Flora (DRF) Recorded in the Survey Area

No Declared Rare Flora were recorded in the North Ellenbrook survey area.

4.2.2 Priority Flora Species Recorded from the Survey Area

One Priority 3 species, *Cyathochaeta teretifolia*, was recorded in the North Ellenbrook survey area (Figure 5; Appendix 5).

Table 4. North Ellenbrook survey quadrat species richness

| QUADRAT | SPECIES | SITE VEGETATION/HABITAT |
|---------|---------|---|
| NEQ1 | 50 | Banksia woodland, upper slope |
| NEQ2 | 21 | Regelia heath dampland |
| NEQ3 | 43 | Banksia woodland, upper slope |
| NEQ4 | 33 | <i>Banksia ilicifolia</i> low open woodland at base of dune |
| NEQ5 | 52 | Banksia woodland, mid-slope |
| NEQ6 | 13 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ7 | 60 | Banksia woodland, lower-mid slope |
| NEQ8 | 27 | Banksia woodland, lower slope |
| NEQ9 | 45 | Banksia woodland, crest of dune |
| NEQ10 | 52 | Banksia woodland in swale |
| NEQ11 | 46 | Banksia woodland, lower slope |
| NEQ12 | 55 | Banksia woodland, upper slope |
| NEQ13 | 19 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ14 | 34 | <i>Beaufortia elegans</i> heath |
| NEQ15 | 49 | Banksia woodland, upper slope |
| NEQ16 | 7 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |
| NEQ17 | 53 | Banksia woodland, upper slope |
| NEQ18 | 40 | Jarrah-Banksia woodland on flats |
| NEQ19 | 50 | Banksia woodland in swale |
| NEQ20 | 19 | <i>Melaleuca preissiana</i> low forest |
| NEQ21 | 18 | Marri-Jarrah woodland on flats |
| NEQ22 | 9 | <i>Melaleuca preissiana</i> - <i>Astartea</i> dampland |

4.2.2.1 *Cyathochaeta teretifolia* (P3)

Cyathochaeta teretifolia is a “rhizomatous, clumped, robust perennial, sedge” that grows to 2 metres high and 1 metre wide (Paczkowska and Chapman, 2000). It has been recorded growing on sand and sandy clay in swamps and along creek edges.

Cyathochaeta teretifolia was recorded in a number of damplands in the North Ellenbrook survey area (Figure 5; Appendix 5). The North Ellenbrook survey area is near the northern extent of the range of *Cyathochaeta teretifolia* (FloraBase, DEC website).

4.2.3 Other Species of Regional Significance Recorded in the Survey Area

Nine plant species recorded in the North Ellenbrook survey area were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum*, *Verticordia nitens* (Appendix 5).

4.2.3.1 *Burchardia bairdiae*

Burchardia bairdiae is a tuberous herb growing to between 0.3 and 1.5 metres high (Plate 1; Paczkowska and Chapman, 2000). It is found in winter wet depressions. It is considered regionally significant in the Perth Metropolitan area where it is near the southern limit of its geographic range (Department of Environmental Protection, 2000b).

Burchardia bairdiae was recorded from a dampland site on Property 14 in the western part of the survey area (Appendix 5).



Plate 1. *Burchardia bairdiae*. (Photograph sourced from the FloraBase, DEC website).

4.2.3.2 *Conostylis aculeata* subsp. *cygnorum*

Conostylis aculeata subsp. *cygnorum* is a small herbaceous plant growing to about 25 cm. It is considered regionally significant in the Perth Metropolitan area because it is endemic to the Swan Coastal Plain (Department of Environmental Protection, 2000b). It occurs mostly in the Perth Metropolitan area and the surrounding area.

It was recorded at one site near quadrat NEQ9 on Property 20 in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodland on a dune crest (Appendix 5). It is likely to be found in similar vegetation elsewhere in the survey area.

4.2.3.3 *Dielsia stenostachya*

Dielsia stenostachya is a small rush that grows to 20 to 90 cm in height and occurs on winter-wet damplands and around the edges of wetlands (Paczkowska and Chapman, 2000). It is considered regionally significant in the Perth Metropolitan area because it is endemic or nearly endemic to the Swan Coastal Plain (Department of Environmental Protection, 2000b). It occurs mostly in the Perth Metropolitan area and the surrounding area.

Dielsia stenostachya was found to occur at many of the damplands in the North Ellenbrook survey area, and was recorded at approximately 12 sites (Appendix 5).

4.2.3.4 *Hensmania turbinata*

Hensmania turbinata is a small, tufted perennial herb that grows to a height of about 20 cm. It is mostly restricted to the Swan Coastal Plain and is considered to be regionally significant in the Perth Metropolitan area where it is near the southern limit of its geographic range (Department of Environmental Protection, 2000b).

Hensmania turbinata was recorded from four locations in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodland on three dune slopes in three Properties (Appendix 5).

4.2.3.5 *Stachystemon axillaris*

Stachystemon axillaris is a shrub that grows to about 1.2 m high (Paczkowska and Chapman, 2000). The North Ellenbrook survey area is near the southern end of the range of *Stachystemon axillaris* and that together with its status as poorly reserved (at the time of the BushForever publication) would make it regionally significant in the Perth Metropolitan area (Department of Environmental protection, 2000b).

Stachystemon axillaris was recorded at one location in *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodland on a dune slope in Property 20 (Appendix 5). It may occur elsewhere in that habitat-vegetation type in the survey area.

4.2.3.6 *Stylidium crosssocephalum*

Stylidium crosssocephalum is a small perennial herb growing to a height of about about 30 cm (Plate 2). It is considered regionally significant in the Perth Metropolitan area

where it is at the southern limit of its geographic range (Department of Environmental Protection, 2000b; FloraBase, DEC website 2012).

Stylidium crossocephalum was recorded at two locations in *Banksia attenuata-Banksia menziesii-Eucalyptus todtiana* woodland on a dune slope in Property 66 (Appendix 5). It may occur elsewhere in that habitat/vegetation type in the survey area.



Plate 2. *Stylidium crossocephalum*. (Photograph sourced from the FloraBase, DEC website).

4.2.3.7 *Stylidium rigidulum*

Stylidium rigidulum is a 'stilted' perennial herb with rosette leaves. The North Ellenbrook survey area is at the southern end of its range, and it is therefore considered to be regionally significant in the Perth Metropolitan area.

It was recorded at two locations in the survey area, in *Banksia attenuata-Banksia menziesii-Eucalyptus todtiana* woodlands on dune slopes and flats (Properties 21 and 64) (Appendix 5). It probably occurs elsewhere in this vegetation type in the survey area.

4.2.3.8 *Stylidium utricularioides*

Stylidium utricularioides is a small herb that occurs on seasonal wetlands (Paczkowska and Chapman, 2000). It occurs across a large part of the Swan Coastal Plain, but was listed as regionally significant in the Perth Metropolitan area in 2000 (Department of Environmental Protection, 2000b).

Stylidium utricularioides was recorded at one location in the survey area, near quadrat NEQ6 in Property 64 in the western part of the survey area (Appendix 5).

4.2.3.9 *Verticordia nitens*

Verticordia nitens is a shrub that grows to between about 50 and 200 cm and occurs on sandy soils. It is mostly restricted to the Swan Coastal Plain and was considered to be regionally significant in the Perth Metropolitan area in 2000 due to the occurrence of significant populations (Department of Environmental Protection, 2000b)

Verticordia nitens was widespread and common in the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* woodlands on dune slopes in the North Ellenbrook survey area. Survey records of *Verticordia nitens* are listed in Appendix 5.

4.3 Other Species of Interest Recorded in the Survey Area

Agonis flexuosa was recorded at one site in the survey area, in the southern part of Property 11 near the boundary with Property 10. It is not likely to occur naturally in this area and has been treated as an introduced taxa to the survey area in this report.

4.4 Weeds Recorded in the Survey Area

Of the forty five (45) non-native (introduced) species recorded from the survey area, seven (7) were species native to Western Australia, but which had been introduced as horticultural plants (in the former wildflower farm area) or were amenity plantings or escapees. Of the other thirty eight (38) weed species in the survey area, three (3) were listed as Declared weeds (Agricultural Protection Board, 2011). These were:

- **Asparagus asparagoides* (Bridle creeper): 1 record in Property 67;
- **Moraea flaccida* (Cape Tulip (formerly *Homeria flaccida*)): 1 record along flow line in Property 21; and
- **Zantedeschia aethiopica* (Arum lily): 1 record in Property 65, in flowline area.

Other weed species of significance included:

- **Leptospermum laevigatum* (Victorian tea-tree): recorded at one location, on the south side of quadrat NEQ21, near the boundary with Property 10; and
- **Cortaderia selloana* (Pampus grass): recorded at two locations.

5 Vegetation of the Survey Area

5.1 Vegetation Description

5.1.1 Introduction to the Vegetation Descriptions

The vegetation units described are considered to be mostly described at the vegetation association level.

The vegetation unit codes that discriminate the mapped vegetation units are derived from the generic and species names of the more abundant genera or species in the different strata present in each unit (see Table 5). For example, the vegetation unit 'CcEm' has its code derived from two of the dominant upper strata species in that unit: 'Cc' (*Corymbia calophylla*) and 'Em' (*Eucalyptus marginata* subsp. *marginata*).

Table 5. Abbreviations for species names that were used in vegetation unit codes.

| CODE | SPECIES NAME | CODE | SPECIES NAME |
|------|---|------|--|
| As | <i>Astartea scoparia</i> | Er | <i>Eucalyptus rudis</i> |
| Ba | <i>Banksia attenuata</i> | Et | <i>Eucalyptus todtiana</i> |
| Be | <i>Beaufortia elegans</i> | Kg | <i>Kunzea glabrescens</i> |
| Bi | <i>Banksia ilicifolia</i> | Mp | <i>Melaleuca preissiana</i> |
| Bm | <i>Banksia menziesii</i> | Pe | <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> |
| Cc | <i>Corymbia calophylla</i> | Ri | <i>Regelia inops</i> |
| Em | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> | Xp | <i>Xanthorrhoea preissii</i> |
| Ep | <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | | |

5.1.2 Vegetation of the North Ellenbrook Survey Area

Fourteen vegetation units were described and mapped in the remnant bushland in the North Ellenbrook survey area (Figure 6). These were organised into the following three broad groupings:

- Banksia and Pricklybark woodlands on dune crests and slopes;
- Vegetation on the sandy parts of swales and flats; and
- Dampland vegetation.

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland covered the dune slopes and crests. The statistical analysis of the quadrat data suggested that this vegetation on the lower slopes may be floristically different, but further work would be needed to confirm this. The cover of *Eucalyptus todtiana* was greater on the

upper slopes and crests and it formed a low woodland in its own right in one small area of dune upper slope on Property 11.

Vegetation on the sandy parts of swales and flats included *Banksia ilicifolia* low woodlands and mixed low woodlands, *Corymbia calophylla* (Marri) woodlands on flats adjacent to damplands and a few small areas of *Eucalyptus marginata* subsp. *marginata* (Jarrah)- *Corymbia calophylla*- *Banksia ilicifolia* woodlands on sandy flats adjacent to damplands.

The dampland vegetation included *Melaleuca preissiana* scattered low trees to low woodlands over *Astartea scoparea* heaths and *Regelia inops* heaths, *Melaleuca preissiana* low closed forests and a small area of *Eucalyptus rudis* open forest dampland.

Most of the remnant vegetation in the survey area occurred in that part mapped as the Bassendean-North Vegetation Complex (Figures 2 and 6). Approximately all of that part of the survey area mapped as Yanga Vegetation Complex was cleared pasture paddocks.

Details of the quadrat, releve and mapping note vegetation sample sites referred to in the following section can be found in Appendices 6 and 7.

(i) **Banksia and Pricklybark woodlands on dune crests and slopes**

BaBmEt

Banksia attenuata, *Banksia menziesii*, *Eucalyptus todtiana* low woodland over *Scholtzia involucrata* and *Beaufortia elegans* high shrublands over *Eremaea pauciflora* var. *pauciflora*, *Astroloma xerophyllum*, *Croninia kingiana* and *Leucopogon conostephioides* low shrublands.

Habitat and soil: Gentle slopes and crests of low dunes. Pale grey sand.

Notes: This vegetation was recorded at quadrats NEQ1, NEQ3, NEQ5, NEQ7, NEQ9, NEQ12, NEQ15, NEQ17, NEQ8 and NEQ11 and at releves NER1, NER4 and NER13 (Plates 3 to 6). *Eucalyptus todtiana* appeared to be more abundant on the upper slopes. The statistical analysis determined the lower slopes sites NEQ8 and NEQ11 to be floristically different from the other sites, but more work would be required to demonstrate that this was not a function of different recorders or limitations of the analysis. The northern part of Property 64 was on a low rise and had a higher cover of *Banksia ilicifolia* like unit BaBmBi, but the understory was structurally and floristically most like the BaBmEt unit.

Et

Eucalyptus todtiana low open woodland over *Adenanthos cygnorum* var. *cygnorum* scattered tall shrubs to high open shrubland over *Beaufortia elegans*, (*Verticordia nitens*) open heath and *Eremaea pauciflora* var. *pauciflora* low open shrubland

Habitat and soil: Crest of low dune. Pale grey sand.

Notes: This vegetation unit was recorded at releve site NER20 (Plate 7). It occurred in the northern part of Property 11. *Banksia attenuata* and *Banksia menziesii* were missing from the low woodland strata that occurred elsewhere on the hill. A few dead *Banksias* were present, but either few *Banksias* naturally grew in this area or more likely, *Banksias* had in the past died (drought or disease or burnt in previous fires) and been subsequently burnt out. Property 21 immediately to the north also had areas with few *Banksias*. *Eucalyptus todtiana* was naturally more abundant on the upper slopes of these dunes.



Plate 3. Vegetation unit BaBmEt at quadrat NEQ5 (Property 65).



Plate 4. Vegetation unit BaBmEt at quadrat NEQ1 (Property 20).



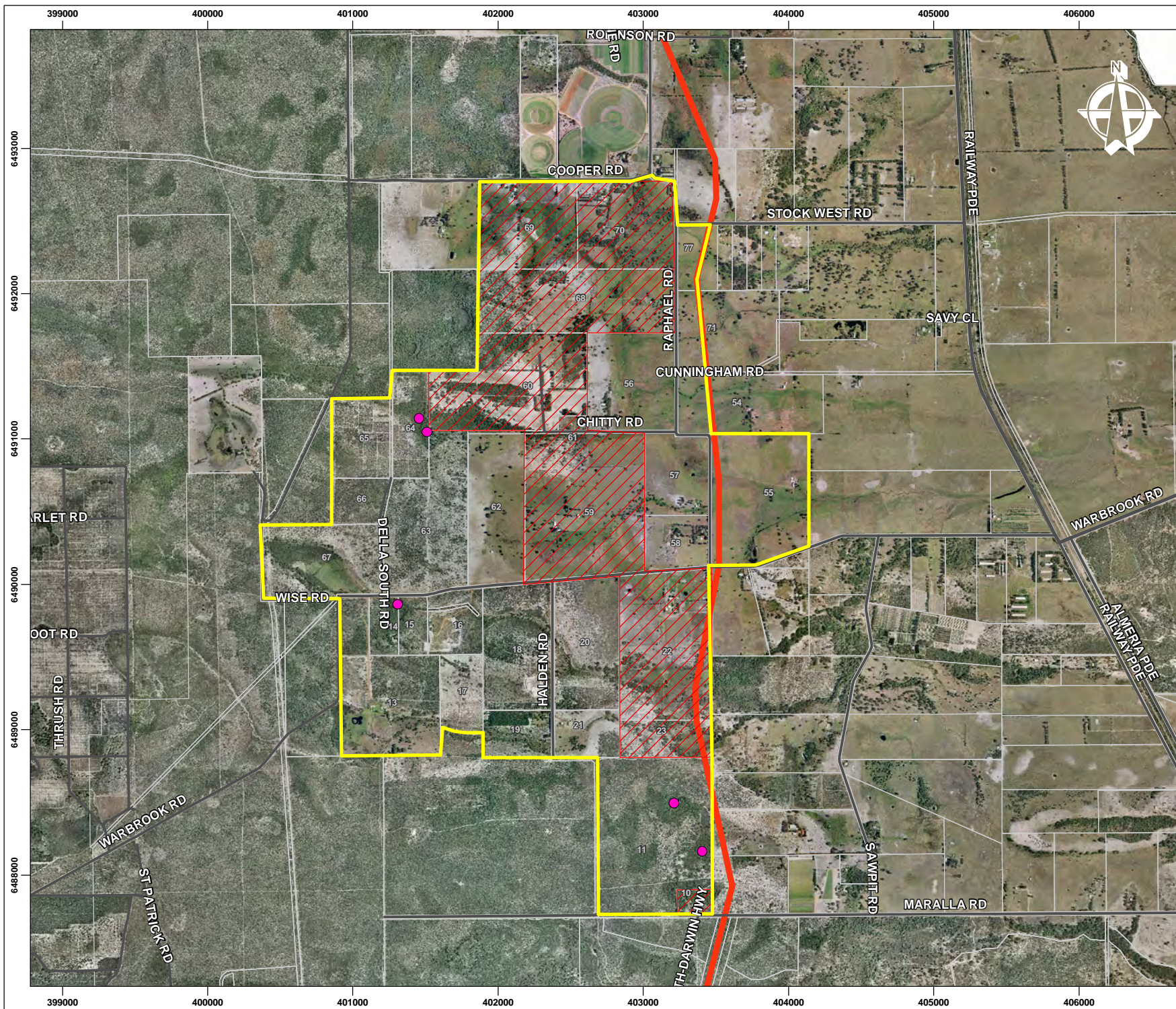
Plate 5. Vegetation unit BaBmEt on lower slopes at quadrat NEQ11, on Property 13.



Plate 6. Vegetation unit BaBmEt on a dune upper slope at quadrat NEQ15, on Property 11.



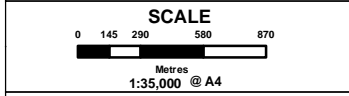
Plate 7. Vegetation unit Et on a dune crest at releve NER20, on Property 11.



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- *Cyathochaeta teretifolia* (Priority 3)
- Minor Roads
- Major Roads
- Perth-Darwin Highway

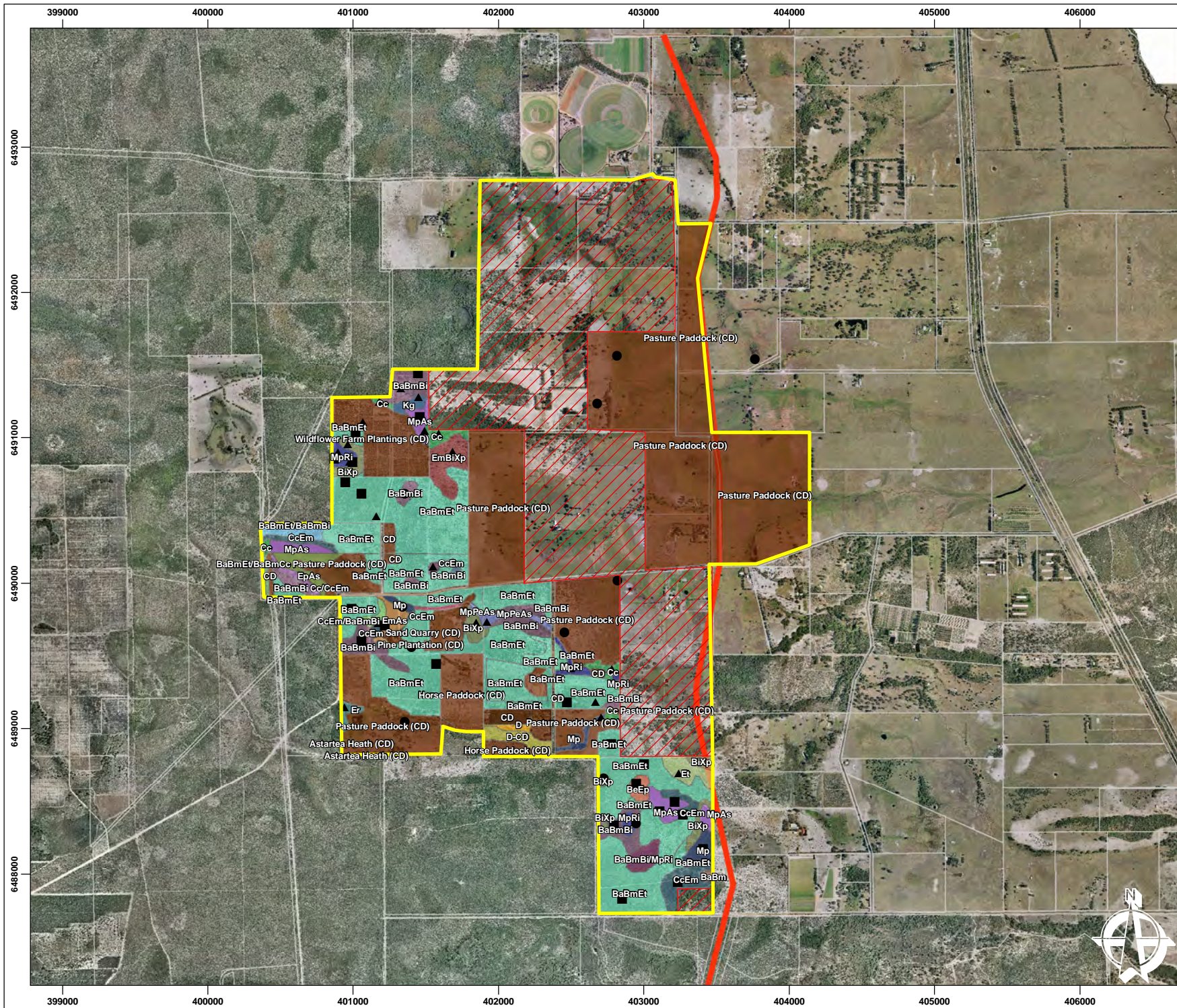
- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey. Declared Rare Flora and Priority Flora
 Figure 5



Legend

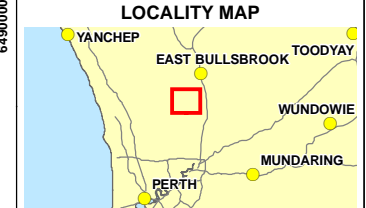
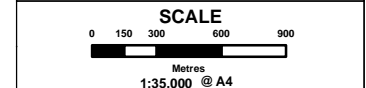
- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Minor Roads
- Major Roads
- Perth-Darwin Highway
- CcEm
- CcEm/BaBmBi
- Degraded
- D-CD
- EcEm
- EmAs
- EmBaBi
- EmBiXp
- EpAs
- Er
- Kg
- Mp
- MpAs
- MpPeAs
- MpPeAs/CcEm
- MpRi
- Mapping Notes
- Quadrats
- Relevés

Vegetation Units

- Completely Degraded
- BaBm
- BaBmBi
- BaBmBi/MpRi
- BaBmEt
- BaBmEt/BaBmBi
- BaBmEt/BaBmCc
- BeEp
- BiXp
- Cc
- Cc/CcEm

NB: combination units (e.g. CcEm/BaBmBi) indicate a patchy mosaic incorporating both of the nominated vegetation units.

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Units
 Figure 6

Legend for Figure 6 Vegetation Units.

(i) Banksia and Pricklybark woodlands on dune crests and slopes

BaBmEt *Banksia attenuata*, *Banksia menziesii*, *Eucalyptus todtiana* low woodland over *Scholtzia involucreta* and *Beaufortia elegans* high shrublands over *Eremaea pauciflora* var. *pauciflora*, *Astroloma xerophyllum*, *Croninia kingiana* and *Leucopogon conostephioides* low shrublands.

Et *Eucalyptus todtiana* low open woodland over *Adenanthos cygnorum* var. *cygnorum* scattered tall shrubs to high open shrubland over *Beaufortia elegans*, (*Verticordia nitens*) open heath and *Eremaea pauciflora* var. *pauciflora* low open shrubland

(ii) Vegetation on the sandy parts of swales and flats

BaBmBi *Banksia attenuata*, *Banksia ilicifolia*, *Banksia menziesii* low woodland over *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Calytrix flavescens*, *Conostephium pendulum*, *Adenanthos obovatus*, *Eremaea pauciflora* var. *pauciflora* low open shrublands over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyopogon bromeliifolius* low herblands.

BeEp *Beaufortia elegans* open heath over *Eremaea pauciflora* var. *pauciflora* low shrubland.

BiXp *Banksia ilicifolia* scattered low trees over *Xanthorrhoea preissii* shrubland over *Eremaea pauciflora* var. *pauciflora*, *Melaleuca seriata* low shrublands over *Lyginia barbata*, *Alexgeorgea nitens* open sedgeland.

Cc *Corymbia calophylla* woodland over *Xanthorrhoea preissii* scattered shrubs to open shrubland.

CcEm *Eucalyptus marginata* subsp. *marginata*, *Corymbia calophylla* scattered trees over *Banksia ilicifolia*, *Banksia attenuata* scattered low trees to low open woodland (patches) over *Xanthorrhoea preissii* shrublands over *Hypocalymma angustifolium* scattered low shrubs to low shrublands over *Hypolaena exsulca* open sedgeland.

EmBiXp *Eucalyptus marginata* subsp. *marginata* scattered trees over *Banksia attenuata*, *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Xanthorrhoea preissii* shrubland over *Dielsia stenostachya*, **Pentaschistis airoides* very open grassland/sedgeland.

(iii) Dampland vegetation

Er *Eucalyptus rudis* (Flooded Gum) open forest over *Xanthorrhoea preissii*, *Astartea scoparia* high open shrubland over *Lepidosperma longitudinale*, *Dielsia stenostachya* open sedgeland.

Kg *Kunzea glabrescens* closed scrub over *Aotus gracillima* open shrubland over *Schoenus efoliatus*, *Dielsia stenostachya* very open sedgeland.

Mp *Melaleuca preissiana*, (*Banksia littoralis*) low closed forest over *Xanthorrhoea preissii* open shrubland, *Astartea scoparia* and *Cyathochaeta teretifolia*, *Dielsia stenostachya*, *Lepidosperma longitudinale* open sedgeland.

MpAs *Melaleuca preissiana* low woodland over *Astartea scoparia* open heath over *Hypocalymma angustifolium* low open shrubland over *Dielsia stenostachya*, *Cyathochaeta teretifolia* sedgeland.

MpPeAs *Melaleuca preissiana* low woodland over open shrubland over *Pericalymma ellipticum* var. *ellipticum*, *Astartea scoparia*, *Regelia inops*, *Xanthorrhoea preissii* shrublands and *Hypocalymma angustifolium* low shrublands.

MpRi *Melaleuca preissiana* scattered low trees over *Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath.

(ii) Vegetation on the sandy parts of swales and flats**BaBmBi**

Banksia attenuata, *Banksia ilicifolia*, *Banksia menziesii* low woodland over *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Calytrix flavescens*, *Conostephium pendulum*, *Adenanthos obovatus*, *Eremaea pauciflora* var. *pauciflora* low open shrublands over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyogon bromeliifolius* low herblands.

Habitat and soil: Flat (swale) between low dunes. Grey sand.

Notes: This unit was recorded at quadrats NEQ10 and NEQ19 (Plates 8 and 9) and releve NER19. This unit was characterised by the *Xanthorrhoea preissii*, *Xanthorrhoea brunonis* subsp. *brunonis* shrubland over *Phlebocarya ciliata*, *Patersonia occidentalis*, *Dasyogon bromeliifolius* low herblands. This unit was similar to the lower slopes unit BiXp, but still had the *Banksia attenuata*, *Banksia menziesii* elements in the low woodland, with a higher tree cover than the scattered *Banksia ilicifolia* low trees in the BiXp unit. In fact, BaBmBi was floristically similar to the BaBmEt unit more so than to the BiXp unit. Occasionally *Eucalyptus marginata* subsp. *marginata* appeared to be associated with stands of this vegetation.

BeEp

Beaufortia elegans open heath over *Eremaea pauciflora* var. *pauciflora* low shrubland.

Habitat and soil: Shallow depression on lower slope. Dry grey sand.

Notes: This heath unit was described at quadrat NEQ14 (Plate 10), on Property 11. It was recorded from one small area, a shallow depression on a lower slope.

BiXp

Banksia ilicifolia scattered low trees over *Xanthorrhoea preissii* shrubland over *Eremaea pauciflora* var. *pauciflora*, *Melaleuca seriata* low shrublands over *Lyginia barbata*, *Alexgeorgea nitens* open sedgelands.

Habitat and soil: Lower slopes of dune, adjacent to flat. Pale grey sand.

Notes: This unit was described at its main occurrence at quadrat NEQ4 and releve NER8 (Plate 11) on Property 65, on lower slopes adjacent to a *Regelia inops* scrub dampland.



Plate 8. Vegetation unit BaBmBi in a swale at releve NEQ10, on Property 13.



Plate 9. Vegetation unit BaBmBi in a swale at releve NEQ19, on Property 11.



Plate 10. Vegetation unit BeEp in a depression near quadrat NEQ14, on Property 11.



Plate 11. Vegetation unit BiXp along lower slopes at releve NER8, on Property 65.

Cc

Corymbia calophylla woodland over *Xanthorrhoea preissii* scattered shrubs to open shrubland.

Habitat and soil: Slight depression on flat plain. Pale grey sand.

Notes: This unit was recorded at releves NER10, NER15 and NER3 (Plate 12). This vegetation typically occurred on the flats adjacent to damplands. Areas of this vegetation were typically degraded with high weed cover due to past grazing, as they were typically in a habitat suitable for farming. The degraded condition of the vegetation is why a quadrat was not located in this unit. Associated species included *Nuytsia floribunda*, *Jacksonia furcellata*, *Jacksonia sternbergiana* and *Dielsia stenostachya*.



Plate 12. Vegetation unit Cc (Degraded) on flats at releve NER15, on Property 20.

CcEm

Eucalyptus marginata subsp. *marginata*, *Corymbia calophylla* scattered trees over *Banksia ilicifolia*, *Banksia attenuata* scattered low trees to low open woodland (patches) over *Xanthorrhoea preissii* shrublands over *Hypocalymma angustifolium* scattered low shrubs to low shrublands over *Hypolaena exsulca* open sedgelands.

Habitat and soil: Gentle slopes and elevated flats adjacent to dampland depressions. Grey sand.

Notes: This vegetation occurred occasionally around some edges of damplands. It was described at quadrats NEQ18 and NEQ21 and at releve NER17. There is some uncertainty as to whether *Corymbia calophylla* is a consistent associate of this unit, but it is assumed that it is on the limited evidence from this survey. Associated

species include *Dasypogon bromeliifolius*, *Regelia inops*, *Pultenaea reticulata* and *Adenanthos obovatus*.

EmBiXp

Eucalyptus marginata subsp. *marginata* scattered trees over *Banksia attenuata*, *Banksia ilicifolia*, *Nuytsia floribunda* scattered low trees over *Xanthorrhoea preissii* shrubland over *Dielsia stenostachya*, **Pentaschistis airoides* very open grassland/sedgeland.

Habitat and soil: Flat plain. Grey-brown sand.

Notes: This unit was recorded at releve NER11 on a sandy flat plain on Property 63. It may be related to unit BaBmBi, but its degraded condition made it difficult to determine what its structure might have been prior to disturbance.

(iii) Dampland vegetation

Er

Eucalyptus rudis open forest over *Xanthorrhoea preissii*, *Astartea scoparia* high open shrubland over *Lepidosperma longitudinale*, *Dielsia stenostachya* open sedgeland.

Habitat and soil: Flat at base of low dune.

Notes: This vegetation was recorded in the south-western part of Property 13 at releve NER16 (Plate 13). It occurred in one small area in the survey area. Associated species included *Melaleuca preissiana*, *Acacia saligna*, *Melaleuca lateritia* and *Gastrolobium ebracteolatum*.



Plate 13. Vegetation unit 'Er' on flats at releve NER15, on Property 13.

Kg

Kunzea glabrescens closed scrub over *Aotus gracillima* open shrubland over *Schoenus efoliatus*, *Dielsia stenostachya* very open sedgeland.

Habitat and soil: Flat plain. Dark grey sand.

Notes: This unit was recorded at releve NER5 (Plate 14). It occurred in one small area on Property 64.

Mp

Melaleuca preissiana, (*Banksia littoralis*) low closed forest over *Xanthorrhoea preissii* open shrubland, *Astartea scoparia* and *Cyathochaeta teretifolia*, *Dielsia stenostachya*, *Lepidosperma longitudinale* open sedgelands.

Habitat and soil: Dampland flats. Dry grey brown peaty sand.

Notes: This unit was broadly mapped in parts of Property 11 and 14. It was described at quadrat NEQ20, releve NER12 and site NEM8. It probably occurred in other parts of unit MpAs in the survey area, but was not separated from that related unit. It was distinguished by its high cover of *Melaleuca preissiana* (closed forest) and more open understory. Associated species included *Aotus gracillima*, *Gastrolobium ebracteolatum*, *Lobelia anceps*, *Baumea articulata*, *Taxandria linearifolia* and *Centella asiatica*.



Plate 14. Vegetation unit 'Kg' on flats at releve NER5, on Property 64.

MpAs

Melaleuca preissiana low woodland over *Astartea scoparia* open heath over *Hypocalymma angustifolium* low open shrubland over *Dielsia stenostachya*, *Cyathochaeta teretifolia* sedgelands.

Habitat and soil: Flat depression between low dunes. Black peaty sand.

Notes: This vegetation was described at quadrats NEQ6, NEQ13, NEQ16 and NEQ22 and relevés NER9 and NER18 (Plate 15). It was probably the most common form of dampland vegetation in the survey area and was recorded on Properties 11, 14, 15, 64 and 67. It varied from areas of *Astartea scoparia* heath with occasionally scattered and fringing *Melaleuca preissiana* low trees (NEQ6 and NEQ13) to *Melaleuca preissiana* low woodlands over *Astartea scoparia* heaths. Some large areas of the unit on different properties appeared to be regrowth after past clearing (Properties 64 and 67 and possibly 14). Associated species included *Aotus gracillima*, *Leucopogon australis*, *Pericalymma ellipticum* var. *ellipticum*, *Taxandria linearifolia*, *Calothamnus lateralis*.

MpPeAs

Melaleuca preissiana low woodland over open shrubland over *Pericalymma ellipticum* var. *ellipticum*, *Astartea scoparia*, *Regelia inops*, *Xanthorrhoea preissii* shrublands and *Hypocalymma angustifolium* low shrublands.

Habitat and soil: Flow line between low dunes. Dark grey sand.

Notes: This vegetation was recorded along a linear flowline at releve NER21 on Property 18. It represents the thin unit of *Melaleuca preissiana* low woodland that grows along the linear flow lines in this area, but which was difficult to reliably sample and describe because of its typically narrow occurrence and mostly degraded condition (often high weed cover and modified by past physical disturbance). The *Melaleuca preissiana* low woodland vegetation in this habitat is likely to be very variable in composition. Associated species included *Acacia saligna*, *Acacia pulchella*, *Melaleuca seriata*, *Mesomelaena graciliceps*, *Phlebocarya ciliata*, *Dasyogon bromeliifolius*.

MpRi

Melaleuca preissiana scattered low trees over *Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath.

Habitat and soil: Broad depression on valley floor between low dunes. Grey sand.

Notes: This vegetation occurred in a few damplands and flow areas and was recorded at quadrat NEQ2, releves NER6 (Plate 16), NER7 and NER14 and at mapping note site NEM12. Some areas of this unit could be considered to be '*Regelia inops*, (*Xanthorrhoea preissii*) open to closed heath', where the *Melaleuca preissiana* was sparsely scattered or absent in parts. Associated species included *Hypocalymma angustifolia* low shrublands over *Dasyogon bromeliifolius*, *Phlebocarya ciliata*, *Lyginia ?imberbis*. One small area of this unit on Property 65 (releve NER7) included a small group of exceptionally tall *Xanthorrhoea preissii* shrubs that grew to a height of between 5 and 6 metres (Plate 17).



Plate 15. Vegetation unit 'MpAs' at quadrat NEQ22, on Property 11.



Plate 16. Vegetation unit 'MpRi' at releve NER6, on Property 65.



