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Office of the Environmental Protection Authority
File:
14 MAR 2014

A:	☐ For Information
fa:	☐ For Discussion
Officer:	☐ For Action
☐ Dir.AC	Response please:
☐ Dir. Bus Ops	☐ GM Signature
☐ Dir. SPPD	☐ Dir for GM (copy to GM)
☐ Dir. Strat Sup	☐ Dir Signature (copy to GM)
☐	☐ Mgr Direct (copy to GM)

WATER CORPORATION

10 March 2014

Dr Paul Vogel
Chairman
Environmental Protection Authority
Locked Bag 33
CLOISTERS SQUARE WA 6850

Dear Dr Vogel

RE: ELLENBROOK WATER SUPPLY TANKS GEOTECHNICAL INVESTIGATION REFERRAL UNDER S38 OF THE *ENVIRONMENTAL PROTECTION ACT 1986*

The Water Corporation is pleased to submit the Environmental Protection Authority's (EPA) Referral Form and supporting documentation in relation to the Water Corporation's proposal to undertake a geotechnical investigation for the development of a new water supply reservoir to be located in Ellenbrook, approximately 20 kilometers (km) north east of Perth.

Please note this letter is to be read in conjunction with the attached EPA Referral Form and associated supporting information.

Background

The geotechnical investigation is proposed to be undertaken within a 14.5 hectare (ha) site which will ultimately be used for the location of three 80 Mega Liter (ML) tanks and associated infrastructure. It is proposed that the future tanks and associated infrastructure will be referred to the EPA under a separate submission.

The total area of ground disturbance of the proposed geotechnical investigation work is approximately 2721 m². The proposal involves the clearing of native vegetation for a four metre wide track and turning circles to allow access for Cone Penetration Testings (CPT) and seismic CPTs/ Dilatometer Testings (DMT). Commencement of the clearing work is proposed for May 2014 and is proposed to take less than four weeks to complete.

Basis for Referral

The proposed project falls within the *Environmental Protection Gnangara Mound Crown Land Policy 1992* area. Part 15 of the *Environmental Protection Gnangara Mound Crown Land Policy 1992* states that 'a person shall not clear, destroy or remove any native vegetation on or from the policy area unless (a) the person is authorised under the Act to do so and is acting in accordance with that authorisation…', where Part 10 of the *Environmental Protection Gnangara Mound Crown Land Policy 1992* states 'authorised under the Act means –

(a) Authorised under a works approval, a licence, a requirement contained in a pollution abatement notice, a condition under Section 45 of the Act, a direction under 73 of the Act or an exemption under 75 of the Act; or

(b) In relation to a proposal, informed by the Authority under Section 40 (1)(a) of the Act that the proposal does not need to be assessment under Part IV of the Act.'

The Office of the Environmental Protection Authority's (OEPA) Environmental Planning Branch Manager, Ms Liesl Rohl, has advised, on this basis, the Water Corporation should refer the proposal to the EPA under section 38(5) of the *Environmental Protection Act 1986* (EP Act).

Further to this, Ms Rohl has communicated that the determination of whether the Water Corporation's internal Clearing Permit (CPS 185) would be considered to be an authorisation under the EP Act for the purposes of the *Environmental Protection Gnangara Mound Crown Land Policy 1992* is a matter for the Department of Environment and Regulation's (DER) Native Vegetation Conservation Branch. The Native Vegetation Conservation Branch A/Manager, Ms Jane Clarkson, response concurs with the OEPA's advice to refer the project (Appendix 2 of the attached S38 Referral Form).

The Proposal

The Water Corporation believes that the proposed geotechnical investigation work does not require formal assessment under Part IV of the EP Act and can be appropriately managed in accordance with the management plans to be developed specifically for this proposal and in accordance with a clearing permit issued under Part V of the EP Act.

Other Matters

The proposed clearing also falls within Bush Forever Site 399 and a letter inviting the Department of Planning to provide comment on the proposal will be sent following the EPA's decision.

The Water Corporation considers that a referral under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) is not warranted as it is considered that that the geotechnical works proposal does not have a significant impact on Black Cockatoos or any other Matters of National Environmental Significance (MNES).

If you have any queries regarding this proposal, please do not hesitate to contact Natalie Jackson (Natalie.Jackson@watercorporation.com.au) or 6330 6741.

Yours sincerely

J. Krsnik

Julia Krsnik
A/Manager, EIA & Approvals Section,
Environment and Aboriginal Affairs Branch
Water Corporation

Enclosed:
EPA Referral Form (Hard Copy)
GHD (2012) Flora, Vegetation and Fauna Report – Ellenbrook Tank Site (Hard Copy)
EPA Referral Form (Electronic Copy - CD)
GHD (2012) Flora, Vegetation and Fauna Report – Ellenbrook Tank Site (Electronic Copy - CD)
Electronic Shapefiles

Environmental Protection Authority

GOVERNMENT OF WESTERN AUSTRALIA

EPA REFERRAL FORM PROPONENT

Referral of a Proposal by the Proponent to the Environmental Protection Authority under Section 38(1) of the *Environmental Protection Act 1986*.

PURPOSE OF THIS FORM

Section 38(1) of the *Environmental Protection Act 1986* (EP Act) provides that where a development proposal is likely to have a significant effect on the environment, a proponent may refer the proposal to the Environmental Protection Authority (EPA) for a decision on whether or not it requires assessment under the EP Act. This form sets out the information requirements for the referral of a proposal by a proponent.

Proponents are encouraged to familiarise themselves with the EPA's *General Guide on Referral of Proposals* [see Environmental Impact Assessment/Referral of Proposals and Schemes] before completing this form.

A referral under section 38(1) of the EP Act by a proponent to the EPA must be made on this form. A request to the EPA for a declaration under section 39B (derived proposal) must be made on this form. This form will be treated as a referral provided all information required by Part A has been included and all information requested by Part B has been provided to the extent that it is pertinent to the proposal being referred. Referral documents are to be submitted in two formats – hard copy and electronic copy. The electronic copy of the referral will be provided for public comment for a period of 7 days, prior to the EPA making its decision on whether or not to assess the proposal.

CHECKLIST

Before you submit this form, please check that you have:

	Yes	No
Completed all the questions in Part A (essential).	X	
Completed all applicable questions in Part B.	X	
Included Attachment 1 – location maps.		
Included Attachment 2 – additional document(s) the proponent wishes to provide (if applicable).	X	
Included Attachment 3 – confidential information (if applicable).	N/A	
Enclosed an electronic copy of all referral information, including spatial data and contextual mapping but excluding confidential information.	X	

Following a review of the information presented in this form, please consider the following question (a response is optional).

Do you consider the proposal requires formal environmental impact assessment? ☐ Yes X No ☐ Not sure
If yes, what level of assessment? ☐ Assessment on Proponent Information ☐ Public Environmental Review

PROPONENT DECLARATION (to be completed by the proponent)

I, Julia Krsnik, declare that I am authorised on behalf of the Water Corporation (being the person responsible for the proposal) to submit this form and further declare that the information contained in this form is true and not misleading.

Signature	Name (print) Julia Krsnik
Position Environmental Impact Assessment & Approvals Manager	Company Water Corporation
Date	

PART A - PROPONENT AND PROPOSAL INFORMATION
(All fields of Part A must be completed for this document to be treated as a referral)

1 PROPONENT AND PROPOSAL INFORMATION

1.1 Proponent

Name	Water Corporation
Joint Venture parties (if applicable)	N/A
Australian Company Number (if applicable)	28 003 434 917
Postal Address (where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State)	629 Newcastle Street Leederville Western Australia 6007
Key proponent contact for the proposal: • name • address • phone • email	Julia Krsnik Environmental Approvals Manager Environment and Aboriginal Affairs Water Corporation 629 Newcastle Street Leederville WA 6007 (08) 9420 2823 Julia.krsnik@watercorporation.com.au
Consultant for the proposal (if applicable): • name • address • phone • email	N/A

1.2 Proposal

Title	Ellenbrook Water Supply Tanks Geotechnical Survey
Description	The Water Corporation proposes to undertake a geotechnical investigation to provide information on the foundation and land capability for the development of a new water supply reservoir to be located in Ellenbrook, approximately 20 kilometers (km) north east of Perth (*See Figure 1 in Attachment 1)*. The geotechnical investigation will be conducted within a 14.5 hectare (ha) site that will ultimately be used for the location of three 80 Mega Litre (ML) tanks. The proposal for the tank construction will be referred to the Environmental Protection Authority (EPA) under a separate submission.

	The proposal for the tank construction and associated works is divided into three stages. Stage 1 of the proposed development includes the provision of the following assets: • One 80 ML Ellenbrook Tank (and associated site works such as a sump, hardstand, etc); • A 4.3 kilometre (km) DN900 inlet main and a 2.35 km DN1200 outlet main; • Chlorination of the tank inlet; • An extension of Gaskell Avenue to allow access to the tank site; • A control valve on the tank inlet; and • Electrical, instrumental and SCADA works associated with the above. Stage 2 will involve the construction of the second 80 ML water supply tank and associated site works. Stage 3 will involve the construction of the third 80 ML water supply tank and associated site works. Based on the neighbouring land use as a quarry (by ROCLA), the geotechnical results are expected to indicate similar foundation materials. The proposal involves the clearing of native vegetation for a four metre wide track and turning circles to allow access for Cone Penetration Testings (CPT) and seismic CPTs/ Dilatometer Testings (DMT).
Extent (area) of proposed ground disturbance.	Total area of ground disturbance is approximately 2670 m²
Timeframe in which the activity or development is proposed to occur (including start and finish dates where applicable).	Commencement of the clearing work is proposed for May 2014 and is proposed to take less than four weeks to complete.
Details of any staging of the proposal.	Staged construction of the proposal.

	Please refer to 'Description'
Is the proposal a strategic proposal?	No
Is the proponent requesting a declaration that the proposal is a derived proposal? If so, provide the following information on the strategic assessment within which the referred proposal was identified: • title of the strategic assessment; and • Ministerial Statement number.	No
Please indicate whether, and in what way, the proposal is related to other proposals in the region.	The proposal is not related to any other proposals in the region
Does the proponent own the land on which the proposal is to be established? If not, what other arrangements have been established to access the land?	The land upon which the proposal is to be established is Crown Land, managed by the Water Corporation Certificate of Title is attached in Attachment 2
What is the current land use on the property, and the extent (area in hectares) of the property?	The extent of the property is 26.7 hectares in size of which 14.8 ha is not in use, and the remainder (11.9 ha) is Road Reserve (Gaskell Avenue). The required construction corridor width for the inlet/ outlet mains is currently being determined.

1.3 Location

Name of the Shire in which the proposal is located.	City of Swan
For urban areas: • street address; • lot number; • suburb; and • nearest road intersection.	Lot 12777 on deposited Plan 219669 Gnangara Road, Ellenbrook See Attachment 2 for Certificate of Title
For remote localities: • nearest town; and • distance and direction from that town to the proposal site.	N/A
Electronic copy of spatial data - GIS or CAD, geo-referenced and conforming to the following parameters: • GIS: polygons representing all activities and named; • CAD: simple closed polygons representing all activities and named; • datum: GDA94; • projection: Geographic (latitude/longitude) or Map Grid of Australia (MGA);	Attachment 1: Figure 1 – Site Location Figure 2 – Proposed Clearing Figure 3 – Bush Forever Site and Wetlands Figure 4 – Vegetation Condition Figure 5 – Environmentally Sensitive Areas, Priority Ecological Communities, Protected Flora and Fauna Figure 6 – Environmental Protection

• format: Arcview shapefile, Arcinfo coverages, Microstation or AutoCAD.	(Gnangara Mound Crown Land) Policy 1992 and Register National Estate Electronic copy of spatial data attached on CD provided

1.4 Confidential Information

Does the proponent wish to request the EPA to allow any part of the referral information to be treated as confidential?	No
If yes, is confidential information attached as a separate document in hard copy?	N/A

1.5 Government Approvals

Is rezoning of any land required before the proposal can be implemented? If yes, please provide details.		No	
Is approval required from any Commonwealth or State Government agency or Local Authority for any part of the proposal? If yes, please complete the table below.		Yes	
Agency/Authority	Approval required	Application lodged Yes / No	Agency/Local Authority contact(s) for proposal
Department of Environment Regulation	Part V – Clearing approval (Geotechnical Works)	Yes	Native Vegetation Conservation Branch, (Department Environment and Regulation)
Department of Environment Regulation	Part V – Clearing approval (Geotechnical Works) – revised clearing area proposal	No	Native Vegetation Conservation Branch, (DER)
Department of Environment Regulation	Part V – Clearing approval (Stage 1,2 and 3)	No	DER
Department of Environment	Referral under EPBC Act (Stage 1, 2 and 3)	No	Department of the Environment

PART B - ENVIRONMENTAL IMPACTS AND PROPOSED MANAGEMENT

2. ENVIRONMENTAL IMPACTS

Describe the impacts of the proposal on the following elements of the environment, by answering the questions contained in Sections 2.1-2.11:

2.1 flora and vegetation;

2.2 fauna;

2.3 rivers, creeks, wetlands and estuaries;

2.4 significant areas and/ or land features;

2.5 coastal zone areas;

2.6 marine areas and biota;

2.7 water supply and drainage catchments;

2.8 pollution;

2.9 greenhouse gas emissions;

2.10 contamination; and

2.11 social surroundings.

These features should be shown on the site plan, where appropriate.

For all information, please indicate:

(a) the source of the information; and

(b) the currency of the information.

2.1 Flora and Vegetation

2.1.1 Do you propose to clear any native flora and vegetation as a part of this proposal?

[A proposal to clear native vegetation may require a clearing permit under Part V of the EP Act (Environmental Protection (Clearing of Native Vegetation) Regulations 2004)]. Please contact the Department of Environment and Conservation (DEC) for more information.

(please tick) X Yes — **If yes**, complete the rest of this section.

☐ No — **If no**, go to the next section

2.1.2 How much vegetation are you proposing to clear (in hectares)?

2670 m²

2.1.3 Have you submitted an application to clear native vegetation to the DEC (unless you are exempt from such a requirement)?

X Yes ☐ No **If yes**, on what date and to which office was the application submitted of the DEC?

Native Vegetation Conservation Branch - 23rd January 2014 (Geotechnical Works only)

2.1.4 Are you aware of any recent flora surveys carried out over the area to be disturbed by this proposal?

X Yes ☐ No

If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

GHD (2012) *Ellenbrook Tank and the Inlet and Outlet Main Flora, Vegetation and Fauna Assessment.* Prepared for the Water Corporation

2.1.5 Has a search of DEC records for known occurrences of rare or priority flora or threatened ecological communities been conducted for the site?

X Yes ☐ No

If you are proposing to clear native vegetation for any part of your proposal, a search of DEC records of known occurrences of rare or priority flora and threatened ecological communities will be required. Please contact DEC for more information.

2.1.6 Are there any known occurrences of rare or priority flora or threatened ecological communities on the site?

X Yes ☐ No

If yes, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

GHD's (2012) report indicated that a search of the DEC's Threatened Flora, the Western Australia Herbarium databases, EPBC Act and Western Australian Museum NatureMap records identified 23 species of conservation significance as potentially occurring within 5 km of the proposal site.