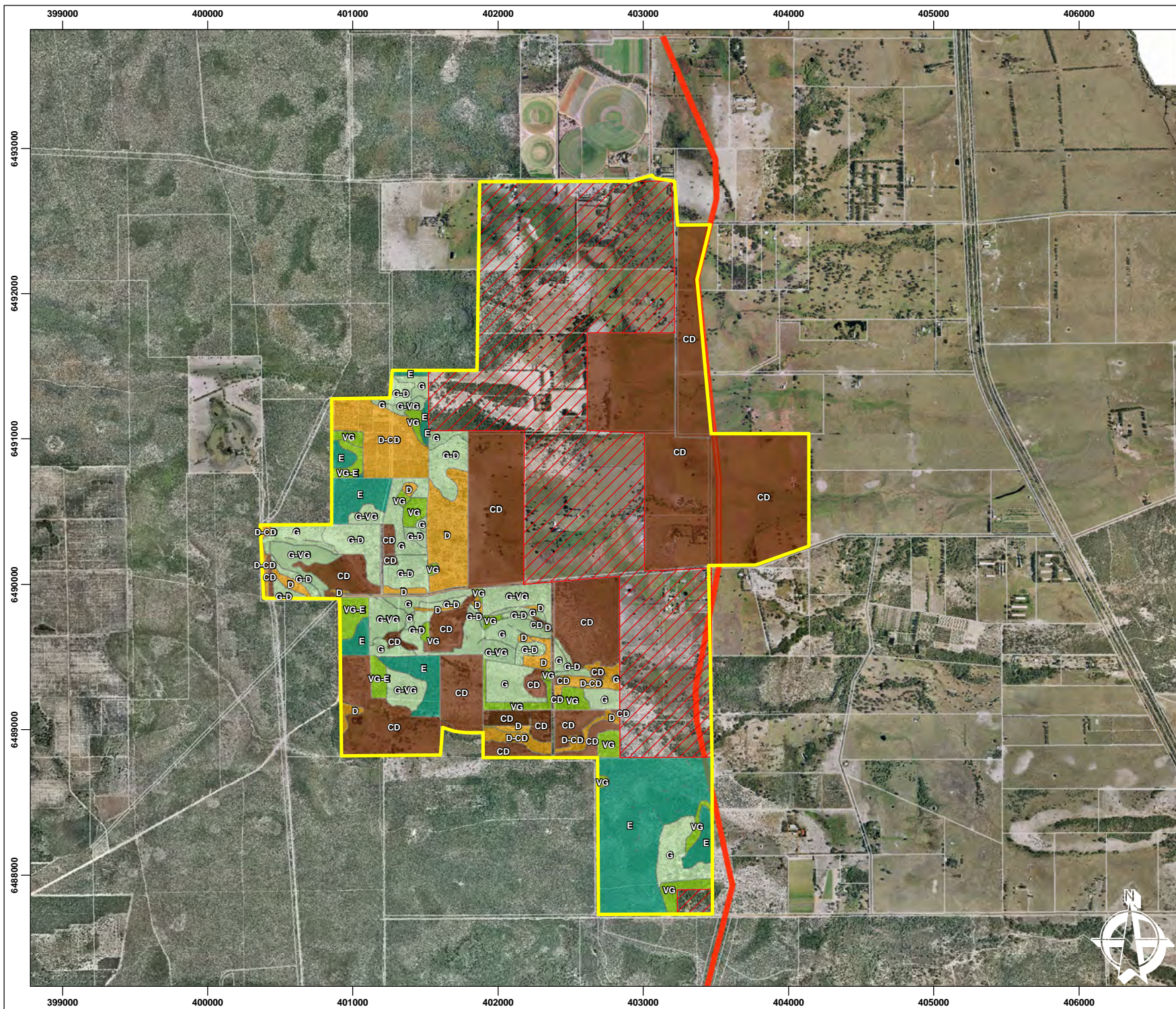
Plate 17. Small area of exceptionally tall *Xanthorrhoea preissii* shrubs (up to about 5 to 6 metres high) at releve NER7 in vegetation unit MpRi, on Property 65.

5.2 Vegetation Condition

5.2.1 Vegetation Condition

Large parts of the North Ellenbrook survey area were cleared pasture paddocks (Figure 7; Plates 18 to 23). Almost all of that part of the survey area that was mapped as Yanga Vegetation Complex (Figure 2) was cleared farmland, with patches of sedge regrowth in the paddocks (Plate 22).

Large areas of the remnant bushland in the survey area had been impacted by past human activities, including grazing, sand mining, clearing (sometimes partial(?)) and extraction of bore water from under the damplands (Plates 24 to 27).



Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Perth-Darwin Highway
- Major Roads
- Minor Roads

Vegetation Condition

- E - Excellent
- VG - Very Good
- G - Good
- D - Degraded
- CD - Completely Degraded

NB: ranges of vegetation condition (e.g. G-VG) indicates the vegetation condition in that area varies between the indicated classes

- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
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SCALE

0 150 300 600 900
 Metres
 1:35,000 @ A4

LOCALITY MAP

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| CREATED BY | CHECKED BY | APPROVED |
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| DATE | REVISION | DRAWING ID |
| 29.02.12 | 2 | EBS137.07 |

North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
 Vegetation Condition
 Figure 7



Plate 18. Scattered *Eucalyptus tottiana* low trees over *Ehrharta calycina* (Perennial Veldt Grass) grassland in a cleared paddock (Property 56) (Completely Degraded).



Plate 19. Dampland flats cleared to pasture paddocks with scattered *Melaleuca preissiana* on Property 56 (Completely Degraded).



Plate 20. The cleared paddocks of Property 55 (Completely Degraded).



Plate 21. Lupin crop in paddock on Property 58 (Completely Degraded).



Plate 22. Degraded regrowth sedgeland in a pasture paddock on Property 57.



Plate 23. Pasture paddock on Property 76 in the north-eastern part of the survey area.



Plate 24. Old sand mine on Property 16.



Plate 25. Regrowth in a cleared Banksia woodland area in northern part of the former wildflower farm, on Property 64.



Plate 26. Regrowth amongst the remains of ****Chamelaucium uncinatum** (Geraldton Wax) plantings on the former wildflower farm, Property 65).



Plate 27. Remnant *Melaleuca preissiana* low woodland (Degraded to Completely Degraded) along a flowline in a cleared paddock on Property 19. **Carpobrotus edulis* (Pigface) is an aggressive weed on the cleared flats.

5.2.2 Dieback (*Phytophthora* sp.)

Patches of *Banksia* spp. deaths were recorded across at least 8 properties with remnant vegetation in the North Ellenbrook survey area (Plates 28). Groups of up to 20 dead *Banksia*'s were recorded.

The deaths and decline of *Banksia* trees may indicate the presence of the Dieback fungus *Phytophthora cinnamomi*. However, other agents such as fire and drought (including falling water tables), as well as other pathogens, may also be responsible for *Banksia* tree deaths. To determine if Dieback is present, a dieback survey by accredited 'dieback interpreters' would be required.



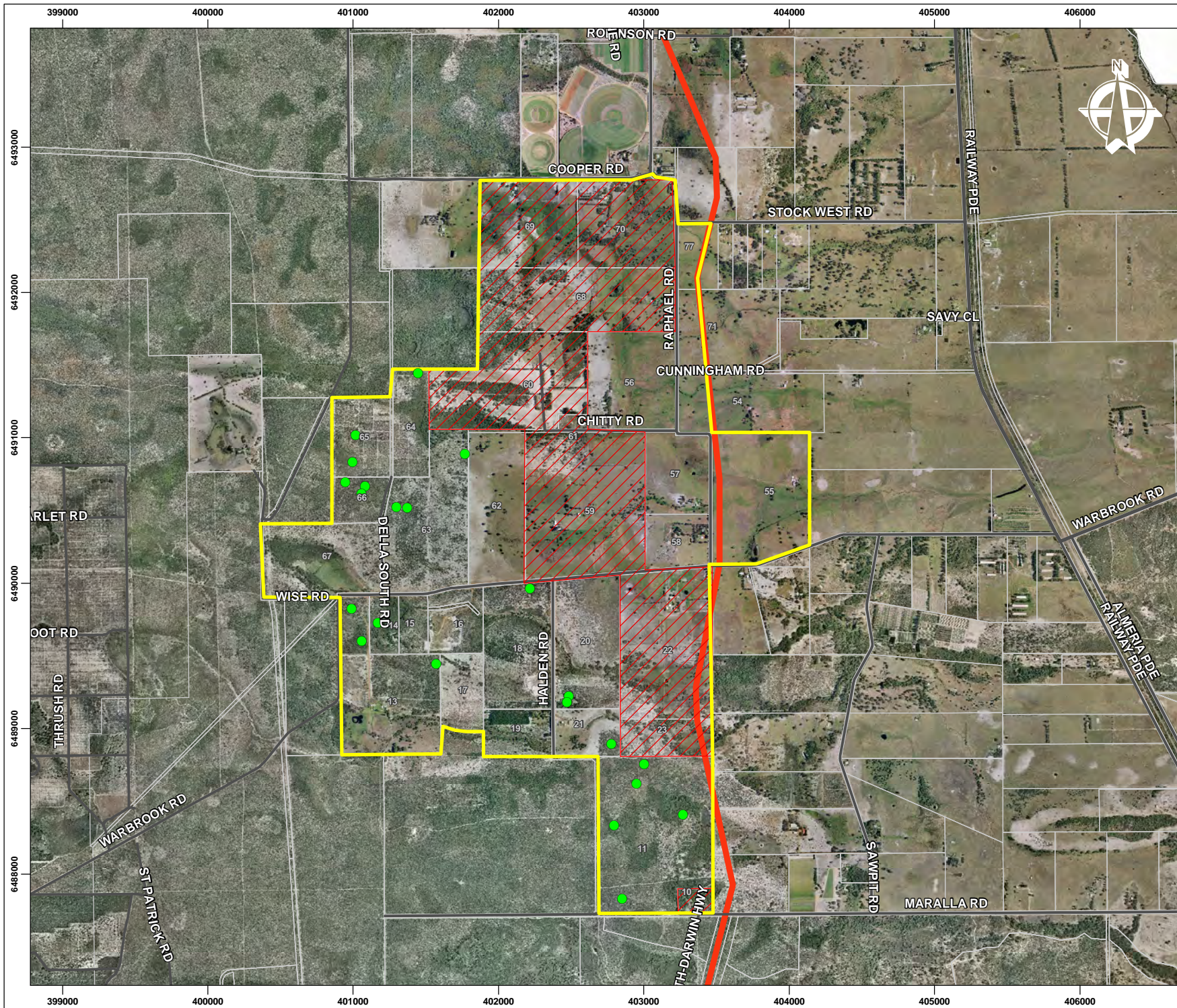
Plate 28. A patch of *Banksia* spp. deaths on Property 63.

5.4 *Lomandra hermaphrodita* Occurrence: Host Plant of the Graceful Sun Moth

The Graceful Sun Moth (*Synemon gratiosa*, Family Castniidae) is endemic to Western Australia, and is currently considered restricted to the Swan Coastal Plain. The Graceful Sun Moth is listed under the *Environment Protection and Biodiversity Conservation Act 1999* and is also currently listed on Schedule 1 (fauna that is rare or is likely to become extinct) of the Western Australian *Wildlife Conservation Act 1950*.

The Graceful Sun Moth is thought to breed exclusively on *Lomandra* species, probably *L. hermaphrodita*. Two known food plants for the Graceful Sun Moth are *Lomandra hermaphrodita* and *L. maritima* (McNamara 2009, cited on Department of Sustainability, Environment, Water, Population and Communities website).

Lomandra maritima was not recorded in the North Ellenbrook survey area. However, *Lomandra hermaphrodita* plants were recorded opportunistically at 22 locations in the survey area (Figure 8). It was recorded in most parts of the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodlands in the survey area and is probably scattered throughout that vegetation type.



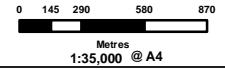
Legend

- North Ellenbrook Survey Area Boundary
- Area Not Surveyed (No Access)
- Lomandra hermaphrodita* Locations
- Minor Roads
- Major Roads
- Perth-Darwin Highway

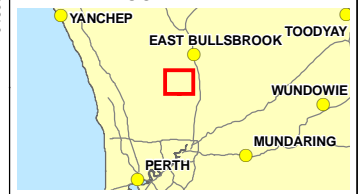


- NOTE THAT POSITION ERRORS CAN BE >5M IN SOME AREAS
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2009
- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2011
- LOCALITY MAP SOURCED FROM LANDGATE 2006

SCALE



LOCALITY MAP



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| METADATA RECORDED | | PROJECTION | |
| 100% | | MGA ZONE 50 | |
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North Ellenbrook
 North Ellenbrook Level 2 Flora & Vegetation Survey
Lomandra hermaphrodita Locations

Figure 8



6 FCTs, TECs and PECs

This section outlines the results of the floristic analysis conducted by Mr Chris Hancock using the 2011 North Ellenbrook survey data and the Gibson *et al.* (1994) Swan Coastal Plain data set. It is based on a report prepared by Mr Chris Hancock, which is attached in full in Appendix 8.

6.1 Floristic analysis

6.1.1 Determination of Floristic Community Types (FCT) by classification

The results of the ordination analysis are presented in Table 6 (see also Appendix 8). This shows that the North Ellenbrook sites appeared to belong to several FCTs: 4, 11, 12, 13, 21c, 23a and 23b.

Table 6. Floristic Community Types (FCTs) estimated from the ordination analysis and their status.

| | UPGMA | FEXIBLE BETA | SUMMARY FCT _A | STATUS _B |
|-------|-------------|--------------|-----------------------------|---------------------|
| NEQ1 | 23a | | 23a | |
| NEQ2 | 4 | 4 | 4 | |
| NEQ3 | 23a | | 23a | |
| NEQ4 | 21c | 4 or 6 | 21c | PEC3 |
| NEQ5 | 23a | | 23a | |
| NEQ6 | 11 or 4 | 11 | 11 | |
| NEQ7 | 23b or 23a | 23a | 23a | |
| NEQ8 | 23b or 23a | 23b | 23b | PEC3 |
| NEQ9 | 23a | | 23a | |
| NEQ10 | 23b or 23a | 23a | 23a | |
| NEQ11 | 23b | | 23b | PEC3 |
| NEQ12 | 23a | | 23a | |
| NEQ13 | 11 | | 11 | |
| NEQ14 | 6 | 21c | 21c | PEC3 |
| NEQ15 | 23a | | 23a | |
| NEQ16 | 11,12,13 | 12 | 12 | |
| NEQ17 | 23a | | 23a | |
| NEQ18 | 21a,23b,23a | 23b | 23b | PEC3 |
| NEQ19 | 23a | | 23a | |
| NEQ20 | 21C or 5 | 14 or 11 | doesn't fit | |
| NEQ21 | 11 or 25 | 6 | doesn't fit | |
| NEQ22 | 13 or 4 | 13 or 4 | 13 | |

a FCT: Floristic Community Type

b PEC: Priority Ecological Community

The *Banksia*-Pricklybark low woodlands on the dune slopes were FCTs 23a (upper slopes and crests) and 23b (lower slopes(?)) while the *Banksia illicifolia* low open woodlands on the lower slopes and flats were FCT21c. The Jarrah-Marri open woodland on the lower slopes adjacent to the dampland (NEQ18) was also found to belong to FCT23b. The *Regelia inops* heath dampland site was FCT4 while the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation was found to be FCTs 11, 12 and 13 (sites NEQ6, 13, 16 and 22). In fact, the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation might be expected to belong to the same FCT and the range of FCTs for this vegetation type might have resulted from the low species richness (and therefore perhaps greater sensitivity to presence/absence of a few species) and seasonal sampling affects. It is also possible that the *Melaleuca preissiana* low woodlands and the *Astartea scoparia* heath were floristically different.

Two quadrats could not be assigned an FCT. Quadrat NEQ20 was in *Melaleuca preissiana* low closed forest vegetation while NEQ21 was in a very small area of Marri-Jarrah forest on the flats adjacent to the damplands. The limited occurrence of these vegetation types in Good or better condition and their occurrence as generally small patches of vegetation, limited the number of quadrats that could be located in them. The *Melaleuca preissiana* low closed forest (NEQ20) would be expected to belong to the same FCT or group of FCTs as the *Melaleuca preissiana*-*Astartea scoparia* heath vegetation, probably FCT4 ('*Melaleuca preissiana* damplands') or FCT11 ('Wet forests and woodlands'). The Marri-Jarrah vegetation (NEQ21) would be more difficult to assign to a FCT. It was assigned, all be it with some reservation, to the same mapping unit (CcEm) as NEQ18 and would therefore most likely be FCT23b.

6.2 North Ellenbrook Survey Area Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs)

The status of the North Ellenbrook vegetation Floristic Community Types (FCTs) is shown in Table 6. This suggests that the *Banksia* woodland vegetation on the lower slopes (NEQ8 and NEQ11) may be the Priority 3 PEC SCP23b 'Swan Coastal Plain *Banksia attenuata*-*Banksia menziesii* woodlands', as would the Jarrah-Marri open woodland on the lower slopes adjacent to the dampland. The analysis also suggests that some of the lower slope *Banksia illicifolia* vegetation (NEQ4, NEQ8) and dry heaths (NEQ14) are Priority 3 PEC SCP21c 'Low lying *Banksia attenuata* woodlands or shrublands'.

7 Regional Significance Assessment

Flora and vegetation values in the North Ellenbrook survey area were assessed for regional significance (Table 7) using the criteria for determination of regional significance of natural areas set out in Bush Forever (DEP, 2000a) and the EPA Guidance Statement No. 10 (EPA, 2006).

The North Ellenbrook survey area was assessed as regionally significant for flora and vegetation on the following grounds (see Table 7):

- General criteria for the protection of Conservation Category Wetland (DEP, 2000b).

The North Ellenbrook survey area includes Conservation Category Wetlands and therefore has regional significance for these. The Conservation Category Wetland areas occur on two of the surveyed properties: in the BushForever 298 damplands area on Property 64 and on Property 11 (Excellent condition).

The North Ellenbrook survey area was also considered to have moderate to high values for 'contiguous or largely contiguous corridor of bushland/wetland areas' linkages, and moderate values for both representation of ecological communities and diversity.

It was considered that the North Ellenbrook survey area rarity values for flora could not be fully assessed because of the late season of the survey relative to the flowering time of some of the Threatened and Priority flora occurring in the general locality (e.g. *Caladenia huegelii*).

Table 7. Regional Significance Assessment: North Ellenbrook

Note bold sections are used to highlight the summaries of the table.

| CRITERION | COMMENT |
|--|--|
| (i) Representation of ecological communities | |
| Vegetation complexes | (System6+part System 1: Bassendean Complex – North: 72.0% of pre-1750 extent; 27.5% in reserve; Yanga Complex: : 18.7% of pre-1750 extent; 1.0% in reserve (EPA, 2006)). Yanga Complex all or almost all cleared. |
| Floristic community types | Affinity to 7 FCTs (more likely 5 FCTs). |
| Size and shape | Large area of remnant vegetation in western part of area, but discontinuity between areas in Very Good condition or better due to different land uses on different properties. |
| Vegetation condition | Eastern part mostly Completely Degraded pasture paddocks. Western part varied greatly between properties, with Properties 11, 13 and 66 having large areas in Excellent condition. |
| Conclusion | Remnant vegetation in Bassendean Complex – North – not regionally significant. Vegetation in >Very Good/Excellent condition limited to a few properties. Lot of Completely Degraded farmland and degraded remnant. Moderate values for representation of ecological communities. |
| (ii) Diversity | |
| Vegetation Complexes | Two Complexes, although one (Yanga) has been cleared for farming. |
| FCT's | Vegetation units mainly group with 7 (more likely 5) FCT's. |
| Vegetation units | Fourteen vegetation units (some only over very small areas). 6 wetland vegetation units. Moderate number for size of survey area. |
| Flora | 181 native plant species recorded. Low to Moderate number for size of area. Species richness: dampland quadrats had low species richness. Banksia units had moderate to high species richness (43-60). |
| Conclusion | Moderate values for diversity. |
| (iii) Rarity | |
| Flora | No DRF; one Priority species (Priority 3). Nine other species of regional significance. Difficult to assess due to poor seasonal conditions. |
| Vegetation :TEC's | No TECs recorded. Five vegetation units grouped with two Priority 3 PECs: Community Types 21c and 23b. These PECs occurred on lower slopes and small areas on edge of damplands. |

| CRITERION | COMMENT |
|--|---|
| Conclusion: | Flora rarity status needs confirming in good season. Otherwise, low to moderate values for rare vegetation. |
| (iv) Maintaining ecological processes | |
| Linkage | 'Contiguous or largely contiguous corridor of bushland/wetland areas' link bushland to the west (BF399) with bush to the south (BF300) and pass through the bushland to the south of the survey area, including the bushland in Property 11. |
| Size of areas in natural condition | Natural condition areas are large in the western part, but with a lot of disturbance in parts, resulting in somewhat fragmented distribution of remnant vegetation in Good or better condition. |
| Creepline/river/estuary | Limited flow line areas and they tended to be disturbed. Numerous dampland areas in western part, with some in Excellent condition (especially Property 11), but others degraded. Extensive damplands in eastern part are now cleared farmland paddocks (Completely Degraded). BF298 covers Conservation category wetland on Property 64. |
| Conclusion: | Moderate to high values for maintaining ecological processes, particularly for linkages (although fragmented natural areas) and vegetated dampland areas in western part of survey area. |
| (v) Scientific or evolutionary importance | Moderate. |
| (vi) General criteria for protection of wetland, streamline, estuarine | Conservation category wetlands on Property 64 (BF298) and in Excellent condition on Property 11. Resource Enhancement wetlands in south-western part of survey area has been cleared and grazed and is Degraded or Completely Degraded. Multiple Use wetland on Property 67 is Completely Degraded in parts, but good regrowth after clearing in parts. |
| Conclusion: | Regionally significant for Conservation Category Wetlands |
| Summary: | <u>Regionally significant, for</u> <ul style="list-style-type: none"> • general criteria for protection of conservation Category Wetlands |

8 Conclusions and Recommendations

One hundred and eighty one (181) native plant species were recorded in the North Ellenbrook survey area. This number of native species was probably a low number for the size of the survey area. This was attributed to the large part of the survey area that was cleared farmland (pasture paddocks) or which was remnant bushland degraded from other activities (including wildflower farming (Properties 64, 65 and 66(?)), grazing, horse paddocks and sand mining). Areas of dampland had also been cleared or partially cleared in the past (now mostly regrowth) and had been impacted by drawdown of the water table from bores. The timing of the survey in late Spring would also have contributed to a lower species count.

No Threatened flora were recorded in the North Ellenbrook survey area. One Priority 3 species, *Cyathochaeta teretifolia*, was recorded in the North Ellenbrook survey area. Nine other recorded plant species were considered to have regional significance: *Burchardia bairdiae*, *Conostylis aculeata* subsp. *cygnorum*, *Dielsia stenostachya*, *Hensmania turbinata*, *Stachystemon axillaris*, *Stylidium crossocephalum*, *Stylidium utricularioides*, *Stylidium rigidulum* and *Verticordia nitens*.

It was considered that the North Ellenbrook survey area rarity values for flora could not be fully assessed because of the late season of the survey relative to the flowering time of some of the Threatened and Priority flora occurring in the general locality (eg *Caladenia huegelii*). It is recommended a second phase be conducted in Late September/ early October.

Groups of up to 20 dead *Banksia*'s were recorded in the survey area and *Banksia* spp. deaths were recorded across at least 8 properties with remnant vegetation. It is recommended that a dieback survey by accredited 'dieback interpreters' be undertaken to determine the Dieback status in the survey area.

The site contains suitable habitat for Black Cockatoo species. Therefore it may be necessary to conduct a Black Cockatoo survey of the site. This should be conducted by a Black Cockatoo expert to determine the presence of significant foraging and breeding habitat.

Lomandra hermaphrodita plants were recorded opportunistically at 22 locations in the survey area, mostly in the *Banksia attenuata*-*Banksia menziesii*-*Eucalyptus todtiana* low woodlands. Due to the presence of *Lomandra hermaphrodita* a Graceful Sun Moth survey may be required for the site.

9 Acknowledgements

Brian Morgan was responsible for completing the field work, identifications and authoring this report.

Chris Hancock assisted with the field work.

Plant identifications were undertaken by Brian Morgan and Eleanor Bennett. Allen Lowry identified the *Stylidium* and *Drosera* taxa and Mike Hislop assisted with the Ericaceae identifications and offered some advice.

Mr Chris Hancock ran the PCOrd analysis and reported the results (Appendix 8).

Tim Donohue, 360 Environmental, prepared the GIS maps used in this report.

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APPENDIX ONE

The Department of Environment and Conservation Declared
Rare Flora and Priority Flora Categories (from Smith, 2010)

Declared Rare Flora - Extant Taxa

Taxa which have been adequately searched for and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such.

Declared Rare Flora - Presumed Extinct Flora

Taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such.

Priority One - Poorly Known Taxa.

Taxa which are known from one or a few (generally < 5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.

Priority Two - Poorly Known Taxa.

Taxa which are known from one or a few (generally < 5) populations, at least some of which are not believed to be under immediate threat (ie. not currently endangered). Such taxa are under consideration for declaration as "rare flora", but are in urgent need of further survey.

Priority Three - Poorly Known Taxa.

Taxa which are known from several populations, and the taxa are not believed to be under immediate threat (i.e. not currently endangered), either due to the number of known populations (generally > 5), or known populations being large, and either widespread or protected. Such taxa are under consideration for declaration as 'rare flora' but are in need of further study.

Priority Four - Rare Taxa.

Taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5-10 years.

APPENDIX TWO

Vegetation structural table of Trudgen based on Aplin's (1979) modification of
Specht's classification

| LIFE FORM AND HEIGHT OF TALLEST STRATUM | PROJECTIVE FOLIAGE COVER OF TALLEST STRATUM AS % | DESCRIPTION |
|---|--|--|
| Trees over 30 metres | 70-100 30-70 10-30 2-10 Under 2 | High closed forest High open forest High woodland High open woodland Scattered tall trees |
| Trees 10 - 30 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed forest Open forest Woodland Open woodland Scattered trees |
| Trees under 10 metres | 70-100 30-70 10-30 2-10 Under 2 | Low closed forest Low open forest Low woodland Low open woodland Scattered low trees |
| Shrubs over 2 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed scrub Open scrub High shrubland High open shrubland Scattered tall shrubs |
| Shrubs 1 - 2 metres | 70-100 30-70 10-30 2-10 Under 2 | Closed heath Open heath Shrubland Open shrubland Scattered shrubs |
| Shrubs under 1 metre | 70-100 30-70 10-30 2-10 Under 2 | low closed heath low open heath low shrubland Low open shrubland Low scattered shrubs |
| Herbs/Sedges/Grasses | 70-100 30-70 10-30 2-10 Under 2 | Closed herb, sedge, grassland Herb, sedge, grassland Open herb, sedge, grassland Very open herb, sedge, g'land Scattered herbs sedges, grasses |

Grasslands then divided into:

- Tussock grasslands (perennial tussock species, e.g. Eragrostis species);
- Hummock grasslands (Triodia and Plectrachne species that form hummocks)
- Curly spinifex grassland (Plectrachne pungens, which does not form hummocks) (follows J.S. Beard).
- Annual tussock grassland (e.g. annual Sorghum species)

APPENDIX THREE

Vegetation condition scale and descriptions

(from Keighery 1994, reproduced in Department of Environmental
Protection 2000b)

Pristine (1):

Pristine or nearly so, no obvious signs of disturbance

Excellent (2):

Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species.

Very Good (3):

Vegetation structure altered, obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.

Good (4):

Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic vegetation structure or ability to regenerate it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.

Degraded (5):

Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.

Completely Degraded (6):

The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as 'parkland cleared' with the flora comprising weed or crop species with isolated native trees or shrubs.

APPENDIX FOUR

Flora list for the North Ellenbrook survey area

Notes:

1. Plant families are listed in alphabetical order within plant kingdom Divisions.
2. An asterisk (*) beside the taxon name indicates an introduced species exotic to Western Australia (weed).
3. The 'status' column shows the conservation status of significant flora species on the list. DRF = Declared Rare Flora; P1 to P4 = Priority 1 to Priority 4 (see definitions in Appendix 1); RS = other regionally significant flora.

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|---|--|---------------|-----------------|
| GYMNOSPERMAE | | | |
| Class CYCADOPSIDA (Cycads) | | | |
| ZAMIACEAE | Macrozamia riedlei | | |
| Class PINOPSIDA (conifers) | | | |
| PINACEAE | *Pinus pinaster | Pinaster Pine | |
| ANGIOSPERMAE (flowering plants) | | | |
| AIZOACEAE | Carpobrotus edulis | | |
| ANARTHRIACEAE | Lyginia barbata | | |
| | Lyginia imberbis | | |
| APIACEAE | Centella asiatica | | |
| | Homalosciadium homalocarpum | | |
| | Xanthosia huegelii | | |
| ARACEAE | *Zantedeschia aethiopica | Arum lily | |
| ARALIACEAE | Trachymene pilosa | | |
| | Trachymene coerulea subsp. coerulea | | |
| ASPARAGACEAE | *Asparagus asparagoides | | |
| | Laxmannia grandiflora subsp. grandiflora | | |
| | Laxmannia ramose subsp. ramose | | |
| | Lomandra caespitosa | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------------|---|----------------|-----------------|
| | Lomandra hermaphrodita | | |
| | Lomandra nigricans | | |
| | Lomandra odora | | |
| | Lomandra preissii | | |
| | Lomandra suaveolens | | |
| | Thysanotus arbuscula | | |
| | Thysanotus manglesianus/patersonii | | |
| | Thysanotus sparteus | | |
| | Thysanotus thyrsoides | | |
| ASTERACEAE | *Arctotheca calendula | | |
| | *Hypochaeris glabra | | |
| | *Lactuca serriola | | |
| | Lagenophora huegelii | | |
| | Millotia tenuifolia | | |
| | Podotheca chrysantha | | |
| | Podotheca gnaphalioides | | |
| | Quinetia urvillei | | |
| | Siloxerus humifusus | | |
| | *Sonchus asper | | |
| | *Sonchus oleraceus | | |
| | *Ursinia anthemoides subsp. anthemoides | | |
| BIGNONIACEAE | Jacaranda mimosifolia | Blue Jacaranda | |
| CAMPANULACEAE | Lobelia anceps | | |
| | Lobelia rhytidosperma | | |
| | *Wahlenbergia capensis | | |
| | Wahlenbergia preissii | | |
| CARYOPHYLLACEAE | *Minuartia mediterranea | | |
| CASUARINACEAE | Allocasuarina fraseriana | | |
| | Allocasuarina humilis | | |
| CENTROLEPIDACEAE | Centrolepis drummondiana | | |
| | Centrolepis mutica | | |
| COLCHICACEAE | Burchardia bairdiae | | RS |
| | Burchardia congesta | | |
| CRASSULACEAE | Crassula colorata var. colorata | | |
| CYPERACEAE | Baumea articulata | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-----------------------|--|--------------|-----------------|
| | Cyathochaeta teretifolia | | P3 |
| | *Isolepis marginata | | |
| | Lepidosperma longitudinale | | |
| | Lepidosperma pubisquameum | | |
| | Lepidosperma sp. | | |
| | Mesomelaena graciliceps | | |
| | Schoenus curvifolius | | |
| | Schoenus efoliatus | | |
| DASYPOGONACEAE | Dasyopogon bromeliifolius | | |
| DILLENIACEAE | Hibbertia hypericoides | | |
| | Hibbertia sp. Gnangara (J.R. Wheeler 2329) | | |
| | Hibbertia spicata subsp. spicata | | |
| | Hibbertia stellaris | | |
| | Hibbertia subvaginata | | |
| DROSERACEAE | Drosera erythrorhiza | | |
| | Drosera macrantha | | |
| | Drosera menziesii subsp. penicillaris | | |
| ERICACEAE | Andersonia heterophylla | | |
| | Astroloma xerophyllum | | |
| | Conostephium minus | | |
| | Conostephium pendulum | | |
| | Conostephium preissii | | |
| | Croninia kingiana | | |
| | Leucopogon australis | | |
| | Leucopogon conostephioides | | |
| | Leucopogon oldfieldii | | |
| | Leucopogon squarrosus subsp. squarrosus | | |
| EUPHORBIACEAE | Beyeria viscosa | | |
| | Monotaxis occidentalis | | |
| | Stachystemon axillaris | | RS |
| FABACEAE | Acacia huegelii | | |
| | Acacia pulchella | | |
| | Acacia saligna | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|----------------------|---|-------------------------|-----------------|
| | <i>Acacia sessilis</i> | | |
| | <i>Aotus gracillima</i> | | |
| | <i>Bossiaea eriocarpa</i> | | |
| | * <i>Chamaecytisus palmensis</i> | | |
| | <i>Daviesia physodes</i> | | |
| | <i>Daviesia triflora</i> | | |
| | <i>Euchilopsis linearis</i> | | |
| | <i>Gastrolobium capitatum</i> | | |
| | <i>Gastrolobium ebracteolatum</i> | | |
| | <i>Gompholobium confertum</i> | | |
| | <i>Gompholobium tomentosum</i> | | |
| | <i>Hovea trisperma</i> | | |
| | <i>Jacksonia floribunda</i> | | |
| | <i>Jacksonia furcellata</i> | | |
| | <i>Jacksonia sternbergiana</i> | | |
| | <i>Kennedia prostrata</i> | | |
| | <i>Latrobea tenella</i> | | |
| | * <i>Lotus</i> sp. | | |
| | <i>Pultenaea reticulata</i> | | |
| | * <i>Trifolium arvense</i> var. <i>arvense</i> | | |
| FUMARIACEAE | * <i>Fumaria capreolata</i> | Whiteflower Fumitory | |
| GOODENIACEAE | <i>Dampiera linearis</i> | | |
| | <i>Lechenaultia floribunda</i> | | |
| | <i>Scaevola repens</i> | | |
| HAEMODORACEAE | <i>Anigozanthos humilis</i> | | |
| | <i>Anigozanthos manglesii</i> | | |
| | <i>Anigozanthos pulcherrimus</i> | | |
| | <i>Anigozanthos rufus</i> | | |
| | <i>Conostylis aculeata</i> subsp. <i>aculeata</i> | | |
| | <i>Conostylis aculeata</i> subsp. <i>cygnorum</i> | | RS |
| | <i>Conostylis juncea</i> | | |
| | <i>Conostylis serrulata</i> | | |
| | <i>Haemodorum paniculatum</i> | | |
| | <i>Haemodorum spicatum</i> | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------|---|---|-----------------|
| | <i>Phlebocarya ciliata</i> | | |
| HALORAGACEAE | <i>Gonocarpus cordiger</i> | | |
| HEMEROCALLIDACEAE | <i>Arnocrinum preissii</i> | | |
| | <i>Dianella revoluta</i> var. <i>divaricata</i> | | |
| | <i>Hensmania turbinata</i> | | RS |
| | <i>Tricoryne elatior</i> | | |
| | <i>Tricoryne tenella</i> | | |
| IRIDACEAE | * <i>Gladiolus caryophyllaceus</i> | | |
| | * <i>Moraea flaccida</i> | One-leaf Cape Tulip (formerly <i>Homeria flaccida</i>) | |
| | <i>Patersonia occidentalis</i> var. <i>angustifolia</i> | | |
| | <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | | |
| JUNCACEAE | <i>Juncus pallidus</i> | | |
| LAMIACEAE | <i>Hemiandra glabra</i> | | |
| | <i>Hemiandra pungens</i> | | |
| LAURACEAE | <i>Cassytha flava</i> | | |
| | <i>Cassytha glabella</i> forma <i>casuarinae</i> | | |
| | <i>Cassytha racemosa</i> forma <i>pilosa</i> | | |
| | <i>Cassytha racemosa</i> forma <i>racemosa</i> | | |
| LOGANIACEAE | <i>Phyllangium paradoxum</i> | | |
| LORANTHACEAE | <i>Nuytsia floribunda</i> | | |
| MOLLUGINACEAE | <i>Macarthuria australis</i> | | |
| MYRTACEAE | <i>Agonis flexuosa</i> | | |
| | <i>Astartea scoparia</i> | | |
| | <i>Beaufortia elegans</i> | | |
| | <i>Calothamnus lateralis</i> | | |
| | <i>Calytrix flavescens</i> | | |
| | <i>Calytrix fraseri</i> | | |
| | <i>Chamelaucium uncinatum</i> | | |
| | <i>Corymbia calophylla</i> | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-----------------------|--|--------------|-----------------|
| | Eremaea pauciflora var. pauciflora | | |
| | Eucalyptus marginata subsp. marginata | | |
| | Eucalyptus rudis | Flooded gum | |
| | Eucalyptus todtiana | | |
| | Hypocalymma angustifolium | | |
| | Kunzea glabrescens | | |
| | *Leptospermum laevigatum | | |
| | Melaleuca lateritia | | |
| | Melaleuca preissiana | | |
| | Melaleuca raphiophylla | | |
| | Melaleuca seriata | | |
| | Melaleuca viminea subsp. viminea | | |
| | Pericalymma ellipticum var. ellipticum | | |
| | Regelia inops | | |
| | Scholtzia involucrate | | |
| | Taxandria linearifolia | | |
| | Verticordia grandis | | |
| | Verticordia nitens | | RS |
| | Verticordia ovalifolia | | |
| ORCHIDACEAE | Caladenia flava subsp. flava | | |
| | Caladenia sp. | | |
| | *Disa bracteata | | |
| | Pterostylis nana complex | | |
| | Pterostylis sanguinea | | |
| | Pyrorchis nigricans | | |
| PHYLLANTHACEAE | Poranthera microphylla | | |
| PINACEAE | *Pinus pinaster | | |
| POACEAE | *Aira caryophyllea | | |
| | Amphipogon turbinatus | | |
| | Austrodanthonia occidentalis | | |
| | Austrostipa compressa | | |
| | Austrostipa flavescens | | |
| | *Avena barbata | Bearded oat | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|---------------|--------------------------------------|--------------------|-----------------|
| | *Briza maxima | | |
| | *Briza minor | | |
| | *Bromus diandrus | | |
| | *Cortaderia seloana | | |
| | *Cynodon dactylon | | |
| | *Ehrarta brevifolia | | |
| | *Ehrarta calycina | | |
| | *Ehrharta longiflora | Annual veldt grass | |
| | *Ehrarta sp. | | |
| | *Pennisetum clandestinum | | |
| | *Pentaschistis airoides | | |
| | *Vulpia bromoides | | |
| | *Vulpia myuros forma myuros | | |
| POLYGALACEAE | Comesperma calymega | | |
| PORTULACACEAE | Calandrinia liniflora | | |
| PRIMULACEAE | *Lysimachia arvensis | | |
| PROTEACEAE | Adenanthos cygnorum subsp. cygnorum | | |
| | Adenanthos obovatus | | |
| | Banksia attenuata | | |
| | Banksia hookeriana | | |
| | Banksia ilicifolia | | |
| | Banksia littoralis | | |
| | Banksia menziesii | | |
| | Conospermum acerosum subsp. acerosum | | |
| | Hakea francisiana | | |
| | Persoonia saccata | | |
| | Petrophile linearis | | |
| | Stirlingia latifolia | | |
| RESTIONACEAE | Alexgeorgea nitens | | |
| | Chordifex microdon | | |
| | Desmocladus flexuosus | | |
| | Dielsia stenostachya | | RS |
| | Hypolaena exsulca | | |
| | Meeboldina coangustata | | |
| RUTACEAE | Boronia ramosa subsp. | | |

| FAMILY | SPECIES | COMMON NAMES | PRIORITY STATUS |
|-------------------------|---|--------------|-----------------|
| | anethifolia | | |
| | Philotheca spicata | | |
| | Philotheca spicata subsp. Moore River National Park (G. & D. Woodman Op 47) | | |
| SOLANACEAE | *Solanum nigrum | | |
| STYLIDIACEAE | Levenhookia pusilla | | |
| | Levenhookia stipitata | | |
| | Stylidium brunonianum | | |
| | Stylidium crossocephalum | | RS |
| | Stylidium repens | | |
| | Stylidium rigidulum | | |
| | Stylidium saxifragoides | | |
| | Stylidium scariosum | | |
| | Stylidium schoenoides | | |
| | Stylidium utricularioides | | RS |
| XANTHORRHOEACEAE | Xanthorrhoea brunonis subsp. brunonis | | |
| | Xanthorrhoea preissii | | |
| ZAMIACEAE | Macrozamia riedlei | | |

APPENDIX FIVE

Significant flora recorded in the North Ellenbrook survey area

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|--|--------|---------|----------|-----------|--------------|---------------------------------|
| <i>Cyathochaeta teretifolia</i> | P3 | 401511 | 6491046 | sedgeland | NEGB54 | NER9, Property 64 |
| <i>Cyathochaeta teretifolia</i> | P3 | 401310 | 6489860 | 2 | | Property 67 |
| <i>Cyathochaeta teretifolia</i> | P3 | 401458 | 6491141 | 1% cover | | NEQ6, Property 64 |
| <i>Cyathochaeta teretifolia</i> | P3 | 403212 | 6488494 | 15% cover | | NEQ16, Property 11 |
| <i>Cyathochaeta teretifolia</i> | P3 | 403406 | 6488163 | 25% cover | | NEQ20, Property 11 |
| <i>Burchardia bairdiae</i> | RS | 401214 | 6489725 | | NER18-1 | NER18, Property 14 |
| <i>Conostylis aculeata subsp. cygnorum</i> | RS | 402775 | 6488895 | | NEQ9-X2 | Just outside NEQ9, Property 20. |
| <i>Dielsia stenostachya</i> | RS | 401180 | 6491247 | | NER3-1,3 | NER3 |
| <i>Dielsia stenostachya</i> | RS | 401449 | 6491278 | | NER5-2 | |
| <i>Dielsia stenostachya</i> | RS | 401489 | 6491049 | | NER9-4 | |
| <i>Dielsia stenostachya</i> | RS | 401589 | 6491030 | | | NER10 |
| <i>Dielsia stenostachya</i> | RS | 401683 | 6490905 | | | NER11 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|---------------------------------|--------|---------|----------|--------|--------------|-------------|
| <i>Dielsia stenostachya</i> | RS | 402499 | 6489415 | | NER14-2 | |
| <i>Dielsia stenostachya</i> | RS | 400938 | 6489145 | | NER16-1 | |
| <i>Dielsia stenostachya</i> | RS | 401214 | 6489725 | | NER18 | |
| <i>Dielsia stenostachya</i> | RS | 401458 | 6491140 | | | NEQ6 |
| <i>Dielsia stenostachya</i> | RS | 401218 | 6489707 | | | NEQ13 |
| <i>Dielsia stenostachya</i> | RS | 403406 | 6488172 | | | NEQ20 |
| <i>Dielsia stenostachya</i> | RS | 403108 | 6488431 | | | NEQ22 |
| <i>Hensmania turbinata</i> | RS | | | | NEGB3 | |
| <i>Hensmania turbinata</i> | RS | 402754 | 6488112 | 2 | NEGB91 | Property 11 |
| <i>Hensmania turbinata</i> | RS | 401570 | 6489444 | | NEQ11-12 | Property 13 |
| <i>Hensmania turbinata</i> | RS | 400989 | 6489822 | | NEQ12-21 | Property 13 |
| <i>Stachystemon axillaris</i> | RS | 402471 | 6489182 | | NEQ9-10 | Property 64 |
| <i>Stylidium crossocephalum</i> | RS | 401058 | 6490614 | | NEQ3-X2 | Property 66 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|----------------------------------|--------|---------|----------|--------|--------------|-------------------|
| <i>Stylidium crossocephalum</i> | RS | 402775 | 6488895 | | NER1-1 | Property 66 |
| <i>Stylidium utricularioides</i> | RS | 401465 | 6491123 | | NEGB32 | Property 64 |
| <i>Stylidium rigidulum</i> | RS | 401336 | 6491355 | | NEGB37 | Property 64 |
| <i>Stylidium rigidulum</i> | RS | 402775 | 6488895 | | NEQ1-20 | NEQ1; Property 21 |
| <i>Verticordia nitens</i> | RS | 401017 | 6491020 | | | NEQ5 |
| <i>Verticordia nitens</i> | RS | 401446 | 6491443 | | | NEQ7 |
| <i>Verticordia nitens</i> | RS | 401058 | 6489600 | | NEQ10-1 | NEQ10 |
| <i>Verticordia nitens</i> | RS | 401570 | 6489444 | | NEQ11-3 | NEQ11 |
| <i>Verticordia nitens</i> | RS | 402949 | 6488620 | | | NEQ14 |
| <i>Verticordia nitens</i> | RS | 403002 | 6488755 | | | NEQ15 |
| <i>Verticordia nitens</i> | RS | 402850 | 6487826 | | | NEQ17 |
| <i>Verticordia nitens</i> | RS | 401159 | 6490461 | | NER1-5 | NER1 |
| <i>Verticordia nitens</i> | RS | 400995 | 6490831 | | | NER4 |

| TAXON | STATUS | EASTING | NORTHING | NUMBER | SPECIMEN NOS | COMMENTS |
|---------------------------|--------|---------|----------|--------|--------------|----------|
| <i>Verticordia nitens</i> | RS | 401218 | 6489707 | | | NER13 |
| <i>Verticordia nitens</i> | RS | 403406 | 6488172 | | | NER20 |

APPENDIX SIX

Quadrat descriptions and species lists for the North Ellenbrook survey area

| NORTH ELLENBROOK: NEQ1 | | | | | |
|------------------------|--|-----------|------------|--------------|-------------------|
| Described by | BRM | Date | 8/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property #21 | | | | |
| MGA Zone | 50 | 332566 mE | 6617450 mN | 115.973686 E | -31.731136 S |
| Habitat | Gentle, north-facing upper slope of low dune. | | | | |
| Soil | Pale grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia menziesii, Banksia attenuata, Eucalyptus tottiana low woodland over Eremaea pauciflora var. pauciflora low open shrubland over Desmodium flexuosus, Lyginia barbata open sedgld. | | | | |
| Veg Condition | (BF) Very Good (low weed cover but some Banksia deaths and prob. Past grazing in area – open areas, apparent disturbance) | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | Pegged: 4x forpers with caps | | | | |

| SPECIES LIST: NEQ1 | | | | |
|--------------------------|-------------|--------|----------------------|-----------------------------------|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 30cm | NEQ1-19 | Acacia huegelii |
| Acacia pulchella | 1% | 170cm | NEQ1-14 | Acacia pulchella |
| Anigozanthos humilis | + | 15cm | Anigozanthos humilis | |
| Arctotheca calendula | + | 15cm | Capeweed | |
| Astroloma xerophyllum | + | 70cm | NEQ1-16 | Conostephium sht stinpy(?) flr |
| Austrostipa compressa | + | 70cm | NEQ1-3 | Austrostipa |
| Banksia attenuata | 15% | 700cm | | Bank atten |
| Banksia menziesii | 25% | 650cm | | Bank menz |
| Beaufortia elegans | + | 130cm | NEQ1-11 | ?Melaleuca |
| Bossiaea eriocarpa | + | 30cm | | Bossiaea eriocarpa |
| Briza maxima | + | 35cm | | Briza max |
| Calytrix flavescens | + | 20cm | (=NEQ5-) | Calytrix flav |
| Carpobrotus edulis | + | 4cm | | Carpobrotus |
| Centrolepis drummondiana | + | 4cm | NEQ1-10 | Centrolepis |
| Chordifex microcodon | + | 25cm | NEQ1-17 | Rush |
| Conostephium | + | 10cm | NEQ1-21 | ?Conostephium |

| | | | | |
|---|------|-------|------------|---------------------------------|
| pendulum | | | | |
| Conostylis juncea | + | 15cm | NEQ1-22 | Conostylis hairy lf |
| Crassula colorata var. colorata | + | 4cm | (=NEQ7-) | Crassula col |
| Dasyopogon bromeliifolius | 2-3% | 60cm | | Dasyopogon brom |
| Desmocladus flexuosus | 8% | 10cm | NEQ1-2 | Desmocladus flex |
| Drosera menziesii subsp. penicillaris | + | 40cm | NEQ1-15 | Drosera climber |
| Ehrharta calycina | + | 60cm | | Ehr calycina |
| Eremaea pauciflora var. pauciflora | 4-5% | 70cm | (=NEQ7-) | Eremaea pauc |
| Eucalyptus todtiana | 5% | 600cm | | Euc tod (not rooted in quadrat) |
| Gastrolobium capitatum | + | 40cm | | Gastrolobium cap |
| Gladiolus caryophyllaceus | + | 12cm | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 6cm | | Gom tom (juv) |
| Gonocarpus cordiger | + | 20cm | NEQ1-13,18 | Codonocarpus |
| Hibbertia hypericoides | + | 40cm | | Hibbertia hyp |
| Hibbertia subvaginata | + | 30cm | | Hib subvag |
| Hypochaeris glabra | + | 2cm | | Hypochaeris |
| Isolepis marginata | + | 3cm | (=NEQ7-) | Isolepis marg |
| Leucopogon conostephioides | + | 4cm | NEQ1-8,9 | Epacrid shiny long lf |
| Lomandra caespitosa | + | 25cm | NEQ1-4 | Lomandra caespitosa |
| Lomandra hermaphrodita | + | 30cm | NEQ1-7 | Lomandra herm (6) |
| Lyginia barbata | 2-3% | 40cm | | Lyginia (clumped) |
| Patersonia occidentalis var. occidentalis | 1-2% | 45cm | | Patersonia occid |
| Pentaschistis airoides | + | 10cm | NEQ1-5 | Prostrate grass |
| Petrophile linearis | + | 10cm | | Petroph lin |
| Podotheca gnaphalioides | + | 30cm | (=) | Podotheca tall tgt heads |
| Schoenus curvifolius | + | 30cm | (=NEQ3-) | Schoenus curvifolius |
| Scholtzia involucreta | + | 20cm | NEQ1-6 | ?Scholtzia involucre |
| Stirlingia latifolia | + | 45cm | | Stirlingia lat |
| Stylidium repens | + | 6cm | (NEQ7-) | Stylid repens |

| | | | | |
|---|---|------|---------|------------------------------|
| <i>Stylidium rigidulum</i> | + | 12cm | NEQ1-20 | Stylid long frts, linear lvs |
| <i>Thysanotus arbuscula</i> | + | 35cm | NEQ1-1 | Tricoryne elat |
| <i>Trachymene pilosa</i> | + | 15cm | | Trachymene pilosa |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30cm | | Ursinnia art |
| <i>Wahlenbergia capensis</i> | + | 15cm | | Wahlenbergia capensis |
| <i>Wahlenbergia preissii</i> | + | 20cm | NEQ1-12 | Wahlenbergia ?preissii |

| NORTH ELLENBROOK: NEQ2 | | | | | |
|------------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 400868 mE | 6490854 mN | 115.953757 E | -31.71330 S |
| Habitat | Flats west of regelia thicket. | | | | |
| Soil | Dark grey sand - moist below surface. | | | | |
| Rock Type | na | | | | |
| Vegetation | Regelia inops open srub over Hypocalymma angustifolium low shrubland over Hypolaena exsulca scatted sedges and Dasypogon bromeliifolius open herbland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | About 4 years since fire. | | | | |
| Notes | 1.7m - 50% 1m - 40% To the west is Mel preissii and Xanth preissii over Regelia (very tall X preissii to 6m worth preserving)!! Pegged: Y Search intensity: really dedicated. | | | | |

| SPECIES LIST: | | | | |
|---|---------------|--------|-----------|----------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> | 1 | 200cm | | <i>Adenanthos cygnorum</i> |
| <i>Austrostipa compressa</i> | + | 20cm | (=NEQ4-4) | <i>Austrostipa flav</i> |
| <i>Chordifex microcodon</i> | 1 | 20cm | NEQ2-4 | <i>Chaetanthus</i> |

| | | | | |
|--|----|-------|------------|--------------------------------|
| <i>Crassula colorata</i> var. <i>colorata</i> | + | 10cm | (=NEQ4-2) | <i>Crassula colorata</i> |
| <i>Dasypogon bromeliifolius</i> | 15 | 40cm | | <i>Dasypogon brom</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 35cm | | <i>Gladiolus caryophylla</i> |
| <i>Hypocalymma angustifolium</i> | 15 | 100cm | (=NEQ6-3) | <i>Hypocalymma angust</i> |
| <i>Hypolaena exsulca</i> | 1 | 30cm | | <i>Hypolaena exsulca</i> |
| <i>Lechenaultia floribunda</i> | + | 30cm | NEQ2-3 | <i>Lechenaultia floribunda</i> |
| <i>Levenhookia stipitata</i> | + | 5cm | NEQ2-5 | <i>Levenhookia chan</i> |
| <i>Pentaschistis airoides</i> | + | 15cm | (=NEQ4-16) | <i>Pentachistis</i> |
| <i>Phyllangium paradoxum</i> | + | 5cm | (=NEQ4-14) | <i>Phyllangium</i> |
| <i>Podotheca gnaphalioides</i> | + | 20cm | (=NEQ4-3) | <i>Podotheca gnaph</i> |
| <i>Pultenaea reticulata</i> | 1 | 60cm | NEQ2-2 | <i>Pultenea</i> |
| <i>Regelia inops</i> | 50 | 170cm | NEQ2-1 | <i>Regelia</i> |
| <i>Schoenus efoliatus</i> | + | 30cm | (=NEQ6-8) | <i>Schoenus rigens</i> |
| <i>Stylidium repens</i> | + | 10cm | (=NEQ4-8) | <i>Stylidium creeping</i> |
| <i>Trachymene pilosa</i> | + | 15cm | | <i>Trachmene pilosa</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30cm | | <i>Ursinniea anthemoides</i> |
| <i>Wahlenbergia capensis</i> | + | 20cm | | <i>Wahlenberga capensis</i> |
| <i>Xanthorrhoea preissii</i> | 1 | 150cm | | <i>Xanthorrhoea presissii</i> |

| NORTH ELLENBROOK: NEQ3 | | | | | |
|------------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401058 mE | 6490614 mN | 115.955738 E | -31.715483 S |
| Habitat | Gentle, north-facing upper slope of low dune. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana low open woodland (regrowth after fire?) over Adenanthos cygnorum subsp. Cygnorum, Scholtzia involucreta open scrub over Astroloma xerophyllum, Leucopogon conostephioides low shrubland over Alexgeorgea nitens, Lyginia barbata very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent (probably hot fire in area and other general activity). | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | | | | | |

| SPECIES LIST: NEQ3 | | | | |
|-------------------------------------|-------------|-----------|------------|-------------------------|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos cygnorum subsp. cygnorum | 20 | 350 | | Aden cyg |
| Alexgeorgea nitens | 3 | 12 | (=) | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | (=) | Amphipogon turb |
| Astroloma xerophyllum | 8 | 50 | NEQ3-10 | Conostephium sht stumpy |
| Austrostipa compressa | + | 25 | NEQ3-12(=N | Vulpia |
| Banksia attenuata | 4 | (250) 600 | | Bank atten |
| Banksia menziesii | + | 300 | | Banksia menz (overhang) |
| Boronia ramosa subsp. anethifolia | + | 20 | (=) | Boronia 3 or 5 palmate |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |

| | | | | |
|--|-----|-------|-----------|---|
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 25 | NEQ3-4 | Burch congest |
| Caladenia flava subsp. flava | + | 20 | NEQ3-8 | Caladenia orchid |
| Caladenia sp. | + | 15 | NEQ3-7 | Orchid narrow lf |
| Calytrix flavescens | + | 20 | (=NEQ5-) | Calytrix flav |
| Chordifex microcodon | + | 60 | NEQ3-14 | ?Meeboldina |
| Conostephium pendulum | + | 50 | NEQ3-5 | Conosteph ?pendul |
| Conostylis juncea | + | 25 | NEQ3-18 | Conostylis sht flr terete |
| Crassula colorata var. colorata | + | 3 | (=) | Crassula |
| Dampiera linearis | + | 20 | | Dampiera linearis |
| Dasypogon bromeliifolius | + | 30 | | Dasypogon brom |
| Desmocladus flexuosus | + | 10 | NEQ3-15 | Desmocladus |
| Drosera erythrorhiza | + | 2 | | Drosera erythrrhy |
| Eremaea pauciflora var. pauciflora | + | 30 | NEQ3-17 | Small shrub |
| Eucalyptus todtiana | 20 | 700cm | | Euc tod (scattered in broader area) |
| Gladiolus caryophyllaceus | + | 60 | | Gladiolus cary |
| Gompholobium tomentosum | + | 20 | | Gom tom |
| Hibbertia subvaginata | + | 20 | | Hibbertia subvag |
| Hypolaena exsulca | + | 50 | NEQ3-11 | Rush |
| Jacksonia furcellata | + | 160 | | Jacksonia furc |
| Laxmannia grandiflora subsp. grandiflora | + | 15 | NEQ3-3 | Laxmania |
| Leucopogon conostephioides | 4 | 40 | NEQ3-2 | Epacrid |
| Lomandra caespitosa | + | 30 | NEQ3-6,16 | Lomandra linear flat |
| Lomandra hermaphrodita | + | 20 | NEQ3-13 | Lom hermaph (10) |
| Lyginia barbata | 1 | 30 | | Lyginia |
| Macrozamia riedlei | + | 90 | | Zamia |
| Patersonia occidentalis var. occidentalis | 2-3 | 40 | | Patersonia occid |
| Pentaschistis airoides | + | 12 | (=NEQ5-) | Pentaschistis |
| Petrophile linearis | + | 35 | | Petroph linearis |
| Schoenus curvifolius | + | 40 | NEQ3-9 | Schoenus curv |

| | | | | |
|---|----|-----|----------|---------------------|
| Scholtzia involucrata | 14 | 210 | NEQ3-1 | ?Scholtzia invol |
| Stylidium repens | + | 6 | (=NEQ7-) | Stylid repens |
| Trachymene pilosa | + | 10 | | Trachmene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 30 | | Ursinnia art |

| NORTH ELLENBROOK: NEQ4 | | | | | |
|------------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 400995 mE | 6490831 mN | 115.955095 E | -31.713520 S |
| Habitat | Gently sloping ground at margin of wet heath. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia ilicifolia low woodland over Xanthorrhoea preissii shrubland over Desmocladius flexuosus, Lyginia barbata open sedgeland with Dasypogon bromeliifolius, Trachymene pilosa herbland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | Greater than 5 years since fire. | | | | |
| Notes | Pegged: Y 4.5m - 30%, 1.8m - 15%, 0.6m - 50% | | | | |

| SPECIES LIST: NEQ4 | | | | |
|--|---------------|--------|----------|---------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Alexgeorgea nitens | 1 | 15 | NEQ4-10 | Alexgeorgea grey |
| Austrostipa compressa | 2 | 60 | NEQ4-4 | Austrostipa flav |
| Banksia ilicifolia | 30 | 450 | | Banksia ilicifolia |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Carpobrotus edulis | + | 20 | | Carpobrotus edulis |
| Centrolepis mutica | + | 4 | NEQ4-15 | Centrolepis awnless |
| Conostylis aculeata subsp. aculeata | + | 30 | NEQ4-7 | Conostylis broad |
| Crassula colorata var. | + | 10 | NEQ4-2 | Crassula colorata |

| | | | | |
|--|----|-----|------------|------------------------|
| colorata | | | | |
| Dasypogon bromeliifolius | 15 | 30 | | Dasypogon brom |
| Desmocladus flexuosus | 5 | 20 | NEQ4-17 | Desmocladus flex |
| Ehrharta calycina | 1 | 40 | | Ehrharta calycina |
| Gladiolus caryophyllaceus | + | 40 | | Gladiolus |
| caryophyllaceus | | | | |
| Gompholobium tomentosum | + | 20 | | Gompholobium |
| tomentosum | | | | |
| Haemodorum spicatum | + | 80 | NEQ4-6 | Haemodorum spicata |
| Hypochaeris glabra | 1 | 25 | | Hypochaeris glabra |
| Isolepis marginata | + | 5 | NEQ4-12 | Isolepis marg |
| Levenhookia stipitata | + | 4 | NEQ4-13 | Levenhookia dubius |
| Lomandra hermaphrodita | + | 20 | | Lomandra hermaphrodita |
| Lyginia barbata | 4 | 25 | NEQ4-9 | Lyginia short |
| Lysimachia arvensis | + | 10 | | Anayallis arvensis |
| Melaleuca seriata | + | 120 | NEQ4-11 | Melaleuca serata |
| Pentaschistis airoides | + | 15 | NEQ4-16,18 | Pentaschistis |
| Petrophile linearis | + | 30 | | Petrophile linearis |
| Phyllangium paradoxum | + | 3 | NEQ4-14 | Phyllangium |
| Podotheca gnaphalioides | + | 20 | NEQ4-3 | Podotheca gnaph |
| Stylidium repens | + | 15 | NEQ4-8 | Stylidium creeping |
| Thysanotus thyrsoideus | + | 60 | NEQ4-5 | Thysanotus thyrsoideus |
| Trachymene pilosa | 25 | 15 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | 1 | 30 | | Ursinnia anthemoides |
| Wahlenbergia capensis | + | 35 | | Wahlenbergia capensis |
| Wahlenbergia preissii | + | 15 | NEQ4-1 | Wahlenbergia presissii |
| Xanthorrhoea preissii | 15 | 180 | | Xanthor preissii |

NORTH ELLENBROOK: NEQ5

| | | | | | |
|---------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 65 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401017 mE | 6491020 mN | 115.955346 E | -31.711817 S |
| Habitat | Gentle, south-facing lower to mid slope of low dune. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |

| | |
|----------------------|--|
| Vegetation | Banksia attenuata, Banksia menziesii, (Eucalyptus todtiana) low woodland over Adenanthos cygnorum subsp. cygnorum scattered tall shrubs over Hibbertia hypericoides, Eremaea pauciflora, Astroloma xerophyllum, Leucopogon conostephioides low shrubland over Lyginea barbata, Alexgeorgea nitens, Desmocladius flexuosus very open sedgeland. |
| Veg Condition | (BF) Very Good (disturbance upslope (north site) and east site. 6 dead Banksia's present.) |
| Fire Age | Greater than 7 years since fire. |
| Notes | |

| SPECIES LIST: NEQ5 | | | | |
|-------------------------------------|---------------|----------|-----------|---------------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia pulchella | + | (10) 170 | | Acacia pulchella |
| Adenanthos cygnorum subsp. cygnorum | | 220 | | Adenanthos cyg |
| Alexgeorgea nitens | | 12 | (=) | Alexgeorgea |
| Arnocrinum preissii | + | 35 | NEQ5-5 | Agrostocr |
| Astroloma xerophyllum | | 45 | NEQ5-11 | Conostephium sht stumpy |
| Austrostipa compressa | + | 70 | NEQ5-1 | Austrostipa |
| Banksia attenuata | | 450 | | B atten |
| Banksia menziesii | | 600 | | B menz |
| Boronia ramosa subsp. anethifolia | + | 30 | NEQ5-4 | Boronia 5 palmate |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Briza maxima | + | 25 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congest |
| Calytrix flavescens | + | 25 | NEQ5-6,7 | Calytrix flavenum |
| Calytrix fraseri | + | 45 | (=NEQ7-) | ?Calytrix fraseri |
| Carpobrotus edulis | + | 5 | (=) | Carpobrotus (prob ylw flowered) |
| Conostylis aculeata subsp. aculeata | + | 35 | NEQ5-17 | Conostylis acul |
| Conostylis juncea | + | 20 | (=NEQ7-) | Conostylis sht flr |
| Crassula colorata var. colorata | + | 3 | (=NEQ7-) | Crassula |
| Dampiera linearis | + | 30 | | Dampiera linearis |
| Desmocladius flexuosus | | 12 | NEQ5-8 | Desmocladius flex |

| | | | | |
|--|---|-----|-----------|------------------------------|
| <i>Drosera erythrorhiza</i> | + | 1 | | Dros erythrorhiza |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 35 | NEQ5-12 | <i>Drosera</i> climber |
| <i>Ehrharta calycina</i> | + | 40 | | Ehr calyc |
| <i>Ehrharta</i> sp. | + | 15 | NEQ5-16 | Amphipogons |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | | 45 | (=NEQ7-) | <i>Eremaea</i> pauc |
| <i>Eucalyptus todtiana</i> | | 600 | | Euc tod |
| <i>Gladiolus caryophyllaceus</i> | + | 20 | | <i>Gladyolis</i> caryoph |
| <i>Gompholobium tomentosum</i> | + | 30 | | Gom tom |
| <i>Hibbertia hypericoides</i> | | 40 | | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 25 | | Hib subvag |
| <i>Hypochaeris glabra</i> | + | 10 | | Hyp glab |
| <i>Isolepis marginata</i> | + | 3 | NEQ5-2 | <i>Isolepis</i> |
| <i>Lagenophora huegelii</i> | + | 6 | | <i>Lagenophora</i> |
| <i>Lepidosperma pubisquameum</i> | + | 40 | NEQ5-18 | <i>Lepidosperma</i> |
| <i>Leucopogon conostephioides</i> | | 40 | NEQ5-9 | Epacrid sht triangle lf |
| <i>Lomandra hermaphrodita</i> | + | 20 | NEQ5-13 | <i>Lomandra</i> hermaph |
| <i>Lomandra preissii</i> | + | 40 | NEQ5-15 | <i>Lomandra</i> preissii |
| <i>Lyginia barbata</i> | | 40 | | <i>Lyginia</i> |
| <i>Patersonia occidentalis</i> | + | 35 | | <i>Patersonia</i> occid |
| <i>Pentaschistis airoides</i> | + | 15 | NEQ5-3 | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petrophile</i> linearis |
| <i>Podotheca chrysantha</i> | + | 20 | NEQ5-18a | <i>Podotheca</i> |
| <i>Podotheca gnaphalioides</i> | + | 20 | NEQ5-14 | <i>Podotheca</i> gnaph |
| <i>Pyrorchis nigricans</i> | + | 2 | | <i>Pyrorchis</i> nigricans |
| <i>Schoenus curvifolius</i> | + | 20 | NEQ5-10 | <i>Schoenus</i> ?curv |
| <i>Scholtzia involucrata</i> | | 80 | (=) | <i>Scholtzia</i> invol |
| <i>Sonchus oleraceus</i> | + | 12 | | <i>Sonchus</i> olerac |
| <i>Stirlingia latifolia</i> | + | 30 | | <i>Stirlingia</i> lat |
| <i>Trachymene pilosa</i> | + | 10 | | <i>Trachymene</i> pilosa |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinia</i> |
| <i>Verticordia nitens</i> | + | 170 | (=) | Vert ?nitens |
| <i>Wahlenbergia capensis</i> | + | 35 | | <i>Wahlenbergia</i> capensis |

| NORTH ELLENBROOK: NEQ6 | | | | | | |
|------------------------|--|-------------|------------|--------------|-------------------|--|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m | |
| Season | | | | | | |
| Location | Property 64 (Wildflower farm) | | | | | |
| MGA Zone | 50 | 401458 mE | 6491140 mN | 115.960012 E | -31.710772 S | |
| Habitat | Seasonally wet flats. | | | | | |
| Soil | Dark brown sandy peat (slightly moist). | | | | | |
| Rock Type | na | | | | | |
| Vegetation | Melaleuca preissiana scattered low trees over Astartea scoparia closed scrub over Dielsia stenostachya, Schoenus efoliatus closed sedgeland. | | | | | |
| Veg Condition | (BF) Excellent | | | | | |
| Fire Age | Greater than 5 years since fire. | | | | | |
| Notes | Pegged: Y 3m - 3%, 1.7m - 90%, 0.5m - 95% | | | | | |

| SPECIES LIST: NEQ6 | | | | |
|---|---------------|--------|----------|--------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Aotus gracillima | 4 | 160 | NEQ6-2 | Sphaerolobium |
| Astartea scoparia | 85 | 170 | NEQ6-1 | Astarteal |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Cassytha racemosa forma pilosa | + | C?? | NEQ6-10 | Cassytha racemosa |
| Cyathochaeta teretifolia | 1 | 60 | NEQ6-9 | Cyathochaeta teretifolia |
| Dielsia stenostachya | 85 | 30 | NEQ6-4 | |
| Hypocalymma angustifolium | 1 | 50 | NEQ6-3 | Hypocalymma angust |
| Leucopogon australis | 1 | 150 | NEQ6-6 | Leucopogon australis |
| Melaleuca preissiana | 3 | 300 | | Melaleuca preissiana |
| Patersonia occidentalis var. angustifolia | 1 | 45 | NEQ6-7 | Patersonia thin swamp |
| Schoenus efoliatus | 9 | 30 | NEQ6-8 | Schoenus rigens |
| Taxandria linearifolia | 1 | 50 | NEQ6-5 | Taxandria linear |
| Xanthorrhoea preissii | 1 | 100 | | Xanth preissii |

NORTH ELLENBROOK: NEQ7

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401446 mE | 6491443 mN | 115.959916 E | -31.708038 S |
| Habitat | Very gentle, south-facing lower slope of low rise. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Kunzea glab scattered tall shrubs over Xanthorrhoea preissii open shrubland to shrubland over Melaleuca seriata, Eremaea pauciflora var. pauciflora low shrubland over Alexgeorgea nitens, Hypolaena exsula, Lyginia barbata very open sedgeland. | | | | |
| Veg Condition | BF) Excellent (considerable surrounding disturbance (clearing of tracks/fire brk, farm plantgs; low weed cover). | | | | |
| Fire Age | More than 7 years since fire. | | | | |
| Notes | Pegged: 4 x f dps with caps Only a couple of Jarrah's seen in this area. | | | | |

| SPECIES LIST: NEQ7 | | | | |
|-------------------------|-------------|---------|------------|-------------------------|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 20 | NEQ7-18 | Acacia ?huegelii |
| Acacia pulchella | + | 25 | | Acacia pulchella |
| Adenanthos obovatus | + | 60 | (=NEGB35) | Adenanthos obovata |
| Alexgeorgea nitens | + | | (=) | ?Alexgeorgea |
| Astroloma xerophyllum | 1-2 | | NEQ7-7 | Conostephium sht stumpy |
| Banksia attenuata | 30-35 | 500-600 | | B attenuata |
| Banksia ilicifolia | 6 | 700 | | B ilicifolia |
| Banksia menziesii | + | (30) | | Banksia menz |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | NEQ7-24 | ?Calytrix flav |
| Calytrix fraseri | + | 35 | NEQ7-8 | Cayltrix ?fraseri |
| Conostephium pendulum | + | 5 | NQ7-4,5,32 | Astroloma |
| Conostylis juncea | + | 20 | (=NEGB6) | Conostylis sht flr |
| Dampiera linearis | + | 20 | | Dampiera linearis |
| Dasyogon bromeliifolius | 2 | 20 | | Dasyogon brom |

| | | | | |
|--|---|-----|------------|---|
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythrorhiza</i> (dessicated) |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 35 | NEQ7-14 | <i>Drosera</i> climber pk flr |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 5 | 50 | NEQ7-2 | <i>Eremaea</i> pauc |
| <i>Gastrolobium capitatum</i> | + | 20 | NEQ7-26 | <i>Nemcia</i> capitata |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus</i> cary |
| <i>Gompholobium tomentosum</i> | + | 10 | , =NEGB34 | Gom tom |
| <i>Gonocarpus cordiger</i> | + | 20 | NEQ7-29 | <i>Codonocarpus</i> |
| <i>Hibbertia spicata</i> subsp. <i>spicata</i> | + | 15 | NEQ7-13 | <i>Hibbertia</i> sht linear lf |
| <i>Hibbertia subvaginata</i> | + | 20 | NEQ7-17 | <i>Hibbertia</i> subvag |
| <i>Hovea trisperma</i> | + | 15 | NEQ7-21 | ? <i>Hovea</i> trisperma |
| <i>Hypochaeris glabra</i> | + | 2 | | <i>Hypochaeris</i> glabra |
| <i>Hypolaena exsulca</i> | 1 | 35 | | <i>Hypolaena</i> exsula |
| <i>Isolepis marginata</i> | + | 4 | NEQ7-27 | <i>Isolepis</i> |
| <i>Jacksonia floribunda</i> | + | 50 | NEQ7-19 | <i>Jacksonia</i> furc |
| <i>Kunzea glabrescens</i> | 4 | 300 | | <i>Kunzea</i> glab |
| <i>Lepidosperma</i> <i>pubisquameum</i> | + | 40 | NEQ7-28 | <i>Lepidospera</i> narrow flat |
| <i>Lepidosperma</i> sp. | | | NEQ7-28b | |
| <i>Leucopogon conostephioides</i> | + | 30 | NEQ7-1 | ? <i>Epacrid</i> |
| <i>Lomandra hermaphrodita</i> | + | 30 | NEQ7-6,9 | <i>Lomandra</i> herm x1 |
| <i>Lomandra nigricans</i> | + | 30 | NEQ7-22 | <i>Lomandra</i> ? <i>nigricans</i> |
| <i>Lomandra preissii</i> | + | 35 | NEQ7-12,36 | <i>Lomandra</i> preissii |
| <i>Lyginia barbata</i> | + | 45 | NEQ7-15 | <i>Lyginia</i> |
| <i>Melaleuca seriata</i> | 9 | 80 | NEQ7-3 | <i>Melaleuca</i> ? <i>sereata</i> pk |
| <i>Nuytsia floribunda</i> | + | 120 | | <i>Nuytsia</i> flor |
| orchid sp. | + | 15 | NEQ7-10 | Orchid |
| <i>Patersonia occidentalis</i> | 1 | 45 | | <i>Patersonia</i> occid |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petroph</i> linearis |
| <i>Philothea spicata</i> | + | | | <i>Philothea</i> spicata |
| <i>Phlebocarya ciliata</i> | 3 | 40 | | <i>Phlebocarya</i> ciliata flat leaf |
| <i>Phyllangium paradoxum</i> | + | 4 | NEQ7-31 | <i>Phyllangium</i> |
| <i>Pterostylis nana</i> complex | + | 2 | NEQ7-33 | <i>Pterostylis</i> ? <i>nana</i> |
| <i>Pterostylis sanguinea</i> | + | 30 | NEQ7-23 | <i>Pterostylis</i> |
| <i>Schoenus curvifolius</i> | + | 25 | NEQ7-35 | <i>Schoenus</i> ? <i>curvifolius</i> |
| <i>Stylidium repens</i> | + | 6 | NEQ7-16 | <i>Stylidium</i> ? <i>repens</i> |
| <i>Stylidium saxifragoides</i> | + | 15 | NEQ7-25 | <i>Stylid</i> cil rosette |

| | | | | |
|--|----|-----|------------|--------------------------------|
| Thysanotus arbuscula | + | 45 | NEQ7-34,20 | Thysanotus erect ?sparteus |
| Thysanotus manglesianus/patersonii | + | 45 | | Thysanotus mang/pat(not flrng) |
| Trachymene pilosa | + | 12 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 15 | | Ursinnia art |
| Verticordia nitens | + | 170 | (=NEGB) | Verticordia ?nitens |
| Wahlenbergia preissii | + | 30 | NEQ7-30 | Wahlenbergia tall |
| Xanthorrhoea preissii | 16 | 170 | | Xanth preis |
| Xanthosia huegelii | + | 15 | NEQ7-11 | Xanthosia palmate |