A likelihood occurrence assessment of the conservation significant species (based on the range, habitat requirements and previous records of the species) determined that three species are likely to occur within the proposal area. Seven were identified as possibly occurring within the project area

Family	Species	Status		Source		Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC	
Apiaceae	*Eryngium pinnatifidum* subsp. *palustre*	P3		X		Possible
Dasypogonaceae	*Calectasia* sp. Pinjar	P1		X		Possible
Euphorbiaceae	*Stachystemon* sp. Keysbrook	P1		X		Possible
Haemodoraceae	*Phlebocarya pilosissima* subsp. *pilosissima*	P3		X		Likely
Myrtaceae	*Chamelaucium* sp. Gingin	T	E		X	Possible
Myrtaceae	*Darwinia foetida*	T	CE		X	Possible
Myrtaceae	*Verticordia lindleyi subsp. Lindleyi*	P4		X		Possible
Orchidaceae	*Caladenia huegelii*	T	E	X		Likely
Orchidaceae	*Thelymitra stellata*	T	E		X	Possible
Restionaceae	*Hypolaena robusta*	P4		X		Likely

No Threatened Flora (previously called Declared Rare Flora) listed under the *Wildlife Conservation Act 1950, species* of national conservation significance listed under the EPBC Act or Priority flora listed by the DEC were recorded within the Project Area during the time of the survey.

2.1.7 If located within the Perth Metropolitan Region, is the proposed development within or adjacent to a listed Bush Forever Site? (You will need to contact the Bush Forever Office, at the Department for Planning and Infrastructure)

X Yes ☐ No **If yes**, please indicate which Bush Forever Site is affected (site number and name of site where appropriate).

The proposed clearing is located within Bush Forever Site No. 399 – '*Melaleuca Park and Adjacent Bushland, Bullsbrook/ Lexia'.* Bush Forever Site 399 is 4150.9 ha in size (*See Figure 3 in Attachment 1).*

2.1.8 What is the condition of the vegetation at the site?

The vegetation condition of the Project Area was assessed using the Keighery (1994) scale. Native vegetation located in the northern section of the Project Area rated between *Pristine* (1) to *Excellent* (2). A small section of rehabilitated vegetation in the Project Area rated between *Good* (3) to *Degraded* (5). Areas south of the rehabilitated area traverse previously disturbed /cleared quarry and roads and these were *Completely Degraded* (6) (*See Figure 4 in Attachment 1).*

2.2 Fauna

2.2.1 Do you expect that any fauna or fauna habitat will be impacted by the proposal?

(please tick) X Yes **If yes**, complete the rest of this section.

☐ No **If no**, go to the next section.

2.2.2 Describe the nature and extent of the expected impact.

Two fauna habitat types were identified by GHD (2012), which are:

- *Banksia* Woodland (14.5ha) – dominated by densely growing *Banksia attenuata* and *Banksia menziesii* offering high habitat value for fauna species due to the variety of microhabitat and various resource niches available. The

woodland is relatively uniform across the proposal site and no large trees were recorded. Throughout the *Banksia* woodland there are areas of loose coastal sand that is suitable for burrowing reptiles. The vegetation also provides potential feeding habitat for Black Cockatoos

- Revegetated *Banksia* woodland (0.7 ha) – associated with the proposed inlet and outlet mains. This area is still in the early stage of growth and as such has a sparse lower storey with very limited leaf litter and ground cover. As a result, this area would provide limited habitat for ground-dwelling fauna, particularly reptiles and mammals.

The geotechnical works propose a total clearing of 2670 m² within the *Banksia* woodland.

2.2.3 Are you aware of any recent fauna surveys carried out over the area to be disturbed by this proposal?

X Yes ☐ No

If yes, please attach a copy of any related survey reports and provide the date and name of persons / companies involved in the survey(s).

If no, please do not arrange to have any biological surveys conducted prior to consulting with the DEC.

GHD (2012) *Ellenbrook Tank and the Inlet and Outlet Main Flora, Vegetation and Fauna Assessment.* Prepared for the Water Corporation

2.2.4 Has a search of DEC records for known occurrences of Specially Protected (threatened) fauna been conducted for the site?

X Yes ☐ No (please tick)

GHD's 2012 desktop queries identified 18 conservation significant species in total including 12 birds, four mammals, one reptile, and one insect.

2.2.5 Are there any known occurrences of Specially Protected (threatened) fauna on the site?

X Yes ☐ No

If yes, please indicate which species or communities are involved and provide copies of any correspondence with DEC regarding these matters.

Species	Federal listing	State listing	Likelihood of occurrence
Birds			
Falco peregrinus Peregrine Falcon	-	S	Possible The species has been recorded within 5 km of the site and there is some suitable habitat. The surrounding levels of development and disturbance may limit habitat values of the site however the proximity of the site to semi-rural areas may increase the likelihood of the species utilising the Project Area.
Leipoa ocellata Malleefowl	V	T	Unlikely The Malleefowl usually occurs in shrublands and low woodlands that are dominated by mallee vegetation. There is no suitable habitat present within the Project Area and the species has not been recorded within 5 km of the Project Area.
Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo	V	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.
Calyptorhynchus baudinii Baudin's Black Cockatoo	V	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.
Calyptorhynchus latirostris Carnaby's Black Cockatoo	E	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.
Rostratula australis Australian Painted Snipe	V	T	Unlikely The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. There is no suitable habitat within the Project Area and the species has not been recorded within 5 km of the Project Area.
Mammals			
Dasyurus geoffroii Chuditch, Western Quoll	V	T	Unlikely The Project Area has some vegetated connectivity between the northern Ellenbrook Tanksite and surrounding Gnangara-Moore River State Forest that would provide some habitat for the Quoll, however, the high levels of disturbance from the mine, development, cats and foxes within the Project Area and in surrounding areas would greatly limit the likelihood of occurrence.
Isoodon obesulus fusciventer Southern Brown Bandicoot	-	P5	Likely Suitable habitat present within Project Area and has been recorded within 5 km of the site. This species is known to occur in urban bushland in some parts of Perth, and has been recorded both in Ellenbrook and within Whiteman Park.
Macropus irma Western Brush Wallaby	-	P4	Likely The Wallaby is known to occur at Whiteman Park and there is some connectivity to the surrounding undeveloped land that could provide suitable habitat. However, the high levels of disturbance, development and foxes within the Project Area and in surrounding areas would limit the population size of this species.
Hydromys chrysogaster Water-rat	-	P4	Unlikely The Project Area does not contain any permanent water bodies which would provide habitat for the water-rat. The Project Area is also not well connected to any other habitat which would provide habitat for the species. The species has been recorded within 5 km of the site, and may travel through the Project Area in search of suitable habitat such as to the south near Ellen Brook. However, the high levels of disturbance, development, cats and foxes within the Project Area and in surrounding areas would limit the likelihood of occurrence.
Reptiles			
Neelaps calonotos Black-striped Snake	-	P3	Likely This species is restricted to the sandy coastal strip of dune habitat between Mandurah and Lancelin, and occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands. There is suitable habitat within the Project area, with the loose coastal sand providing burrowing habitat for the Black-striped snake. The species has also been recorded within 5 km of the Project Area.
Insects			
Synemon gratiosa Graceful Sun-moth	E	P4	Likely The Graceful Sun-moth is closely associated with *Banksia* woodland and this vegetation occurs within the Project Area. The species is also dependent upon *Lomandra maritima* and *L. hermaphrodita* being present for breeding, of which *L. hermaphrodita* was found to be present within the Project Area. It has also been recorded within 5 km of the Project Area, and therefore likely to occur

2.3 Rivers, Creeks, Wetlands and Estuaries

2.3.1 Will the development occur within 200 metres of a river, creek, wetland or estuary?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

X No **If no**, go to the next section.

2.3.2 Will the development result in the clearing of vegetation within the 200 metre zone?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.3.3 Will the development result in the filling or excavation of a river, creek, wetland or estuary?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.3.4 Will the development result in the impoundment of a river, creek, wetland or estuary?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.3.5 Will the development result in draining to a river, creek, wetland or estuary?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.3.6 Are you aware if the proposal will impact on a river, creek, wetland or estuary (or its buffer) within one of the following categories? (please tick)

Conservation Category Wetland	☐ Yes	X No	☐ Unsure
Environmental Protection (South West Agricultural Zone Wetlands) Policy 1998	☐ Yes	X No	☐ Unsure
Perth's Bush Forever site	X Yes	☐ No	☐ Unsure
Environmental Protection (Swan & Canning Rivers) Policy 1998	☐ Yes	X No	☐ Unsure
The management area as defined in s4(1) of the *Swan River Trust Act 1988*	☐ Yes	X No	☐ Unsure
Which is subject to an international agreement, because of the importance of the wetland for waterbirds and waterbird habitats (e.g. Ramsar, JAMBA, CAMBA)	☐ Yes	X No	☐ Unsure

2.4 Significant Areas and/ or Land Features

2.4.1 Is the proposed development located within or adjacent to an existing or proposed National Park or Nature Reserve?

X Yes ☐ No **If yes**, please provide details.

Gnangara-Moore River State Forest

2.4.2 Are you aware of any Environmentally Sensitive Areas (as declared by the Minister under section 51B of the EP Act) that will be impacted by the proposed development?

X Yes ☐ No **If yes**, please provide details.

- Bush Forever Site (*See Figure 3 in Attachment 1*);
- Area covered by *Environmental Protection (Gnangara Mound Crown Land) Policy 1992* (*See Figure 6 in Attachment 1*);
- Ellenbrook National Estate Area (RNE) (*See Figure 6 in Attachment 1).*

2.4.3 Are you aware of any significant natural land features (e.g. caves, ranges etc) that will be impacted by the proposed development?

☐ Yes X No **If yes**, please provide details.

2.5 Coastal Zone Areas (Coastal Dunes and Beaches)

2.5.1 Will the development occur within 300metres of a coastal area?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

X No **If no**, go to the next section.

2.5.2 What is the expected setback of the development from the high tide level and from the primary dune?

N/A

2.5.3 Will the development impact on coastal areas with significant landforms including beach ridge plain, cuspate headland, coastal dunes or karst?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.5.4 Is the development likely to impact on mangroves?

☐ Yes ☐ No **If yes**, please describe the extent of the expected impact.

2.6 Marine Areas and Biota

2.6.1 Is the development likely to impact on an area of sensitive benthic communities, such as seagrasses, coral reefs or mangroves?

☐ Yes X No **If yes**, please describe the extent of the expected impact.

2.6.2 Is the development likely to impact on marine conservation reserves or areas recommended for reservation (as described in *A Representative Marine Reserve System for Western Australia*, CALM, 1994)?

☐ Yes X No **If yes**, please describe the extent of the expected impact.

2.6.3 Is the development likely to impact on marine areas used extensively for recreation or for commercial fishing activities?

☐ Yes X No **If yes**, please describe the extent of the expected impact, and provide any written advice from relevant agencies (e.g. Fisheries WA).

2.7 Water Supply and Drainage Catchments

2.7.1 Are you in a proclaimed or proposed groundwater or surface water protection area?

(You may need to contact the Department of Water (DoW) for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

X Yes ☐ No **If yes**, please describe what category of area.

Proclaimed Groundwater Area 'Gnangara Groundwater Area'

2.7.2 Are you in an existing or proposed Underground Water Supply and Pollution Control area?

(You may need to contact the DoW for more information on the requirements for your location, including the requirement for licences for water abstraction. Also, refer to the DoW website)

X Yes ☐ No **If yes**, please describe what category of area.

Environmental Protection (Gnangara Mound Crown Land) Policy 1992

2.7.3 Are you in a Public Drinking Water Supply Area (PDWSA)?

(You may need to contact the DoW for more information or refer to the DoW website. A proposal to clear vegetation within a PDWSA requires approval from DoW.)

☐ Yes X No **If yes**, please describe what category of area.

2.7.4 Is there sufficient water available for the proposal?

(Please consult with the DoW as to whether approvals are required to source water as you propose. Where necessary, please provide a letter of intent from the DoW)

☐ Yes X No (please tick)

2.7.5 Will the proposal require drainage of the land?

☐ Yes X No **If yes**, how is the site to be drained and will the drainage be connected to an existing Local Authority or Water Corporation drainage system? Please provide details.

2.7.6 Is there a water requirement for the construction and/ or operation of this proposal?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

X No **If no**, go to the next section.

2.7.7 What is the water requirement for the construction and operation of this proposal, in kilolitres per year?

2.7.8 What is the proposed source of water for the proposal? (e.g. dam, bore, surface water etc.)

2.8 Pollution

2.8.1 Is there likely to be any discharge of pollutants from this development, such as noise, vibration, gaseous emissions, dust, liquid effluent, solid waste or other pollutants?

(please tick) ☐ Yes **If yes**, complete the rest of this section.

X No **If no**, go to the next section.

2.8.2 Is the proposal a prescribed premise, under the Environmental Protection Regulations 1987?

(Refer to the EPA's *General Guide for Referral of Proposals to the EPA under section 38(1) of the EP Act 1986* for more information)

☐ Yes ☐ No **If yes**, please describe what category of prescribed premise.

2.8.3 Will the proposal result in gaseous emissions to air?

☐ Yes ☐ No **If yes**, please briefly describe.

2.8.4 Have you done any modelling or analysis to demonstrate that air quality standards will be met, including consideration of cumulative impacts from other emission sources?

☐ Yes ☐ No **If yes**, please briefly describe.

2.8.5 Will the proposal result in liquid effluent discharge?

☐ Yes ☐ No **If yes**, please briefly describe the nature, concentrations and receiving environment.

2.8.6 If there is likely to be discharges to a watercourse or marine environment, has any analysis been done to demonstrate that the State Water Quality Management Strategy or other appropriate standards will be able to be met?

☐ Yes ☐ No **If yes**, please describe.

2.8.7 Will the proposal produce or result in solid wastes?

☐ Yes ☐ No **If yes**, please briefly describe the nature, concentrations and disposal location/ method.

2.8.8 Will the proposal result in significant off-site noise emissions?

☐ Yes ☐ No **If yes**, please briefly describe.

2.8.9 Will the development be subject to the Environmental Protection (Noise) Regulations 1997?

☐ Yes ☐ No **If yes**, has any analysis been carried out to demonstrate that the proposal will comply with the Regulations?

Please attach the analysis.

2.8.10 Does the proposal have the potential to generate off-site, air quality impacts, dust, odour or another pollutant that may affect the amenity of residents and other "sensitive premises" such as schools and hospitals (proposals in this category may include intensive agriculture, aquaculture, marinas, mines and quarries etc.)?

☐ Yes ☐ No **If yes**, please describe and provide the distance to residences and other "sensitive premises".

2.8.11 If the proposal has a residential component or involves "sensitive premises", is it located near a land use that may discharge a pollutant?

☐ Yes ☐ No ☐ Not Applicable

If yes, please describe and provide the distance to the potential pollution source

2.9 Greenhouse Gas Emissions

2.9.1 Is this proposal likely to result in substantial greenhouse gas emissions (greater than 100 000 tonnes per annum of carbon dioxide equivalent emissions)?

☐ Yes X No **If yes**, please provide an estimate of the annual gross emissions in absolute and in carbon dioxide equivalent figures.

2.9.2 Further, if yes, please describe proposed measures to minimise emissions, and any sink enhancement actions proposed to offset emissions.

2.10 Contamination

2.10.1 Has the property on which the proposal is to be located been used in the past for activities which may have caused soil or groundwater contamination?

☐ Yes X No ☐ Unsure **If yes**, please describe.

2.10.2 Has any assessment been done for soil or groundwater contamination on the site?

☐ Yes X No **If yes**, please describe.

2.10.3 Has the site been registered as a contaminated site under the *Contaminated Sites Act 2003*? (on finalisation of the CS Regulations and proclamation of the CS Act)

☐ Yes X No **If yes**, please describe.