NORTH ELLENBROOK: NEQ8

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 6/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 401458 mE | 6491140 mN | 115.960012 E | -31.710772 S |
| Habitat | Seasonally wet flats. | | | | |
| Soil | Dark brown sandy peat (slightly moist). | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana scattered low trees over Astartea scoparia closed scrub over Dielsia stenostachya, Schoenus efoliatus closed sedgeland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | Greater than 5 years since fire. | | | | |
| Notes | Pegged: Y 3m - 3%, 1.7m - 90%, 0.5m - 95% | | | | |

SPECIES LIST: NEQ8

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------------------------|---------------|--------|------------|------------------------|
| Adenanthos cygnorum subsp. cygnorum | 2 | 250 | | Adenanthos cygnorum |
| Alexgeorgea nitens | 2 | 15 | (=NEQ4-10) | Alexgeorgea grey |
| Andersonia heterophylla | 3 | 35 | NEQ8-8 | Andersonia small white |
| Arnocrinum preissii | + | 45 | NEQ8-2 | Arnocrinum |
| Astroloma xerophyllum | 4 | 90 | NEQ8-7 | Conostephium sharp |
| Austrostipa compressa | + | 30 | | Austrostipa flav |

| | | | | |
|---|----|-----|-----------|------------------------|
| Banksia attenuata | 15 | 500 | | Banksia attenuata |
| Banksia menziesii | 1 | 250 | | Banksia menzies |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | NEQ8-3 | Calytrix flav |
| Cassytha flava | + | 6 | NEQ8-4 | Cassytha heads |
| Conostephium minus | 1 | 50 | NEQ8-6 | Conostephium blunt |
| Crassula colorata var. colorata | + | 5 | (=NEQ4-2) | Crassula colorata |
| Ehrharta brevifolia | + | 30 | NEQ8-12 | Ehrorta small |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryophyllum |
| Hibbertia subvaginata | 2 | 20 | NEQ8-1 | Hibbertia subvaginata |
| Isolepis marginata | + | 4 | NEQ8-9 | Bulbostylis |
| Leucopogon conostephioides | + | 45 | NEQ8-10 | Leucopogon short sharp |
| Lomandra hermaphrodita | + | 25 | | Lomandra hermaphrodita |
| Lyginia barbata | 5 | 35 | (=NEQ4-9) | Lyginiea short |
| Patersonia occidentalis var. occidentalis | + | 40 | NEQ8-11 | Patersonia occ |
| Pentaschistis airoides | + | 20 | | Pentaschistis |
| Petrophile linearis | + | 30 | | Petrophile linearis |
| Phyllangium paradoxum | + | 5 | | Phyllangium |
| Scholtzia involucrata | 20 | 20 | NEQ8-5 | Baeckea tall |
| Stylidium repens | + | 10 | | Stylidium creeping |
| Ursinia anthemoides subsp. anthemoides | 1 | 35 | | Ursinnia anthenoides |

| NORTH ELLENBROOK: NEQ9 | | | | | |
|------------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 8/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 64 (Wildflower farm) | | | | |
| MGA Zone | 50 | 402471 mE | 6489182 mN | 115.970506 E | -31.728522 S |
| Habitat | Crest of dune. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Eucalyptus todtiana, Banksia menziesii, Banksia attenuata low woodland over Jacksonia floribunda scattered tall shrubs over Eremaea pauciflora var. pauciflora low shrubland over Desmocladus flexuosus, Lyginia barbata open sedgld. | | | | |
| Veg Condition | (BF) Very Good (probably grazed in part; old fenceline near quadrat; stumps of old cut trees; low weed cover). | | | | |

| | |
|-----------------|-------------------------------|
| Fire Age | More than 7 years since fire. |
| Notes | Pegged: 4 x f dps and caps |

| SPECIES LIST: NEQ9 | | | | |
|------------------------------------|---------------|---------|------------|--------------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Alexgeorgea nitens | + | 12 | NEQ9-2 | Alexgeorgea cpr base |
| Anigozanthos manglesii | + | 20 | NEQ9-14 | Anigozanthos mang (no flrs) |
| Arnocrinum preissii | + | 60 | (=NEQ1-X2) | Agrostocrinium |
| Astroloma xerophyllum | | 45 | (=NEQ1-16) | Conostephium sht stumpy flr |
| Austrostipa compressa | + | 50 | (=NEQ1-3) | Austrostipa |
| Banksia menziesii | 17 | 550 | | Bank menz |
| Bossiaea eriocarpa | + | 15 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 35 | | Burchardia congesta |
| Calytrix flavescens | 1 | 20 | | Calytrix flav |
| Carpobrotus edulis | + | 5 | | Carpobrotus edulis (???) |
| Cassytha flava | + | 40 | NEQ9-9 | Cassytha |
| Conostephium pendulum | + | 40 | NEQ9-12 | Conostephium glauc |
| Conostylis juncea | + | 20 | NEQ9-1 | Conostylis sht flr, hry terete |
| Dampiera linearis | + | 25 | | Dampiera linearis |
| Dasyogon bromeliifolius | 1 | 20 | | Dasyogon bromel |
| Daviesia triflora | + | 40 | NEQ9-6 | Leafless (Acac/daviesia) |
| Desmocladus flexuosus | 14 | 10-12 | (=NEQ1-2) | Desmocladus |
| Drosera erythrorhiza | + | 1 | | Drosera eryth (dessicated) |
| Ehrharta calycina | + | 40 | | Ehr calycinus |
| Eremaea pauciflora var. pauciflora | 25-30 | 80-170 | | Eremaea pauciflora |
| Eucalyptus todtiana | 7 | 500-600 | | Euc tod overhang |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 80 | | Gomph tomentosum |
| Haemodorum paniculatum | + | 80 | NEQ9-13 | Haemodorum spicata |
| Hibbertia hypericoides | + | 35 | Hib hyp | |
| Hibbertia subvaginata | + | 25 | NEQ9-8 | Hib subvag |

| | | | | |
|---|---|--------|-----------|------------------------------|
| Jacksonia floribunda | + | 140 | | Jacksonia floribunda |
| Leucopogon conostephioides | + | 35 | NEQ9-5 | Epacrid sht triangle lf |
| Lomandra caespitosa | + | 35 | NEQ9-4 | Lomandra caespitosa |
| Lomandra hermaphrodita | + | 25 | NEQ9-3 | Lomandra hermaph (16) |
| Lyginia barbata | 2 | 35 | NEQ9-7 | Lyginia rhizomes |
| Patersonia occidentalis var. occidentalis | 1 | 35 | | Patersonia occid |
| Pentaschistis airoides | + | 15 | NEQ9-15 | Pentaschistis |
| Persoonia saccata | 1 | 190 | NEQ9-11 | Persoonia |
| Petrophile linearis | + | 40 | | Petroph linearis |
| Podotheca gnaphalioides | + | 12 | (=) | Podotheca tall tght hd |
| Pyrorchis nigricans | + | 2 | | Pyrorchis nigrican leaf only |
| Scaevola repens | + | 10 | | Scaevola repens |
| Schoenus curvifolius | + | 30 | | Schoenus curv |
| Stachystemon axillaris | + | 35(70) | NEQ9-10 | Herb erect |
| Stirlingia latifolia | + | 35 | | Stirlingia elat |
| Stylidium repens | + | 12 | (=NEQ7-) | Stylid repens |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 30 | | Ursinnia art |

NORTH ELLENBROOK: NEQ10

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 401058 mE | 6489600 mN | 115.955635 E | -31.724630 S |
| Habitat | Flat (swale) between low dunes. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Regelia inops scattered tall shrubs over Xanthorrhoea preissii open shrubland over Calytrix flavescens, Conostephium pendulum, Adenanthos obovatus low open shrubland over Hypolaena exsulca scattered sedges with Phlebocarya ciliata, Patersonia occidentalis, Dasyopogon bromeliifolius open herbland to herbland. | | | | |
| Veg Condition | (BF) Very Good (past logging and past clearing in adjacent areas). | | | | |
| Fire Age | Greater than 10 years since fire. | | | | |

| | |
|--------------|---|
| Notes | Pegged: 4 f dps and 4 caps One old Jarrah stump seen in area. |
|--------------|---|

| SPECIES LIST: NEQ10 | | | | |
|--|---------------|--------|------------|--|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos obovatus | 2 | 70 | | Adenanthos obovates |
| Aira caryophyllea | + | 12 | NEQ10-17 | Pentaschistis |
| Alexgeorgea nitens | + | 10 | NEQ10-19 | Alexgeorgea |
| Astroloma xerophyllum | + | 35 | NEQ10-13 | Short triangle lf Epacrid |
| Austrostipa compressa | + | 35 | NEQ10-8 | Austrostipa |
| Banksia attenuata | 14 | 600 | | Banksia attenuata (1 dead just outside quadrat, overhanging) |
| Banksia ilicifolia | 15 | 600 | | Banksia ilicifolia (1 dead) |
| Banksia menziesii | 1-2 | 400 | | Banksia menz |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Calytrix flavescens | 1 | 20 | | Calytrix flaves |
| Centrolepis drummondiana | + | 3 | NEQ10-2 | Centrolepis drummondii |
| Conostephium pendulum (accuminata leaf) | 1 | 20 | NEQ10-9 | Conostephium |
| Conostephium preissii | + | 30 | NEQ10-31 | ?Conostephium obtuse lf |
| Conostylis juncea | + | 20 | NEQ10-10 | Conostylis sht flr splu |
| Dampiera linearis | + | 15 | NEQ10-23 | Dampiera linearis |
| Dasyogon bromeliifolius | 3 | 30 | | Dasyogon brom |
| Disa bracteata | + | 20 | | Weed orchid |
| Drosera macrantha | + | 40 | NEQ10-28 | Drosera climber |
| Eremaea pauciflora var. pauciflora | + | 45 | NEQ10-6 | ??Eremaea pauc/ Melaleuca |
| Gladiolus caryophyllaceus | + | 70 | | Gladiolus cary |
| Hovea trisperma | + | 12 | NQ10-20,21 | Hovea trisperma/ Bos ariata |
| Hypochaeris glabra | + | 12 | | Hypochaeris glab |
| Hypolaena exsulca | + | 15 | NEQ10-18 | Hypolaena exsulca (male) |
| Isolepis marginata | + | 3 | NEQ10-3 | Isolepis marg |
| Lepidosperma pubisquameum | + | 35 | NEQ10-16 | Lepidosperma pubi |

| | | | | |
|---|-------|------------|----------|--|
| <i>Lomandra hermaphrodita</i> | + | 25 | NEQ10-25 | <i>Lomandra hermaph</i> > 10 |
| <i>Lomandra odora</i> | + | 20 | NEQ10-5 | <i>Lomandra nigrican/preissii</i> |
| <i>Lomandra suaveolens</i> | + | 30 | NEQ10-14 | <i>Lomandra caespitosa</i> |
| <i>Macrozamia riedlei</i> | + | 50-60(200) | | <i>Zamia</i> |
| <i>Melaleuca seriata</i> | + | 30 | NEQ10-22 | <i>Melaleuca serata</i> pk flr |
| <i>Monotaxis occidentalis</i> | + | 4 | NEQ10-30 | Herb |
| <i>Patersonia occidentalis</i> | 9-10 | 60 | | <i>Patersonia occid</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petrophile linearis</i> |
| <i>Philotheca spicata</i> | + | 35 | | <i>Philotheca spicata</i> |
| <i>Phlebocarya ciliata</i> | 11-12 | 35 | | <i>Phlebocarya cil</i> (flat linear lf 5mm wide) |
| <i>Phyllangium paradoxum</i> | + | 3 | (=) | <i>Phyllangium</i> (dessicated) |
| <i>Podotheca gnaphalioides</i> | + | 8 | NEQ10-27 | <i>Podotheca</i> |
| <i>Regelia inops</i> | <1 | 180 | NEQ10-7 | <i>Regelia</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Sonchus oleraceus</i> | + | 10 | | <i>Sonchus olerac</i> |
| <i>Stylidium repens</i> | + | 10 | NEQ10-12 | <i>Stylid repens</i> |
| <i>Stylidium saxifragoides</i> | + | 1 | NEQ10-4 | <i>Stylid ciliate</i> rosette |
| <i>Thysanotus arbuscula</i> | + | 45 | NEQ10-26 | <i>Thysanotus erect</i> |
| <i>Trachymene pilosa</i> | + | 15 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne elatior</i> | + | 30 | | <i>Tricoryne elator</i> |
| <i>Tricoryne tenella</i> | + | 12 | NEQ10-15 | Hib? |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 20 | | <i>Ursinnia art</i> |
| <i>Verticordia nitens</i> | 3-4 | 110-130 | NEQ10-1 | <i>Verticordia nitens</i> |
| <i>Vulpia bromoides</i> | + | 12 | NEQ10-29 | <i>Vulpia</i> |
| <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> | 5 | 80-90 | NEQ10-11 | <i>Xanthor ?brunonianus/preis</i> (spindly tussocks) |
| <i>Xanthorrhoea preissii</i> | 7-9 | 160 | | <i>Xanthorrhoea preissii</i> |

NORTH ELLENBROOK: NEQ11

| | | | | | |
|---------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 22/11/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 401570 mE | 6489444 mN | 115.961023 E | -31.726081 S |
| Habitat | Gentle, south-facing lower slope of low dune. | | | | |
| Soil | Grey sand. | | | | |

| | |
|----------------------|---|
| Rock Type | na |
| Vegetation | Banksia attenuata, Banksia menziesii (not in quadrat), Eucalyptus todtiana low woodland over Adenanthos cygnorum subsp. cygnorum scattered tall shrubs to high shrubland (patchy) over Beaufortia elegans shrubland over Eremaea pauciflora var. pauciflora, Astroloma xerophyllum, Hibbertia hypericoides low shrubland over Desmocladius flexuosus, Lyginia barbata, Schoenus curvifolius scattered sedges. |
| Veg Condition | (BF) Excellent (low weed cover, little disturbance; horse paddock boundary 20m to east) |
| Fire Age | More than 7-10years since fire. |
| Notes | Caretaker Ray questioned about pegs - said OK Elevation: 58m Pegged: 4 x fd and caps Search intensity: thorough |

SPECIES LIST: NEQ11

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------------------------|---------------|--------|------------|------------------------|
| Adenanthos cygnorum subsp. cygnorum | | 300 | | Andenathos cygnorum |
| Astroloma xerophyllum | 1-2 | 40 | NEQ11-14 | Conostegium sht frt |
| uprgt | | | | |
| Banksia attenuata | 27 | 700 | | Banksia attenuata |
| Beaufortia elegans | 9-10 | 180 | NEQ11-2 | Regelia |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 40 | | Briza max |
| Burchardia congesta | + | 40 | | Burch congesta |
| Calytrix flavescens | + | 35 | | Calytrix flavescens |
| Carpobrotus edulis | + | 5 | NEQ11-8 | Carpobrotus |
| Cassytha flava | + | 30 | NEQ11-22 | Cassytha hairy |
| Cassytha glabella forma casuarinae | + | 50 | NEQ11-20 | Cassytha glabrous |
| Centrolepis drummondiana | + | 5 | NEQ11-10 | Centrolepis drummondii |
| Chordifex microcodon | + | 40 | NEQ11-13 | Rush |
| Conostephium pendulum | + | 35 | NEQ11-18 | Conosteph ?precissie |
| Conostylis juncea | + | 30 | NEQ11-7,19 | Conostylis sht flr |
| Crassula colorata var. colorata | + | 3 | NEQ11-5 | Herb |
| Dasyopogon bromeliifolius | + | 30 | | Dasyopogon brom |

| | | | | |
|--|-------|-------|----------|--|
| <i>Desmocladus flexuosus</i> | 1-2 | 15-20 | NEQ11-1 | Desmoclad flax |
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythorhya</i> (dessicated) |
| <i>Drosera menziesii</i> subsp. <i>penicillaris</i> | + | 12 | NEQ11-21 | <i>Drosera</i> |
| <i>Ehrharta calycina</i> | + | 70 | | <i>Ehr calycinus</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 17-20 | 45 | | <i>Eremaea pauciflora</i> |
| <i>Eucalyptus todtiana</i> | 10-11 | 600 | | Euc tod (not rooted in quad, just outside) |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus car</i> (not flg - prob common pk) |
| <i>Hensmania turbinata</i> | + | 30 | NEQ11-12 | <i>Hensmania</i> |
| <i>Hibbertia hypericoides</i> | + | 30 | | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ11-15 | <i>Hibbertia subvag</i> |
| <i>Hypochaeris glabra</i> | + | 30 | | <i>Hypochaeris glab</i> |
| <i>Isolepis marginata</i> | + | 3 | NEQ11-9 | <i>Isolepis marg</i> |
| <i>Leucopogon conostephioides</i> | + | 40 | NEQ11-17 | Epacrid sht lves |
| <i>Lomandra hermaphrodita</i> | + | 25 | | <i>Lomandra hermaph</i> (9) |
| <i>Lyginia barbata</i> | + | 40 | | <i>Lyginia long rhizomes</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | Pat occid |
| <i>Pentaschistis airoides</i> | + | 20 | NEQ11-23 | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petroph linearis</i> |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | <i>Phyllangium ?paradox</i> (funked?? Flrg) |
| <i>Podotheca gnaphalioides</i> | + | 20 | NEQ11-11 | <i>Podolepis gnaph</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Scholtzia involucrata</i> | 2-3 | 30 | (=) | <i>Scholtzia involucra</i> |
| <i>Stylidium repens</i> | + | 10 | NEQ11-4 | <i>Stylid repens</i> |
| <i>Thysanotus sparteus</i> | + | 40 | NEQ11-16 | <i>Thysanotus unrgt dy ???</i> |
| <i>Trachymene pilosa</i> | + | 10 | | <i>Trachymene pilosa</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 35 | | <i>Ursinnia art</i> |
| <i>Verticordia nitens</i> | 1 | 190 | NEQ11-3 | <i>Verticordia nitens</i> |
| <i>Wahlenbergia capensis</i> | + | 35 | | <i>Wahlenbergia capensis</i> |
| <i>Wahlenbergia preissii</i> | + | 45 | NEQ11-24 | <i>Wahlenbergia</i> |

NORTH ELLENBROOK: NEQ12

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 13 | | | | |
| MGA Zone | 50 | 400989 mE | 6489822 mN | 115.954929 E | -31.722621 S |
| Habitat | Gentle, north-facing, upper slope of low dune. | | | | |
| Soil | Pale grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii low woodland over Jacksonia floribunda scattered shrubs over Calytrix flavescens, Scholtzia involucrata, Leucopogon conostephioides low open shrubland to low shrubland over Alexgeorgia nitens open sedgeland. | | | | |
| Veg Condition | (BF) Very Good to Excellent (moderate weed cover < 1% Ehr calyc; some nearby Banksia deaths; water table impacts?) | | | | |
| Fire Age | More than 10 years since fire. | | | | |
| Notes | Pegged: 4 fdps and 4 caps Elevation: 60m | | | | |

| SPECIES LIST: | | | | |
|------------------------------|---------------|--------|------------|---|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 20 | (=) | Acacia ?hueg |
| Acacia sessilis | + | 70 | NEQ12-24 | ?Persoonia suceaa prickly linear lf shb |
| Aira caryophyllea | + | 15 | (=NEQ10-17 | Pentaschistis |
| Alexgeorgia nitens | 10-11 | 12 | NEQ12-4 | Alexgeorgia copper base |
| Amphipogon turbinatus | + | 30 | NEQ12-1 | Amphipogon |
| Andersonia heterophylla | + | 30 | NEQ12-7 | Leucopogon wte flr sht triangle leaf |
| Anigozanthos manglesii | + | 12 | NEQ12-19 | Anigozanthos ?humilis |
| Arnocrinum preissii | + | 30 | | Agrostocrinum |
| Austrodanthonia occidentalis | + | 30 | NEQ12-20 | Austrodanthonia |
| Austrostipa flavescens | + | 30-60 | NEQ12-26 | Austrostipa |
| Banksia attenuata | 9 | 550 | | B attenuata |
| Banksia menziesii | 12-15 | 550 | | B menziesii |
| Bossiaea eriocarpa | + | 30 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 40 | | Burch congesta |
| Caladenia flava subsp. flava | + | 12 | NEQ12-17 | Caladenia flava |

| | | | | |
|--|------|--------|-------------|---|
| <i>Calytrix flavescens</i> | 6-7 | 30 | NEQ12-5 | <i>Calytrix flav ylw</i> |
| <i>Calytrix fraseri</i> | + | 30(90) | NEQ12-23 | ? <i>Calytrix fraseri</i> |
| <i>Carpobrotus edulis</i> | + | 3 | | Pig face |
| <i>Cassytha racemosa</i> | + | 35 | NEQ12-6 | <i>Cassytha</i> |
| <i>Centrolepis drummondiana</i> | + | 3 | (=NEQ10-2) | <i>Centrolepis drum</i> |
| <i>Conostephium pendulum</i> | + | 40 | NEQ12-16 | <i>Conostephium preiss</i> (<i>accuminate</i> Lf) |
| <i>Conostylis aculeata</i> subsp. <i>aculeata</i> | + | 40 | NEQ12-15 | <i>Conostylis aculeata</i> |
| <i>Conostylis juncea</i> | + | 20 | NEQ12-9 | <i>Conostylis sht hry terete</i> lef |
| <i>Dampiera linearis</i> | + | 30 | (=NEQ10-23) | <i>Dampiera linears</i> |
| <i>Desmocladus flexuosus</i> | 1 | 15-20 | NEQ12-13 | <i>Desmocladus</i> |
| <i>Drosera erythrorhiza</i> | + | 3 | | <i>Drosera erythor</i> (<i>dessicated</i>) |
| <i>Ehrharta calycina</i> | <1 | 80-90 | | <i>Ehr calycinus</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | + | 35 | NEQ12-14 | <i>Eremaea pauc</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 40-70 | | <i>Gladiolus cal</i> |
| <i>Gompholobium tomentosum</i> | + | 20 | | <i>Gom tom</i> |
| <i>Hensmania turbinata</i> | + | 20 | NEQ12-21 | <i>Hensmania</i> |
| <i>Hibbertia hypericoides</i> | + | 45 | | <i>Hibb hyp</i> |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ12-11 | <i>Hibb ?subvag</i> |
| <i>Isolepis marginata</i> | + | 4 | NEQ12-2 | <i>Isolepis</i> |
| <i>Jacksonia floribunda</i> | + -1 | 170 | | <i>Jack floribunda</i> |
| <i>Lechenaultia floribunda</i> | + -1 | 30 | NEQ12-8 | <i>Lechenaultia ?flor</i> |
| <i>Leucopogon conostephioides</i> | 2 | 30 | NEQ12-10 | <i>Epacrid sht triangle lf</i> |
| <i>Lomandra hermaphrodita</i> | + | 25 | NEQ12-12 | <i>Lomandra hermaph</i> (6) |
| <i>Lyginia barbata</i> | + | 40 | | <i>Lyginia clump sprdg</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | <i>Patersonia occid</i> |
| <i>Persoonia saccata</i> | + | 45 | NEQ12-27 | <i>Persoonia</i> |
| <i>Petrophile linearis</i> | + | 30 | | <i>Petroph linearis</i> |
| <i>Phlebocarya ciliata</i> | 1 | 40 | | <i>Phlebocarya cil</i> |
| <i>Phyllangium paradoxum</i> | + | 10 | (=) | <i>Phyllangium</i> |
| <i>Podotrochea gnaphalioides</i> | + | 20 | NEQ12-18 | <i>Podotrochea</i> |
| <i>Schoenus curvifolius</i> | + | 35 | | <i>Schoenus curvifolius</i> |
| <i>Scholtzia involucreta</i> | 2-3 | 110 | NEQ12-3 | <i>Scholtzia involucre</i> |
| <i>Stylidium repens</i> | + | 5 | (=NEQ10-12) | <i>Stylidium repens</i> |
| <i>Thysanotus arbuscula</i> | + | 5 | NEQ12-22 | <i>Herb</i> |

| | | | | |
|--|---|----|----------|----------------------------------|
| Thysanotus manglesianus/patersonii | + | 40 | | Thysanotus mang/pat (dessicated) |
| Tricoryne elatior | + | 30 | | Tricoryne elator |
| Ursinia anthemoides subsp. anthemoides | 1 | 30 | | Ursinnia |
| Wahlenbergia capensis | + | 20 | NEQ12-28 | Wahlenbergia cap |
| Wahlenbergia preissii | + | 20 | NEQ12-25 | Wahlenbergia p |

NORTH ELLENBROOK: NEQ13

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 1/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 14 | | | | |
| MGA Zone | 50 | 401218 mE | 6489707 mN | 115.957334 E | -31.723678 S |
| Habitat | Narrow (?flow) depression on plain, between low dunes. | | | | |
| Soil | Dark grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Taxandria linearifolia, Astartea scoparia open scrub over Aotus gracillima, Hypocalymma angustifolium open heath over Dielsia stenostachya, Lepidosperma longitudinale very open sdgld. | | | | |
| Veg Condition | (BF) Very Good (probably human caused changes in water table) | | | | |
| Fire Age | Greater than 7 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps Dampland very dry. | | | | |

SPECIES LIST: NEQ13

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|----------------------------------|---------------|---------|----------|-----------------|
| Aotus gracillima | 10 | 160 | NEQ13-2 | small ylw pea |
| Astartea scoparia | 40 | 140-220 | NEQ13-10 | Astartea |
| Briza maxima | + | 30 | | Briza max |
| Bromus diandrus | + | 40 | NEQ13-9 | Grass |
| Calothamnus lateralis | 1-2 | 140 | | Calothamnus lat |
| Carpobrotus edulis | + | 5 | | Pigface |
| Cassytha flava | + | 40 | NEQ13-8 | Cassytha flrg |
| Cassytha racemosa forma racemosa | + | 140 | NEQ13-1 | Cassytha glab |

| | | | | |
|-----------------------------------|-------|---------|---------|--|
| <i>Dielsia stenostachya</i> | 5-10 | 25 | NEQ13-4 | Squiggly rush |
| <i>Gastrolobium ebracteolatum</i> | + | 90 | NEQ13-7 | Canocolata(?) pea |
| <i>Hypocalymma angustifolium</i> | 50% | 120 | | <i>Hypocalymma angust</i> |
| <i>Hypochaeris glabra</i> | + | 1 | | Hypoch glab |
| <i>Lepidosperma longitudinale</i> | 1-2 | 40 | NEQ13-3 | <i>Lepidosp longitud</i> |
| <i>Lysimachia arvensis</i> | + | 5 | | <i>Anagallis arv (orge flr)</i> |
| <i>Melaleuca preissiana</i> | 3-4 | (110)45 | | Mel preiscana |
| <i>Phyllangium paradoxum</i> | + | 4 | | <i>Phyllangium ?paradox not flg (finished)</i> |
| <i>Siloxerus humifusus</i> | + | 2 | NEQ13-5 | <i>Siloxerus</i> |
| <i>Taxandria linearifolia</i> | 10-15 | 230 | | <i>Taxandra lin</i> |
| <i>Xanthosia huegelii</i> | + | 10 | NEQ13-6 | <i>Xanthosia</i> |

NORTH ELLENBROOK: NEQ14

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 3/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 402949 mE | 6488620 mN | 115.975495 E | -31.733632 S |
| Habitat | (?) Shallow depression on lower slope. | | | | |
| Soil | Dry grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Beaufortia elegans open heath over Eremaea pauciflora var. pauciflora low shrubland over Lyginea barbata very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y 1.5m - 70%, 0.3m - 10% | | | | |

SPECIES LIST: NEQ14

| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
|--|-------------|--------|------------|-------------------------------|
| <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> | + | 150 | | <i>Adenanthos cygnorum</i> |
| <i>Alexgeorgea nitens</i> | + | 15 | (=NEQ4-10) | <i>Alexgeorgea grey</i> |
| <i>Allocausuarina humilis</i> | 1 | 140 | | <i>Allocausuarina humilis</i> |
| <i>Arnocrinum preissii</i> | + | 60 | NEQ14-6 | <i>Arnocrinum purple</i> |

| | | | | |
|---|----|-------|-----------|---------------------------------------|
| <i>Astroloma xerophyllum</i> | 1 | 45 | NEQ14-9 | <i>Leucopogon styphelia</i> |
| <i>Austrostipa compressa</i> | + | 30 | (=NEQ4-4) | <i>Austrostipa flav</i> |
| <i>Banksia attenuata</i> | + | 10 | | <i>Banksia attenuata</i> seedlings |
| <i>Beaufortia elegans</i> | 50 | 140 | NEQ14-1 | <i>Regelia beaufortia</i> |
| <i>Bossiaea eriocarpa</i> | + | 25 | | <i>Bossiaea eriocarpa</i> |
| <i>Briza maxima</i> | + | 20 | | <i>Briza maxima</i> |
| <i>Carpobrotus edulis</i> | + | 20 | | <i>Carpobrotus edulis</i> |
| <i>Cassytha flava</i> | + | C(??) | NEQ14-4 | <i>Cassytha furry</i> fruit |
| <i>Centrolepis mutica</i> | + | 5 | NEQ14-11 | <i>Centrolepis awnless</i> |
| <i>Crassula colorata</i> var. <i>colorata</i> | + | 5 | | <i>Crassula colorata</i> |
| <i>Croninia kingiana</i> | + | 50 | NEQ14-5 | <i>Leucopogon ruscifolia</i> |
| <i>Dasyogon bromeliifolius</i> | 1 | 25 | | <i>Dasyogon bromclifolius</i> |
| <i>Desmocladus flexuosus</i> | 1 | 15 | NEQ14-8 | <i>Desmocladus hairy</i> |
| <i>Ehrharta calycina</i> | 1 | 40 | | <i>Ehrarta calycina</i> |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 15 | 80 | NEQ14-2 | <i>Eremaea pauciflora</i> |
| <i>Gladiolus caryophyllaceus</i> | + | 30 | | <i>Gladiolus caryophyllareu</i> |
| <i>Gompholobium tomentosum</i> <i>tomentosum</i> | + | 20 | | <i>Gompholobium</i> |
| <i>Isolepis marginata</i> | + | 5 | NEQ14-12 | <i>Isolepis marginata</i> |
| <i>Laxmannia grandiflora</i> subsp. <i>grandiflora</i> | + | 15 | NEQ14-3 | <i>Laxmannia dry</i> |
| <i>Lomandra hermaphrodita</i> | + | 20 | | <i>Lomandra hermaphrodita</i> |
| <i>Lyginia barbata</i> | 3 | 40 | NEQ14-7 | <i>Lyginia barbata</i> |
| <i>Patersonia occidentalis</i> | + | 35 | | <i>Patersonia occidentalis</i> |
| <i>Pentaschistis airoides</i> | + | 25 | | <i>Pentaschistis</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petrophile linearis</i> |
| <i>Phyllangium paradoxum</i> | + | 5 | | <i>Phyllangium sp</i> |
| <i>Podotheca gnaphalioides</i> | + | 20 | | <i>Podotheca gnaphalliodes</i> |
| <i>Thysanotus sparteus</i> | + | 70 | NEQ14-10 | <i>Thysanotus scabru</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 23 | | <i>Ursinnea anthemoides</i> |
| <i>Verticordia nitens</i> | + | 120 | | <i>Verticordia nitens</i> |
| <i>Wahlenbergia preissii</i> | + | 15 | NEQ14-13 | <i>Wahlenbergia small hairy</i> |