2.11 Social Surroundings

2.11.1 Is the proposal on a property which contains or is near a site of Aboriginal ethnographic or archaeological significance that may be disturbed?

☐ Yes X No ☐ Unsure **If yes**, please describe.

2.11.2 Is the proposal on a property which contains or is near a site of high public interest (e.g. a major recreation area or natural scenic feature)?

☐ Yes X No **If yes**, please describe.

2.11.3 Will the proposal result in or require substantial transport of goods, which may affect the amenity of the local area?

☐ Yes X No **If yes**, please describe.

3. PROPOSED MANAGEMENT

3.1 Principles of Environmental Protection

3.1.1 Have you considered how your project gives attention to the following Principles, as set out in section 4A of the EP Act? (For information on the Principles of Environmental Protection, please see EPA Position Statement No. 7, available on the EPA website)

1. The precautionary principle.	X Yes	☐ No
2. The principle of intergenerational equity.	X Yes	☐ No
3. The principle of the conservation of biological diversity and ecological integrity.	X Yes	☐ No
4. Principles relating to improved valuation, pricing and incentive mechanisms.	X Yes	☐ No
5. The principle of waste minimisation.	X Yes	☐ No

3.1.2 Is the proposal consistent with the EPA's Environmental Protection Bulletins/Position Statements and Environmental Assessment Guidelines/Guidance Statements (available on the EPA website)?

X Yes ☐ No

3.2 Consultation

3.2.1 Has public consultation taken place (such as with other government agencies, community groups or neighbours), or is it intended that consultation shall take place?

X Yes ☐ No

If yes, please list those consulted and attach comments or summarise response on a separate sheet.

The following stakeholders have been consulted with in regard to the Geotechnical Works proposal

- The Department of Environment Regulation's Native Vegetation Conservation Branch (*see Attachment 2*); and
- Rocla Pty Ltd.

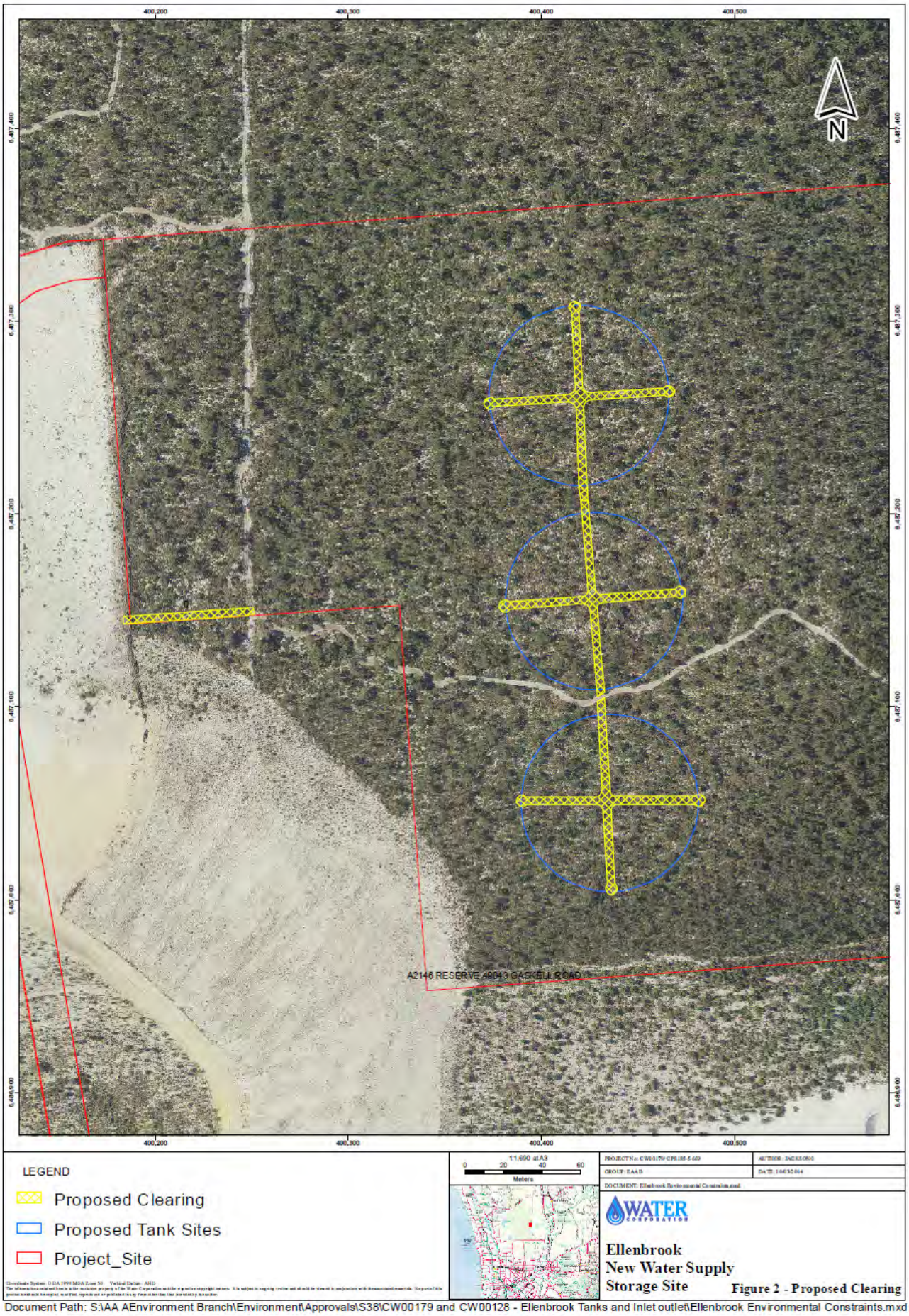
The following stakeholders are proposed to be consulted with in regard to Stage 1 and 2 of the proposal:

- Department of Planning (Bush Forever Office);
- Office of Environmental Protection Authority;
- The Office of the Commissioner of Soil and Land Conservation in the Department of Agriculture and Food;
- The Department of Water's Drainage and Waterways Branch;
- The Conservation Council of Western Australia Inc;
- The City Of Swan;
- Any other environment or community group that the permit holder reasonably considers may have an interest in the clearing that is proposed to be done; and
- Project will likely be referred to the Department of the Environment (DoE) (Commonwealth).

Attachment 1

Figures

Document Path: S:\AA AEnvironment Branch\Environment\Approvals\S38\CW00179 and CW00128 - Ellenbrook Tanks and Inlet outlet\Ellenbrook Environmental Constraints.mxd



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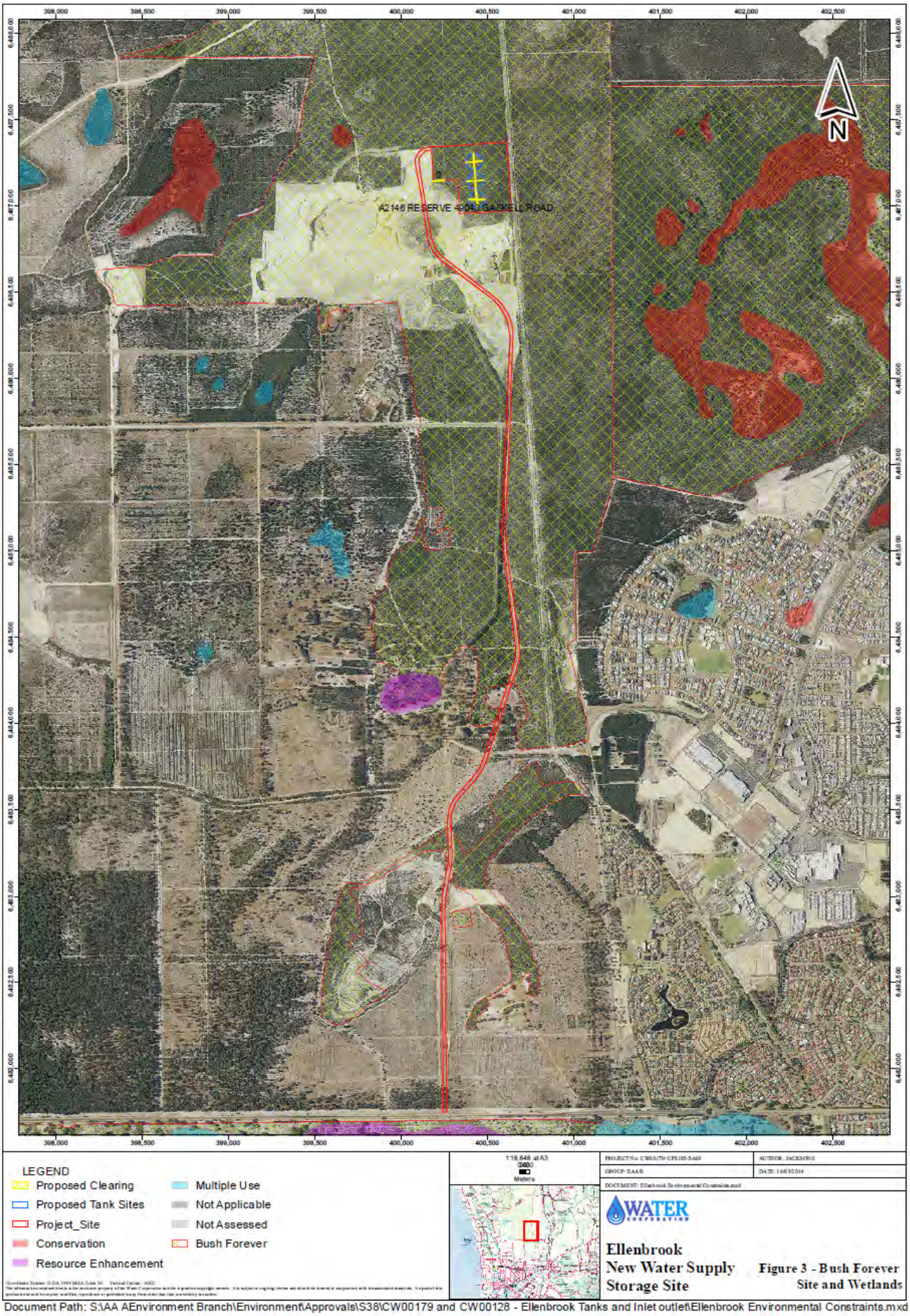

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LEGEND

- Suspected Dieback Locations
- Project Area

Vegetation Condition

- 1 : Pristine or nearly so
- 1-2
- 2 : Excellent
- 3 : Very good
- 3-4
- 4 : Good
- 4-5
- 5 : Degraded
- 5-6
- 6 : Completely degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

GHD

WATER CORPORATION

powered by SLIP ENABLER

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Vegetation Condition and Suspected Dieback Locations

Job Number	61-28780
Revision	0
Date	13 Dec 2012

Sheet 1 of 3

Figure 4

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239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD: Suspected Dieback Locations - 20121213, Project Area - 20121018, Vegetation Condition - 20121211; GA: 250k Topo Series 3 - 2006. Created by: bfonzek, vdinh

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WATER CORPORATION

powered by SLIP ENABLER

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Vegetation Condition and Suspected Dieback Locations

Job Number 61-28780
Revision 0
Date 13 Dec 2012

Sheet 2 of 3

Figure 4

239 Adelaide Terrace Perth WA 6004 Australia T 61 8 6222 8222 F 61 8 6222 8555 E permail@ghd.com.au W www.ghd.com.au

LEGEND

- Suspected Dieback Locations
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GHD

WATER CORPORATION

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Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Vegetation Condition and Suspected Dieback Locations

Job Number	61-28780
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Sheet 3 of 3

Figure 4

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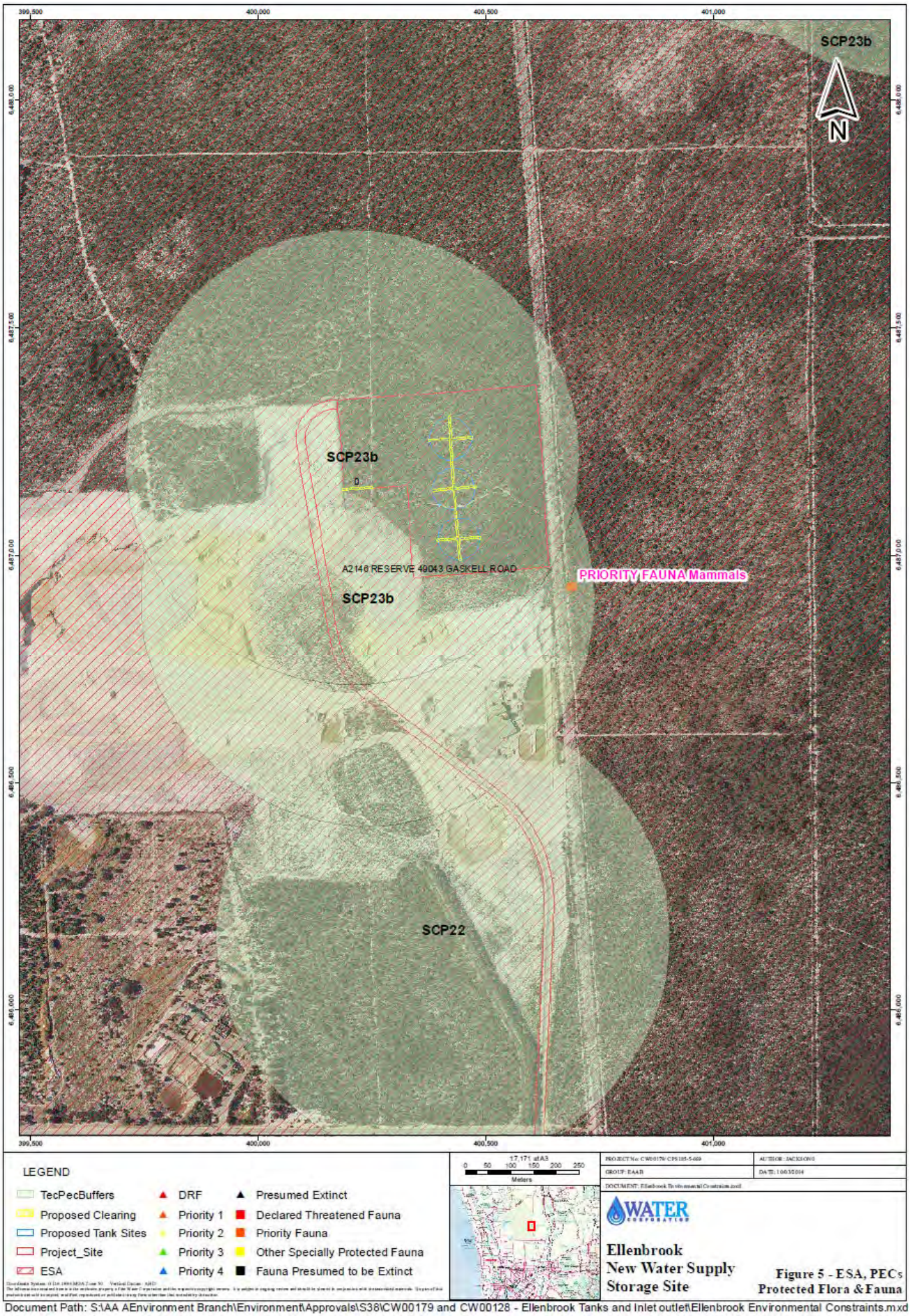

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Document Path: S:\AA AEnvironment Branch\Environment\Approvals\S38\CW00179 and CW00128 - Ellenbrook Tanks and Inlet outlet\Ellenbrook Environmental Constraints.mxd

Attachment 2

Additional Documentation

WESTERN AUSTRALIA

REGISTER NUMBER	
12777/DP219669	
DUPLICATE EDITION	DATE DUPLICATE ISSUED
N/A	N/A

RECORD OF QUALIFIED CERTIFICATE OF CROWN LAND TITLE

VOLUME LR3147 FOLIO 731

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

NO DUPLICATE CREATED

The undermentioned land is Crown land in the name of the STATE of WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 12777 ON DEPOSITED PLAN 219669

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE)

STATUS ORDER/INTEREST: RESERVE UNDER MANAGEMENT ORDER

PRIMARY INTEREST HOLDER: WATER CORPORATION OF P.O. BOX 100, LEEDERVILLE.
(XE K072490) REGISTERED 30 JANUARY 2007

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. K056763 TAKING ORDER. THE DESIGNATED PURPOSE OF TO CREATE A RESERVE FOR WATER, TRIG STATION AND ACCESS. AS TO THE PORTION FORMERLY COMPRISED IN LOTS 15277 AND 15278 ON DP219669 ONLY. REGISTERED 15.1.2007.
2. K072489 RESERVE 49043 FOR THE PURPOSE OF WATER, TRIG STATION AND ACCESS REGISTERED 30.1.2007.
   K072490 MANAGEMENT ORDER. CONTAINS CONDITIONS TO BE OBSERVED. REGISTERED 30.1.2007.