NORTH ELLENBROOK: NEQ15

| | | | | | |
|---------------------|-----|-------------|-----------|-------------|-------------------|
| Described by | BRM | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
|---------------------|-----|-------------|-----------|-------------|-------------------|

| | | | | | |
|----------------------|--|-----------|------------|--------------|--------------|
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403002 mE | 6488755 mN | 115.976068 E | -31.732419 S |
| Habitat | Gentle, south-facing upperslope of low dune. | | | | |
| Soil | Grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana (not in quad) low woodland over Beaufortia elegans, Verticordia nitens open heath over Eremaea pauciflora var. pauciflora low shrubland over Schoenus curvifolius, Lyginia barbata scattered sedges. | | | | |
| Veg Condition | (BF) Excellent | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps Veget unit heath layer in area opens up to scattered Beaufortia elegans, Vert nitens open shbld over Eremaea pauc low shrubland to low open heath. | | | | |

| SPECIES LIST: NEQ15 | | | | |
|--------------------------------------|------------------|---------|------------|--------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia pulchella | + | 110 | NEQ15-15 | Acacia pulchella |
| Adenanthos cygnorum subsp. cygnorum | + | 90 | NEQ15-18 | Adenanthos cyg |
| Alexgeorgea nitens | + | 10 | (=NEQ12-) | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | NEQ15-4 | Amphipogon |
| Arnocrinum preissii | + | 50 | (=) | Agrostocrinum |
| Astroloma xerophyllum triangle lf | 1-2 | 70 | NEQ15-12 | Epacrid sht frt flr long |
| Austrostipa compressa | + | 40 | NEQ15-22 | Austrostipa |
| Austrostipa flavescens | + | 35 | NEQ15-17 | Grass |
| Banksia attenuata | 4 | 600 | | B attenuata |
| Banksia menziesii | 20 | 600 | | B menziesii |
| Beaufortia elegans | 50 | 120-160 | NEQ15-1 | Regelia sml frt |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 30 | (=NEQ12-) | Calytrix flav |
| Cassytha flava | + | 40 | NEQ15-6 | Cassytha hairy |
| Centrolepis drummondiana | + | 5 | (=) | Centrolepis drum |

| | | | | |
|--|-----|-------|-------------------|-------------------------------|
| <i>Conostylis juncea</i> | + | 25 | NEQ15-14 | Conostylis |
| <i>Croninia kingiana</i> | + | 150 | (=NEGB64) | Conostephium tall |
| <i>Dasypogon bromeliifolius</i> | + | 20 | Dasypogon brom | |
| <i>Daviesia triflora</i> | + | 35 | NEQ15-21 | Leafless glabrous |
| <i>Desmocladus flexuosus</i> | + | 12-35 | NEQ15-2 | Desmocladus flex |
| <i>Drosera erythrorhiza</i> | + | 3 | | Drosera eryth (dessicated) |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 6-8 | 50 | | Eremaea pauc |
| <i>Gladiolus caryophyllaceus</i> | + | 45 | | Gladiolus carve |
| <i>Gompholobium tomentosum</i> | + | 40 | | Gom tom |
| <i>Hibbertia hypericoides</i> | + | 45 | NEQ15-13 | Hib hyp |
| <i>Hibbertia subvaginata</i> | + | 25 | NEQ15-9 | Hibbertia ?subvag |
| <i>Hypolaena exsulca</i> | + | 45 | NEQ15-11 | Rush |
| <i>Isolepis marginata</i> | + | 6 | NEQ15-7 | Isolepis marg |
| <i>Jacksonia floribunda</i> | + | 180 | (=NEGB84) | Jacksonia floribunda |
| <i>Leucopogon conostephioides</i> | | 35-50 | NEQ15-10 | Epacrid sht triangle lf |
| <i>Lomandra caespitosa</i> | + | 35 | NEQ15-3 | Lomandra ?caespitosa |
| <i>Lomandra hermaphrodita</i> | + | 20 | (=) | Lomandra herm |
| <i>Lomandra preissii</i> | + | 35 | NEQ15-5 | Lomandra preissii |
| <i>Lyginia barbata</i> | + | 30 | | Lyginia |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | + | 35 | | Patersonia occidentalis |
| <i>Petrophile linearis</i> | + | 40 | | Petroph linearis |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | Phyllangium |
| <i>Schoenus curvifolius</i> | + | 35 | | Schoenus curvifolia |
| <i>Scholtzia involucreta</i> | + | 40 | (=NEQ12-) | Scholtzia involucre |
| <i>Stirlingia latifolia</i> | + | 60 | | Stirlingia latifolia |
| <i>Stylidium brunonianum</i> | + | 35 | NEQ15-19 | Stylid |
| <i>Stylidium repens</i> | + | 6 | (=NEQ12-) | Stylid repens |
| <i>Thysanotus sparteus</i> | + | 45 | NEQ15-20 | Thysanotus upright |
| <i>Trachymene pilosa</i> | + | 5-10 | | Trachymene pilosa |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 20 | | Ursinnia art |
| <i>Verticordia nitens</i> | 4-5 | 200 | (=) | Verticordia nitens |
| <i>Wahlenbergia preissii</i> | + | 30 | NEQ15-8 | Wahlenbergia |

NORTH ELLENBROOK: NEQ16

| | | | | | |
|----------------------|--|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | P | | | | |
| Location | | | | | |
| MGA Zone | 50 | 403212 mE | 6488494 mN | 115.978259 E | -31.734791 S |
| Habitat | Dampland flats. | | | | |
| Soil | Dry grey-brown loam. | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana low open forest over Astartea scoparia closed scrub over Cyathochaeta teretifolia open sedgeland. | | | | |
| Veg Condition | (BF) Pristine. | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y 11m - 40%, 2.3m - 95%, 1m - 15% | | | | |

SPECIES LIST: NEQ16

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|--------------------------|------------------|--------|-----------|--------------------------|
| Astartea scoparia | 95 | 230 | (=NEQ6-1) | Astartea |
| Carpobrotus edulis | + | 10 | | Carpobrotus edulis |
| Cyathochaeta teretifolia | 15 | 120 | (=NEQ6-9) | Cyathochaeta teretifolia |
| Leucopogon australis | + | 35 | NEQ6-6 | Leucopogon australis |
| Lobelia anceps | + | 25 | NEQ16-1 | Lobelia anceps |
| Meeboldina coangustata | + | 50 | NEQ16-2 | Meeboldina |
| Melaleuca preissiana | 40 | 1100 | | Mel preissiana |

NORTH ELLENBROOK: NEQ17

| | | | | | |
|---------------------|--|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 402850 mE | 6487826 mN | 115.974371 E | -31.740786 S |
| Habitat | Gentle, east-facing upper slope of low dune. | | | | |
| Soil | Grey-brown sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia menziesii, Eucalyptus todtiana low woodland over Beaufortia elegans, Verticordia nitens shrubland over Eremaea pauciflora var. pauciflora, Astroloma xerophyllum low shrubland over Schoenus curvifolius, Lyginia barbata scattered sedges. | | | | |

| | |
|----------------------|--|
| Veg Condition | (BF) Excellent. |
| Fire Age | More than 7-10 years since fire. |
| Notes | Pegged: 4 f dps and 4 caps Search intensity: thorough |

| SPECIES LIST: | | | | |
|--------------------------|--------------|---------|------------|--|
| NAME | COVER CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia pulchella | + | (4)300 | (=NEQ15-) | Ac pulch |
| Alexgeorgea nitens | + | 20 | | Alexgeorgea |
| Amphipogon turbinatus | + | 15 | NEQ17-8 | Amphipogon |
| Anigozanthos manglesii | + | 15-20 | NEQ17-6 | ??? Anigozanthos |
| Arnocrinum preissii | + | 45 | NEQ17-14 | Agrostocrinum |
| Astroloma xerophyllum | 5 | 80 | NEQ17-5 | Epacrid sht frt flr, long triangle lf |
| Austrostipa compressa | + | 40 | NEQ17-11 | Austrostipa |
| Banksia attenuata | 20 | 600-650 | | Bank attenuata |
| Banksia menziesii | 6 | 700 | | Bank menziesii |
| Beaufortia elegans | 11-12 | 120-190 | (=NEQ15-1) | Regelia |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Briza maxima | + | 20 | | Briza max |
| Burchardia congesta | + | 40 | | Burchardia congesta |
| Calytrix flavescens | + | 20 | (=NEQ12-) | Calytrix flav |
| Calytrix flavescens | + | 35 | NEQ17-18 | Calytrix fraseri |
| Cassytha flava | + | 20 | (=NEQ15-6) | Cassytha hry |
| Chordifex microcodon | + | 30 | NEQ17-3 | Rush (male) |
| Conostephium pendulum | +Astrol o | 35 | NEQ17-2 | Conostephium accumata ma xerophyl lum |
| Conostylis juncea | + | 20 | NEQ17-12 | Conostylis sht flr terete |
| Croninia kingiana | + | 110 | (=NEGB64) | Tall Euc/Conosteph |
| Dampiera linearis | + | 30 | | Dampiera linearis |
| Dasypogon bromeliifolius | + | 30 | | Dasypogon brom |
| Daviesia triflora | + | 50 | NEQ17-16 | Leafless |
| Drosera sp. | + | 30 | NEQ17-1 | Drosera climber dessicated |
| Eremaea pauciflora var. | 4-5 | 90 | | Eremaea pauc |

| | | | | |
|---|---|--------|-------------|-----------------------------|
| pauciflora | | | | |
| Eucalyptus todtiana | 4 | 500 | | Euc tod (not rooted in qdt) |
| Gladiolus caryophyllaceus | + | 35 | | Gladiolus caryoph |
| Gompholobium tomentosum | + | 60 | | Gom tom |
| Gonocarpus cordiger | + | 25 | NEQ17-4 | Herb ylw flr |
| Hibbertia hypericoides | 1 | 60 | Hib hyp | |
| Hibbertia subvaginata | + | 35 | NEQ17-10 | Hib subvag |
| Isolepis marginata | + | 3 | (=NEQ15-7) | Isolepis |
| Jacksonia furcellata | + | 140 | | Jacksonia furcelata |
| Laxmannia ramosa subsp. ramosa | + | 12 | NEQ17-7 | Laxmannia |
| Leucopogon conostephioides | + | 5 | NEQ17-15 | Astroloma |
| Leucopogon conostephioides | + | 30 | (=NEQ15-10) | Epacrid sht triangle lf |
| Lomandra caespitosa | + | 25 | NEQ17-19 | Lomandra caesalp |
| Lomandra hermaphrodita | + | 40 | NEQ17-20 | Lomandra |
| Lomandra hermaphrodita | + | 30 | NEQ17-9 | Lomandra hermaph |
| Lomandra preissii | + | 45 | NEQ17-17 | Lomandra preissii |
| Lyginia barbata | + | 40 | | Lyginia herb long rhizomes |
| Macrozamia riedlei | + | 45 | | Zamia |
| Patersonia occidentalis var. occidentalis | + | 45 | | Patersonia occid (wide lf) |
| Petrophile linearis | + | 45 | | Petroph lin |
| Philothea spicata | + | 70 | | Philothea spicata |
| Phyllangium paradoxum | + | 4 | (=) | Phyllangium |
| Schoenus curvifolius | + | 20 | | Schoenus curvifolius |
| Scholtzia involucrata | 1 | 110 | NEQ17-13 | Scholtzia invol |
| Stirlingia latifolia | + | 45 | | Stirlingia lat |
| Stylidium brunonianum | + | 30 | (=NEQ15-19) | Stylid pk |
| Stylidium repens | + | 10 | (=NEQ12-) | Stylid repens |
| Stylidium repens | | | NEQ17-7B | |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. anthemoides | + | 20 | | Ursinnia art |
| Verticordia nitens | 3 | 90-180 | (=) | Vert nitens |
| Wahlenbergia capensis | + | 35 | (=NEQ15- | Wahlenbergia capensis |

| | | | | |
|-----------------------|---|----|------------|--------------|
| | | | 16 | |
| Wahlenbergia preissii | + | 30 | (=NEQ15-8) | Wahlenbergia |

| NORTH ELLENBROOK: NEQ18 | | | | | |
|-------------------------|--|-----------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | | | | | |
| MGA Zone | 50 | 403268 mE | 6488409 mN | 115.978841 E | -31.735562 S |
| Habitat | Low flats adjacent to dampland flats. | | | | |
| Soil | Dry grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Eucalyptus marginata subsp. marginata open woodland over Banksia attenuata, Banksia ilicifolia low woodland over Hypocalymma angustifolium, Adenanthos obovatus low open shrubland over Hypolaena exsulca very open sedgeland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | About 6 years since fire. | | | | |
| Notes | Pegged: Y Search intensity: intense 10m - 20%, 2m - 20%, <1m - 30% | | | | |

| SPECIES LIST: NEQ18 | | | | |
|--------------------------|---------------|--------|------------|---------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Adenanthos obovatus | 2 | 100 | NEQ18-2 | Adenanthos obovatus |
| Aira caryophyllea | + | 10 | | Aira |
| Alexgeorgea nitens | + | 15 | | Alexgeorgea grey |
| Austrostipa compressa | + | 25 | NEQ18-17 | Austrostipa small |
| Banksia attenuata | 15 | 1000 | | Banksia attenuata |
| Banksia ilicifolia | 2 | 900 | | Banksia ilicifolia |
| Bossiaea eriocarpa | + | 25 | | Bossiaea eriocarpa |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Carpobrotus edulis | + | 15 | | Carpobrotus edulis |
| Centrolepis drummondiana | | | NEQ18-3b | |
| Centrolepis mutica | + | 5 | (=NEQ14-11 | Centrolepis awnless |

| | | | | |
|---|----|------|------------|----------------------------------|
| <i>Comesperma calymega</i> | + | 45 | NEQ18-5 | <i>Comesperma calycina</i> |
| <i>Conostephium pendulum</i> | + | 25 | NEQ18-13 | <i>Brachyloma wide</i> |
| <i>Conostephium preissii</i> | 1 | 45 | NEQ18-15 | <i>Brachyloma small</i> |
| <i>Corymbia calophylla</i> | + | 150 | | <i>Corymbia calophylla</i> |
| <i>Dasypogon bromeliifolius</i> | 2 | 25 | | <i>Dasypogon bromeliifolius</i> |
| <i>Daviesia physodes</i> | 1 | 150 | NEQ18-16 | <i>Daviesia preisii</i> |
| <i>Eucalyptus marginata</i> subsp. <i>marginata</i> | 3 | 1000 | | <i>Euc marginata</i> |
| <i>Gonocarpus cordiger</i> | + | 30 | NEQ18-7 | <i>Stackhousia</i> |
| <i>Hibbertia hypericoides</i> | + | 40 | | <i>Hibbertia hypericoides</i> |
| <i>Hibbertia subvaginata</i> | 1 | 30 | NEQ18-10 | <i>Hibbertia subvag grey</i> |
| <i>Hibbertia subvaginata</i> | + | 30 | NEQ18-11 | <i>Hibbertia subvag green</i> |
| <i>Hypocalymma angustifolium</i> | 7 | 50 | | <i>Hypocalymma angustifolium</i> |
| <i>Hypolaena exsulca</i> | 1 | 30 | | <i>Hypolaena exsulca</i> |
| <i>Isolepis marginata</i> | + | 5 | (=NEQ14-12 | <i>Isolepis marginata</i> |
| <i>Leucopogon conostephioides</i> | 1 | 20 | NEQ18-14 | <i>Leucopogon styphelia</i> |
| <i>Lomandra caespitosa</i> | + | 20 | NEQ18-4 | <i>Lomandra caespitosa</i> |
| <i>Lomandra hermaphrodita</i> | + | 10 | | <i>Lomandra hermaphrodita</i> |
| <i>Lomandra preissii</i> | + | 45 | NEQ18-6 | <i>Lomandra sanders</i> |
| <i>Patersonia occidentalis</i> | 7 | 40 | | <i>Patersonia occidentalis</i> |
| <i>Petrophile linearis</i> | + | 35 | | <i>Petrophile linearis</i> |
| <i>Philothea spicata</i> | + | 40 | NEQ18-12 | <i>Philothea spicata</i> |
| <i>Phyllangium paradoxum</i> | + | 5 | NEQ18-1 | <i>Phyllangium sp</i> |
| <i>Poranthera microphylla</i> | + | 5 | NEQ18-3 | <i>Poranthera</i> |
| <i>Pultenaea reticulata</i> | 2 | 80 | NEQ18-9 | <i>Prteneae</i> |
| <i>Quinetia urvillei</i> | + | 5 | | <i>Quinetia urvillei</i> |
| <i>Trachymene pilosa</i> | + | 5 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne tenella</i> | + | 20 | NEQ18-8 | <i>Tricoryne tenella</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinia anthemoides</i> |
| <i>Wahlenbergia preissii</i> | + | 10 | | <i>Wahlenbergia small hairy</i> |
| <i>Xanthorrhoea preissii</i> | 20 | 200 | | <i>Xanthorrhoea preissii</i> |

NORTH ELLENBROOK: NEQ19

| | | | | | |
|---------------------|-------------|-------------|-----------|-------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |

| | | | | | |
|----------------------|--|-----------|------------|--------------|--------------|
| MGA Zone | 50 | 402795 mE | 6488333 mN | 115.973841 E | -31.736208 S |
| Habitat | Flat (swale) between low dunes. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Banksia attenuata, Banksia ilicifolia, Banksia menziesii low woodland over Jacksonia furcellata scattered tall shrubs over Xanthorrhoea preissii, ?Xanthorrhoea brunonis subsp. brunonis shrubland over Eremaea pauciflora var. pauciflora, Calytrix flavescens, Astroloma xerophyllum low open shrubland over Lyginia barbata scattered sedges with Dasypogon bromeliifolius, Patersonia occidentalis var. occidentalis very open herbland. | | | | |
| Veg Condition | (BF) Excellent (some weeds, but low cover). | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 fdps and 4 caps Elevation: 45m | | | | |

| SPECIES LIST: | | | | |
|---------------------------------|------------------|--------|------------|--------------------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Acacia huegelii | + | 15 | NEQ19-15 | Acacia huegelii |
| Acacia pulchella | + | 10 | (=NEQ15-) | Ac pulchella |
| Aira caryophyllea | + | 12 | NEQ19-4 | Aira |
| Alexgeorgea nitens | + | 6 | | Alexgeorgea |
| Astroloma xerophyllum | 3 | 120 | (=NEQ17-5) | Epacrid sht fat flr long triangle lf |
| Austrostipa compressa | + | 40 | NEQ19-9 | Austrostipa |
| Banksia attenuata | 20-22 | 700 | | B attenuata |
| Banksia ilicifolia | 7 | 650 | | Bank ilicifolia |
| Banksia menziesii | + | 180 | | Banksia menz |
| Bossiaea eriocarpa | + | 20 | | Bossiaea eriocarpa |
| Briza maxima | + | 30 | | Briza max |
| Burchardia congesta | + | 30 | | Burchardia congesta |
| Calytrix flavescens | 2-3 | 20 | | Calytrix flav |
| Carpobrotus edulis | + | 3 | | Pigface |
| Cassytha flava | + | 20 | (=NEQ15-) | Cassytha hry |
| Conostephium minus | + | 30 | NEQ19-20 | Epacrid obtuse lf |
| Conostephium pendulum | + | 20 | NEQ19-6 | Conostephium acuminate |
| Conostylis juncea | + | 25 | NEQ19-13 | Conostylis sht flr |
| Crassula colorata var. colorata | + | 4 | NEQ19-17 | Crassula colorata |

| | | | | |
|--|-------|---------|------------|--|
| <i>Dasyogon bromeliifolius</i> | 6 | 20-30 | | Dasyogon brom |
| <i>Desmocladus flexuosus</i> | 1 | 10 | NEQ19-18 | Desmocladus flex |
| <i>Drosera erythrorhiza</i> | + | 1 | | <i>Drosera erythrorhiza</i> dessicated |
| <i>Ehrharta calycina</i> | + | 40 | | Ehr calycina |
| <i>Eremaea pauciflora</i> var. <i>pauciflora</i> | 2-3 | 30-60 | | <i>Eremaea pauc</i> |
| <i>Gastrolobium ebracteolatum</i> | + | 35 | NEQ19-8 | <i>Hovea trisperma</i> |
| <i>Gompholobium tomentosum</i> | + | 30 | | Gom tom |
| <i>Hibbertia subvaginata</i> | + | 15 | NEQ19-10 | <i>Hibbertia ?subvag</i> |
| <i>Hypochaeris glabra</i> | + | 15 | | <i>Hypochaeris</i> |
| <i>Isolepis marginata</i> | + | | NEQ19-3 | <i>Isolepis</i> |
| <i>Jacksonia furcellata</i> | 1-2 | 170-280 | NEQ19-1 | <i>Jacksonia furc</i> |
| <i>Lepidosperma pubisquameum</i> | + | 20-40 | NEQ19-14 | <i>Lepidosperma publi</i> |
| <i>Leucopogon squarrosus</i> subsp. <i>squarrosus</i> | + | 40 | NEQ19-12 | <i>Leucopogon smll ovate</i> leaf |
| <i>Lomandra hermaphrodita</i> | + | 15 | NEQ19-2 | <i>Lomandra hermaph</i> |
| <i>Lomandra odora</i> | + | 35 | NEQ19-5 | <i>Lomandra caes</i> |
| <i>Lyginia barbata</i> | + | 10 | | <i>Lyginia</i> |
| <i>Patersonia occidentalis</i> var. <i>occidentalis</i> | 1-2 | 45 | | <i>Patersonia occid wide lf</i> |
| <i>Pentaschistis airoides</i> | + | 15 | | <i>Pentaschistis (lost)</i> |
| <i>Petrophile linearis</i> | + | 20 | | <i>Petroph linearis</i> |
| <i>Philothea spicata</i> subsp. Moore River National Park (G. & D. | + | 35 | NEQ19-11 | <i>Philothea spicata</i> Woodman Op 47) |
| <i>Phyllangium paradoxum</i> | + | 4 | (=) | <i>Phyllangium</i> |
| <i>Scholtzia involucrata</i> | + | 40 | NEQ19-16 | <i>Scholtzia invol</i> |
| <i>Sonchus oleraceus</i> | + | 12 | | <i>Sonchus olerac</i> |
| <i>Stylidium repens</i> | + | 6 | (=) | <i>Stylid repens</i> |
| <i>Stylidium saxifragoides</i> | + | 1 | NEQ19-21 | <i>Stylid ciliate rosette</i> |
| <i>Trachymene pilosa</i> | + | 12 | | <i>Trachymene pilosa</i> |
| <i>Tricoryne elatior</i> | + | 40 | | <i>Tricoryne elator</i> |
| <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> | + | 30 | | <i>Ursinnia</i> |
| <i>Vulpia myuros</i> forma <i>myuros</i> | + | 15 | NEQ19-19 | <i>Vulpia</i> |
| <i>Xanthorrhoea brunonis</i> subsp. <i>brunonis</i> | 10-12 | | (=NEQ10-) | <i>Xanthor brunonis</i> |
| <i>Xanthorrhoea preissii</i> | 10-12 | 130 | | <i>Xanth preissii</i> |

| NORTH ELLENBROOK: NEQ20 | | | | | |
|-------------------------|---|-------------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403406 mE | 6488172 mN | 115.980274 E | -31.737712 S |
| Habitat | Dampland flats. | | | | |
| Soil | Dry grey brown peaty sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Melaleuca preissiana, Banksia littoralis open to closed low forest over Xanthorrhoea preissii open shrubland over Cyathochaeta teretifolia, Dielsia stenostachya sedgeland. | | | | |
| Veg Condition | (BF) Excellent. | | | | |
| Fire Age | More than 5 years since fire. | | | | |
| Notes | Pegged: Y 10m - 80%, 1m - 50% | | | | |

| SPECIES LIST: NEQ20 | | | | |
|----------------------------|---------------|--------|------------|-----------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Aotus gracillima | + | 50 | NEQ20-2 | Sphaerolobium leaflet |
| Astartea scoparia | 1 | 100 | (=NEQ6-1) | Astartea |
| Banksia littoralis | 5 | 900 | | Banksia littoralis |
| Carpobrotus edulis | + | 15 | | Carpobrotus |
| Cyathochaeta teretifolia | 25 | 100 | | Cyathochaeta |
| Dielsia stenostachya | 15 | 25 | (=NEQ6-4) | Turbastes like |
| Ehrharta brevifolia | + | 25 | NEQ20-3 | Ehrharta brevifolia |
| Hibbertia subvaginata | + | 20 | NEQ20-4 | Hibbertia swamp |
| Hypochaeris glabra | 1 | 20 | | Hypochaeris glabra |
| Kunzea glabrescens | + | 60 | | Kunzea glabrescens |
| Melaleuca preissiana | 75 | 1000 | | Melaleuca preissiana |
| Pentaschistis airoides | + | 15 | | Pentaschistis ateroid |
| Phyllangium paradoxum | + | 5 | (=NEQ18-1) | Phyllangium sp |
| Podotheca gnaphalioides | + | 15 | | Podotheca gnaphalia |
| Solanum nigrum | + | 15 | NEQ20-1 | Solanum |
| Sonchus asper | + | 90 | | Sonchus asper |
| Trachymene pilosa | + | 10 | | Trachymene pilosa |
| Ursinia anthemoides subsp. | + | 20 | | Ursinnia anthemoides |

| | | | |
|-----------------------|---|-----|--------------|
| anthemoides | | | |
| Xanthorrhoea preissii | 3 | 110 | Xanthorrhoea |

| NORTH ELLENBROOK: NEQ21 | | | | | |
|-------------------------|--|-----------|------------|--------------|-------------------|
| Described by | CH | Date | 4/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403233 mE | 6487945 mN | 115.978426 E | -31.739745 S |
| Habitat | Flat adjacent to dampland. | | | | |
| Soil | Grey sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Corymbia calophylla (Marri), Eucalyptus marginata subsp. marginata (Jarrah) open forest over Banksia attenuata scattered low trees over Xanthorrhoea preissii shrubland over Hypolaena exsulca scattered sedges and Dasypogon bromeliifolius open herbl. | | | | |
| Veg Condition | (BF) Very Good (a lot of past partial clearing in general area and probably past grazing). | | | | |
| Fire Age | More than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps | | | | |

| SPECIES LIST: | | | | |
|---------------------------------------|---------------|-----------|----------|-------------------------|
| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
| Banksia attenuata | 4% | (180)600 | | Banksia attenuata |
| Briza maxima | + | 20 | | Briza max |
| Conostephium pendulum | + | 25 | NEQ21-5 | Conostephium |
| Corymbia calophylla | 50-60 | 1200 | | Marri |
| Dasypogon bromeliifolius | 20 | 30 | | Dasypogon brom |
| Daviesia physodes | + | 30 | NEQ21-6 | Daviesia physodes (juv) |
| Eucalyptus marginata subsp. marginata | 11 | (450)1400 | | Jarrah |
| Hibbertia subvaginata | + | 20 | NEQ21-7 | Hibbertia |

| | | | | |
|---------------------------|-------|----------|---------|--------------------------|
| Hypolaena exsulca | + | 20 | NEQ21-3 | Hypolaena exsulca (male) |
| Lactuca serriola | + | 45 | NEQ21-2 | Sonchus |
| Lepidosperma pubisquameum | + | 30 | NEQ21-4 | Lepidosperma pubi |
| Macrozamia riedlei | + | 20 | | Zamia (juv) |
| Melaleuca preissiana | 1 | 450 | | Mel preisiana |
| Patersonia occidentalis | + | 35 | | Patersonia occid |
| Pinus pinaster | + | 450 | | Pinus 2 needle folllice, |
| rooted just outside qdt | | | | |
| Pinus pinaster | + | 10 | | Pigface edulis |
| Pterostylis sp. | + | 30 | NEQ21-1 | Pterostylis |
| Trachymene pilosa | + | 12 | | Trachymene pilosa |
| Xanthorrhoea preissii | 11-12 | 180(260) | | Xanth preis |

NORTH ELLENBROOK: NEQ22

| | | | | | |
|----------------------|---|-------------|------------|--------------|-------------------|
| Described by | BRM | Date | 10/12/2011 | Type | Quadrat 10m x 10m |
| Season | | | | | |
| Location | Property 11 | | | | |
| MGA Zone | 50 | 403108 mE | 6488431 mN | 115.977155 E | -31.735350 S |
| Habitat | Flat depression between low dunes. | | | | |
| Soil | Black peaty sand. | | | | |
| Rock Type | na | | | | |
| Vegetation | Mealeucal preissiana low woodland over Astartea scoparia open heath over Hypocalymma angustifolium low open shrubland over Dielsia stenostachya open to closed sedgeland. | | | | |
| Veg Condition | (BF) Excellent (no obvious signs of disturbance) | | | | |
| Fire Age | Greater than 7-10 years since fire. | | | | |
| Notes | Pegged: 4 f dps and 4 caps | | | | |

SPECIES LIST: NEQ22

| NAME | COVER C CLASS | HEIGHT | SPECIMEN | NOTES |
|-------------------|---------------|---------|----------|---------------------------|
| Aotus gracillima | 1 | 110-190 | NEQ22-4 | Shrub (?pea) |
| Astartea scoparia | 40-50 | 150 | NEQ22-1 | Astartea |
| Burchardia sp. | + | 40 | | Burchardia sp (no old flr |

| | | | | |
|--|-------|-------|---------|--------------------|
| | | | | spike??) |
| Cassytha racemosa forma racemosa | + | 120 | NEQ22-6 | Cassytha |
| Dielsia stenostachya | 60-70 | 40 | NEQ22-2 | Club sedge |
| Hypocalymma angustifolium | 5-8 | 110 | | Hypocalymma angust |
| Leucopogon australis | 2-3 | 45-90 | NEQ22-3 | Leucopogon |
| Melaleuca preissiana | 17-20 | 450 | | Mel preisiana |
| Pericalymma ellipticum var. ellipticum | + | 110 | NEQ22-5 | Perycalymma(??) |

APPENDIX SEVEN

Releve descriptions and species lists for the North Ellenbrook survey area

| NORTH ELLENBROOK SITE: NER1 | |
|-----------------------------|---|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 66 |
| Photo: | BM100:54, 55 |
| AMG: | Zone 50 401159mE, 6490461mN (WGS84) |
| Habitat: | Gentle, east-facing upper slope of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Eucalyptus todtiana</i> scattered low trees over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high shrubland over <i>Beaufortia elegans</i> , <i>Regelia inops</i> open shrubland over <i>Astroloma xerophyllum</i> scattered low shrubs over <i>Alexgeorgia nitens</i> open sedgeland. |
| Assoc. species: | <i>Lyginia barbata</i> , <i>Cassytha flava</i> , <i>Dampiera linearis</i> , <i>Verticordia nitens</i> (1.5m), <i>Stylidium crossocephalum</i> , <i>Burchardia congesta</i> , <i>Gompholobium tomentosum</i> , <i>Patersonia occidentalis</i> , <i>Lechenaultia floribunda</i> , <i>Macarthuria australis</i> , <i>Conospermum acerosum</i> subsp. <i>acerosum</i> (130cm), <i>Melaleuca seriata</i> (30cm). |
| Veg Condition | (BF): Good – appears to have previously been a Banksia woodland, which has been cleared or had the Banksia's cleared. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK SITE: NER2 | |
|-----------------------------|---|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:56, 57 |
| AMG: | Zone 50 401065mE, 6491107mN (WGS84) |
| Habitat: | Gentle, north-east facing slope of low dune. |
| Soil: | Grey-brown sand. |
| Vegetation: | <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high open shrubland to high shrubland over <i>Chamelaucium uncinatum</i> , <i>Scholtzia involucreta</i> shrubland over <i>Conostephium pendulum</i> (40cm), <i>Stirlingia latifolia</i> (40cm) scattered low shrubs to low open shrubland over <i>Lyginia barbata</i> scattered sedges. |
| Assoc. species: | |
| Veg Condition | (BF): Degraded – regrowth in old native cut flower farm cultivation area. |
| Fire Age: | More than 7 years since fire. |
| Notes: | Old native cut flower farm cultivation area. Would have been Banksia woodland prior to clearing for wildflower farm. |

| NORTH ELLENBROOK - SITE: NER3 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:58, 59 |
| AMG: | Zone 50 401180mE, 6491247mN (WGS84) |
| Habitat: | Flow line on valley floor/flat at base of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) scattered trees over <i>Melaleuca preissiana</i> scattered low trees over <i>Kunzea glabrescens</i> scrub over <i>Astartea scoparia</i> scattered shrubs over <i>Hypocalymma angustifolium</i> scattered low shrubs (to low heath in patches) over <i>Dielsia stenostachya</i> (35cm) very open sedgeland. |
| Assoc. species:. | <i>Acacia saligna</i> , <i>Zantedeschia aethiopica</i> (Arum lily) x1, <i>Dasypogon bromelifolius</i> , <i>Kennedia prostrata</i> , <i>Trachymene pilosa</i> , <i>Jacksonia furcellata</i> , <i>Gompholobium tomentosum</i> |
| Veg Condition | (BF): G – disturbed area with some apparent old earthwork's, ?past clearing, rubbish. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER4 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:60-63 |
| AMG: | Zone 50 401328mE, 6491339mN (WGS84) |
| Habitat: | Broad low rise (low dune). |
| Soil: | Pale grey sand. |
| Vegetation:. | <i>Banksia menziesii</i> , <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> low open woodland (regeneration after clearing for horticulture) over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> high open shrubland to high shrubland over <i>Verticordia nitens</i> open shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Scholtzia involucrata</i> low shrubland |
| Assoc. species: | <i>Jacksonia furcellata</i> , <i>Podothea gnaphaloides</i> , <i>Austrostipa ?compressa</i> . |
| Veg Condition (BF): | Good to Degraded – regrowth after past clearing; signs of old tractor tracks, by open areas ite?? Weed cover mostly low). |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER5 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 5/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:64 |
| AMG: | Zone 50 401449mE, 6491278mN (WGS84) |
| Habitat: | Flat plain. |
| Soil: | Dark grey sand. |
| Vegetation: | <i>Kunzea glabrescens</i> closed scrub over <i>Aotus gracillima</i> scattered shrubs to open shrubland over <i>Schoenus efoliatus</i> , <i>Dielsia stenostachya</i> very open sedgeland. |
| Assoc. species: | <i>Homalosciadium homalocarpum</i> , <i>Phyllangium paradoxum</i> , <i>Austrostipa compressa</i> , <i>Hypolaena exsulca</i> , <i>Hypocalymma angustifolium</i> . |
| Veg Condition (BF): | Good – regeneration after clearing for horticulture – native cut flower farming. |
| Fire Age: | Greater than 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER6 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:79-81 |
| AMG: | Zone 50 400975mE, 6490834mN (WGS84) |
| Habitat: | Broad depression on valley floor between low dunes. |
| Soil: | Grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Regelia inops</i> (170cm), (<i>Xanthorrhoea preissii</i>) closed heath over <i>Dasypogon bromeliifolius</i> , <i>Phlebocarya ciliata</i> , <i>Lyginia ?imberbis</i> (tussock) herbland/sedgeland. |
| Assoc. species: | <i>Trachymene pilosa</i> , <i>Wahlenbergia capensis</i> , <i>Hypochaeris glabra</i> , <i>Gompholobium tomentosum</i> , <i>Austrostipa compressa</i> , <i>Ursinnia anthemoides</i> , <i>Crassula colorata</i> , <i>*Isolepis marginata</i> , <i>Lomandra caespitosa</i> . |
| Veg Condition (BF): | Excellent – probably affected by water table draw down in past; disturbance of farm tracks etc nearby; low weed cover. |
| Fire Age: | More than 7 years since fire. |
| Notes: | Chris H's quad NEQ2 in disturbed area with little <i>Regelia</i> heath at west end of area. |

| NORTH ELLENBROOK - SITE: NER7 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 66 |
| Photo: | BM100:82-86 |
| AMG: | Zone 50 400894mE, 6490901mN (WGS84) |
| Habitat: | Broad depression (flats) between low dunes. |
| Soil: | Grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Xanthorrhoea preissii</i> high open shrubland over <i>Regelia inops</i> closed scrub over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> scattered shrubs over <i>Lyginia imberbis</i> (tussocks) scattered sedges. |
| Assoc. species: | <i>Pterostylis nana</i> complex, <i>Trachymene pilosa</i> , <i>Wahlenbergia preissii</i> , * <i>Hypochaeris glabra</i> , * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , <i>Dasyogon bromeliifolius</i> , <i>Phlebocarya ciliata</i> . |
| Veg Condition (BF): | ~Pristine – low weed cover, no signs of disturbance. |
| Fire Age: | Greater than 7 years since fire. |
| Notes: | Exceptional <i>Xanthorrhoea preissii</i> shrubs in this area (to 5 to 6 metres high!). |

| NORTH ELLENBROOK - SITE: NER8 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 65 |
| Photo: | BM100:87-89 (looking East) |
| AMG: | Zone 50 400962mE, 6490953mN (WGS84) |
| Habitat: | Lower slopes of dune, adjacent to flat. |
| Soil: | Pale grey sand. |
| Rock Type: | na |
| Vegetation: | <i>Banksia ilicifolia</i> scattered low trees over <i>Adenanthos cygnorum</i> subsp. <i>cygnorum</i> scattered tall shrubs over <i>Xanthorrhoea preissii</i> open shrubland over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> (40-80cm) low shrubland over <i>Lyginia barbata</i> , <i>Alexgeorgea nitens</i> open sedgeland. |
| Assoc. species: | <i>Patersonia occidentalis</i> , <i>Dasyogon bromeliifolius</i> , <i>Macrozamia riedlei</i> , <i>Tricoryne elatior</i> , <i>Haemodorum spicatum</i> , <i>Nuytsia floribunda</i> , <i>Burchardia congesta</i> . |
| Veg Condition (BF): | Excellent – low weed cover (<2%) of * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> and * <i>Ehrharta brevifolia</i> . |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER9 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 64 |
| Photo: | BM100:90-92 |
| AMG: | Zone 50 401489mE, 6491049mN (WGS84) |
| Habitat: | Depression between dunes. |
| Soil: | Dark grey (humic) sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low open forest over <i>Taxandria linearifolia</i> , <i>Astartea scoparia</i> high shrubland to open scrub over <i>Aotus gracillima</i> scattered shrubs over <i>Cyathochaeta teretifolia</i> , <i>Dielsia stenostachya</i> sedgeland. |
| Assoc. species: | <i>Cassutha racemosa forma pilosa</i> , <i>Burchardia congesta</i> (60-90cm), <i>Leucopogon australis</i> . |
| Veg Condition (BF): | Pristine – very low weed cover. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER10 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 63 |
| Photo: | BM100:93-94 |
| AMG: | Zone 50 401589mE, 6491030mN (WGS84) |
| Habitat: | Slight depression on flat plain. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) open woodland to woodland over <i>Melaleuca raphiophylla</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Kunzea glabrescens</i> high shrubland over <i>Xanthorrhoea preissii</i> scattered shrubs to open shrubland over <i>Dielsia stenostachya</i> open sedgeland. |
| Assoc. species: | <i>Jacksonia furcellata</i> , <i>Jacksonia sternbergiana</i> , <i>Austrostipa compressa</i> , <i>Podotheca gnaphalioides</i> , <i>Kennedia prostrata</i> . |
| Veg Condition (BF): | Good – probably past grazing, quite a lot of disturbance, quite good native vegetation cover in parts. |
| Fire Age: | About 7 or more years since last fire. |