Warning: (1) A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.
(2) The land and interests etc. shown hereon may be affected by interests etc. that can be, but are not, shown on the register.
(3) The interests etc. shown hereon may have a different priority than shown.

----------END OF CERTIFICATE OF CROWN LAND TITLE----------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND: DP219669.
PREVIOUS TITLE: LR3132-699, LR3132-698, LR3128-902.
PROPERTY STREET ADDRESS: NO STREET ADDRESS INFORMATION AVAILABLE.

END OF PAGE 1 - CONTINUED OVER

ORIGINAL CERTIFICATE OF CROWN LAND TITLE
QUALIFIED

REGISTER NUMBER: 12777/DP219669 VOLUME/FOLIO: LR3147-731 PAGE 2

LOCAL GOVERNMENT AREA: CITY OF SWAN.
RESPONSIBLE AGENCY: WATER CORPORATION.

NOTE 1: K072488 CORRESPONDENCE FILE 01774-1989-02RO.

Government of **Western Australia**
Department of **Environment Regulation**

Your ref: CPS185-5-669
Our ref: CPS 185/5
Enquiries: Derek Jenkins
Phone: 6467 5031
Fax: 6467 5532
Email: nvp@der.wa.gov.au

Ms Julia Krsnik
A/Manager EIA & Approvals Section
Environment and Aboriginal Affairs Branch
Water Corporation
PO Box 100
LEEDERVILLE WA 6902

Attn: Ms Natalie Jackson

Dear Ms Krsnik

CLEARING PERMIT CPS 185/5 – PRELIMINARY SUBMISSION – ELLENBROOK WATER STORAGE GEOTECHNICAL INVESTIGATION PROJECT

Thank you for your letter dated 20 January 2014, inviting the Department of Environment Regulation's (DER) Native Vegetation Conservation Branch to provide comment on Water Corporation's proposed Ellenbrook Water Storage Geotechnical Investigation project. I understand the project involves the clearing of approximately 0.132 hectares of native vegetation.

Submissions are invited in accordance with condition 7 of Clearing Permit CPS 185/5 for any clearing that 'may be at variance', 'is at variance' or 'is seriously at variance' with the clearing principles contained within Schedule 5 of the *Environmental Protection Act 1986* (EP Act).

In relation to the 0.132 hectares of native vegetation proposed to be cleared, DER has reviewed the information supplied and undertaken a desktop survey of the proposal against the clearing principles in Schedule 5 of the EP Act.

In relation to clearing principle (a), you advise that the project is at variance. I consider the project is not likely to be at variance to this principle. Due to the small size of the proposed clearing area, it is unlikely to hold high biodiversity values in comparison to other vegetation remnants in the local area (10 kilometre radius). Furthermore the proposed clearing is unlikely to impact upon any flora, fauna or ecological communities of conservation significance.

In relation to the remaining clearing principles I concur with your assessment that the proposed clearing is not likely to be at variance.

In accordance with section 51P of the EP Act the CEO cannot make a decision which would be inconsistent with any approved policy. A decision by DER on this matter will be made following determination by the Environmental Protection Authority (EPA).

Please be advised the area under application falls within the Environmental Protection Gnangara Mound Crown Land Policy 1992 (GM EPP) area. As per advice provided on 17 February 2014 to Ms Natalie Jackson by Ms Liesl Rohl from the OEPA the project should be referred to the EPA for a decision on whether or not to assess the proposal.

If you have any queries regarding the matters raised above, please contact Mr Derek Jenkins at DER's Native Vegetation Conservation Branch on 6467 5031.

Yours sincerely

Jane Clarkson
A/MANAGER
NATIVE VEGETATION CONSERVATION BRANCH

Officer delegated under Section 20
of the Environmental Protection Act 1986

4 March 2014

Natalie Jackson

From: Clarkson, Jane <Jane.Clarkson@DER.wa.gov.au>
Sent: Friday, 14 February 2014 1:45 PM
To: Natalie Jackson
Cc: Jenkins, Derek; Julia Krsnik
Subject: RE: Ellenbrook Geotechnical Investigation

Hi Natalie

Unfortunately Derek is out of the office today.

I have reviewed the application and although there appears to be no significant environmental impacts associated with the proposed clearing of 0.3122 hectares of native vegetation, the project falls within the Environmental Protection Gnangara Mound Crown Land Policy 1992 area. The Department of Environment is required to refer the application to the Environmental Protection Authority (EPA) under section 38(5) of the *Environmental Protection Act 1986*. I have had a look at your correspondence and checked the EPA website and spoken with the Manager, Environmental Planning Branch of the EPA, however it does not appear that this project has been referred to the EPA by the Water Corporation.

If this has been referred and assigned 'Not Assessed' by the EPA could you please provide me with the documentation. If not the project will need to be referred to the EPA.

In relation to the time taken to respond to the Water Corporations submission, Condition 7(c) states that the permit holder must allow a period of at least 21 days for submissions to be made. DER received water corporations letter on 23 January 2014. Today would be 22 days from receipt of submission.

I am happy to meet and discuss alternative forms of submitting proposal documentation to provide DER additional time to assess the proposal. DER has recently implemented with Main Roads a formalised approach to handling state-wide purpose permit project correspondence, where submission of all Management Plans, exemption requests, assessment reports etc. go through a Central Review and Submission Process (CRSP), from Main Roads state-wide purpose permit mailbox to DER's NVP mailbox so it can be logged and tracked. Follow-up queries on status of responses would come through the CRSP. There may be benefits in adopting a similar approach with Water Corporation.

Kind Regards

Jane Clarkson
Native Vegetation Conservation Branch
Department of Environment Regulation

From: Natalie Jackson [mailto:Natalie.Jackson@watercorporation.com.au]
Sent: Friday, 14 February 2014 9:17 AM
To: Clarkson, Jane
Cc: Jenkins, Derek; Julia Krsnik
Subject: Ellenbrook Geotechnical Investigation

Hi Jane,

In regard to my letter sent to the Department of Environment Regulation (DER) on 20th January 2014 regarding Ellenbrook and the subsequent phone messages received on Wednesday and Thursday, 12th and 13th February 2014 respectively from Derek Jenkins, are you or Derek able to give me a call and clarify the queries Derek has immediately. It is important that we are aware of matters concerning this project as soon as they are known so that

they do not cause any unnecessary delays. The project must start as essentially state infrastructure prior to the end February.

As you are aware, it is usual for the Water Corporation to receive responses of this nature from the DER within approximately 21 days. We believe the delayed response to the Water Corporation's letter is not reasonable.

We are aware that similar delays for other projects within the Water Corporation are putting projects on the critical path. It is urgent that we should meet to resolve this matter.

Kind regards,

Natalie Jackson
Environmental Scientist
Environment & Aboriginal Affairs Branch
Water Corporation

T: (08) 6330 6741 (**Monday, Tuesday, Wednesday and Friday**)
629 Newcastle Street, Leederville, WA 6007
PO Box 100, Leederville, WA 6902
www.watercorporation.com.au

Water Corporation

Ellenbrook Tank and the Inlet and Outlet main
Flora, vegetation and fauna assessment

April 2013

Executive summary

The Water Corporation are currently planning to develop the Ellenbrook Tanksite, which will include clearing of native vegetation for the proposed DN900 inlet and DN1200 outlet mains and at the proposed Ellenbrook Tanksite (herein referred to as the Project Area). The inlet and outlet mains are both within a 3.8 km long section of the existing 20 m wide easement and the Ellenbrook Tanksite is approximately 14.5 hectares in size. The Water Corporation has commissioned GHD Pty Ltd (GHD) to undertake a spring survey of the inlet and outlet mains and Ellenbrook Tanksite, including a Level two flora and vegetation survey and Level one fauna and habitat assessment. The purpose of the flora, vegetation and fauna surveys is to define the environmental sensitivity of the site, including key values such as conservation significant flora, fauna and communities.

The following is a summary of the findings of the flora and fauna assessment:

Existing Environment

- The Project Area is located within an Environmentally Sensitive Area (ESA) buffer extent, which is associated with several Conservation Category geomorphic wetlands and a Resource Enhancement Category wetland;
- There are no conservation areas managed by the Department of Environment and Conservation (DEC) within the Project Area, however the Project Area is surrounded by the DEC Gnangara-Moore River State Forest;
- The Project Area is located within Bush Forever Site No. 399 and adjacent to Bush Forever Site No. 300. Both Bush Forever Sites are noted for being corridors through otherwise highly cleared lands and provide linkages of regional significance; and
- No watercourses or wetlands were identified within the Project Area.

Flora and Vegetation

- Two vegetation types were identified within the Project Area during the survey: *Banksia* Low Open Forest and *Kunzea, Banksia* and *Jacksonia* Shrubland;
- The vegetation types present in the Project Area correspond to Beard (1979) vegetation associations 1001 and 949. According to information provided in the Government of Western Australia (2010) these associations are classified as *Vulnerable* for vegetation association 1001 and of *Least Concern* for vegetation associations 949. A total of 0.68 ha of vegetation association 1001 is located within the Project Area in the *Completely Degraded* section along the road in the south of the Project Area;
- The vegetation condition of the Project Area was assessed using the Keighery (1994) scale. Native vegetation located in the northern section of the Project Area rated between *Pristine* (1) to *Excellent* (2). A small section of rehabilitated vegetation in the Project Area rated between *Good* (3) to *Degraded* (5). Areas south of the rehabilitated area traverse previously disturbed /cleared quarry and roads and these were *Completely Degraded* (6);
- A preliminary assessment for *Phytophthora* spp. (Dieback) as part of the vegetation condition assessment recorded some *Banksia* deaths suspected to be related to Dieback;
- A total of 116 plant taxa were recorded within the Project Area, comprising of 33 plant families and 80 plant genera;
- A total of 14 introduced (exotic) species were recorded during the survey. No Weeds of National Significance (WONS) listed by the Federal Government or Declared Plants

under the Section 37 of the *Agricultural and Related Resources Protection Act 1976* were recorded in the Project Area;

- No Federal and State Threatened Ecological Communities (TECs) were recorded during the survey;
- The Priority Ecological Community (PEC) Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b, listed as a Priority 3 PEC by the DEC is present within the northern section of the Project Area. This PEC is associated with the vegetation type *Banksia* Low Open Forest. Approximately 14.5 ha of this PEC is located within the Project Area;
- The buffer zone for the PEC *Banksia ilicifolia* woodlands, SCP22, listed as a Priority 3 PEC at the State level, was identified from desktop assessments as located over the Project Area. The buffer for this PEC is located within the rehabilitated vegetation of *Kunzea, Banksia* and *Jacksonia* Shrubland and other areas that have previously been cleared. *Banksia ilicifolia* was not recorded during the time of the survey. This PEC was not recorded during the field survey;
- No Threatened Flora (previously called Declared Rare Flora) listed under the *Wildlife Conservation Act 1950,* species of national conservation significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Priority flora listed by the Department of Environment and Conservation (DEC) were recorded from the Project Area; and
- A likelihood of occurrence assessment for conservation significant species identified three species as likely to occur and seven species possibly occurring within the Project Area. This is based on the species known range and habitat requirements.

Fauna

- The Project Area contains two broad fauna habitat types, based on the predominant landforms, soil and vegetation structure of the area. These habitat types are broadly based on the vegetation types identified within the Project Area;
- A total of 21 fauna species were recorded within the Project Area, consisting of 19 birds and two mammals. All of the species recorded during the survey are typical of the Perth Swan Coastal Plain;
- Habitat assessments were undertaken for Black Cockatoos and the Graceful Sun Moth (GSM). This identified 15.2 ha of Black Cockatoo foraging and 14.5 ha of GSM habitat present within the Project Area;
- A likelihood of occurrence assessment for conservation significant fauna species based on the known locations and distribution of species and habitat requirements identified eight conservation significant fauna species as likely to occur or possibly to occur within the Project Area;
- It is likely that the project will trigger referral to the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) due to the clearing of Black Cockatoo foraging habitat. A total of 15.2 ha of Black Cockatoo foraging habitat is located within the Project Area. The majority of this area is located within the Ellenbrook Tanksite, where there is 14.5 ha of quality foraging habitat. There is one Carnaby's Cockatoo known roosting site located approximately 2 km west of the Project Area, in *Melaleuca* trees and the Project Area has been identified as likely to provide a habitat linkage between other foraging and roosting sites;

- There is up to 14.5 ha of potential GSM habitat present within the Ellenbrook Tanksite. Confirmation of this species presence requires a targeted assessment. Should GSM be present, the Project is likely to trigger a referral to DSWEPaC as there is a real chance or possibility that it will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; and
- Database searches indicate that seven bird species listed under the EPBC Act as Migratory and/or Marine occur or potentially occur within 5 km of the Project Area. While there is the potential for a number of migratory bird species to occur occasionally within the Project Area, the Project Area is not considered to be important habitat for any of the migratory species and it is unlikely that listed migratory species would be significantly impacted by the proposed works.

Assessment against the 10 Clearing Principles

An assessment against the "10 Clearing Principles" identified that the Project is at variance to Principles (a) and (b) and may be at variance with Principle (h).

Recommendations

Recommendation 1

The proposed clearing of native vegetation for the proposed Ellenbrook Tanksite is to be limited or avoided, as this area of bushland is the PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b, listed as a Priority 3 PEC by the DEC. If clearing for the proposed Ellenbrook Tanksite cannot be avoided, it is recommended the project is discussed with the DEC, in regards to potential environmental offsets as a means to offset the clearing of the *Banksia attenuata - Banksia menziesii* woodlands, SCP23b.

Rehabilitation of cleared areas is recommended, to reinstate the *Banksia attenuata - Banksia menziesii* woodlands, SCP23b.

Recommendation 2

Clearing of the Ellenbrook Tanksite is likely to trigger referral to the DSEWPaC due to the clearing of more than 1 ha of quality Black Cockatoo foraging habitat. A total of 14.5 ha of Black Cockatoo foraging habitat is located within this section of the Project Area. It is recommended the project be discussed with DSEWPaC before a final decision to refer is made.

Recommendation 3

GHD recommends a targeted Graceful Sun Moth survey in the native vegetation proposed to be cleared for the Ellenbrook Tanksite. This survey will determine their presence or absence within the Project Area.

Recommendation 4

As there is an ESA and Bush Forever Site located over the Project Area, the exemptions to clearing regulations do not apply and an application to the DEC for a clearing permit will need to be submitted to clear native vegetation within the Project Area.

Recommendation 5

A formal dieback assessment consistent with DEC requirements should be conducted prior to works to determine if *Phytophthora* spp. are present within native bushland proposed to be cleared in the Project Area. A Dieback Management plan to address issues and the management of the disease should be employed.

Recommendation 6

A Construction Environmental Management Plan (CEMP) should be developed to address the potential impacts expected to be experienced during the clearing of native vegetation for the proposed Ellenbrook Tanksite and inlet and outlet mains.

This report is subject to, and must be read in conjunction with, the limitations set out in section 2.4 and the assumptions and qualifications contained throughout the Report.

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Appendices

1. Introduction

1.1 Background

The Water Corporation require a flora, vegetation and fauna survey of Ellenbrook Tanksite and inlet and outlet mains located in Ellenbrook, 20 kilometres (kms) north east of Perth. The Water Corporation is planning to develop the Ellenbrook Tanksite and two inlet and outlet mains.

GHD Pty Ltd (GHD) was commissioned to undertake a spring flora and fauna investigation for the proposed work. The purpose of the flora, vegetation and fauna surveys is to define the environmental sensitivity of the site, including key values such as conservation significant flora, fauna and communities.

1.2 Project Area

The Project Area (Figure 1) is 23.3 hectares (ha) in size and consists of:

- Ellenbrook Tanksite (approximately 14.5 ha); and
- The inlet and outlet mains, which are both within a 3.8 km long section of the existing 20 metre (m) wide easement.

1.3 Scope of Works

This flora and fauna assessment included both a desktop review and field survey. The scope of works, as per the Water Corporation Brief and GHD proposal was to:

- Review existing literature and databases to gather background information, including:
  - Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Protected Matters Search;
  - Department of Environment and Conservation (DEC) NatureMap Flora and Fauna Search; and
  - DEC Threatened and Priority Ecological Communities and Threatened Flora database search.
- Complete a Level 2 flora survey including grid-based searches and quadrat based sampling. The survey was to provide details on the:
  - vegetation types present;
  - vegetation condition;
  - locations of declared weeds;
  - locations of *Lomandra maritima*, *Lomandra hermaphrodita*, Threatened or Priority flora and any other flora of local or taxonomic significance;
  - visual evidence of disease status or other existing impacts on vegetation. The dieback assessment considered the presence of key indicator species, but was not a formal dieback assessment consistent with DEC requirements.
- Complete a Level 1 fauna assessment including:

- a habitat survey;
- assessment of the likelihood of occurrence of conservation significant species;
- opportunistic sightings of non-cryptic species;
- an assessment for the potential for Graceful Sun Moth (*Synemon gratiosa*) to occur; however, identification of species presence requires targeted surveys during the month of March; and
- An assessment of Black Cockatoo foraging habitat and significant trees.

1.4 Report Limitations and Assumptions

This Report has been prepared by GHD for the Water Corporation and may only be used and relied on by the Water Corporation for the purpose agreed between GHD and the Water Corporation as set out in section 1.3 of this Report.

GHD otherwise disclaims responsibility to any person other than the Water Corporation arising in connection with this Report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this Report were limited to those specifically detailed in the Report and are subject to the scope limitations set out in the Report.

The opinions, conclusions and any recommendations in this Report are based on conditions encountered and information reviewed at the date of preparation of the Report. GHD has no responsibility or obligation to update this Report to account for events or changes occurring subsequent to the date that the Report was prepared.

GHD has prepared this Report on the basis of information provided by the Water Corporation and Government authorities, which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the Report which were caused by errors or omissions in that information.

The opinions, conclusions and any recommendations in this Report are based, in part, on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points. Investigations undertaken in respect of this Report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this Report.

Site conditions (species and communities of conservation significance) may change after the date of this Report. GHD does not accept responsibility arising from, or in connection with, any change to the site conditions. GHD is also not responsible for updating this Report if the site conditions change.

2. Methodology

2.1 Desktop Assessment

Prior to the commencement of field surveys, a desktop review was undertaken. The desktop review included:

- A review of the Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) Protected Matters database (DSEWPaC, 2012b) – to identify species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) potentially occurring within the Project Area;
- A review of the DEC NatureMap database (DEC, 2012b), for flora and species previously recorded within a 5 km buffer of the Project Area;
- A review of the DEC Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) databases to determine the potential for TECs or PECs to be present within the Project Area;
- A review of the DEC Flora and Communities Database for records of conservation significant species and communities recorded within the Project Area and surrounds;
- A review of previous vegetation mapping of the Project Area;
- A review of the DEC Environmentally Sensitive Area (ESA) database to determine whether any ESA's are located within the Project Area;
- Beard (1979) and Heddle *et al*. (1980) vegetation mapping for the Project Area; and
- Aerial photography, geology, soils, hydrology and topography data.

2.2 Field Survey

2.2.1 Flora and Vegetation

Field surveys were undertaken with regards to the Environmental Protection Authority (EPA) Guidance Statement No. 51, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004a) and *Terrestrial Biological Surveys as an Element of Biodiversity Protection,* Position Statement No. 3 (EPA, 2002). Two GHD ecologists visited the site on 30 October, 2012.

Field assessment methodology involved sampling using quadrats located in representative vegetation types and recording of plant species present (visible) at the time of the survey in the Project Area. Grid-based searches, 30 metres apart, allowed for specific mapping of *Lomandra maritima*, *Lomandra hermaphrodita*, Threatened and Priority flora and other flora of local or taxonomic significance.

Vegetation types were identified by means of a combination of aerial photography interpretation, topographical features, previous mapping (Beard, 1979 and Heddle *et al*. 1980) and field observations.

Quadrat sampling sites were an area of 10 m × 10 m and the position of each site was recorded using a GPS unit. The information presented in Table 1 was recorded for each quadrat. During the field assessment six quadrats were assessed.

The locations of quadrats are provided in Figure 3, Appendix A.

Table 1 Field data recorded during the field survey

Aspect	Measurement
Physical Features	Aspect, soil attributes. Percentage surface cover by: rocks, logs and branches, leaf litter, bare ground.
Location	Coordinates recorded in GDA94 datum using a hand-held Global Positioning System (GPS) tool and PDA (Trimble Nomad), to accuracy approximately ± 5 m and ± 2 m respectively.
Vegetation Condition	Vegetation condition was assessed using the condition rating scale devised by Keighery (1994).
Disturbance	Level and nature of disturbances (e.g. weed presence, fire – and time since last fire, impacts from grazing, exploration activities).
Flora	List of dominant flora from each structural layer. Cover class for each structural layer.

Flora species Identification

Species that were well known to the survey botanists were identified in the field, while species that were unknown were collected and assigned a unique number to facilitate tracking. Plant species were identified by the use of local and regional flora keys and by comparison with the named species held at the Western Australian Herbarium. Plant taxonomists who are considered to be an authority on a particular plant group were consulted when necessary.

The conservation status of all recorded flora was compared against the current lists available on FloraBase (DEC, 2012a) and the EPBC Threatened species database provided by DSEWPaC (2012a).

2.2.2 Vegetation Condition

The vegetation condition of the Project Area was assessed using the vegetation condition rating scale developed by Keighery (1994) that recognises the intactness of vegetation, which is defined by the following:

- Completeness of structural levels;
- Extent of weed invasion;
- Historical disturbance from tracks and other clearing or dumping; and
- The potential for natural or assisted regeneration.

The scale consists of six rating levels as outlined in Table 2.

Table 2 Vegetation condition rating scale

Vegetation condition rating	Vegetation condition	Description
1	Pristine or Nearly So	No obvious signs of disturbance.
2	Excellent	Vegetation structure intact, disturbance affecting individual species, and weeds are non-aggressive species.
3	Very Good	Vegetation structure altered, obvious signs of disturbance.
4	Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances, retains basic vegetation structure or ability to regenerate it.
5	Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration but not in a state approaching good

Vegetation condition rating	Vegetation condition	Description
		condition without intensive management.
6	Completely Degraded	The structure of the vegetation is no longer intact and the area is completely or almost without native species.

A preliminary assessment for *Phytophthora cinnamomi* (Dieback) based on the presence/absence of typical indicator species was undertaken. This is not a formal dieback assessment consistent with DEC requirements.

2.3 Fauna

The fauna assessment was consistent with a Level 1 assessment (reconnaissance survey) in accordance with Guidance Statement No. 56, *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA, 2004b). Nomenclature used in the report follows that used by the Western Australian Museum and DEC's NatureMap program, as it is deemed to contain the most up-to-date species information for Western Australia.

The methodology used to undertake the fauna assessment included:

- Opportunistic searches across all habitat types within the Project Area. This ensured the maximum suite of species potentially occurring at the Project Area was observed. This involved searching through microhabitats including turning over logs or rocks, turning over leaf litter and examining hollow logs;
- Opportunistic visual and aural surveys. This accounted for many bird species potentially utilising the Project Area;
- The site was also be searched for tracks, scats, bones, diggings and feeding areas for both native and feral fauna;
- A Black Cockatoo and Graceful Sun Moth habitat assessment including grid-based searches for *Lomandra maritima* and *Lomandra hermaphrodita*, as well as an assessment of Black Cockatoo foraging habitat and significant trees with a DBH greater than 500 mm; and
- Domestic animals that were present at the Project Area through recreational activities were discounted in the species diversity results for this report.

2.4 Limitations to Assessment

2.4.1 Fauna Survey Limitations

The fauna assessment undertaken was a reconnaissance survey only (Level 1) and thus only sampled those species that can be easily seen, heard or have distinctive signs, such as tracks, scats, diggings etc. Many cryptic and nocturnal species would not have been identified during a reconnaissance survey.

The fauna assessment was aimed at identifying habitat types within the Project Area. In addition, terrestrial vertebrate fauna using the Project Area were identified. No sampling for invertebrates or aquatic species occurred. The information available on the identification, distribution and conservation status of invertebrates is generally less extensive than that of vertebrate species.

This survey was carried out during only one season and in one year. Complete faunal surveys often require multiple surveys, at different times of year, and over a period of a number of years, to enable full survey of all species present.

2.4.2 Flora Survey Limitations

Complete flora and vegetation surveys can require multiple surveys, at different times of year, and over a period of a number of years, to enable observation of all species present. Some flora species, such as annuals, are only available for collection at certain times of the year and others are only identifiable at certain times (such as when they are flowering). Additionally, climatic and stochastic events (such as fire) may affect the presence of plant species. Species that have a very low abundance in the area are more difficult to locate, due to above factors.

Flora composition changes over time, with flora species having specific growing periods, especially annuals and ephemerals (some plants lasting for a markedly brief time, some only a day or two). Therefore, the results of future botanical surveys in this location may differ from the results of this survey.

The timing of the flora survey and the rainfall during the preceding months was considered satisfactory for the identification of all annual and ephemeral species, including any Threatened or Priority listed species that may have been present. The Project area received a total of 235.4 mm of rainfall during the months of August to 30th October, which is 1.6 mm below the historical average annual rainfall (1944-2010).

2.4.3 Desktop Survey Limitations

Desktop investigations use a variety of online resources (as detailed in section 2.1), the responsibility for the accuracy of such data remains with the issuing authority, not with GHD. The DSEWPaC Protected Matters database is used to identify species listed under the EPBC Act. This data base draws on various sources to report on the potential of the species occurrence within the area. The DSEWPaC search tool is broad-scale in its' reporting and often the specific habitat requirements of the species do not occur within Project Areas and are unlikely to occur within the area. For this reason not all species reported by the search tool need to be considered in impact assessments. The DEC NatureMap database reports on records of the species within the designated area and can provide more accurate information of the likelihood of species presence.

The EPBC Act Protected Matters Search Tool is based on bioclimatic modelling for the potential presence of species. As such, this does not represent actual records of the species within the area. The records from DEC searches of threatened flora and fauna provide more accurate information for the general area; however, some records of collections, sightings or trappings can be dated and often misrepresent the current range of threatened species.

3. Existing Environment

3.1 Bioregion

The Project Area is located within the Swan Coastal Plain Interim Biogeographic Regionalisation of Australia (IBRA) Region, Swan Coastal Plain Sub-Region. This sub-region is dominated by woodlands of *Banksia* and Tuart on sandy soils, sheoak on outwash plains, and paperbark in swampy areas. The colluvial and aeolian sand areas represent three phases of Quaternary marine sand dune development (which provide relief), and include a complex series of seasonal fresh water wetlands, alluvial river flats, coastal limestones and several off-shore islands. Younger sandy areas and limestones are dominated by heath and/or Tuart woodlands, while *Banksia* and Jarrah-*Banksia* woodlands are found on the older dune systems (Mitchell *et a*l. 2002).

3.2 Climate

The Project Area experiences a Mediterranean climate, with mild wet winters and hot dry summers. The closest Bureau of Meteorology (BOM) weather station to the Project Area is located 15 km away at Perth Airport (station number 9021). A summary of the climatic data (Bureau of Meteorology, 2012) for this weather station is provided in Table 3 and is graphed in Plate 1.

Table 3 Climatic data for Perth Airport (station 9021)

Mean annual maximum temperature:	17.9 °C to 31.9 °C
Mean annual minimum temperature:	8.0 °C to 17.5 °C
Annual Rainfall:	774.4 mm
Mean number of days of rain ≥ 1 mm per year:	86.3

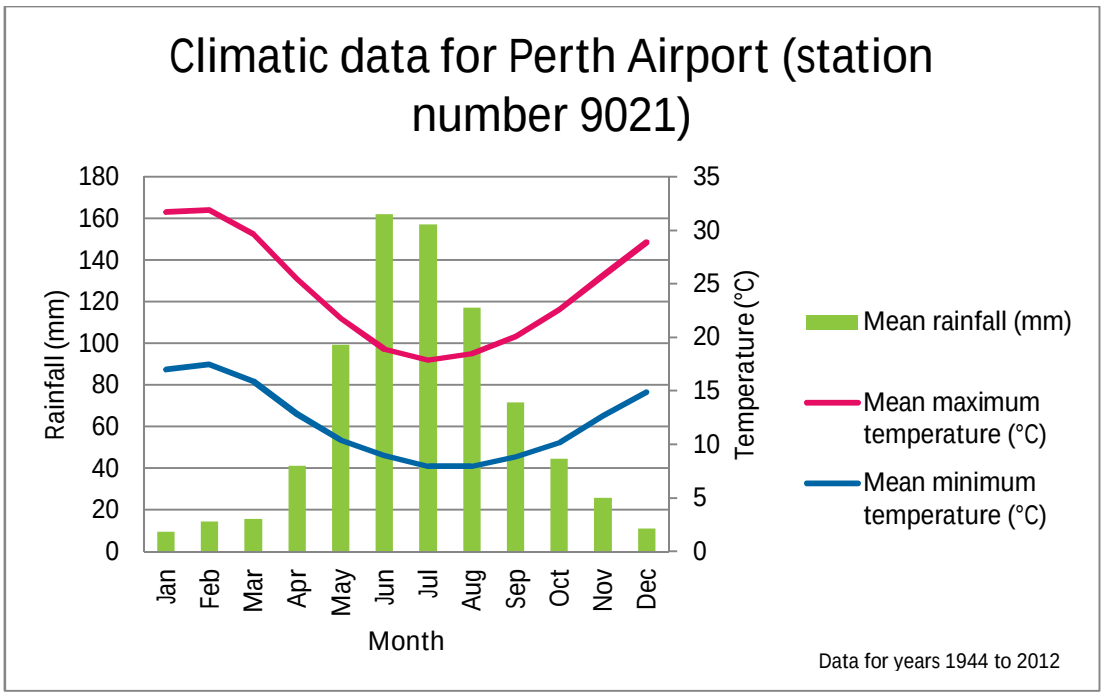

Plate 1 Climatic data for Perth Airport (station 9021)

3.3 Landform and Soils

The Swan Coastal Plain is generally of low relief, 20 to 30 km wide, and composed of Quaternary continental sediments. Its boundary is marked by scarps and associated features. The alluvial terrain, along the eastern fringe of the Plain, comprises materials of different ages and this is the basis for subdivision into mapping units. In the Darling Plateau, the lateritic uplands, which are dominated by duricrust, gravels and sands, forms a gently undulating surface (Department of Conservation and Environment, 1980).