| NORTH ELLENBROOK - SITE: NER11 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 7/11/2011 |
| Location: | Property 63 |
| Photo: | BM100:95-98 (looking East) |
| AMG: | Zone 50 401683mE, 6490905mN (WGS84) |
| Habitat: | Flat plain. |
| Soil: | Grey-brown sand. |
| Vegetation: | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah) scattered trees over <i>Banksia attenuata</i> , <i>Banksia ilicifolia</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> shrubland over <i>Dielsia stenostachya</i> , * <i>Pentstemon airoides</i> very open grassland/sedgeland. |
| Assoc. species: | <i>Patersonia occidentalis</i> , * <i>Carpobrotus edulis</i> , * <i>Briza maxima</i> , <i>Podotrochea chrysantha</i> (open hds), <i>Dasypogon bromeliifolius</i> , <i>Jacksonia furcellata</i> , * <i>Ehrharta calycina</i> . |
| Veg Condition (BF): | Good to Degraded – a lot of a few native taxa; very weedy between <i>Xanthorrhoea preissii</i> shrubs. |
| Fire Age: | More than about 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER12 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 8/11/2011 |
| Location: | Property #21 |
| Photo: | BM100:102, 103 |
| AMG: | Zone 50 402704mE, 6489076mN (WGS84) |
| Habitat: | Flow line between low dunes. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low closed forest over * <i>Ehrharta longiflora</i> closed grassland. |
| Assoc. species: | * <i>Arctotheca calendula</i> (Capeweed), <i>Xanthorrhoea preissii</i> , <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , * <i>Hypochaeris glabra</i> , <i>Astartea scoparia</i> , * <i>Jacaranda mimosifolia</i> (Blue Jacaranda), <i>Pinus pinaster</i> (Pinaster Pine) (at stone causeway). |
| Veg Condition (BF): | Degraded to Completely Degraded – too many <i>M. preissiana</i> trees to call it CD, but only weed grassland/herbland understory. |
| Fire Age: | More than about 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER13 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 8/11/2011 |
| Location: | Property #20 |
| Photo: | BM100:105, 106, 107 (looking North East from site) |
| AMG: | Zone 50 402668mE, 6489181mN (WGS84) |
| Habitat: | Gentle, east-facing mid to lower slope of dune. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Banksia menziesii</i> , <i>Banksia attenuata</i> scattered low trees over <i>Jacksonia floribunda</i> scattered tall shrubs over <i>Beaufortia elegans</i> (110-120cm), <i>Eremaea pauciflora</i> low shrubland to low open heath over <i>Lyginia barbata</i> open sedgeland. |
| Assoc. species: | <i>Nuytsia floribunda</i> , <i>Verticordia nitens</i> , * <i>Ursinnia anthemoies</i> subsp. <i>anthemoides</i> (2-5%). |
| Veg Condition (BF): | Good to Very Good (regrowth?) – although <i>Banksia</i> 's probably cleared or burnt out, low weed cover and low heath in good condition. |
| Fire Age: | Greater than 7 years since fire. |
| Notes: | |

| NORTH ELLENBROOK - SITE: NER14 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property #21 |
| Photo: | BM100:118, 119 |
| AMG: | Zone 50 402499mE, 6489415mN (WGS84) |
| Habitat: | Linear depression over/flow line at base of dune. |
| Soil: | Grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland to low open forest over <i>Regelia inops</i> high open shrubland over <i>Xanthorrhoea preissii</i> open shrubland over <i>Hypocalymma angustifolium</i> scattered low shrubs over <i>Dielsia stenostachya</i> sedgeland. |
| Assoc. species: | <i>Podotheca gnaphalioides</i> , <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> , <i>Trachymene pilosa</i> , * <i>Fumaria capreolata</i> , * <i>Hypochaeris glabra</i> , * <i>Ehrharta longiflora</i> , * <i>Briza minor</i> , * <i>Briza maxima</i> , * <i>Solanum nigrum</i> , * <i>Moraea flaccida</i> (Cape tulip), <i>Nuytsia floribunda</i> , <i>Astartea scoparia</i> . |
| Veg Condition (BF): | Good to Degraded (in parts) – quite weedy in parts, past grazing, change in water table(s). |
| Fire Age: | More than about 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER15 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property 20 |
| Photo: | BM100:123, 124 |
| AMG: | Zone 50 402778mE, 6489411mN (WGS84) |
| Habitat: | Flats adjacent to flow line. |
| Soil: | Grey sand. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri) open forest over <i>Xanthorrhoea preissii</i> scattered shrubs to open shrubland (some parts) over <i>Ehrarta calycina</i> closed grassland. |
| Assoc. species:. | * <i>Ursinia anthemoides</i> subsp. <i>anthemoides</i> , * <i>Hypochaeris glabra</i> , <i>Melaleuca seriata</i> , <i>Jacksonia sternbergiana</i> , <i>Nuytsia floribunda</i> |
| Veg Condition (BF): | Degraded to Completely Degraded – understory is a weed grassland. |
| Fire Age | : ? More than about 7 years since fire. |
| Notes: | Similar vegetation to site R10. <i>Melaleuca preissiana</i> along wetter edges of this unit. |

| NORTH ELLENBROOK - SITE: NER16 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 22/11/2011 |
| Location: | Property #13 |
| Photo: | BM100:91 |
| AMG: | Zone 50 400938mE, 6489145mN (WGS84) |
| Habitat: | Flat at base of low dune. |
| Vegetation: | <i>Eucalyptus rudis</i> (Flooded gum) open forest over <i>Melaleuca preissiana</i> , <i>Acacia saligna</i> scattered low trees over <i>Xanthorrhoea preissii</i> , <i>Astartea scoparia</i> high open shrubland over <i>Lepidosperma longitudinale</i> , <i>Dielsia stenostachya</i> open sedgeland with * <i>Bromus diandrus</i> , * <i>Pennisetum clandestinum</i> (Kikuyu), * <i>Briza maxima</i> , * <i>Avena barbata</i> open grassland. |
| Assoc. species: | <i>Gastrolobium ebracteolatum</i> (250cm), <i>Melaleuca raphiophylla</i> , * <i>Carpobrotus edulis</i> (Pigface), <i>Melaleuca lateritia</i> . |
| Veg Condition (BF): | Degraded – high weed cover. |
| Notes: | Areas of NER16 in grazing paddock (NW corner), have a * <i>Cynodon dactylon</i> (couch), <i>Centella asiatica</i> grassland/herbland. |

| NORTH ELLENBROOK - SITE: NER17 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 1/12/2011 |
| Location: | Property #14 |
| Photo: | BM100:173, 174 |
| AMG: | Zone 50 401170mE, 6489727mN (WGS84) |
| Habitat: | Gentle slopes adjacent to dampland depression. |
| Soil: | Grey sand. |
| Vegetation: | <i>Eucalyptus marginata</i> subsp. <i>marginata</i> (Jarrah), <i>Corymbia calophylla</i> (Marri) scattered trees over <i>Banksia ilicifolia</i> , <i>Banksia attenuata</i> scattered low trees to low open woodland (patches) over <i>Regelia inops</i> , <i>Xanthorrhoea preissii</i> , <i>Pultenaea reticulata</i> shrubland over <i>Hypocalymma angustifolium</i> scattered low shrubs over <i>Hypolaena exsulca</i> open sedgeland with <i>Dasypogon bromeliifolius</i> very open herbland. |
| Assoc. species: | <i>Macrozamia riedlei</i> , * <i>Briza maxima</i> , <i>Lomandra hermaphrodita</i> , <i>Trachymene pilosa</i> , <i>Tricoryne elator</i> , <i>Patersonia occidentalis</i> . |
| Veg Condition (BF): | ?Good – appears to have been grazed in past → open area and big pile of uprooted <i>Melaleuca preissiana</i> pushed up. |
| Fire Age: | Greater than 10 years since fire. |

| NORTH ELLENBROOK - SITE: NER18 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 1/12/2011 |
| Location: | Property #14 |
| Photo: | BM100:178 |
| AMG: | Zone 50 401214mE, 6489725mN (WGS84) |
| Habitat: | Linear depression between low dunes. |
| Soil: | Dark grey sand (organic) surface. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Astartea scoparia</i> open shrubland over <i>Hypocalymma angustifolium</i> low heath over <i>Dielsia stenostachya</i> very open sedgeland. |
| Assoc. species: | <i>Xanthorrhoea preissii</i> , <i>Taxandria linearifolia</i> , <i>Burchardia bairdiae</i> (60cm). |
| Veg Condition (BF): | Very Good – low weed cover, but possibly past disturbance to drainage/water tables. |
| Fire Age: | Greater than 7 years since fire. |

| NORTH ELLENBROOK - SITE: NER19 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property #63 |
| Photo: | BM100:194 |
| AMG: | Zone 50 401550mE, 6490115mN (WGS84) |
| Habitat: | Small swale between dunes. |
| Soil: | Pale grey sand. |
| Vegetation: | <i>Banksia ilicifolia</i> , <i>Banksia menziessi</i> low open woodland over <i>Xanthorrhoea preissii</i> open shrubland over <i>Eremaea pauciflora</i> , <i>Scholtzia involucrata</i> , <i>Melaleuca seriata</i> low shrubland over <i>Alexgeorgea nitens</i> , <i>Lyginia barbata</i> (rhizome) open sedgeland with <i>*Ehrarta calycina</i> very open grassland. |
| Assoc. species: | <i>Conostephium pendulum</i> , <i>Petrophile linearis</i> , <i>*Ehrarta sp.</i> , <i>Podotheca gnaphalioides</i> , <i>Patersonia occidentalis</i> , <i>Dasypogon bromeliifolius</i> , <i>Macrozamia riedlei</i> , <i>Jacksonia furcellata</i> , <i>*Pentaschistis airoides</i> , <i>*Gladiolus caryophyllaceus</i> , <i>*Ursinia anthemoides</i> , <i>Dampiera linearis</i> . |
| Veg Condition (BF): | Very Good. |
| Notes: | Similar to vegetation at quadrat NEQ10? |

| NORTH ELLENBROOK - SITE: NER20 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 4/12/2011 |
| Location: | Property #11 |
| Photo: | BM100:207, 208 |
| AMG: | Zone 50 403237mE, 6488691mN (WGS84) |
| Habitat: | Crest of low dune. |
| Soil: | Pale grey sand. |
| Elevation: | 47m |
| Vegetation: | <i>Eucalyptus todtiana</i> low open woodland over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> scattered tall shrubs to high open shrubland over <i>Beaufortia elegans</i> , (<i>Verticordia nitens</i>) open heath over <i>Eremaea pauciflora</i> var. <i>pauciflora</i> low open shrubland over <i>Schoenus curvifolius</i> , <i>Lyginia ? barbata</i> scattered sedges. |
| Assoc. species: | <i>Dasyopogon bromeliifolius</i> , <i>Calytrix flavescens</i> , <i>Conostylis serrulata</i> , * <i>Ursinia anthemoides</i> , <i>Jacksonia floribunda</i> , <i>Astroloma xerophyllum</i> , dead <i>Banksias</i> , a few <i>Allocasuarina fraseriana</i> in general area. |
| Veg Condition (BF): | Excellent? – very low weed cover but probably past <i>Banksia</i> deaths. |
| Fire Age: | Greater than 7-10 years since fire. |
| Notes: | Elevation: 47m, NB: probably = NEQ15 but old dead <i>Banksia</i> sts??? |

| NORTH ELLENBROOK - SITE: NER21 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 10/12/2011 |
| Location: | Property #18 |
| Photo: | BM100:27, 28 |
| AMG: | Zone 50 401921mE, 6489736mN (WGS84) |
| Habitat: | Flow line between low dunes. |
| Soil: | Dark grey sand. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Xanthorrhoea preissii</i> high open shrubland over <i>Pericalymma ellipticum</i> var. <i>ellipticum</i> , <i>Astartea scoparia</i> , <i>Regelia inops</i> open shrubland over <i>Melaleuca seriata</i> , <i>Hypocalymma angustifolium</i> low open shrubland over <i>Phlebocarya ciliata</i> , <i>Dasypogon bromeliifolius</i> herbland to closed herbland. |
| Assoc. species: | <i>Acacia saligna</i> , <i>Ehrarta calycina</i> , <i>Mesomelaena graciliceps</i> , <i>Wahlenbergia capensis</i> , <i>Acacia pulchella</i> . |
| Veg Condition (BF): | Very Good – areas of higher weed cover, but generally moderate cover; impacts from water bores. |
| Fire Age: | Greater than 7-10 years since fire. |

| NORTH ELLENBROOK - SITE: NER22 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 10/12/2011 |
| Location: | Property #16 |
| Photo: | BM100:30 |
| AMG: | Zone 50 401846mE, 6489730mN (WGS84) |
| Habitat: | Flats adjacent to flow line. |
| Soil: | Grey sand |
| Vegetation: | <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> , <i>Regelia inops</i> scattered shrubs to open shrubland (patches of <i>Regelia inops</i> heath) over <i>Beaufortia elegans</i> , <i>Eremaea pauciflora</i> , <i>Xanthorrhoea brunonis</i> low shrubland over <i>Lyginia</i> spp. scattered sedges with <i>Dasypogon bromeliifolius</i> , <i>Patersonia occidentalis</i> , <i>Phlebocarya ciliata</i> herbland. |
| Assoc. species: | <i>Adenanthos obovatus</i> , <i>Eucalyptus todtiana</i> , <i>Banksia ilicifolia spicatum</i> . (same unit 50m away), <i>Bossiaea eriocarpa</i> , <i>Calytrix flavescens</i> , <i>Hypolaena exsulca</i> , * <i>Ehrarta calycina</i> , * <i>Ursinia anthemoides</i> , * <i>Pentaschistis airoides</i> , <i>Haemodorum</i> |
| Veg Condition (BF): | Good – lot of old disturbance, with partial(?) clearing; hard to know how genuine veg unit is). |

Mapping Notes

| NORTH ELLENBROOK - SITE: NEM1 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property 20 |
| Photo: | BM100:120, 121 (looking East) |
| AMG: | Zone 50 402452mE, 6489660mN (WGS84) |
| Habitat: | Low rise on very gently undulating plain. |
| Soil: | Grey sand. |
| Vegetation: | <i>Nuytsia floribunda</i> scattered low trees over <i>Xanthorrhoea preissii</i> , ? <i>Xanthorrhoea brunonis</i> scattered shrubs over * <i>Carpobrotus edulis</i> , <i>Podotheca gnaphalioides</i> , * <i>Pentaschistis airoides</i> herbland/grassland. |
| Assoc. species: | * <i>Ehrarta calycina</i> (scattered), <i>Crassula colorata</i> var. <i>colorata</i> . |
| Veg Condition (BF): | Completely Degraded – pasture paddock |
| | Notes: A flat occupies the northern end of the paddock and has <i>Xanthorrhoea preissii</i> , ? <i>Xanthorrhoea brunonis</i> scattered shrubs to open shrubland over * <i>Carpobrotus edulis</i> , <i>Lupinus</i> sp., * <i>Bromus diandrus</i> , * <i>Cynodon dactylon</i> (Couch) herbland/grassland (Completely Degraded). |

| NORTH ELLENBROOK - SITE: NEM2 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 9/11/2011 |
| Location: | Property #20 |
| Photo: | BM100:122 |
| AMG: | Zone 50 402817mE, 6490018mN (WGS84) |
| Habitat: | Man-made soak (hole) at north-east corner of property. |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Astartea scoparia</i> closed heath over <i>Juncus pallidus</i> scattered sedges. |
| Assoc. species: | |
| Veg Condition (BF): | Degraded to Completely Degraded – banks beyond <i>Astartea</i> are * <i>Cynodon dactylon</i> (Couch), * <i>Carpobrotus edulis</i> herbland/grassland. |

| NORTH ELLENBROOK - SITE: NEM3 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 15/11/2011 |
| Location: | Property #56 |
| Photo: | BM100:1 |
| AMG: | Zone 50 402678mE, 6491234mN (WGS84) |
| Habitat: | low rise |
| Soil: | Grey sand |
| Vegetation: | <i>Eucalyptus todtiana</i> scattered (sparsely) low trees over * <i>Ehrarta calycina</i> closed grassland. |
| Veg Condition (BF): | Completely Degraded |
| Notes: | Pasture paddock. |

| NORTH ELLENBROOK - SITE: NEM4 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 15/11/2011 |
| Location: | (Property 56) |
| Photo: | BM100:2 |
| AMG: | Zone 50 402814mE, 6491564mN (WGS84) |
| Habitat: | Depression on plain. |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Juncus pallidus</i> open sedgeland over * <i>Lotus</i> sp. closed herbl. |
| Veg Condition (BF): | Completely Degraded – pasture paddock. |

| NORTH ELLENBROOK - SITE: NEM5 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 22/11/2011 |
| Location: | Property #13 (southern end) |
| Photo: | BM100:88-90 (South East corner looking East) |
| AMG: | Zone 50 401353mE, 6489044mN (WGS84) |
| Habitat: | Broad flats between dunes. |
| Vegetation: | <i>Corymbia calophylla</i> (Marri), * <i>Pinus pinaster</i> scattered trees to woodland over <i>Melaleuca preissiana</i> scattered low trees over <i>Xanthorrhoea preissii</i> scattered shrubs (parts) over * <i>Ehrarta calycina</i> , * <i>Pentaschistis airoides</i> , * <i>Hypochaeris glabra</i> , * <i>Ursinia anthemoides</i> closed grassland/herbland. |
| Assoc. species: | <i>Haemodorum spicatum</i> , <i>Jacksonia furcellata</i> , <i>Astartea scoparia</i> (large patch in SW approx???), weed orchid??? |
| Veg Condition (BF): | Completely Degraded – remnant <i>Melaleuca preissiana</i> and <i>Corymbia calophylla</i> on pasture paddocks. |
| Notes: | Pasture paddocks. |

| NORTH ELLENBROOK - SITE: NEM8 | |
|-------------------------------|---|
| Described by: | BM |
| Date: | 2/12/2011 |
| Location: | (Property 14/15) |
| Photo: | BM100: |
| AMG: | Zone 50 401338mE, 6489836mN (WGS84) |
| Habitat: | Depression between dunes. |
| Vegetation: | <i>Melaleuca preissiana</i> closed low forest over <i>Gastrolobium ebracteolatum</i> scattered tall shrubs over <i>Astartea scoparia</i> scattered shrubs over <i>Lepidosperma longitudinale</i> very open sedgeland. |
| Assoc. species: | <i>Lobelia anceps</i> , <i>Baumea articulata</i> , <i>Taxandria linearifolia</i> , <i>Centella asiatica</i> . |
| Veg Condition (BF): | Good – quite a lot of weeds. |
| Notes: | Similar to NEQ20. |

| NORTH ELLENBROOK - SITE: NEM9 | |
|-------------------------------|--|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property #63 |
| Photo: | BM100:192 |
| AMG: | Zone 50 401353mE, 6490615mN (WGS84) |
| Habitat: | Swale between dunes. |
| Soil: | Grey sand. |
| Vegetation: | <i>Banksia attenuata</i> , <i>Banksia menziesii</i> low woodland over <i>Adenanthos cygnorum</i> var. <i>cygnorum</i> scattered tall shrubs over <i>Xanthorrhoea presissii</i> open shrubland over <i>Leucopogon conostephioides</i> , <i>Bossiaea eriocarpa</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> scattered low shrubs over <i>Alexgeorgea nitens</i> open sedgeland with * <i>Ehrarta calycina</i> , * <i>Pentaschistis airoides</i> very open grassland and <i>Patersonia occidentalis</i> , <i>Dasyogon bromeliifolius</i> very open herbland. |
| Assoc. species: | <i>Burchardia congesta</i> , <i>Dampiera linearis</i> , <i>Petrophile linearis</i> , <i>Gompholobium tomentosum</i> . |
| Veg Condition (BF): | Very Good? Regrowth after past (old) partial or full clearing. |
| Notes: | Similar vegetation to NEQ10. |

| NORTH ELLENBROOK - SITE: NEM10 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 3/12/2011 |
| Location: | Property 11 |
| Photo: | BM100:195 |
| AMG: | Zone 50 402722mE, 6488658mN (WGS84) |
| Habitat: | Small swale between dunes. |
| Soil: | Pale grey-white sand. |
| Vegetation: | <i>Banksia ilicifolia</i> , <i>Nuytsia floribunda</i> scattered low trees over <i>Beaufortia elegans</i> , <i>Eremaea pauciflora</i> var. <i>pauciflora</i> , <i>Melaleuca seriata</i> low shrubs to low open heath over <i>Austrostipa compressa</i> , <i>Lyginia ?barbata</i> scattered grasses/sedges, <i>Phlebocarya ciliata</i> , <i>Dasyogon bromeliifolius</i> herbland. |
| Assoc. species: | |
| Veg Condition (BF): | Excellent – but lot of dead <i>Banksia</i> 's around edge of swale (drought?) |

| NORTH ELLENBROOK - SITE: NEM12 | |
|--------------------------------|---|
| Described by: | BM |
| Date: | 4/12/2011 |
| Location: | Property 11 |
| Photo: | BM100: |
| AMG: | Zone 50 402945mE, 6488347mN (WGS84) |
| Habitat: | Depression between low dunes. |
| Vegetation: | <i>Melaleuca preissiana</i> low woodland over <i>Regelia inops</i> closed scrub over <i>Lepidosperma longitudinale</i> very open sedgeland. |
| Assoc. species: | <i>Astartea scoparia</i> , <i>Trachymene coerulea</i> subsp. <i>coerulea</i> , <i>Dianella revoluta</i> var. <i>divaricata</i> , <i>Hibbertia stellaris</i> , <i>Nuytsia floribunda</i> . |
| Veg Condition (BF): | Excellent. |

| NORTH ELLENBROOK - SITE: NEM13 | |
|--------------------------------|--|
| Described by: | BM |
| Date: | 13/12/2011 |
| Location: | Property 71 |
| Photo: | BM100:57 (looking North) |
| AMG: | Zone 50 403762mE, 6491540mN (WGS84) |
| Habitat: | Shallow depression on plain. |
| Soil: | |
| Rock Type: | |
| Vegetation: | <i>Melaleuca preissiana</i> scattered low trees over <i>Juncus pallidus</i> open sedgeland with * <i>Lolium</i> sp., * <i>Vulpia</i> sp., * <i>Hypochaeris glabra</i> , * <i>Lotus</i> sp closed grassland/herbland. |
| Assoc. species: | |
| Veg Condition (BF): | Completely Degraded – cleared pasture paddock with few remnant <i>Melaleuca preissiana</i> . |
| Fire Age: | |
| Notes: | |

APPENDIX EIGHT

Reproduction of the statistical analysis for North Ellenbrook by Mr Chris Hancock

Data analysis

Groups

To test the alliances of the native plant communities in the context of the southern Swan Coastal Plain, the floristic data from the North Ellenbrook spring survey were amalgamated with the original data set used by Gibson et al. (1994) in their floristic survey of the southern Swan Coastal Plain. The entire data set (presence-absence data) was then re-analyzed using Bray-Curtis ordination based on the Sørensen similarity coefficient (Sørensen 1948) and the unweighted pair-group mean average (UPGMA) fusion method (Sneath and Sokal 1973) using the computer program PC-ORD (MJM Software Design). The positions of the North Ellenbrook quadrats within the output dendrogram were then used to allocate each quadrat to the community types defined by Gibson et al. (1994). As multiple additional sites tend to cluster together and disrupt the original Gibson et al. (1994) groupings, the North Ellenbrook quadrats were added to the Gibson dataset and analysed one at a time.

Occasionally UPGMA grouped a North Ellenbrook quadrat with quadrats from two or more Gibson et al. (1994) community types. In these cases the analysis was repeated using the flexible beta method of hierarchical grouping using the Sørensen distance measure with $\beta = -0.25$. This is one of two methods recommended by McCune and Grace (2002) as a way of avoiding space distortion and chaining among samples. The quadrats were also appraised in terms of the general descriptions given in Appendix 1 of Gibson et al. (1994). These methods enabled all but two of the North Ellenbrook quadrats to be allocated to the most appropriate southern Swan Coastal Plain community type. Quadrats NEQ20 and NEQ21, which were located in dampland and lowland country, did not show meaningful similarities with any of the Gibson et al. (1994) community types. Presumably these particular vegetation types were not sampled in the 1994 survey.

Results

| | UPGMA | FEXIBLE BETA | BEST GUESS |
|-------|-------------|--------------|-------------|
| NEQ1 | 23a | | 23a |
| NEQ2 | 4 | 4 | 4 |
| NEQ3 | 23a | | 23a |
| NEQ4 | 21c | 4 or 6 | 21c |
| NEQ5 | 23a | | 23a |
| NEQ6 | 11 or 4 | 11 | 11 |
| NEQ7 | 23b or 23a | 23a | 23a |
| NEQ8 | 23b or 23a | 23b | 23b |
| NEQ9 | 23a | | 23a |
| NEQ10 | 23b or 23a | 23a | 23a |
| NEQ11 | 23b | | 23b |
| NEQ12 | 23a | | 23a |
| NEQ13 | 11 | | 11 |
| NEQ14 | 6 | 21c | 21c |
| NEQ15 | 23a | | 23a |
| NEQ16 | 11,12,13 | 12 | 12 |
| NEQ17 | 23a | | 23a |
| NEQ18 | 21a,23b,23a | 23b | 23b |
| NEQ19 | 23a | | 23a |
| NEQ20 | 21C or 5 | 14 or 11 | doesn't fit |
| NEQ21 | 11 or 25 | 6 | doesn't fit |
| NEQ22 | 13 or 4 | 13 or 4 | 13 |

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Appendix F

360 Environmental (2013) Black Cockatoo Foraging and Breeding Assessment of North Ellenbrook

Our Ref: 117 AA

3 December 2013

Andrew Lang
ABN Group
Development Manager
Ground Floor Optima Building
133 Hasler Road
Osborne Park WA 6017
Via email: alang@abngroup.com.au

Dear Andrew

Black Cockatoo Foraging and Breeding Assessment of North Ellenbrook

1 . Background

Three species of Black Cockatoo occur in the south-west of Western Australia (WA) and all three species are protected under the following State and Commonwealth legislation:

- The *Wildlife Conservation Act 1950* (WC Act), Western Australia; and
- The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Commonwealth.

Carnaby's Black Cockatoo (*Calyptorhynchus latirostris*) is listed as Endangered under the WC Act and EPBC Act. The Red-tailed Black Cockatoo (*Calyptorhynchus banksia naso*) and Baudin's Black Cockatoo (*Calyptorhynchus baudinii*) are classified as Endangered under the WC Act and Vulnerable under the EPBC Act.

There are also EPBC Act referral guidelines for the three threatened species of Black Cockatoo that occur in the south-west of WA (DSEWPaC 2012 – now DoE). These guidelines are intended to assist proponents in determining whether a proposed action needs to be referred.

In spring 2012, a flora and vegetation survey was conducted by 360 Environmental Pty Ltd (360 Environmental) in the North Ellenbrook area. During this survey, several plant species

that are known dietary items and other tree species that are known to form hollows in which Black Cockatoos nest, were recorded in the survey area.

Consequently, 360 Environmental recommended that a Black Cockatoo assessment be undertaken to confirm the presence of foraging habitat (and foraging evidence) and determine if breeding habitat is present in the survey area.

2. Objectives

The objectives of the Black Cockatoo assessment were to:

- Confirm the presence of foraging habitat;
- Look for evidence of foraging; and
- Determine if potential breeding or breeding habitat was present.

3. Methodology

3.1. Survey Area

The survey area is approximately 30 km north east of Perth. The original flora survey area was much larger than the current survey area (Figure 1 – 1037 ha and 76.84 ha respectively). The original survey area was commissioned to look at additional landholdings, most likely as a due diligence exercise. The current survey area included land only under ownership/management of our client (ABN group) (Figure 2). We also further restricted our assessment, based on literature, to areas with vegetation that included known dietary items and or potential nesting trees (Valentine and Stock 2008).

The survey area is well within the known distribution and modelled distribution of Carnaby's Black Cockatoo, and very close to the boundary of the known and modelled distribution of the Red-tailed Black Cockatoo and Baudin's Black Cockatoo (DSEWPaC 2012; Johnstone *et al.* 2013).

3.2. Sampling

The Black Cockatoo foraging and breeding assessment was undertaken on the 23 November 2013. We traversed as much of the site as possible on foot to determine if foraging habitat was present and we were also looking for evidence of foraging e.g. chewed Banksia cones and particularly the chewed fruit (nuts) of Marri (*Corymbia calophylla*).

In order to determine if potential breeding or breeding trees were present, we traversed vegetation types (based on the 360 Environmental flora and vegetation report from 2012) that contained species of trees known to be used for nesting i.e. Marri and Jarrah (*Eucalyptus marginata*) and dead trees. Once located, trees were assessed based on the following criteria:

- Diameter at Breast Height (DBH) \geq 500 mm (50 cm); and
- Hollows present and their size (entrance diameter in cm).

The diameter of the trees was measured with a DBH tape measure. Trees with a DBH \geq 50 cm are considered to have hollow bearing potential, and as such are deemed potential breeding habitat.

We also recorded the tree height and the location of the tree with a GPS. In addition, signs of use, such as droppings and feathers were also searched for under each tree, particularly if hollows were noted.

The Black Cockatoo assessment was undertaken and where practical and relevant the methods used were those outlined in the EPBC Act referral guidelines for the three threatened Black Cockatoo species (2012).

4. Results

4.1. Foraging Assessment

Foraging habitat was present in all of the areas we traversed and occurs in all of the vegetation of the survey area (according to the vegetation mapping for the site – see 360 Environmental 2012). However, no signs of foraging were recorded during the assessment.

4.2. Breeding Assessment

During the breeding assessment, 14 trees that had a DBH \geq 50 cm were recorded (Table 1 and Figure 2). No obvious hollows were observed in these trees during the assessment.

No Black Cockatoos were recorded on site during the assessment.

Table 1. Tree species, their DBH, height and location in the survey area.

| Tree No. | Tree Species | DBH (cm) | Height (m) | Easting* | Northing |
|----------|--------------------------------------|----------|------------|----------|----------|
| 1 | Marri - <i>Corymbia calophylla</i> | 65 | 12 | 0402600 | 6489363 |
| 2 | Marri - <i>C. calophylla</i> | 51 | 12 | 0402408 | 6489402 |
| 3 | Marri - <i>C. calophylla</i> | 57 | 12 | 0402408 | 6489402 |
| 4 | Marri - <i>C. calophylla</i> | 52 | 12 | 0402410 | 6489398 |
| 5 | Marri - <i>C. calophylla</i> | 54 | 10 | 0402372 | 6489691 |
| 6 | Dead Tree | 57 | 14 | 0402369 | 6489699 |
| 7 | Marri - <i>C. calophylla</i> | 61.5 | 12 | 0401554 | 6490731 |
| 8 | Jarrah - <i>Eucalyptus marginata</i> | 70 | 16 | 0401547 | 6490823 |
| 9 | Marri - <i>C. calophylla</i> | 95 | 16 | 0401543 | 6490847 |
| 10 | Marri - <i>C. calophylla</i> | 85 | 18 | 0401528 | 6496859 |
| 11 | Jarrah - <i>E. marginata</i> | 68 | 19 | 0401566 | 6490874 |
| 12 | Dead Tree | 59 | 14 | 0401578 | 6490864 |
| 13 | Jarrah - <i>E. marginata</i> | 56 | 14 | 0401585 | 6490883 |
| 14 | Jarrah - <i>E. marginata</i> | 60 | 12 | 0401553 | 6490907 |
| 15 | Dead Tree | 71 | 8 | 0401586 | 6490928 |
| 16 | Marri - <i>C. calophylla</i> | 55 | 15 | 0401733 | 6490974 |
| 17 | Jarrah - <i>E. marginata</i> | 56 | 15 | 0401688 | 6490835 |

*Datum was GDA 94.

5. Summary of Findings

The key findings of the assessment are summarised below:

- The survey area does represent foraging habitat;
- No signs of foraging were recorded in the survey area during the assessment;
- During the assessment 14 trees considered potential breeding habitat were recorded;
- However, no hollows were recorded in these 14 trees; and
- No Black Cockatoos were recorded in the survey area during the assessment.

On behalf of

360 Environmental Pty Ltd

Luke Rogers – Senior Environmental Scientist

Enc:

Figure 1 – Significant Tree Locations

Appendix B – Plates

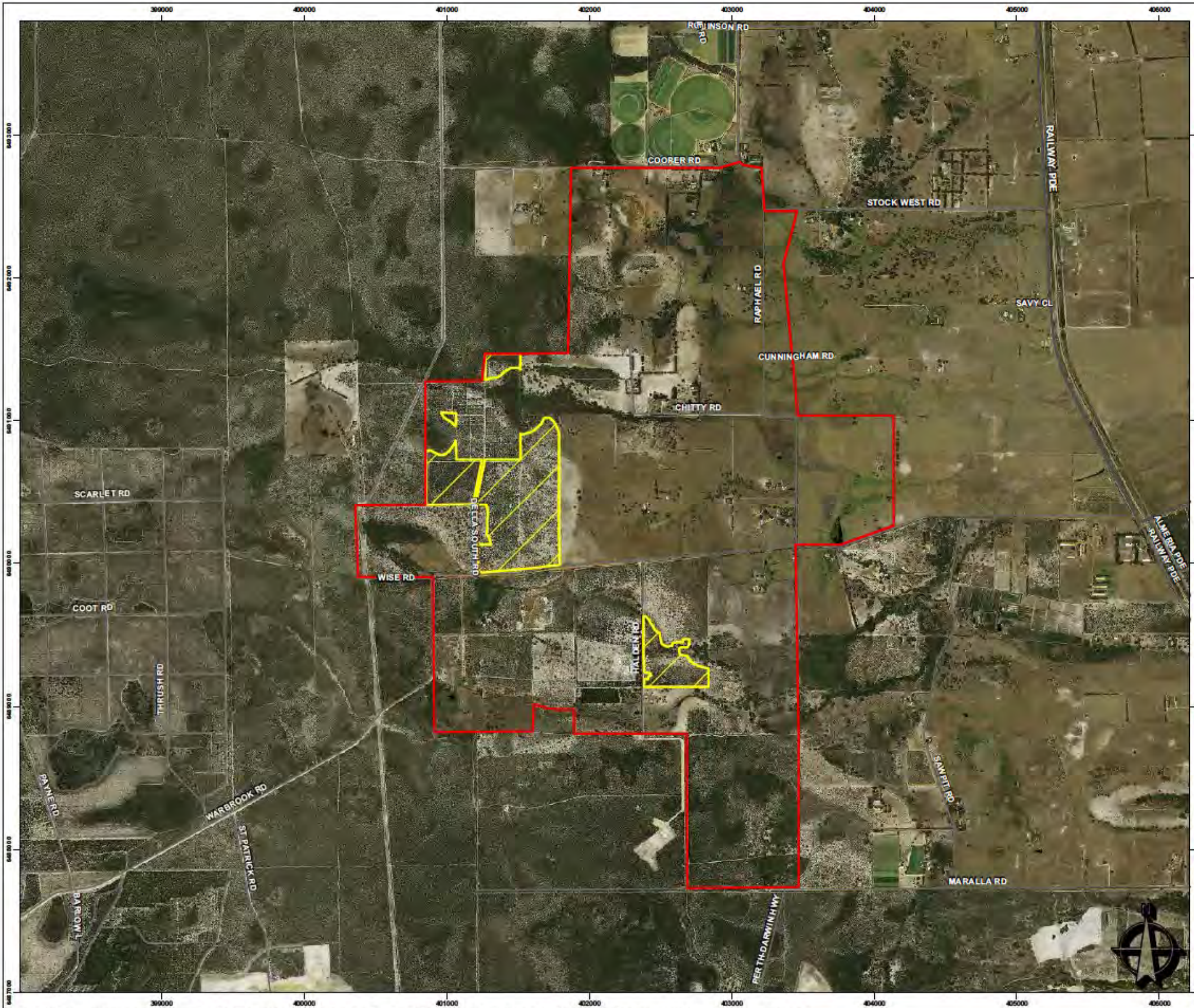
6. References

Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) (2012). EPBC Act Referral guidelines for three threatened black cockatoo species. <http://www.environment.gov.au/epbc/publications/pubs/referral-guidelines-wa-black-cockatoo.pdf> Accessed on 30/7/2012.