Based on the mapping by Churchwood and McArthur (1978), the Project Area occurs on the Swan Coastal Plain, Bassendean dunes. The Bassendean dunes are defined by sand plains with low dunes and occasional swamps; iron or humus podzols; and areas of complex steep dunes.

3.4 Environmentally Sensitive Areas

Environmentally Sensitive Areas (ESAs) are declared by notice under Section 51B of the *Environmental Protection Act 1986* (EP Act).

A search of DEC's online Native Vegetation Viewer (DEC, 2012c) was undertaken to determine the location of any ESAs within the Project Area.

The Project Area is located within an ESA (Figure 2). The ESA extends beyond the bounds of the Project area and is associated with several geomorphic wetlands and Bush Forever Sites in the Project surrounds.

3.5 Conservation Areas and Reserves

There are no conservation areas managed by the DEC within the Project Area. An unnamed Nature reserve is located approximately 400 metres to the west of the Project Area (Figure 2). The Project Area is surrounded by the DEC Gnangara-Moore River State Forest.

3.6 Bush Forever Sites

The Bush Forever Strategy is a 10 year strategic plan which formally commenced in 2000 to protect approximately 51, 200 ha of regionally significant bushland within approximately 290 Bush Forever Sites. This strategy represents, where achievable, a target of at least 10% of each of the original 26 vegetation complexes of the Swan Coastal Plain portion of the Perth Metropolitan Region he (Government of Western Australia, 2000).

The Project Area is located within one Bush Forever Site (Site 399). Bush Forever Site 399 is adjacent to Bush Forever Site 300 (Figure 2). Details of these Sites are provided in Table 4.

Both Sites are listed has being 'part of a regionally significant contiguous bushland/wetland linkage which is a contiguous or largely contiguous corridor of bushland/wetland areas, being regionally significant links that are continuous or largely continuous bushland or wetland areas' (The Government of Western Australia, 2000). These areas are of particular significance as they provide corridors through otherwise highly cleared lands and provide linkages of regional significance (The Government of Western Australia, 2000).

Table 4 Bush Forever Sites and details in the vicinity of the Project Area

Site number	Site name	Size (ha)	Landscape features	Selection criteria met	Bush Forever recommendation	Linkages
300	Maralla Road Bushland, Ellenbrook/Upper Swan	641.5	Tall dune, open water, vegetated wetland, creek, vegetated uplands.	Providing a representation of ecological communities; diversity; rarity; maintaining ecological processes or natural systems; scientific or evolutionary importance; general criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation.	Site with Some Existing Protection; the Site is already reserved for Parks and Recreation in the Metropolitan Region Scheme and should be purchased for National Park, Conservation Park, Nature Reserve or Regional Park.	Adjacent native vegetation to the north and south outside the Site, east (Site 301), and west (Site 399); adjacent bushland north available; part of Greenways 36, 40, 59; part of a regionally significant contiguous[1] bushland/wetland linkage
399[2]	Melaleuca Park and Adjacent Bushland, Bullsbrook/Lexia	4150.9	Tall dune, open water, vegetated wetland, creek, vegetated uplands.	Providing a representation of ecological communities; diversity; rarity; maintaining ecological processes or natural systems; scientific or evolutionary importance; general criteria for the protection of wetland, streamline and estuarine fringing vegetation and coastal vegetation.	Site with Some Existing Protection; the existing care, control and management of this Site is endorsed (Proposed 'Gnangara Park' – Cabinet 1996).	Adjacent native vegetation to the north (Site 462); east (Sites 6, 298 and 300) and west (Site 398); part of Greenways 40, 41, 36; part of a regionally significant contiguous and fragmented bushland/wetland linkage[3].

[1] Contiguous or largely contiguous corridors of bushland/wetland areas, being regionally significant links that are continuous or largely continuous bushland or wetland areas (The Government of Western Australia, 2000).
[2] Located adjacent to the Project Area
[3] Linkages are areas are of particular significance as they provide corridors through otherwise highly cleared lands and provide linkages of regional significance (The Government of Western Australia, 2000).

3.7 Wetlands and Watercourses

3.7.1 Watercourses

No watercourses were identified within the Project Area (Figure 2).

3.1 Geomorphic Wetlands

Wetlands include not only lakes with open water, but areas of seasonally, intermittently or permanently waterlogged soil. Approximately 25% of the Swan Coastal Plain between Moore River and Mandurah is classified as wetland (Hill *et al*. 1996).

Though extensive on the Swan Coastal Plain, not all wetlands retain significant ecological values due to the concentration of urban and agricultural development in the region. Most wetlands have been cleared, filled or developed over, leaving only 20% of all the wetlands that were present on the Swan Coastal Plain prior to European settlement. Of these, an estimated 15% of the wetland area has retained high ecological values (Hill *et al.* 1996).

Categorisation of wetlands has been undertaken by Hill *et al*. (1996), delineating the Swan Coastal Plain into levels of protection and management categories.

Conservation Category Wetlands are wetlands that support high levels of attributes and functions. Resource Enhancement Wetlands are those that have been partly modified but still support substantial functions and attributes. Multiple Use Wetlands are classified as those wetlands that have few important ecological attributes and functions remaining.

The Geomorphic Wetlands Swan Coastal Plain dataset displays the location, boundary, geomorphic classification (wetland type) and management category of wetlands on the Swan Coastal Plain.

No Geomorphic Wetlands are present within the Project Area (Figure 2). Two Geomorphic wetlands are located within 500 metres to the west of the Project Area: a dampland Resource Enhancement Category wetland (UFI 8541) and a sumpland Conservation Category wetland (UFI 8553).

3.2 Broad Vegetation Types

Broadscale vegetation mapping of the area undertaken by Beard (1975) indicates the following vegetation associations are present within the Project Area:

- Low woodland; *Banksia* (association 949); and
- Medium very sparse woodland; Jarrah, with low woodland; *Banksia* & *Casuarina* (association 1001).

Heddle *et al*. (1980) mapped the Perth area at a finer scale than Beard. The Heddle *et al*. (1980) mapping identified the following vegetation complexes within the Project Area:

- Bassendean complex – north – transition vegetation complex (complex 45): a transition complex of low open forest and low woodland of *Banksia* species – *E. todtiana* on a series of high sand dunes. The understory species reflect similarities with both the Bassendean – north and Karrakatta – north vegetation complexes; and

- Bassendean complex – north (43): vegetation ranges from a low open forest and low open woodland of *Banksia* species *E. todtiana* to low woodland of *Melaleuca* species and sedgelands which occupy moister sites.

3.3 Broad Vegetation Type Extent and Status

A vegetation type is considered under-represented if there is less than 30% of its original distribution remaining. From a purely biodiversity perspective, and not taking into account any other land degradation issues, there are several key criteria now being applied to vegetation (Environmental Protection Authority, 2000). These are detailed below:

- The "threshold level" below which species loss appears to accelerate exponentially at an ecosystem level is regarded as being at 30% of the pre-European/pre-1750 extent for the vegetation type;
- 10% of the pre-European/pre-1750 extent for the vegetation type is regarded as being a level representing *Endangered*; and
- Clearing which would put the threat level into the class below should be avoided.

Such status can be delineated into five classes:

- *Presumed Extinct*: Probably no longer present in the bioregion
- *Endangered**: <10% of pre-European extent remains
- *Vulnerable**: 10-30% of pre-European extent exists
- *Depleted**: 30–50% of pre-European extent exists
- *Least Concern*: >50% pre-European extent exists and subject to little or no degradation over a majority of this area.

* Or a combination of depletion, loss of quality, current threats and rarity gives a comparable status

The EPA Guidance Statement No. 10 (Environmental Protection Authority, 2006) assesses the extent of Heddle *et al*. (1980) vegetation complexes currently present against predicted pre-European extents. As shown in Table 5, the Bassendean complexes mapped within the Project Area are present at more than 72 % of the pre-1750 extent and are regarded as *Least Concern*.

Table 5 Vegetation complex, extent and status within the Project Area based on Heddle *et al*. (1980) and the Environmental Protection Authority (2006)

Vegetation complex	Total pre-1750 extent (ha)	Present extent (1997/98) in the System 6/part System 1 area[1] (hectares)	% of each remaining (1997/98)	% of each remaining of pre-1750 extent in secure tenure (2002)
45: Bassendean complex – north – transition vegetation complex	17 675	16 308	92.3 (Least Concern)	57.8
43: Bassendean complex – north vegetation complex	74 147	53 384	72.0 (Least Concern)	27.5

(Environmental Protection Authority, 2006 and Heddle *et al*. 1980)

The extent of remnant vegetation associations has been assessed by the Government of Western Australia (2010), based on vegetation association mapping undertaken by Beard (1979). The remaining extents of the vegetation associations present within the Project Area as shown in Table 6, are considered *Vulnerable* for vegetation association 1001 and of *Least Concern* for vegetation associations 949. A total of 0.68 ha of vegetation association 1001 is located within the Project Area along the road in the south of the Project Area (Figure 2).

Table 6 Vegetation type, extent and status of pre-European vegetation within the Project Area for the whole of the State, Bioregion and City of Swan Local Government Area (LGA) (Government of Western Australia, 2010).

Vegetation Association	Region	Pre-European extent (ha)	Current extent (ha)	% remaining	% current extent in DEC Managed lands
949: Low woodland; *Banksia*	State	218193.94	124119.8	56.9%	51.1%
	SCP Bioregion	209,983.3	121,248.3	57.74%	51.63%
	LGA	16,235.17	8,266.44	50.92%	55.41%
1001: Medium very sparse woodland; Jarrah, with low woodland; *Banksia* & *Casuarina*	State	57410.23	14151.90	24.65	5.66
	SCP Bioregion	57,410.23	14,151.90	24.65	5.66
	LGA	8,868.67	2,393.76	26.99	2.70

According to the EPA Guidance Statement No. 10, it is important to note that the "remnant native vegetation mapping used in the Region is derived from dated aerial photography (in this case 1998) with limited ground-truthing. As a consequence the percentages of ecological

communities remaining are generally an overestimate of the native vegetation remaining at present and at the date of this Guidance [2006]. The principal factors contributing to this overestimation are:

- The preferential mapping of treed landscapes, leading to some mapping of areas that are parkland cleared or completely degraded;
- The inclusion of areas that are approved for clearing through development approvals and/or clearing permits; and
- Some areas that have been cleared since the time of the aerial photography.

It is therefore important to bear these issues in mind when the percentage of the vegetation complexes remaining is approaching 30%." (Environmental Protection Authority, 2006); furthermore, additional clearing of the Swan Coastal Plain (since 1998) is likely to further reduce the actual percentage remaining of each vegetation type.

4. Results

4.1 Vegetation type and condition

4.1.1 Vegetation types

A total of two vegetation types (not including highly disturbed areas) were identified within the Project Area. Native vegetation remaining within the Project Area consists predominantly of *Banksia* Low Open Forest which is consistent with Beard (1975) and Heddle *et al*. (1980) vegetation mapping for the area.

The vegetation types are described in Table 7 and mapped in Figure 3, Appendix A.

Table 7 Vegetation types present in the Project Area

Broad Vegetation Association/Formation	Vegetation Association	GHD Quadrat	Site Photo
Banksia Low Open Forest	BaPlAxAcLb Low Open Forest of *Banksia attenuata* and *Banksia menziesii* over Shrubland of *Petrophile linearis*, *Regelia ciliata* and *Stirlingia latifolia* over Open Low Heath of *Astroloma xerophyllum*, *Croninia kingiana* and *Hibbertia subvaginata* over Very Open Grassland of *Austrostipa compressa* over Very Open Herbland of *Lechenaultia biloba*, *Stylidium* species and **Ursinia anthemoides*	Q1, Q2, Q3, Q4	
Kunzea, Banksia and *Jacksonia* Shrubland	KgRcCa Shrubland of *Kunzea glabrescens*, *Banksia attenuata* and *Jacksonia furcellata* over Low Shrubland of *Regelia ciliata*, *Gompholobium tomentosum* and Hibbertia species over Very Open Herbland of *Conostylis aculeata* subsp. *aculeata*, **Gladiolus caryophyllaceus* and *Laxmannia squarrosa*	Q5, Q6	

Broad Vegetation Association/Formation	Vegetation Association	GHD Quadrat	Site Photo
Highly Disturbed	HD Areas where clearing or other activities have fundamentally altered the composition of native vegetation and are not self-sustaining. These areas are completely or almost completely without native species. Some scattered native trees (*Eucalyptus* spp. and *Melaleuca* spp.) and shrub species may remain with an understorey dominated by introduced grasses (or crop species) and herbs.		

4.1.2 Vegetation Condition

Based on the Keighery (1994) condition rating scale (Table 2) the vegetation condition of the Project Area ranged from *Pristine* (1) to *Completely Degraded* (6). The native vegetation located in the northern section of the Project Area rated between *Pristine* (1) to *Excellent* (2). Common pasture weeds such as **Ursinia anthemoides*, **Hypochaeris* sp. and **Conyza* sp. were scattered in low abundance throughout the native vegetation in the northern section of the Project Area.

A small section of rehabilitated vegetation was located south west of the native vegetation in the north of the Project Area. The vegetation condition of the rehabilitated area rated between *Good* (3) to *Degraded* (5) as the vegetation structure within the rehabilitated vegetation was basic and signs of clearing in the past were evident. Areas south of the rehabilitated area have previously been disturbed /cleared for mining and infrastructure of these areas were assigned a rating of *Completely Degraded* (6).

Vegetation condition mapping is shown at Figure 4, Appendix A.

4.1.3 Dieback Assessment

GHD undertook a preliminary assessment for *Phytophthora* spp. (Dieback) as part of the vegetation condition assessment. This was based on the presence/absence of typical indicator species, such as *Banksia* species. *Banksia* deaths suspected to be related to Dieback were recorded during the field survey and have been mapped at Figure 4.

4.1.4 Flora Diversity

A NatureMap search identified 417 flora species collected within 5 km of the Project Area; of which 50 are naturalised (introduced) species. A copy of the desktop searches is provided in Appendix B.

The GHD spring survey identified a total 116 plant taxa (including subspecies and varieties) representing 33 families and 80 plant genera were recorded in the Project Area. This total is comprised of 102 native species and 14 introduced (exotic) species.

Dominant families recorded from the Project Area included:

- Myrtaceae 20 taxa;
- Stylidiaceae 10 taxa;
- Fabaceae 9 taxa; and
- Poaceae 8 taxa.