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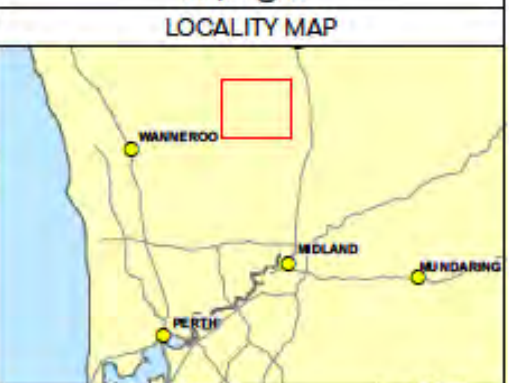
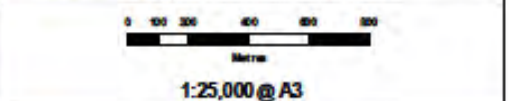
- Legend**
- Flora & Vegetation Assessment 2011
 - Foraging & Breeding Habitat 2013
 - Major Roads
 - Minor Roads

- TREE DATA RECORDED WITH GPS IN FIELD OCTOBER 2013 BY 360 ENVIRONMENTAL
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2008
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2013
 (© Western Australian Land Information Authority 2013)

SLIP ENABLER

- NOTE THAT POSITION ERRORS CAN BE ±5M IN SOME AREAS

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 f (08) 9381 2360
 www.360environmental.com.au



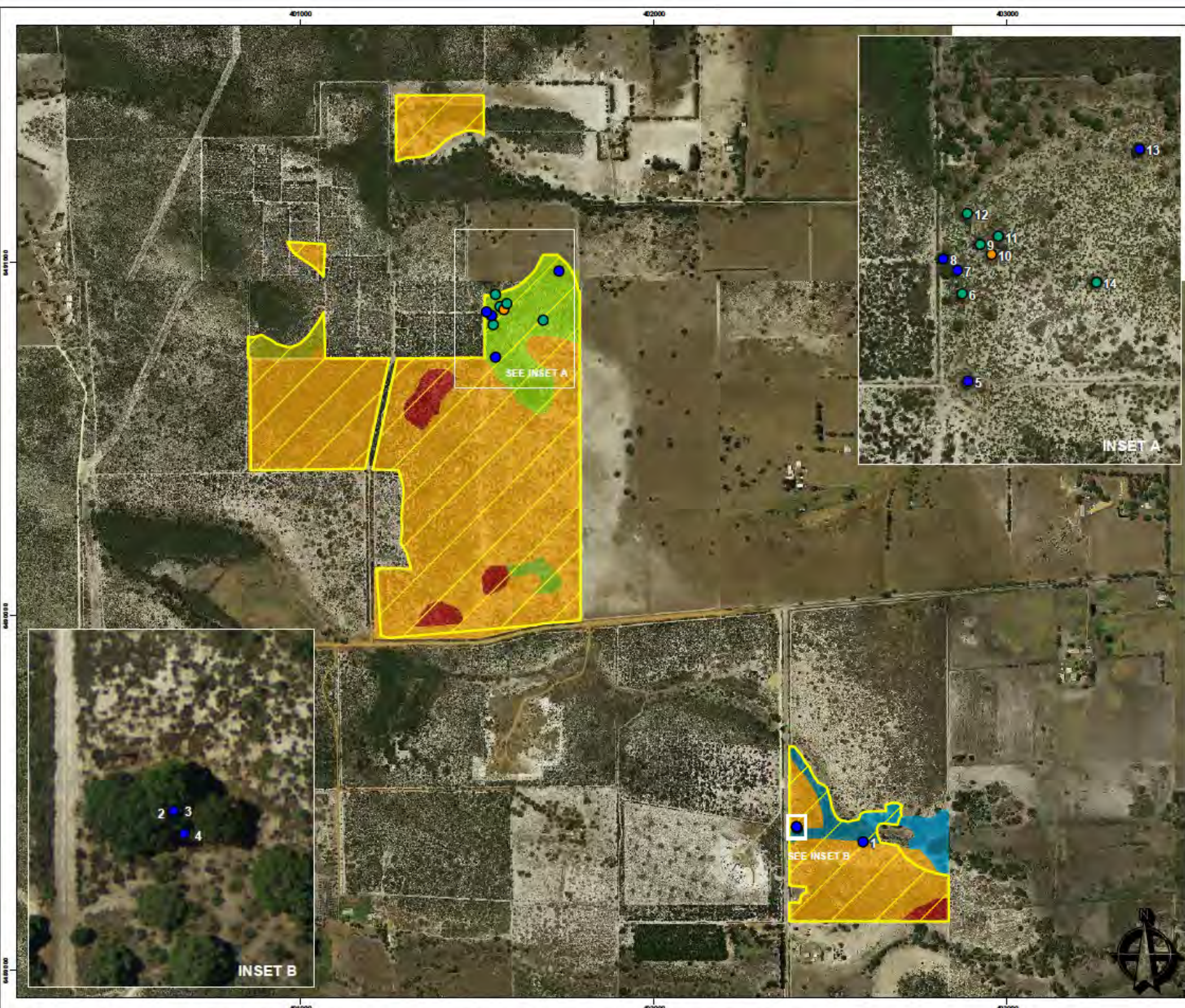
| | | | |
|---|---------------|--------------------|---------------|
| DRAWING ID tree_data_from_field_oct23 | | DATE 22/11/2013 | |
| HORIZONTAL DATUM AND PROJECTION GDA 1984 MGA Zone 50 | | | |
| CREATED CS | CHECKED RF | APPROVED TS | REVISION 0 |

ABN Group
 North Ellenbrook

A=N
 ALCOCK BROWN LEAVES GROUP

Significant Tree Survey

Figure 1 - Survey Area Overview



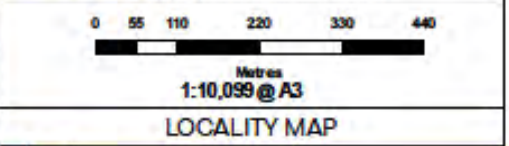
- Legend**
- Site Location
 - Native Vegetation Units**
 - BaBmBi
 - BaBmEt
 - BiXp
 - Cc
 - CcEm
 - EmBiXp
 - MpRi
 - Corymbia calophylla*
 - Eucalyptus marginata*
 - Dead tree

- TREE DATA RECORDED WITH GPS IN FIELD OCTOBER 2013 BY 360 ENVIRONMENTAL
 - CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
 - LOCALITY MAP SOURCED FROM LANDGATE 2008
 - AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2013
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| | | | |
|---|---------------|--------------------|---------------|
| DRAWING ID tree_data_from_field_oct23 | | DATE 22/11/2013 | |
| HORIZONTAL DATUM AND PROJECTION GDA 1984 MGA Zone 50 | | | |
| CREATED CS | CHECKED RF | APPROVED TS | REVISION 0 |

ABN Group
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 ALCOCK BROWN-HEAVES GROUP

Significant Tree Survey

Figure 2 - Foraging and Breeding Habitat

APPENDIX B

Plates



Typical Banksia Woodland that occurs in the survey area.



Large Marri - DBH 95 cm and height 16 m (no. 9 on Figure 2).

Appendix G

Heritage Assessments



Aboriginal Heritage Report

North Ellenbrook: Ethnographic heritage assessment of various lots

Report prepared by AHA Logic for 360 Environmental Pty Ltd
for Parcel Property Pty Ltd.

August 2019

Disclaimers

The analysis and recommendations contained within this report are based on information made available at the time of its preparation. The authors can take no responsibility for omissions and/or inconsistencies that may result from information becoming available subsequent to the report's completion. This report offers independent heritage advice and recommendations to assist 360 Environmental Pty Ltd and Parcel Property Pty Ltd. This advice is based on the authors' own opinions, interpretations, knowledge, and experience of the Aboriginal heritage system in WA and does not constitute legal advice.

AHA Logic Personnel

Mr. Aaron Rayner conducted the ethnographic survey and prepared this report for 360 Environmental. Aaron is the former Chief Heritage Officer and Deputy Director General at the Department of Aboriginal Affairs in Western Australia. In these roles Aaron was responsible for managing the *Aboriginal Heritage Act 1972* and its regulations and for providing advice to executive government, Aboriginal organisations and industry proponents. For five years Aaron was a member of the Aboriginal Cultural Material Committee (ACMC) the statutory body that provides advice to the Minister for Aboriginal Affairs on all Aboriginal heritage matters. Aaron is an experienced ethnographer with significant experience and expert understanding of the Aboriginal heritage regulatory framework in WA and is routinely called upon to provide expert witness testimony in the National Native title Tribunal and State Administrative Tribunal.

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- Ms Bella Bropho
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- Mrs Gwyn Corruna
- Mr Richard Wilkes
- Ms Violet Wilkes
- Ms Alison Wilkes
- Ms Tahn Donovan – South West Aboriginal Land and Sea Council
- Mr Andrew Murphy – Department of Planning, Land and Heritage

Executive Summary

This report details the results of an Aboriginal ethnographic survey undertaken for 360 Environmental for the North Ellenbrook Project Area on behalf of Parcel Property Pty Ltd. The survey comprised both desktop research and an ethnographic field survey.

The Project Area is located near Warbrook Road and Railway Parade approximately 26km north of Perth within the City of Swan. It is intended that the land be rezoned from rural to urban residential development under the Metropolitan Region Scheme (MRS) to support the proposed future land use of the existing environmental values. The purpose of the survey was to determine and confirm if any ethnographic sites are of importance and significance in Noongar custom and traditions are located within the Project Area. The survey was designed to support the approvals processes for an amendment to the MRS and fulfil the land developers' statutory obligations under the *Aboriginal Heritage Act 1972*.

The ethnographic survey was conducted with senior Aboriginal Consultants who have longstanding connections to the local area. In addition, an archaeological survey was carried out over a sample of the project area at the same time by Dr Kathryn Przywolnik of AHA Logic. This survey, its recommendations and results are reported separately.

The desktop assessment found three Aboriginal sites listed on the Aboriginal Heritage Inquiry System in the vicinity with the Project Area. One site NATGAS122 ID 4143 is a small artefact scatter located near a wetland in the western part of the survey area. This site is awaiting formal assessment by the Aboriginal Cultural Material Committee to determine whether it is an Aboriginal site under section 5 of the *Aboriginal Heritage Act 1972*, and therefore capable of legal protection.

The second site, Ellen Brook: Upper Swan ID 3525 relates to the upper section of the main channel and primary tributaries of this waterway. This site is registered as a mythological site and one of the tributaries intersects with the Project Area. The third site, Lord Street 02 ID15120 is awaiting assessment. It is recorded as a camping place with mythological associations. This site is not within the Project Area the centre point being some 6km away.

The ethnographic field survey was conducted on 22 May 2019. The survey team decided to inspect five (5) wetland locations within the Project Area. The Aboriginal survey participants confirmed that these wetland areas held some cultural significance because all water is important in the customs and traditions of Noongar People. The historic presence of cultural

artefacts (NATGAS 122 ID 4143) is evidence that Aboriginal people were using these wetlands.

The other water courses within the Project Area were also identified as being of cultural significance.

The Aboriginal survey participants requested that the developer avoid the five (5) wetland areas (**Attachment Three**), the tributary of Ellen Brook ID 3525 and other water courses when design occurs within the subsequent planning phases i.e. Local Structure Plan (LSP). They also noted that while not considered Aboriginal sites, their preference was for mature trees to be kept in situ as part of any future development.

Recommendations

These recommendations are informed by the desktop research, field survey and interviews with the Aboriginal survey participants. It is recommended that in considering future land use development that the proponent:

1. Notes the existence of Aboriginal site NATGAS122 ID 4143 and Ellen Brook: Upper Swan ID 3525 within the Project Area
2. Notes that consent under section 18 of the *Aboriginal Heritage Act 1972* would be required prior to any disturbance to NATGAS122 ID 4143 or Ellen Brook: Upper Swan ID 3525
3. Notes the five wetland areas and other water courses within the Project Area are of cultural significance to the Noongar People consulted and that a reasonable buffer should be implemented to avoid any damage to these areas
4. Notes that a formal assessment by the Aboriginal Cultural Material Committee would be required to determine whether these five areas are ethnographic sites under section 5b of the *Aboriginal Heritage Act 1972*
5. Further consultation with Noongar People prior to the future land use of the five areas and to agree management measures protect the cultural values associated with these places. This process can occur at subsequent planning processes i.e. LSP.
6. Wherever possible ensure that mature trees within the Project Area are not disturbed

Introduction

AHA Logic was commissioned by 360 Environmental Pty Ltd on behalf of Parcel Property Pty Ltd (the **Proponent**) to carry out Aboriginal ethnographic and archeological surveys to inform an environmental assessment report (**EAR**) for various land lots bound by Cooper Road and the Perth to Darwin Highway in North Ellenbrook, within the City of Swan (**Project Area**) refer to Attachment One.

The Project Area is within the Whadjuk Native Title Claim Area (WC2011/009). The Whadjuk region is one of six regions within Noongar Country. The purpose of the heritage assessment including the ethnographic survey was to determine whether the Project Area contains any known or previously unrecorded ethnographic sites that should be considered as part of the EAR. The ethnographic survey was undertaken by Mr. Aaron Rayner of AHA Logic in consultation with eight (8) Aboriginal people with a strong cultural association with the area. Sadly, one of the survey participants, Mr Albert Corunna passed away three (3) weeks following the survey. As a result, this survey report contains very few photographs as Mr. Corunna appears in most of them and out of respect for his family they will not be published.

An archeological survey was conducted at the same time by Dr Kathryn Przywolnik of AHA Logic. The findings of that report and its recommendations are reported separately.

This report contains the findings of the desktop assessment and field survey undertaken on 22 May 2019.

Scope of engagement

360 Environmental engaged AHA Logic to provide Aboriginal heritage due diligence advice including a field inspection, recommendations on how to proceed in compliance with the *Aboriginal Heritage Act 1972* (AH Act), and conduct a consultation with Aboriginal people about the proposed rezoning of the project area.

The Project Area that Parcel Property Ltd intends to rezone has already been the subject of environmental study to produce an EAR document that summarises the environmental factors and issues relevant to the specific area of the rezoning. The scope of this reports includes:

- Identification of known or potential Aboriginal archaeological and ethnographic heritage issues within the survey area that may affect the proposed development;

- Summary of outcomes of consultation with Aboriginal representatives with knowledge of Aboriginal heritage in the area; and
- Recommendations regarding compliance with the AH Act and management of Aboriginal heritage within the survey area.

Regulatory Framework: State Aboriginal heritage legislation

The AH Act is the primary legislation for protecting all Aboriginal heritage sites of significance in Western Australia whether they are known or unknown. Section 5 defines the places the Act protects. The legislative regime is expansive as it protects both cultural material places and sacred sites of importance and significance.

Section 5 of the Act applies to:

- (a) Any place of importance and significance where persons of Aboriginal descent have, or appeared to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with traditional cultural life of the Aboriginal people, past or present;
- (b) Any sacred, ritual, or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;
- (c) Any place which, in the opinion of the Committee, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological, or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State; and
- (d) Any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or remove.

Section 15 confers an obligation on anyone who discovers an Aboriginal site to report it to the Registrar of Aboriginal Sites or the Police.

Section 17 of the AH Act provides that it is a criminal offence to excavate, destroy, damage, conceal or in any way alter any Aboriginal site.

Section 18 of the AH Act provides the only means whereby a landowner can use land where an Aboriginal site might exist, and where a site can be altered or damaged in any way without the activity being an offence.

Section 62 provides that it is a defence if the charged person did not know and could not reasonably be expected to have known, that the place or object to which the charge relates was a place or object to which the Act applies.

Ethnographic Survey Methods

The ethnographic survey was conducted in the following stages:

- Desktop research
- Ethnographic field survey including interviews with the Aboriginal survey participants
- Report preparation

Desktop Research and Results – Aboriginal Sites

A search of the Aboriginal Heritage Inquiry System (**AHIS**) indicates that three Aboriginal sites are in the vicinity of the Project Area (**Attachment Two**). These include:

| ID | Name | Status | Type & Description |
|--------------|-------------------------|------------|--------------------|
| 3525 | Ellen Brook: Upper Swan | Registered | Mythological |
| 4143 | NATGAS 122 | Lodged | Artefacts scatter |
| 15120 | Lord Street 02 | Lodged | Mythological/Camp |

Ellen Brook: Upper Swan ID 3525

The Aboriginal heritage site file held by the DPLH is “closed”, which means it is not available to the public view. Information about the cultural values that relate to this site are available in several survey reports that are not culturally restricted. An analysis of these reports was carried out as part of the desktop assessment.

The mapping displayed on the AHIS is ‘dithered’ or artificially extended to protect the actual location of the site. However, the actual extent of the site is the waterway and an associated buffer either side of it and its main tributaries.

The primary informant of this site is Mr Robert Bropho deceased. His daughter, Ms Bella Bropho was part of the survey team for this survey. The site was recorded in 1993 during a survey undertaken by Dr E. McDonald. The Noongar name for Ellen Brook is *Gynning*. It is said to have two associations with the ‘turtle’, one being the Brook’s role as part of a

mythological turtle Dreaming Track. The other association is related to the ecological importance of turtles which use the brook to swim down to the Swan River. In addition, the brook is part of a system associated with the creation figure known as the *Waugal*.

In Aboriginal culture, ancestral beings and their corresponding myths are founded in the existence of the fauna and the flora of a region. Certain fauna and flora, and their corresponding regions, are mythicized in Aboriginal culture in the Dreamtime which is the integrating force of Aboriginal religious life and underlies and validates all Aboriginal life and culture.

The manifestations of the ancestral beings are apparent in regional animal and plant forms and regional geography. Aboriginal people perceive 'ancestral beings' as 'real' because their essence has impregnated all aspects of nature. With regard to the *Waugal*, the rainbow serpent its habitat extended roughly south west of Geraldton to Esperance, which is roughly the same distribution as the Noongar people.

Noongar Aboriginal mythological interpretation of the landscape of the southwest region is intimately connected with the *Waugal*, the principal *creator being* of the southwest region of WA. The *Waugal* of the Noongar people is similar to the other serpent mythologies in Aboriginal traditions throughout Australia and the belief systems that are associated with these creative beings have both regenerative and punitive aspects.

Bates who worked amongst Noongar people between 1904 and 1910 wrote that during the *Waugal's* creative journeys during the Dreamtime (in Noongar language *Nyitting*);

It made all the big rivers of the southwest. Wherever it travelled it made a river. The places where it camped were always sacred. All those places in the south west where it rested were made known by the presence of lime which was its excreta and certain salt pans now found inland were formed by its urine (Bates in White 1985:221).

Aboriginal mythology from the Perth area attributes the creation of waterways to the movements of the *Waugal*, the powerful serpent-like dreamtime spirit who watched over the law and punished transgressors.

The Bropho, Wilkes, and Corunna families have maintained an ongoing cultural connection to this site. They also have cultural responsibilities for the cultural health and maintenance of the site.

NATGAS 122 ID 4143

This site was recorded in 1981 during an Aboriginal heritage survey for the Dampier to Perth Gas Pipeline. It was recorded as a low-density artefacts scatter consisting of quartz and chert pieces. Further information is provided in the accompanying archeological survey report by Dr Kathryn Przywolnik.

Lord Street 02 ID 15120

This site was recorded during an ethnographic survey of the proposed Perth – Darwin Highway, Lord Street Extensions, Ellenbrook Gnarara Road to Maralla Road Section in 1995. It is described as a spiritual and camping place by the report author who interviewed an unnamed Aboriginal person¹. There is very limited information about the site except that it is located outside of the Project Area. Therefore, not further discussed as proposed rezoning and future works within the project area will not impact this site.

Desktop Research and Results – Aboriginal Site Surveys

A search of the AHIS shows that at least 16 separate Aboriginal heritage surveys have been undertaken within the general vicinity of the survey area since 1971. A list of reports relating to the survey area is provided in **Attachment Four**.

The multiple surveys overlap across the survey area and for the most part the extent of the geographic coverage for the reports on the AHIS has been generous. The reports relate to a wide variety of purposes, from due diligence exercises for installation of linear infrastructure (pipelines and roads) to reporting on National Heritage Estate and research projects and previous exploration and mining activity.

¹ Addendum Report of an Aboriginal Heritage Survey Proposed Perth – Darwin Highway. Lord Street Extensions, Ellenbrook Gnarara Road to Maralla Road Section by E. Blockley October 1995 page 21.

Ethnographic Field Survey

Aaron Rayner conducted the ethnographic field survey and consultation on 22 May 2019 with the participation of the following Whadjuk Noongar People:

- Ms Bella Bropho
- Mr Rob Baker
- Mr Albert Corunna
- Mr Nathan Corunna
- Mrs Gwyn Corruna
- Mr Richard Wilkes
- Ms Violet Wilkes
- Ms Alison Wilkes

Mr. Nathan Corunna stood in at last minute due to Maureen Nettle not attending.

All the consultants have a longstanding cultural association with the area and are the primary informants for most of the site registrations in the vicinity of the Project Area. The South West Aboriginal Land and Sea Council (SWLASC) routinely nominate these people to attend surveys in this region of the Whadjuk claim group area for their cultural knowledge of the landscape and the culturally significant sites within it.

At the commencement of the survey Mr Rayner gave an overview of the purpose of the survey and the objectives to rezone the land to support urban land use. A large (A0) map was scrutinized by the survey team at the commencement of the survey and five areas were identified by the survey team as areas of interest for closer inspection, as identified in Attachment Three. The discussions amongst the group focused on inspecting areas where there was a potential for the presence of water.

The five areas were approached by vehicles and pedestrian access.

The survey area is a mixture of agricultural land under crop cultivation, industrial land (sand mining), relatively open sand plain and areas moderately to densely vegetated with scrub and grasses. Ground surface visibility is variable, ranging from bare sandplain to thick woodland within well-watered areas. Some parts of the survey area could not be accessed due to thick vegetation obscuring the ground surface, and also presenting a safety hazard for the older

and less able survey team members.

Outcomes of Ethnographic Survey

The survey participants confirmed that the main Ellen Brook: Upper Swan Tributaries, other water courses and the five wetlands were of cultural significance to the Noongar people. This is because of the cultural association of the Waugal who is believed to have created and resides in all water sources (permanent and ephemeral). No specific mythological, ceremonial or ritual information was provided by the Aboriginal consultants. The information provided was generalized in nature.

Absent from these generalized reports are the type of ethnographic accounts recorded by early researchers such as Daisy Bates (1985), which highlight the variations in localized Waugal myths. Some Waugals, according to these accounts, were *boogur* (angry) and therefore dangerous to all, others to strangers, some always had to be propitiated with specific food and or rushes, others just treated respectfully.

The Aboriginal consultants stated that all waterways in the southwest are sacred sites because the mythical Waugal has created them. As a result, they reported concern about potential impacts of any proposed residential development upon all waterways and wetlands. In the absence of detailed ethnographic descriptions of the sacred, ritual or ceremonial aspects of the reported sites, it is unlikely that the ACMC would include the sites in the Register of Aboriginal Sites.

Nevertheless, it is the case that in this consultation the Noongar people stated that the five wetland areas and the tributaries of the Ellen Brook continue to be protected and that any proposed land development design avoids these places. A map of these areas is at **Attachment Three**. Photographs are provided in **Attachment Five**, and a table of photograph GPS points in **Attachment Six**

The survey participants explained that they had historic associations and cultural obligations to the maintenance of Ellen Brook ID 3525. Mr. Corunna and Mr. Wilkes explained the Dreamtime story of the turtle and its importance in Noongar traditions. Mr. Corunna explained the importance of the health of the creek system and that it was important to protect it and keep it healthy. Mr. Wilkes agreed that no damage to the wetlands or creek should be caused.

Conclusions and Recommendations

This report presents the findings of Aboriginal heritage ethnographic survey undertaken for 360 Environmental on behalf of Parcel Property Ltd for the North Ellenbrook Project Area. There are two existing recorded sites within the Project Area listed on the AHIS. The eight (8) Aboriginal people who participated in the survey have longstanding historical and familial connections to the survey area, confirmed that these places continue to be of importance and significance in Noongar customs and traditions.

The ethnographic survey identified five hitherto unreported wetland areas as being of general cultural significance to Noongar people because of their associations with the Waugal creative being. No specific sacred, ceremonial or ritual information was provided during the survey. On the information provided it cannot be confirmed whether these five places would constitute sites under section 5(b) of the AH Act. Nevertheless, the Aboriginal survey participants articulated that these places are of sentimental and historical importance and requested they be avoided.

In light of this feedback it would be prudent to avoid any impacts to these places. To ensure that these places can be preserved in a development context, it is recommended that further consultation with Noongar elders is conducted prior to any and use to ensure that adequate cultural heritage management measures can be put in place to reduce impacts to these places.

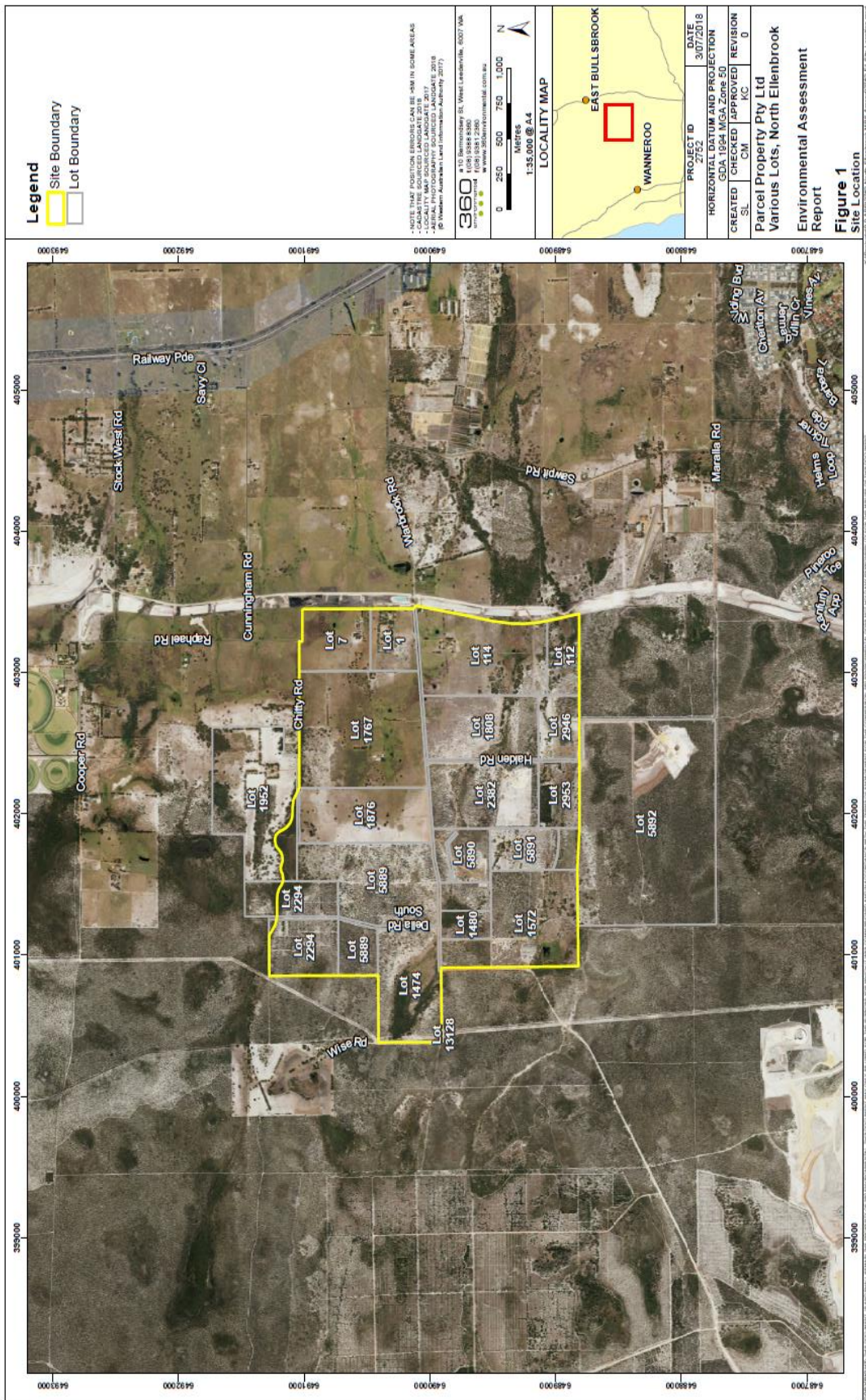
In the event that any proposed development would directly impact any of the registered sites and places identified during this survey, it is recommended that a consent under section 18 of the AH Act be obtained prior to any ground disturbing activities to avoid an offence against section 17 of the AH Act being committed. Specific consultation with Noongar elders would be required to support any section 18 application.

It is recommended that in considering future land use development that the proponent:

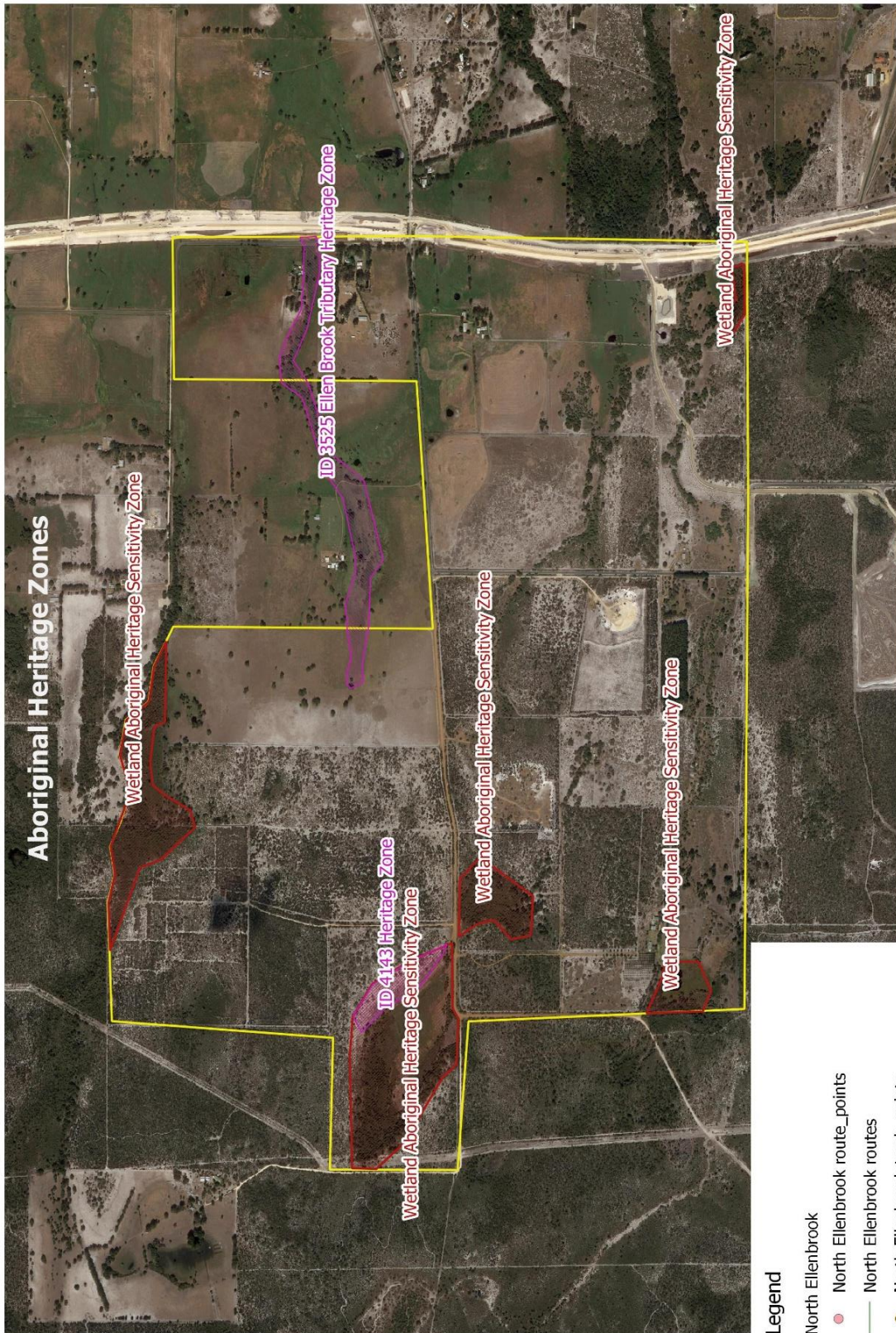
1. Notes the existence of Aboriginal site NATGAS122 ID 4143 and Ellen Brook: Upper Swan ID 3525 within the Project Area
2. Notes that a consent under section 18 of the *Aboriginal Heritage Act 1972* would be required prior to any disturbance to NATGAS122 ID 4143 or Ellen Brook: Upper Swan ID 3525

3. Notes the five wetland areas and other water courses within the Project Area are of cultural significance to the Noongar People consulted and that a buffer should be implemented to avoid or minimise damage to these areas
4. Notes that a formal assessment by the Aboriginal Cultural Material Committee would be required to determine whether these five areas are ethnographic sites under section 5b of the *Aboriginal Heritage Act 1972*
5. Further consults with Noongar People prior to the future land use of the five areas as per Attachment Three and to agree management measures protect the cultural values associated with these places
6. Wherever possible ensure that mature trees within the Project Area are not disturbed

Attachment One: Map of Survey Area



Attachment Three – All Aboriginal Heritage Places within Survey Area



Attachment Four – Survey Reports

| Date | Authors | Title |
|----------------------|--------------------------------------|--|
| April 1971 | University of Western Australia. | An Archaeological Survey Project: The Perth Area, Western Australia. |
| March 1979 | Dept of Aboriginal Sites. | Dampier to Perth Natural Gas Pipeline Route: A Survey for Aboriginal Sites. |
| 1982 | Pickering, Michael | An archaeological survey of the Dampier to Perth natural gas pipeline route: section 6 Muchea to Wagerup. |
| 1985 | Bates, Daisy | The Native Title Tribes of Australia |
| July 1985 | O'Connor, R., Bodney, C., Little, L. | Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan & Murray River Regions. |
| October 1995 | Blockley, E. | Addendum Report of an Aboriginal Heritage Survey Proposed Perth – Darwin Highway. Lord Street Extensions, Ellenbrook Gngangara Road to Maralla Road Section. |
| November 1986 | Dames & Moore | Gngangara Mound Groundwater Resources: environmental review and management programme |
| 1994 | Machin, Barrie | Ballaruk (traditional owners) Aboriginal site recording project |
| 1995 | Machin, Barrie | Ballaruk (traditional owners of Whadjuk territorial boundaries the lands of the Ballaruk Peoples) Aboriginal site recording project: additional material |
| February 2001 | McDonald, Hales and Associates. | Summary report on Aboriginal heritage investigations proposed Dampier to Bunbury natural gas pipeline corridor widening project: prepared to assist the Aboriginal Cultural Material Committee |
| February 2001 | McDonald, Hales and Associates. | Report on Aboriginal heritage investigations: proposed DBNGP pipeline corridor widening project |
| October 2003 | Hames Consultancy Group | Management report of Aboriginal Heritage aspects of the Dampier to Bunbury Natural Gas Pipeline corridor through the Perth Metropolitan Area |
| February 2005 | GHD | Perth - Darwin National Highway - alignment definition study: indigenous Heritage issues report field survey and consultation: Southern section - Maralla Road to the MRS Boundary |
| February 2005 | GHD | Perth - Darwin National Highway - alignment definition study: indigenous Heritage issues report filed survey and consultation: Northern section - MRS Boundary to Calingiri Road |

| | | |
|---------------------|------------------------------------|---|
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia Volume I |
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia: Volume 1 restricted report Volume II |
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia: Volume 2 inventory of registered sites restricted report for Department of Environment Volume III |
| July 2009 | Australian Interaction Consultants | Heritage Monitoring Report of Aboriginal Sites within Loop 9 of DBNGP Stage 5B, Bullsbrook to Beechboro, WA |

Attachment Five: Consultation Photographs



1. Wetland within Survey Area (400945 mE 6489128 mN Z50)



2. Cleared area within Survey Area (401381 mE 6490719 mN Z50)



3. Paddock within Survey Area (401850 mE 6489963 mN Z50)



4. Edge of Wetland within Survey Area (400853 mE 6490385 mN Z50)



5. Wetland (401295 mE 6489588 mN Z50)

Attachment Six: Photograph Geographic Coordinates

| Photograph number | Easting Z50 | Northing Z50 |
|-------------------|-------------|--------------|
| 1 | 400945 | 6489128 |
| 2 | 401381 | 6490719 |
| 3 | 401850 | 6489963 |
| 4 | 400853 | 6490385 |
| 5 | 401295 | 6489588 |



Aboriginal Heritage Report

North Ellenbrook: Archaeological heritage assessment of various lots

Report prepared by AHA Logic for 360 Environmental Pty Ltd
for Parcel Property Pty Ltd.

August 2019

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Disclaimers

The analysis and recommendations contained within this report are based on information made available at the time of its preparation. The authors can take no responsibility for omissions and/or inconsistencies that may result from information becoming available subsequent to the report's completion. This report offers independent heritage advice and recommendations to assist 360 Environmental Pty Ltd and Parcel Property Pty Ltd. This advice is based on the authors' own opinions, interpretations, knowledge, and experience of the Aboriginal heritage system in WA and does not constitute legal advice.

AHA Logic Personnel

Mr Aaron Rayner and Dr Kathryn Przywolnik conducted the field inspection and prepared this report for 360 Environmental Pty Ltd and Parcel Property Pty Ltd. Aaron is an experienced ethnographer and the former Chief Heritage Officer and Deputy Director General at the Department of Aboriginal Affairs in Western Australia. Kathryn Przywolnik is the former Registrar of Aboriginal Sites (seven years) and holds a PhD in archaeology, specialising in Aboriginal heritage. Aaron and Kathryn have significant experience and expert understanding of the Aboriginal Heritage regulatory framework in WA.

Glossary of Terms

| | |
|-----------|--|
| ACMC | Aboriginal Cultural Material Committee |
| AH Act | <i>Aboriginal Heritage Act 1972</i> |
| AHIS | Aboriginal Heritage Information System |
| DPLH | Department of Planning, Lands and Heritage |
| Minister | Minister for Aboriginal Affairs |
| NT Act | Native Title Act 1993 (Cth) |
| Register | Register of Aboriginal Sites |
| Registrar | Registrar of Aboriginal Sites |
| s18 | Section 18 of the <i>Aboriginal Heritage Act 1972 (WA)</i> |

Executive Summary

Parcel Property Pty Ltd (the proponent) is planning rezone a collection of lots (the site) from Rural to Urban through an amendment of the existing Metropolitan Region Scheme (MRS). The site and the general surrounds have been subject to heritage survey previously, although sporadically, and the Department of Planning, Lands and Heritage (DPLH) is aware of one Aboriginal heritage site and one lodged Aboriginal place mapped on the Aboriginal Heritage Information System (AHIS) as intersecting with the land area of the site.

The site is located in the area of North Ellenbrook, approximately 26km north of Perth. As part of its planning and rezoning, Parcel Property is required to undertake due diligence regarding Aboriginal heritage, and comply with the *Aboriginal Heritage Act 1972* (AH Act). To inform its planning and risk management, AHA Logic has conducted an ethnographic and archaeological Aboriginal heritage survey with Aboriginal site informants and knowledge holders. This report details the findings of the archaeological heritage survey.

The field inspection was undertaken on 22 May 2019. As a result of the field inspection, it was found:

- A tributary of Aboriginal site ID 3525 Ellen Brook exists within the survey area;
- Aboriginal place ID 4143 NATGAS 122 is located within the survey area; and
- Five areas of wetlands within the survey area are confirmed by the Aboriginal people participating in the survey as places of cultural importance and significance and are may meet the requirements of section 5 of the AH Act; and
- No Aboriginal objects were identified within the areas surveyed, although Aboriginal objects may exist in subsurface deposits in areas of intact original ground surface within and in the immediate vicinity of the 5 wetlands.

Recommendations

It is recommended that the proponent:

- Plan its ground disturbing activities to avoid the areas of ID 3525, ID 4143, and the five wetlands identified in this report;
- Apply a reasonable buffer (subject to further investigation) around ID 3525, ID 4143, and the five wetlands identified in this report;
- Take a precautionary approach and avoid waterways places where permanent water collects (e.g. soaks);
- Should avoidance of these area not be possible, further archaeological field investigation and ethnographic consultation with Aboriginal people regarding ID 3525, ID 4143, and the five wetlands identified in this report is necessary to evaluate the importance and significance of the sites and the proposed impacts to the heritage sites and places;
- Should avoidance of these area not be possible, seek consent from the Minister for Aboriginal Affairs pursuant to s18 of the *Aboriginal Heritage Act 1972* for ID 3525ID 4143 prior to any disturbance of the potential sites; and,
- Prepare a cultural heritage management plan in consultation with the Aboriginal knowledge holders for the area that identifies appropriate management measures and provisions for

long term care of ID 3525, ID 4143, and the five wetlands identified in this report.

It is also recommended that the Parcel Property ensure its staff and contractors are aware of the provisions of the AH Act.

Introduction

Parcel Property Pty Ltd (the proponent) is planning rezone a collection of lots (the site) from Rural to Urban through an amendment of the existing Metropolitan Region Scheme (MRS). The site is located in North Ellenbrook, approximately 26km north of Perth within the City of Swan.

Parcel Property commissioned 360 Environmental Pty Ltd (360 Environmental) to undertake biological and social environmental technical studies and provide advice on identification of environmental issues to support the progression of the rezoning through preparation of an Environmental Assessment Report (EAR), which was completed in November 2018.

Parcel Property's objective undertake rezoning of the site must consider impacts to Aboriginal heritage, and any subsequent development within the site is required to comply with the *Aboriginal Heritage Act 1972* (AH Act). 360 Environmental commissioned AHA Logic to undertake Aboriginal Heritage due diligence within the site, and advise on compliance with the AH Act.

Scope of engagement

360 Environmental engaged AHA Logic to due diligence advice including a field inspection, recommendations on how to proceed in compliance with the *Aboriginal Heritage Act 1972* (AH Act), and conduct a consultation with Aboriginal people about the proposed rezoning and future urban landuse of the site.

The site that Parcel Property intends to rezone has already been the subject of environmental study to produce an Environmental Assessment Report (EAR) document that summarises the environmental concerns and issues relevant to the specific area of the rezoning. The scope of this reports includes:

- Identification of known or potential Aboriginal archaeological heritage issues within the survey area that may affect the proposed development;
- Summary of outcomes of consultation with Aboriginal representatives with knowledge of Aboriginal heritage in the area; and,
- Recommendations regarding compliance with the AH Act and management of Aboriginal heritage within the survey area.

Survey area

The site covers a number of lots and comprises an area of approximately 607 ha in size. One lot within the site was not included in this Aboriginal heritage assessment as access to the lot had not been resolved at the time of the survey. A map of the portion of the site included in the scope for Aboriginal heritage survey (the survey area) is provided in **Attachment 1**.

The general area of the site includes a range of different land uses currently in operation, and has been subject to land clearing and agriculture for at least 50 years. Aerial photography has shown that most of the site had been cleared of vegetation and under cultivation in 1965 (360 Environmental November 2019). The land uses currently in operation within the survey area include sand mining, a pine plantation and agricultural cultivation. The survey area is networked with sealed roads and unsealed tracks, and it is evident that services and utilities including power, gas, water and waste water have been installed throughout the area. There are several human-built dams that collect water for agricultural purposes, and paddocks are clearly marked with fences and firebreaks. The combined past and current land uses have resulted in a landscape that is significantly modified and in parts highly disturbed.

Regulatory Framework

STATE ABORIGINAL HERITAGE LEGISLATION

The AH Act is the primary legislation for protecting all Aboriginal heritage sites of significance in Western Australia whether they are known or unknown. Section 5 defines the places the Act protects. The legislative regime is expansive as it protects both cultural material places and sacred sites of importance and significance.

Section 5 of the Act applies to:

- a) Any place of importance and significance where persons of Aboriginal descent have, or appeared to have, left any object, natural or artificial, used for, or made or adapted for use for, any purpose connected with traditional cultural life of the Aboriginal people, past or present;
- b) Any sacred, ritual, or ceremonial site, which is of importance and special significance to persons of Aboriginal descent;
- c) Any place which, in the opinion of the Committee, is or was associated with the Aboriginal people and which is of historical, anthropological, archaeological, or ethnographical interest and should be preserved because of its importance and significance to the cultural heritage of the State; and
- d) Any place where objects to which this Act applies are traditionally stored, or to which, under the provisions of this Act, such objects have been taken or removed.

Section 15 confers an obligation on anyone who discovers an Aboriginal site to report it to the Registrar of Aboriginal Sites or the Police.

Section 17 of the AH Act provides that it is a criminal offence to excavate, destroy, damage, conceal or in any way alter any Aboriginal site.

Section 18 of the AH Act provides the only means whereby a land owner can use land where an Aboriginal site might exist, and where a site can be altered or damaged in any way without the activity being an offence.

Section 28 establishes the Aboriginal Cultural Material Committee as an advisory body to the Minister for Aboriginal Affairs.

Section 38 provides for a Register of Aboriginal Places and Objects.

Section 39 prescribes the functions of the ACMC to evaluate on behalf of the community the importance of places and objects alleged to be associated with Aboriginal persons and to recommend to the Minister places and objects which, in the opinion of the ACMC, are, or have been, of special significance to persons of Aboriginal descent and should be preserved. Associated sacred beliefs, and ritual or ceremonial usage, in so far as such matters can be ascertained, are regarded as the primary considerations to be taken into account in the evaluation of any place or objects for the purposes of this Act.

Section 62 provides that it is a defence if the charged person did not know and could not reasonably be expected to have known, that the place or object to which the charge relates was a place or object to which the Act applies.

Existing Aboriginal heritage site information and Aboriginal heritage surveys

RECORDED ABORIGINAL SITES

The Department of Planning, Lands and Heritage (DPLH) maintains a Register of Aboriginal Sites (Register) and a database of heritage survey reports, which are accessed through the Aboriginal Heritage Information System (AHIS). A review of the AHIS shows that 1 Aboriginal site is entered in the Register of Aboriginal Sites (Register) that is mapped as intersecting with the survey area. In addition, a “lodged” place awaits formal assessment before entry in the Register by the Registrar of Aboriginal Sites (Registrar).

Aboriginal heritage site ID 3252 Ellenbrook: Upper Swan is a closed site recorded in the early 1990s as a site of importance and significance for its association within the mythological narratives of the Waugal, a dreaming being responsible for the creation of waterways within the southwest of Western Australia. Site ID 3525 is associated with the waters and river bed of the Ellen Brook, the main channel of which is located approximately 5km east of the survey area. The “closed” status of the site indicates that specific details regarding the location are deliberately obscured by the DPLH through application of an artificially enlarged “dithered” site boundary. The actual boundary of the site closely is aligned to the margins of Ellen Brook and its tributaries.

The “lodged” Other Heritage Place ID 4143 was originally recorded and reported in 1981, and is described as a small surface scatter of five basalt and quartz artefacts located within an area of vegetation clearing. The artefact scatter was found as part of field investigation for the Dampier to Perth natural gas pipeline project. Subsequent archaeological fieldwork in the area has failed to relocate the artefact scatter, and there is information relating to the site that is more recent than the original 1981 recording. Two archaeological field surveys, one in 2001 and another in 2009 observe that the scatter of artefacts that constitutes ID 4143 is unlikely to exist given the degree of land modification within the area.

A map of the Aboriginal site and place records relevant to the survey area is provided in **Attachment 2**. A summary of all sites and lodged places, with reference to the field inspection area, is provided in **Tables 1 and 2**.

| ID number | Name | Description |
|-----------|-------------------------|--------------|
| 3525 | Ellen Brook: Upper Swan | Mythological |

Table 1: Registered Aboriginal Site relevant to the field inspection area

| ID number | Name | Description |
|-----------|------------|-------------|
| 4143 | NATGAS 122 | Artefacts |

Table 2: Lodged Other Heritage Place relevant to the field inspection area

RECORDED ABORIGINAL SURVEYS

A search of the AHIS shows that at least 16 separate Aboriginal heritage surveys have been undertaken within the general vicinity of the survey area since 1971. A list of reports relating to the survey area is provided in **Table 3**.

The multiple surveys overlap across the survey area and for the most part the extent of the geographic coverage for the reports on the AHIS has been generous. The reports relate to a wide variety of purposes, from due diligence exercises for installation of linear infrastructure (pipelines and roads) to reporting on National Heritage Estate research projects and previous exploration and mining activity.

| Date | Authors | Title |
|----------------------|--------------------------------------|--|
| April 1971 | University of Western Australia. | An Archaeological Survey Project: The Perth Area, Western Australia. |
| March 1979 | Dept of Aboriginal Sites. | Dampier to Perth Natural Gas Pipeline Route: A Survey for Aboriginal Sites. |
| 1982 | Pickering, Michael | An archaeological survey of the Dampier to Perth natural gas pipeline route: section 6 Muchea to Wagerup. |
| July 1985 | O'Connor, R., Bodney, C., Little, L. | Preliminary Report on the Survey of Aboriginal Areas of Significance in the Perth Metropolitan & Murray River Regions July 1985. |
| November 1986 | Dames & Moore | Gnangara Mound Groundwater Resources: environmental review and management programme |
| 1994 | Machin, Barrie | Ballaruk (traditional owners) Aboriginal site recording project |
| 1995 | Machin, Barrie | Ballaruk (traditional owners of Whadjuk territorial boundaries the lands of the Ballaruk Peoples) Aboriginal site recording project: additional material |
| February 2001 | McDonald, Hales and Associates. | Summary report on Aboriginal heritage investigations proposed Dampier to Bunbury natural gas pipeline corridor widening project: prepared to assist the Aboriginal Cultural Material Committee |
| February 2001 | McDonald, Hales and Associates. | Report on Aboriginal heritage investigations: proposed DBNGP pipeline corridor widening project |
| October 2003 | Hames Consultancy Group | Management report of Aboriginal Heritage aspects of the Dampier to Bunbury Natural Gas Pipeline corridor through the Perth Metropolitan Area |
| February 2005 | GHD | Perth - Darwin National Highway - alignment definition study: indigenous Heritage issues report filed survey and consultation: Southern section - Maralla Road to the MRS Boundary |
| February 2005 | GHD | Perth - Darwin National Highway - alignment definition study: indigenous Heritage issues report filed survey and consultation: Northern section - MRS Boundary to Calingiri Road |
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia Volume I |
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia: Volume 1 restricted report Volume II |
| October 2005 | McDonald, Edward | Study of groundwater - related Aboriginal Cultural Values on the Gnangara Mound, Western Australia: Volume 2 inventory of registered sites restricted report |

| | | |
|------------------|------------------------------------|---|
| | | for Department of Environment Volume III |
| July 2009 | Australian Interaction Consultants | Heritage Monitoring Report of Aboriginal Sites within Loop 9 of DBNGP Stage 5B, Bullsbrook to Beechboro, WA |

Table 3: Heritage survey reports relevant to the field inspection area

Field Survey

Methodology

AHA Logic conducted a search of the DPLH's Aboriginal Site Register and the Aboriginal Heritage Inquiry System (AHIS), to review the existing heritage information about the area to inform the on-site engagement with the Aboriginal people.

AHA Logic invited members of the Swan Valley Nyungar families to nominate family members to attend the consultation exercise. The primary site informant families for Aboriginal site ID 3525 include:

- Bropho family
- Wilkes family
- Corunna family

It was agreed to meet to undertake a field inspection of the survey area, to determine potential impacts of the proposed development to Aboriginal heritage values.

On 22 May 2019, the group of Aboriginal knowledge holders (survey team) met with AHA Logic representatives at Yagan Memorial Park. The survey team consisted of:

- Ms Bella Bropho
- Mr Rob Baker
- Mr Albert Corunna
- Mr Nathan Corunna
- Mrs Gwyn Corruna
- Mr Richard Wilkes
- Ms Violet Wilkes
- Ms Alison Wilkes

Mr. Nathan Corunna stood in at last minute due to Maureen Nettle not attending.

Sadly, Mr Albert Corunna, a very senior and most respected knowledge holder, custodian and traditional owner within the Swan Valley area, passed away within two weeks of the field inspection. Out of respect for Mr Corunna, his family and the Aboriginal community, photographs including Mr Corunna are not included in this report.

Mr Aaron Rayner and Dr Kathryn Przywolnik discussed the proposed project and extent of the survey area with the survey team, gave an overview of the information known about the heritage values of the area provided a description of the works proposed within the survey area. The group looked at maps of the area, and agreed on a survey methodology involving targeted pedestrian transects and vehicular survey were possible.

The survey team travelled together to the survey area and drove vehicles in convoy around the general area to have an initial familiarisation with the area. The group stopped to discuss and more closely inspect wetlands, and areas with visible ground surface.

The methodology used to meet the objectives of the engagement brief is as follows:

- Vehicle and pedestrian navigation to the geographic extent of the survey area via existing roads and tracks;

- Pedestrian transects in areas in the vicinity of known Aboriginal sites and places within the survey area; and,
- Targeted pedestrian inspection of areas with greater potential to contain Aboriginal objects (stone artefacts and other cultural material) such as dunes, waterways, ridges and areas of cleared vegetation.

The survey area is a mixture of agricultural land under crop cultivation, industrial land (sand mining), relatively open sand plain and areas moderately to densely vegetated with scrub and grasses. Ground surface visibility is variable, ranging from bare sandplain to thick woodland within well-watered areas. Some parts of the survey area could not be accessed due to thick vegetation obscuring the ground surface, and also presenting a safety hazard for the older and less able survey team members.

Findings of field survey

The survey team confirmed that Ellen Brook is an Aboriginal site of importance and significance to Aboriginal people, which is valued for its mythological associations and for its fresh water. Members of the survey team talked about their various family and historical connections to Ellen Brook. The survey team also confirmed a tributary of Ellen Brook is located within the survey area, an ephemeral drainage channel north of and running parallel to Warbrook Road.

The survey team confirmed that Aboriginal place ID 4143 is a site of importance and significance to Aboriginal people primarily through its association with an area of wetland, and although the artefacts have not been located since the original recording in 1981, the presence of the artefacts indicates that there is some potential that Aboriginal objects could exist in a sub-surface context where the ground remains undisturbed.

The findings relevant to the Aboriginal site and place within the field inspection area are detailed in the section below. A map of the Aboriginal heritage site and places identified during the survey is provided in **Attachment 3**. Photographs are provided in **Attachment 4**, and a table of photograph GPS points in **Attachment 5**.

The survey team identified five areas of wetland to be culturally important and significant. Waterways, permanent pools, lakes and wetlands generally hold great significance to Aboriginal people in the broader Perth metropolitan area for several reasons, which are outlined in detail below.

No Aboriginal objects (stone artefacts or any other form of Aboriginal cultural material) were identified within the survey area.

Aboriginal sites entered on the Register

ID 3525 ELLEN BROOK: UPPER SWAN

Mythological

Existing information: ID 3525 was originally recorded in the 1990s and relates to mythological narratives and spiritual beliefs of the main channel and tributaries of Ellen Brook. The site was entered on the Register in the early 2000s.

Current condition: A tributary of Ellen Brook extends into the survey area, north and roughly parallel with Warbrook Road. A map of the tributary extension of ID 3525. The survey team confirmed that the tributary is part of Aboriginal site ID 3525.

Lodged places

ID 4143 NATGAS 122

Artefacts

Existing information: ID 4143 was originally recorded in 1981 as part of a broader survey undertaken by the Western Australian Museum ahead of the Dampier to Perth natural gas pipeline. The recording refers to a small surficial scatter of 5 quartz and chert stone artefacts visible within a vegetation clearing adjacent to a small watercourse. The nature and characteristics of ID 4143 is consistent with other types of heritage sites and places identified within the northern Perth area, although smaller in size and artefact population than is generally observed. Unfortunately the recording is very brief and cursory, and does not provide a lot of detail regarding the accurate location of the place or its contents.

Current condition: The general area of ID 4143 was inspected by the survey team, and it was observed that the area is thickly vegetated and has experienced ground surface modification in the years since 1981. No stone artefacts were identified by the survey team. The possibility remains that stone artefacts may still be preserved within sub-surface sand deposits within the area of the wetland in areas where the original ground surface remains intact. Following the recorded information for this place, an area was identified on the edge of a wetland that is most likely to be the actual location of ID 4143. This area is shown in the map provided in **Attachment Three**.

Other findings and relevant observations

Wetlands and water courses

The survey team identified five areas of wetlands as depicted in **Attachment Three** and one tributary as places of cultural importance and significance within the survey area, for several different but interrelated reasons.

Wetlands and sources of water were on a practical level critical to the survival of Aboriginal people who lived in and travelled through the Swan Coastal Plain in the past. Wetlands were a key economic resource that provided reliable supplies of potable water and wetlands game, such as turtles, frogs and water birds. Wetlands also attracted larger game, such as kangaroos, and were favoured places to visit and camp throughout the year. Water is on its own a valuable cultural resource, and viewed by many Aboriginal people as requiring protection and preservation for the benefit of future generations as an environmental concern as much as a cultural concern.

Recurring visits by Aboriginal people to access the resources of wetlands over thousands of years has resulted in accumulations of surface and in some places subsurface artefacts forming as generations of people have camped in the area. Places where their ancestors hunted, camped and gathered together are places of importance and significance to Aboriginal people.

Wetlands and water sources are also places understood to have been created by ancestral and beings during the dreaming, and are a focal point for beliefs relating to creator serpents. Wetlands are important spiritual places, and many creeks, rivers and lakes have been entered on the Register of Aboriginal Sites for associations with spiritual beliefs and mythological narratives.

The survey team confirmed that the five wetlands and tributary of Ellen Brook observed within the survey area are places of cultural importance, primarily for a general association with mythological and spiritual beliefs. The wetlands and waterway within the survey area were viewed as places where

Aboriginal people would have visited in the past, although the survey team acknowledged that ground modification and past land uses have in all likelihood removed much of the physical evidence and archaeological remains associated with that use. The survey team confirmed that as much as possible the wetlands, and the areas of land immediately adjacent to the wetlands, should be avoided and protected from impacts.

Areas of Aboriginal heritage sensitivity

During the pedestrian transects in the survey area, no Aboriginal objects (stone artefacts or other cultural material) were identified. No sources of suitable stone materials were found outcropping within the survey area, and no stone sources or quarries have been recorded within the broader area. The lack of stone resource, such as boulders, cobbles or nodules of medium or fine-grained stone, within the survey may at least in part account for lack of artefactual material that was encountered. A key factor in the lack of archaeological material however is the degree of ground disturbance and modification that has occurred since European settlement.

There are a number of factors that contribute to the occurrence of Aboriginal sites and past use of the area by Aboriginal people, that are relevant to the findings of this field inspection. These are outlined below.

- The survey area is located with an expanse of sandy sediments and undulating dunes, which in some areas are unconsolidated and apparently mobile. Land clearing has likely altered and affected the consolidation of sediments within the area, and from visual inspection it does not appear the original ground surface is retained within most of the survey area.
- While the area is hospitable for human occupation and movement through country in the past, the factors of post-settlement erosion, land use impacts and sediment movement affected the deposition of archaeological and cultural remains, resulting in the poor preservation of archaeological materials encountered.
- No lithic sources, outcrops or surface expressions of stone were identified within the area of the field inspection. The limited range of resources available and poor preservation conditions are not conducive to the accumulation of archaeological materials, which appear to have not survived the ravages of time and weather.
- The wetlands are the areas within the survey area with the greatest potential to retain archaeological material in surface and sub-surface contexts, as firstly these area would have attracted the most occupation and use in the past, and secondly these areas have been comparatively less impacted by post-settlement land use.
- Any remnant original ground surface within the area of the five wetlands retains the greatest potential for the preservation of archaeological and cultural deposit within the survey area.

Recommendations

Key considerations

An Aboriginal site and lodged place are mapped on the AHIS as intersecting with the survey area. An ephemeral tributary of Ellen Brook, site ID 3525, occurs within the boundary of the survey area. The tributary is connected to the Ellen Brook main channel, and is confirmed by the survey team as part of the Aboriginal site (ID3525) associated with that watercourse.

Lodged place ID 4143 was recorded more than 30 years ago and the 5 artefacts observed at the time of the recorded have not since been relocated. The description of the place is consistent with the wetland located in the centre of the survey area, and the survey team confirmed that the potential remains for stone artefacts to exist within those parts of the wetland and immediately adjacent area where ground disturbance has not occurred or has been minimal.

The survey team also confirmed that the five other wetlands areas are sensitive cultural places, and retain potential to have preserved Aboriginal cultural material where unmodified or minimally disturbed ground exists.

The broader survey area has been subject to modification through various past land uses, and in some places extensively disturbed, such as within the area of the operating sand mine.

No Aboriginal objects (stone artefacts or Aboriginal cultural material) were identified during the field inspection.

Areas to avoid

The survey team confirmed that Aboriginal site ID 3525 should be avoided. The survey team also confirmed that all 5 wetlands areas and Aboriginal place ID 4143 are potentially Aboriginal sites of importance and significance, and should be regarded as places to which the provisions of the AH Act may apply.

One of the wetlands areas is associated with an Aboriginal place that was recorded in 1981, ID 4143. The wetlands and ID 4143 are assessed to be places with potential for Aboriginal object to exist in surface and sub-surface contexts, and the potential is associated with the presence of original ground surface and the absence of post-settlement modification.

The proponent is advised that future planning and development within the survey area should be configured to avoid or minimise impacts to the areas of ID 3525, ID 4143, and the five wetlands.

The proponent is also advised that places where Aboriginal objects and Aboriginal cultural material are identified be avoided, should any Aboriginal objects be identified in pursuit of any future ground disturbing activity.

The proponent is further advised that a reasonable area of buffer be applied around the sites and sensitive heritage areas identified in this report, and that the extent of the buffers be confirmed and refined through further, targeted field investigation of those areas.

Regulatory compliance

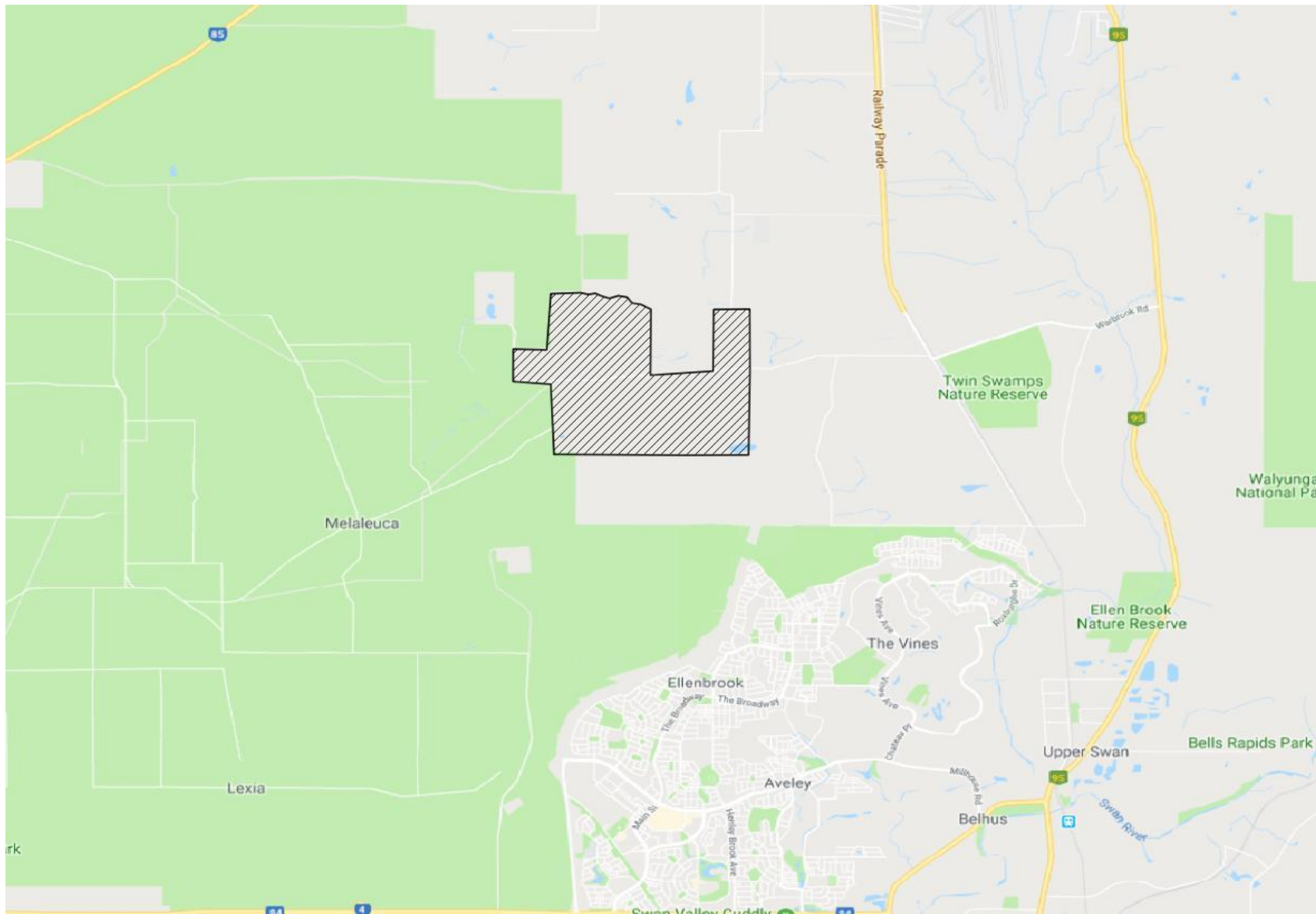
It is recommended that the proponent:

- Plan its ground disturbing activities to avoid the areas of ID 3525, ID 4143, and the five wetlands identified in this report;

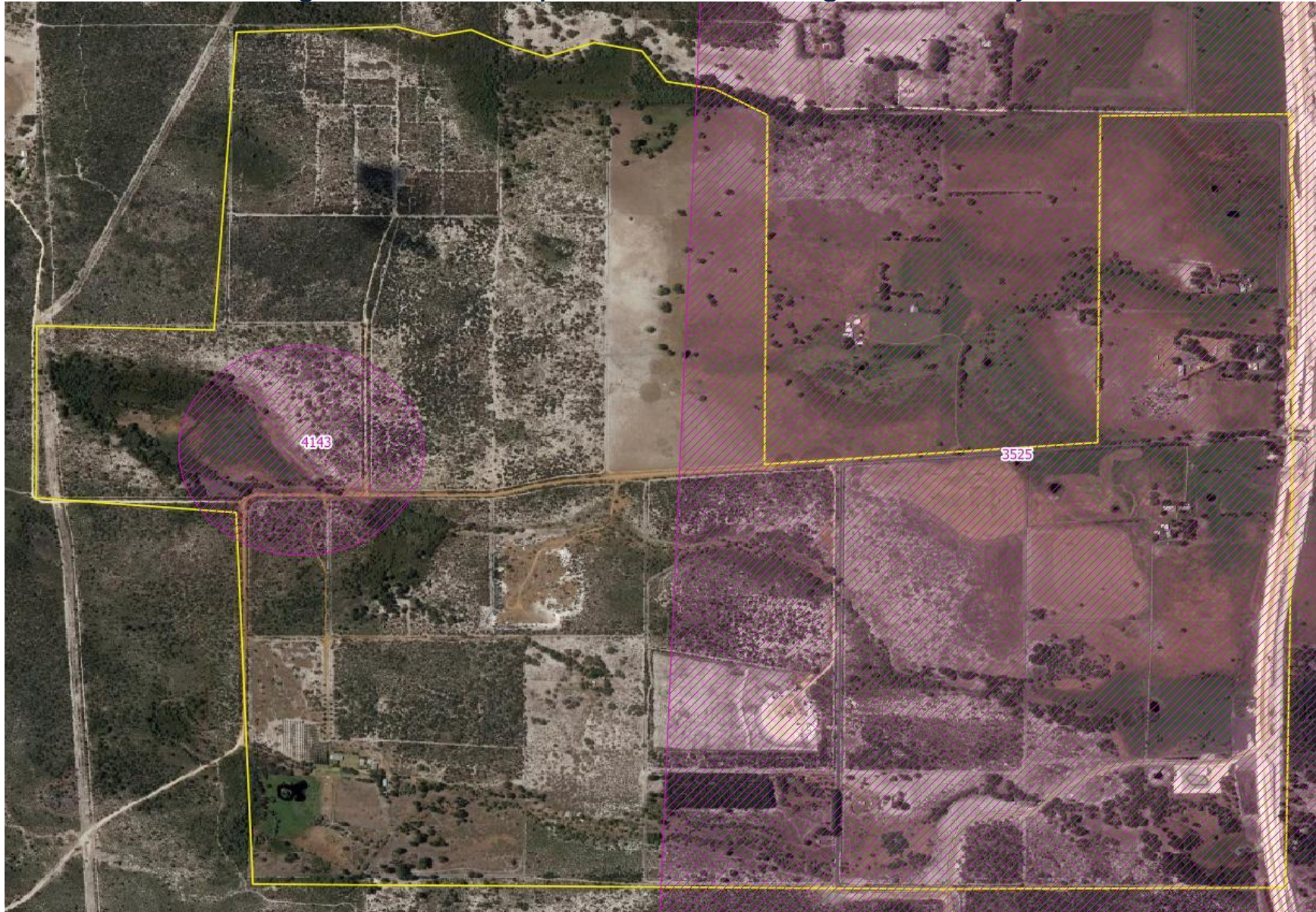
- Apply a reasonable buffer (subject to further investigation) around ID 3525, ID 4143, and the five wetlands identified in this report;
- Take a precautionary approach and avoid waterways places where permanent water collects (e.g. soaks);
- Should avoidance of these area not be possible, further archaeological field investigation and ethnographic consultation with Aboriginal people regarding ID 3525, ID 4143, and the five wetlands identified in this report is necessary to evaluate the importance and significance of the sites and the proposed impacts to the heritage sites and places;
- Should avoidance of these area not be possible, seek consent from the Minister for Aboriginal Affairs pursuant to s18 of the *Aboriginal Heritage Act 1972* for ID 3525ID 4143 prior to any disturbance of the potential sites; and,
- Prepare a cultural heritage management plan in consultation with the Aboriginal knowledge holders for the area that identifies appropriate management measures and provisions for long term care of ID 3525, ID 4143, and the five wetlands identified in this report.

It is also recommended that the proponent ensure its staff and contractors are aware of the provisions of the AH Act.

Attachment 1: Map of Survey Area



Attachment 2: Aboriginal sites and places intersecting with survey area





Attachment 3: Aboriginal sites and places identified during the field inspection



Legend

results

-  ID 4143 Heritage Zone
-  ID 3525 Ellen Brook Tributary Heritage Zone
-  Wetland Aboriginal Heritage Sensitivity Zone
-  survey area

Attachment 4: Photographs



Photograph 1: example of agricultural pastureland and extent of vegetation clearing within survey area (401917 mE 6489971 mN Z50)



Photograph 2: example of land modification and vegetation regrowth within survey area (401892 mE 6489424 mN Z 50)



Photograph 3: example vegetation clearing and sandy dune sediments within survey area (401892 mE 6490718mN Z50)



Photograph 4: example of wetland Aboriginal Heritage Sensitivity Zone (401245 mE 6489849 mN Z50)

Attachment 5: Photograph Geographic Coordinates

| Photograph number | Easting Z50 | Northing Z50 |
|--------------------------|--------------------|---------------------|
| 1 | 401917 | 6489971 |
| 2 | 401892 | 6489424 |
| 3 | 401517 | 6490718 |
| 4 | 401245 | 6489849 |



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