Eight of the collections could not be positively identified to species level and 14 of the collections could not be positively identified to genera level due to the absence of adequate flowering parts and/or fruiting bodies.

A full inventory of flora species present in the Project Area in Appendix D.

4.1.5 Threatened and Priority Ecological Communities

Ecological communities are defined as naturally occurring biological assemblages that occur in a particular type of habitat (English & Blythe, 1997). Threatened Ecological Communities (TECs) are ecological communities that have been assessed and assigned to one of four categories related to the status of the threat to the community i.e. Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable.

TECs are listed under both State and Federal legislation; Federally-listed TECs are protected under the EBPC Act administered by the DSEWPaC. DEC maintains a list of TECs for Western Australia; some of these TECs are also protected under the EPBC Act.

DEC also maintains a Priority Ecological Community (PEC) List. PECs are not listed under any formal Federal or State legislation but are considered by DEC as important as whole ecosystems (including their processes and communities). Priorities 1, 2 and 3 PECs are ecological communities that are adequately known; are rare but not threatened, or meet criteria for Near Threatened. PECs that have been recently removed from the threatened list are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5. Further information on the conservation codes is provided in Appendix C.

A search of the EPBC Act Protected Matters Search Tool database identified the Organic Mound Springs TEC listed as Critically Endangered and the Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain TEC listed as Endangered within 5 km of the Project Area.

A search of the DEC TEC/PEC database identified one TEC within 5 km of the Project Area, three PECs within 5 km of the Project Area and two PECs within the Project Area (Figure 2).

It should be noted that DEC provides locations for TECs and PECs that have a buffer placed typically between 500 m and 1 500 m radius around the community. As such, the TEC/PEC may not be present within the entire extent of the buffer area.

Organic Mound Springs

The Organic Mound Springs is listed as a Critically Endangered TEC at the State level and Endangered under the EPBC Act.

The habitat of this community is characterised by a continuous discharge of groundwater in raised areas of peat. The peat and surrounds provide a stable, permanently moist series of microhabitats. Intact vegetated tumulus springs are only found at three locations. Typical and common native plant taxa associated with the tumulus springs are the trees *Banksia littoralis*, *Melaleuca preissiana* and *Eucalyptus rudis*, and the shrubs *Taxandria linearifolia, Pteridium esculentum*, *Astartea fascicularis* and *Cyclosorus interruptus.* The maintenance of hydrological processes in terms of both quality and quantity of water to the mounds is essential to sustain the tumulus spring communities *(DEWSPaC, 2012g).*

Field Assessment: No areas of continuous discharge of groundwater or peat were located within the Project Area during the time of the survey.

Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain

The Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain are listed as an Endangered TEC at the State level and Endangered under the EPBC Act.

This vegetation community occurs on heavy soils composed of black clay or sandy clay on limestone. Typical plant species within this TEC are *Casuarina obesa, Eucalyptus decipiens* and *Eucalyptus foecunda*, *Melaleuca huegelii*, *Alyogyne huegelii* var. *huegelii*, *Grevillea curviloba* ssp*. incurva, Grevillea curviloba* ssp*. curviloba, Grevillea evanescens, Melaleuca acerosa, Melaleuca huegelii and Thysanotus arenarius.* The following exotic species are also currently common*; Hypochaeris glabra*, *Sonchus asper*, *Briza maxima*, *Briza minor*, *Anagallis arvensis* and *Centaurium erythraea (DEWSPaC, 2012f).*

Field Assessment: No plant species compositions comparable to this TEC were identified during the field survey.

Low lying *Banksia attenuata* woodlands or shrublands, SCP 21c

The Low lying *Banksia attenuata* woodlands or shrublands, SCP 21c is listed as a Priority 3 PEC by the DEC. The desktop assessment identified this PEC as occurring within 5 km of the Project Area.

This vegetation community is restricted to the Bassendean system on lower lying wetter areas and is dominated by *Melaleuca preissiana, Banksia attenuata*, *B. menziesii, Regelia ciliata, Eucalyptus marginata* or *Corymbia calophylla*. The Low lying *Banksia attenuata* woodlands or shrublands may be either a woodland or shrubland (DEC, 2010c).

Field Assessment: The vegetation type *Banksia* Low Open Forest recorded in the northern section of the Project Area shares some similarities in plant species composition with this PEC, however the PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b is located within this section of the Project Area.

Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b

The Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b is Listed as a Priority 3 PEC by the DEC. The desktop assessment identified this PEC as occurring within the northern section of the Project Area.

This vegetation community occurs on the Bassendean system in *Banksia* woodlands north of Perth.

Field Assessment: This PEC is recorded in the northern section of the Project Area. The vegetation type *Banksia* Low Open Forest recorded in the northern section of the Project Area shares similar plant species composition with this PEC.

Banksia ilicifolia woodlands, SCP22

The *Banksia ilicifolia* woodlands are listed as a Priority 3 PEC by the DEC. The desktop assessment identified this PEC as occurring within the Project Area.

Field Assessment: The buffer zone for this PEC is located over the Project Area where rehabilitated vegetation of *Kunzea, Banksia* and *Jacksonia* Shrubland and Highly Disturbed areas were identified during the field survey (Figure 3). *Banksia ilicifolia* was not recorded during the survey. This PEC was not recorded during the field survey.

4.1.6 Conservation Significant flora

The Federal conservation level of flora species and their significance status is assessed under the EPBC Act. The State conservation level of flora are listed under the WC Act, the State Minister for the Environment may declare species of flora to be protected if they are considered to be in danger of extinction, rare or otherwise in need of special protection.

Additionally, in Western Australia, DEC produces a supplementary list of Priority Flora, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislative protection, but their presence would normally be considered relevant to an assessment of the conservation status of an area. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened flora or fauna.

For the purposes of this assessment, all species listed under the EPBC Act, WC Act and DEC Priority species are considered conservation significant. Further information on the conservation codes relevant to this report is provided in Appendix C.

A search of the DEC's Threatened Flora, the Western Australian Herbarium (WAHERB) databases, EPBC Act and Western Australian Museum NatureMap records identified 23 species of conservation significance as potentially occurring within 5 km of the Project Area.

Likelihood of occurrence assessment

A likelihood of occurrence assessment of conservation significant species (based on the range, habitat requirements and previous records of the species) (Appendix D) determined that three species are likely to occur within the Project Area (one EPBC Act- and WC Act-listed species and two DEC Priority species). Seven conservation significant species were identified as possibly occurring within the Project Area (Table 8).

Table 8 Summary of flora likelihood of occurrence assessment

Family	Species	Status		Source		Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC	
Apiaceae	*Eryngium pinnatifidum* subsp. *palustre*	P3		X		Possible
Dasypogonaceae	*Calectasia* sp. Pinjar	P1		X		Possible
Euphorbiaceae	*Stachystemon* sp. Keysbrook	P1		X		Possible
Haemodoraceae	*Phlebocarya pilosissima* subsp. *pilosissima*	P3		X		Likely
Myrtaceae	*Chamelaucium* sp. Gingin	T	E		X	Possible
Myrtaceae	*Darwinia foetida*	T	CE		X	Possible
Myrtaceae	*Verticordia lindleyi subsp. Lindleyi*	P4		X		Possible
Orchidaceae	*Caladenia huegelii*	T	E	X		Likely
Orchidaceae	*Thelymitra stellata*	T	E		X	Possible
Restionaceae	*Hypolaena robusta*	P4		X		Likely

No Threatened Flora (previously called Declared Rare Flora) listed under the *Wildlife Conservation Act 1950, species* of national conservation significance listed under the EPBC Act or Priority flora listed by the DEC were recorded within the Project Area during the time of the survey.

4.1.7 Introduced flora

A total of 14 introduced (exotic) species were recorded from the Project Area. Introduced grasses and herb species were scattered throughout the understorey of much of the native vegetation in the Project Area and dominant in highly disturbed areas.

No Weeds of National Significance (WONS) listed by the Federal Government were recorded in the Project Area.

No weeds listed as Declared Plants under the Section 37 of the *Agricultural and Related Resources Protection Act 1976* were recorded in the Project Area.

4.2 Fauna

4.2.1 Fauna habitats

Two fauna habitat types were identified within the Project Area, which are closely aligned with the vegetation types outlined in section 4.1.1.

- *Banksia* Woodland (14.5 ha)

This habitat type is the dominant vegetation type present within the Project Area.

Woodland habitats offer particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available in the woodland habitat. The *Banksia* woodland is relatively uniform across the site and no large trees were recorded. Throughout the *Banksia* Woodland there are areas of loose coastal sand that are suitable for burrowing reptiles, and in particular provide potential habitat for the conservation significant *Neelaps calonotos* (Black-striped Snake). The *Banksia* Woodland is dominated by *Banksia attenuata* and *Banksia menziesii* with other proteaceous species. The vegetation in this area is very dense and provides good habitat for a number of fauna species including potential feeding habitat for the conservation significant for Black Cockatoos. The Project Area is located within a larger area of foraging habitat to the north and east and provides regionally significant contiguous bushland linkages, which are a contiguous or largely contiguous corridor of bushland areas. These areas are of particular significance as they provide corridors through otherwise highly cleared lands and provide linkages of regional significance for fauna species.

- Revegetated *Banksia* Woodland (0.7 ha)

This habitat type occurred within the area of the proposed inlet and outlet mains, and consisted of mine revegetation of *Banksia* Woodland. This habitat type was still in the early stages of growth and as such had sparse lower storey vegetation and very limited leaf litter and ground cover. As a result, this habitat type would provide limited habitat for ground-dwelling fauna, particularly reptiles and mammals, due to the lack of cover for these species.

4.2.2 Fauna diversity

A NatureMap search identified 109 fauna species as recorded within 5 km of the Project Area, of which none are introduced (feral) species (Appendix B). During the survey 21 fauna species were recorded within the Project Area, consisting of 19 birds and two mammals (Appendix E).

4.2.3 Conservation Significant Fauna

The Federal conservation level of fauna species and their significance status is currently assessed under the EPBC Act. The significance levels for fauna used in the EPBC Act are

those recommended by the International Union for the Conservation of Nature and Natural Resources (IUCN).

The State conservation level of fauna species and their significance status is currently assessed under the State WC Act (*Wildlife Conservation (Specially Protected Fauna) Notice 2010(2)*). The WC Act uses a set of Schedules but also classifies species using some of the IUCN categories. Schedule 3 fauna species are those which are "subject to an agreement between the government of Australia and the governments of Japan, China and the Republic of Korea relating to the protection of migratory birds, are declared to be fauna that is in need of special protection" (Government of Western Australia, 2012) and the eight species listed as Schedule 3 are covered under the marine and migratory fauna species category.

Also in Western Australia, the DEC produces a supplementary list of Priority Fauna, these being species that are not considered Threatened under the WC Act but for which the Department feels there is a cause for concern. These species have no special legislative protection, but their presence would normally be considered relevant to an assessment of the conservation status of an area. Such taxa need further survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.

The desktop queries identified 18 conservation significant species in total including 12 birds, four mammals, one reptile, and one insect (Appendix B).

Seven of the 12 bird species identified for the Project Area are listed as Migratory (i.e. migratory marine, migratory terrestrial or migratory wetland) under the EPBC Act. Species solely listed as migratory marine (e.g. Fork-tailed Swift, *Apus pacificus*) and/or migratory wetland (e.g. Great Egret, *Ardea alba* and Cattle Egret, *Ardea* ibis, Australian Painted Snipe *Rostratula benghalensis australis*) were excluded from this assessment as no marine or wetland habitat was present within the Project Area. The remaining three species are listed as migratory terrestrial and are considered as part of this assessment.

Likelihood of Occurrence

An assessment on the likelihood of these species occurring in the Project Area was conducted. This assessment was based on species biology, habitat requirements, the quality and availability of suitable habitat and records of the species in the area. The assessment concluded that seven species were likely to occur within the Project Area and one species could possibly occur within the Project Area and four species were unlikely to occur (Table 9).

No conservation fauna species were recorded during the field study.

Table 9 Fauna likelihood of occurrence

Species	Federal listing	State listing	Likelihood of occurrence
Birds			
Falco peregrinus Peregrine Falcon	-	S	Possible The species has been recorded within 5 km of the site and there is some suitable habitat. The surrounding levels of development and disturbance may limit habitat values of the site however the proximity of the site to semi-rural areas may increase the likelihood of the species utilising the Project Area.
Leipoa ocellata Malleefowl	V	T	Unlikely The Malleefowl usually occurs in shrublands and low woodlands that are dominated by mallee vegetation. There is no suitable habitat present within the Project Area and the species has not been recorded within 5 km of the Project Area.
Calyptorhynchus banksii naso Forest Red-tailed Black Cockatoo	V	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.
Calyptorhynchus baudinii Baudin's Black Cockatoo	V	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.
Calyptorhynchus latirostris Carnaby's Black Cockatoo	E	T	Likely Suitable foraging habitat present within Project Area and has been recorded within 5 km of the site.

Species	Federal	State	Likelihood of occurrence
Rostratula australis Australian Painted Snipe	V	T	Unlikely The Australian Painted Snipe generally inhabits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. There is no suitable habitat within the Project Area and the species has not been recorded within 5 km of the Project Area.
Mammals			
Dasyurus geoffroii Chuditch, Western Quoll	V	T	Unlikely The Project Area has some vegetated connectivity between the northern Ellenbrook Tanksite and surrounding Gnangara-Moore River State Forest that would provide some habitat for the Quoll, however, the high levels of disturbance from the mine, development, cats and foxes within the Project Area and in surrounding areas would greatly limit the likelihood of occurrence.
Isoodon obesulus fusciventer Southern Brown Bandicoot	-	P5	Likely Suitable habitat present within Project Area and has been recorded within 5 km of the site. This species is known to occur in urban bushland in some parts of Perth, and has been recorded both in Ellenbrook and within Whiteman Park.
Macropus irma Western Brush Wallaby	-	P4	Likely The Wallaby is known to occur at Whiteman Park and there is some connectivity to the surrounding undeveloped land that could provide suitable habitat. However, the high levels of disturbance, development and foxes within the Project Area and in surrounding areas would limit the population size of this species.
Hydromys chrysogaster Water-rat	-	P4	Unlikely The Project Area does not contain any permanent water bodies which would provide habitat for the water-rat. The Project Area is also not well connected to any other habitat which would provide habitat for the species. The species has been recorded within 5 km of the site, and may travel through the Project Area in search of suitable habitat such as to the south near Ellen Brook. However, the high levels of disturbance, development, cats and foxes within the Project Area and in surrounding areas would limit the likelihood of occurrence.
Reptiles			

Species	Federal	State	Likelihood of occurrence
Neelaps calonotos Black-striped Snake	-	P3	Likely This species is restricted to the sandy coastal strip of dune habitat between Mandurah and Lancelin, and occurs on dunes and sand-plains vegetated with heaths and eucalypt/banksia woodlands. There is suitable habitat within the Project area, with the loose coastal sand providing burrowing habitat for the Black-striped snake. The species has also been recorded within 5 km of the Project Area.
Insects			
Synemon gratiosa Graceful Sun-moth	E	P4	Likely The Graceful Sun-moth is closely associated with *Banksia* woodland and this vegetation occurs within the Project Area. The species is also dependent upon *Lomandra maritima* and *L. hermaphrodita* being present for breeding, of which *L. hermaphrodita* was found to be present within the Project Area. It has also been recorded within 5 km of the Project Area, and therefore likely to occur

Conservation codes are presented in Appendix C and definitions of likelihood of occurrence are presented in Appendix E.

Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act)

CE	Critically Endangered (EPBC Act)
E	Endangered (EPBC Act)
V	Vulnerable (EPBC Act)
Ma	Marine (EPBC Act)
Mi	Migratory (EPBC Act)

Wildlife Conservation Act 1950 (WC Act)

T	Threatened (–WC Act)
S	Other specially protected fauna (WC Act)

Department of Environment and Conservation (DEC)

P1	Priority 1 (DEC)

P2	Priority 2 (DEC)
P3	Priority 3 (DEC)
P4	Priority 4 (DEC)
P5	Priority 5 (DEC)

4.2.4 Black Cockatoos

There are three species of Black Cockatoo that occur on the Swan Coastal Plain (potentially present in the Project Area):

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo) is listed as *Endangered* by the EPBC Act and *Threatened* by the WC Act. This species has been recorded within 5 km of the Project Area;
- *Calyptorhynchus baudinii* (Baudin's Black Cockatoo) is listed as *Vulnerable* by the EPBC Act and *Threatened* by the WC Act; This species has been recorded within 5 km of the Project Area; and
- *Calyptorhynchus banksii naso* (Forest Red-tailed Black Cockatoo) is listed as *Vulnerable* by the EPBC Act. This species has not been recorded within 5 km of the Project Area.

Foraging

These cockatoo species are known to feed on *Allocasuarina*, *Eucalyptus,* and *Banksia* species (DSEWPaC, 2012c; Groom, 2011), of which *Allocasuarina* and *Banksia* species were identified within the Project Area. The *Banksia attenuata* and *Banksia menziesii* present throughout the Project Area would provide potential foraging habitat for Black Cockatoo species, and is regarded as a high value foraging species for Carnaby's Black Cockatoo (Groom, 2011). Some Sheoak (*Allocasuarina fraseriana*) was recorded within Project Area and also provides potential foraging habitat for Black Cockatoo species. The Project Area is also classified as potential feeding vegetation for Carnaby's Black Cockatoo on the Swan Coastal Plain (Department of Planning, 2011).

A total of 14.5 hectares (ha) of *Banksia* Low Open Forest vegetation type and 0.7 ha of *Kunzea, Banksia* and *Jacksonia* Shrubland vegetation type within the Project Area contain *Banksia* and *Allocasuarina* species, making up a total area of 15.2 ha of Black Cockatoo foraging habitat (Figure 5). The majority of this area is located within the Ellenbrook Tanksite. Black Cockatoos are also known to opportunistically use a wide variety of plant taxa as food resources; therefore all vegetation within the Project Area was generally assessed for signs of use by Black Cockatoos. There was no evidence found during the field survey that the Project Area was being used by Black Cockatoos for foraging.

Roosting

Baudin's and Carnaby's Black Cockatoos generally roost in or near riparian environments, or permanent water sources, in *Eucalyptus* species; Forest Red-tailed Black Cockatoos generally roost in tall Jarrah (*Eucalytpus marginata*) or Marri (*Corymbia calophylla*) trees within or on the edges of forests (DSEWPaC, 2012c). As the Project Area is not situated within a riparian environment or forest, it is unlikely that the area is used by Black Cockatoo species for roosting. However, there is one Carnaby's Cockatoo known roosting site located approximately 2 km west of the Project Area, in *Melaleuca* trees (Department of Planning, 2011). Therefore, the Project Area is likely to provide a habitat linkage between other foraging and roosting sites.

Breeding

Trees with potential nesting qualities are Tuart (*Eucalyptus gomphocephala*), Wandoo (*Eucalyptus wandoo*), Jarrah (*Eucalyptus marginata*) and Marri (*Corymbia calophylla*) with a diameter at breast height (DBH) of greater than 500 mm for Jarrah, Marri and Tuart and 300

mm for Wandoo. Trees of this size are considered to have nesting potential now, or will develop hollows within 100 years. No trees with a DBH of greater than 500 mm for Jarrah, Marri and Tuart or 300 mm for Wandoo were recorded in the Project Area.

Assessing the Impact on Black Cockatoos

DSEWPaC (2012c) provides a risk table that gives guidance on what the Department views as risks/impacts to Black Cockatoos that will trigger referral. Risk is broken into three categories (high, uncertain and low) and primarily focuses on breeding, feeding and roosting areas as well as indirect impacts. If there is uncertainty in regards to risks to Black Cockatoos then the Department recommends referring the project or contacting the Department to ensure legal certainty. There are one high risk and three uncertain risks where the Project Area is likely to impact on Black Cockatoos. As detailed in Table 11 it is likely that the project will trigger referral to the DSEWPaC due to this potential impact. Some of the impacts to Black Cockatoos may be avoided through appropriate selection and design of the project.

Table 10 DSEWPaC Black Cockatoo risk referral table.

Risk type	Referral trigger
High risk of significant impacts: referral to DSEWPaC recommended	
Clearing of any known nesting tree.	Referral is not triggered There are no known breeding trees within the Project Area.
Clearing or degradation of any part of a vegetation community known to contain breeding habitat	Referral is not triggered There are no vegetation communities containing breeding habitat that will be cleared within the Project Area.
Clearing of more than 1 ha of quality foraging habitat.	Referral is triggered. There is more than 1 ha of high quality foraging habitat present within the Project Area (up to 15.2 ha).
Clearing or degradation (including pruning the top canopy) of a known roosting site.	Referral is not triggered
Creating a gap or greater than 4 km between patches of Black Cockatoo habitat (breeding, foraging or roosting).	Referral is not triggered
Uncertainty: referral recommended or contact DSEWPaC	
Degradation (such as through altered hydrology or fire regimes) of more than 1 ha of foraging habitat. Significance will depend on the level and extent of degradation and the quality of the habitat.	Referral is likely to be triggered. Clearing of up to 15.2 ha of quality foraging habitat within the Project Area will further degrade the surrounding foraging habitat through altered hydrology.
Clearing or disturbance in areas surrounding Black Cockatoo breeding, foraging or night roosting habitat that has the potential to degrade habitat through introduction of invasive species, edge effect, hydrological changes, increase human visitation or fire.	Referral may be triggered. The Project Area is located within a larger area of foraging habitat to the north and east and therefore clearing of 15.2 ha of quality foraging habitat will further degrade the surrounding foraging habitat through edge effects and introduction of exotic species.
Actions that do not directly affect the listed species but that have the potential for indirect impacts such as increasing competitors for nest hollows.	Referral is not triggered.

Risk type	Referral trigger
Actions with the potential to introduce known plant diseases such as *Phytophthora* spp. to an area where the pathogen was not previously known.	Referral may be triggered. *Phytophthora* spp. is known to occur widely on the Swan Coastal Plain and is also known to occur in vegetation to the west of the Project Area. As such, *Phytophthora* spp. may already be present at the Project Area. A *Phytophthora* spp. assessment would need to be conducted to confirm whether the disease is present. If not, then it is likely that clearing of the Project Area may introduce *Phytophthora* spp. to areas where the pathogen was not previously known. Given the urban development and somewhat fragmented nature of the area, the vegetation would be considered highly susceptible to diseases such as *Phytophthora* spp.
Low risk of significant impacts: referral may not be required but may refer to DSEWPaC for legal certainty	
Actions that do not affect Black Cockatoo habitat or individuals.	Not applicable.
Actions whose impacts occur outside the modelled distribution of the three Black Cockatoos.	Not applicable.

4.2.5 Graceful Sun Moth

The Graceful Sun Moth (*Synemon gratiosa*) (GSM) is a day-flying moth endemic to the south-west of Western Australia. Once widespread on the Swan Coastal Plain, the moth is now only present in a few scattered conservation areas, due to dramatically increased urban development destroying the moths' habitat. The species is listed as Priority 4 by DEC, and endangered under the EPBC Act. Until recently, the GSM was listed under the WC Act list as Threatened, but as of November 2012 it has been delisted to Priority 4, meaning it is "*considered to have been adequately surveyed and which, whilst being rare (in Australia), is not currently threatened by any identifiable factors*" (Appendix C).

There is limited information on the ecology and biology of the GSM, however, it appears that the remaining populations are severely fragmented and declining (DEC, 2010a). The larvae of the GSM inhabit sandy soils and feed upon root mats formed by *Lomandra maritima* and *L. hermaphrodita*. The GSM is only active in autumn, unlike the majority of Lepidoptera that are most active during spring and summer months. The active periods for the GSM dictate the scheduling for field surveys for the species; DEC has published species and habitat survey guidelines for the GSM (DEC, 2010b).

The GSM is closely associated with *Banksia* woodlands. The vegetation type *Banksia* Low Open Forest located within the proposed Ellenbrook Tanksite, in the northern section of the Project Area, is considered potential GSM habitat. *Lomandra hermaphrodita*, a known food source for the moth, was also recorded during the field survey and locations of this plant species have been mapped in Figure 5. This indicates that the Project Area may be used by the Graceful Sun Moth and there are potentially 14.5 ha of GSM habitat within the Project Area.

4.2.6 Migratory Species

Desktop investigations resulted in seven migratory species recorded within 5 km of the Project Area.

No important habitat for any of the migratory terrestrial species mentioned in this report would be substantially removed or modified as part of the proposed works. The proposed works are unlikely to disrupt the lifecycle of an ecologically significant proportion of a population of listed migratory species. The Project is unlikely to result in an invasive species that is harmful to a listed migratory species becoming established in an area of important habitat for listed migratory species. It is unlikely that listed migratory species would be significantly impacted by the proposed works.

5. Legislation and Approvals

5.1 Federal - Environment Protection and Biodiversity Conservation Act 1999

Black Cockatoos

The Commonwealth EPBC Act promotes the conservation of biodiversity by providing protection for threatened species, threatened ecological communities, migratory and marine species and other protected matters.

In October 2012, DSEWPaC released the referral guidelines for the assessment of projects for potential impacts on Black Cockatoos (DSEWPaC, 2012c). These guidelines are for all Black Cockatoo species, and do not provide information relative to particular areas of the State, but provide information to decide whether a project may trigger referral.

Within these guidelines, DSEWPaC provides a risk table that gives guidance on what it views as risks/impacts to Black Cockatoos that will trigger referral. Risk is broken into three categories, high, uncertain and low, and primarily focuses on breeding, feeding and roosting areas as well as indirect impacts. If there is uncertainty in regards to risks on Black Cockatoos then the DSEWPaC recommends referring the project or contacting the Department to ensure legal certainty.

Given the presence and extent of known foraging habitat (approximately 15.2 ha) within the Project Area, DSEWPaC (2012c) considers impacts of greater than 1 ha of quality foraging habitat as a high risk activity. As such, should the Project require more than 1 ha of clearing within the *Banksia* Woodland it is recommended that the Project be referred.

Graceful Sun Moth

In 1999, DSEWPaC released the significant impact guidelines 1.1 for the assessment of Matters of National Environmental Significance (DSEWPaC, 1999). These draft guidelines are for all listed Threatened species, and do not provide information relative to particular areas of the State, but provide information to decide whether a project may trigger referral.

Within these guidelines, DSEWPaC provides advice that gives guidance on what it views as risks/impacts to Threatened species that will trigger referral. Based on the risk guidelines, "*an action is likely to have a significant impact on a critically endangered or endangered species if there is a real chance or possibility that it will":*

- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline;
- interfere with the recovery of the species; and
- adversely affect habitat critical to the survival of a species.

There is up to 14.5 ha of potential GSM habitat present within the Ellenbrook Tanksite. Confirmation of this species presence requires a targeted assessment. Should GSM be present, the Project is likely to trigger a referral to DSWEPaC as there is a real chance or possibility that it will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline.

5.2 Assessment Against the 10 Clearing Principles

Any clearing of native vegetation will require a permit under Part V Division 2 of the *Environmental Protection Act 1986* (EP Act), except where an exemption applies under Schedule 6 of the Act or is prescribed by regulation in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, and it is not in an Environmentally Sensitive Area (ESA).

To assist with the consideration of potential vegetation clearing an assessment against the "10 Clearing Principles" has been undertaken and is provided in Table 11. Clearing for the proposed Ellenbrook Tanksite and inlet and outlet mains is at variance to Principles (a) and (b) and may be at variance with Principle (h).

Table 11 Assessment against the Ten Clearing Principles for the Project Area

Principle	Assessment	Variance
(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.	A total 116 plant taxa representing 33 families and 80 plant genera were recorded in the Project Area. This total is comprised of 102 native species and 14 introduced (exotic) species. The Priority 3 PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b is located in the Project Area and is presented in the GHD vegetation mapping as *Banksia* Low Open Forest. There is 14.5 ha of the Priority 3 PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b located within the Project Area. This PEC is considered a naturally occurring unique assemblage of plants in a specific habitat. No Priority flora was identified during the time of the field survey. A total of 21 fauna species, comprising of 19 birds, and two mammals were recorded during the survey. All of the species recorded during the survey are typical of the Perth Swan Coastal Plain	The proposal is at variance with the Principle.
(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.	The Project Area has been identified as likely to be or possibly being an area of habitat for eight conservation significant fauna species: • Peregrine Falcon (*Falco peregrinus* - State Schedule 4); • Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso* - State Threatened, Federally Vulnerable); • Baudin's Black Cockatoo (*Calyptorhynchus baudinii* - State Threatened, Federally Endangered); • Carnaby's Black Cockatoo (*Calyptorhynchus latirostris* - State Threatened, Federally Endangered); • Black-striped Snake (*Neelaps calonotos* – State Priority 3); • Graceful Sun-moth (*Synemon gratiosa* – State Priority 4, Federally	The proposal is at variance with the Principle.

	Endangered); • Southern Brown Bandicoot (*Isoodon obesulus fusciventer* - State Priority 5); and • Western Brush Wallaby (*Macropus irma* -State Priority 4). The Swan Coastal Plain has been extensively cleared and as a result, the habitats present at the Project Area are not well-represented in the area. The Project Area, although small, is potentially an area of important habitat for the conservation significant species as well as being a habitat corridor for other species of fauna. Clearing of the Project Area would lead to a further decrease in habitat available for these species. Habitat for the threatened Black Cockatoos is present within the Project Area. Approximately 15.2 ha of Cockatoo foraging habitat occur within the Project Area. Though not observed during the field survey it is considered likely that the Black-striped Snake, Southern Brown Bandicoot and Western Brush Wallaby may also be present with the Project Area. A targeted search and fauna survey for the Graceful Sun Moth would need to be undertaken to determine whether this species occurs within the Project Area.	
(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.	No Threatened flora was identified during the time of the field survey.	The proposal is not at variance with the Principle.
(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community.	Desktop Assessments identified two Threatened Ecological Communities within the area: Organic Mound Springs and Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain. Field surveys did not identify these TECs within the Project area.	The proposal is not at variance with the Principle.
(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.	Under this principle, clearing in areas with greater than 30% native vegetation is not likely to be at variance if there is greater than 30% of the total vegetation in the local area and within the bioregion in good condition. The vegetation of the Project Area is within Heddle *et al*. (1980) vegetation complexes 45 and 43. These complexes are classified as *Least Concern* (present at more than 72 %). The vegetation of the Project Area is within Beards (1979) vegetation associations	The proposal is not at variance with the Principle.

	1001 and 949. The remaining extents of the vegetation associations present within the Project Area are considered *Vulnerable* for vegetation association 1001 and of *Least Concern* for vegetation associations 949. A total of 0.68 ha of vegetation association 1001 is located within the Project Area along the road in the south of the Project Area. The area where vegetation association 1001 is located, vegetation condition is Completely Degraded and no native vegetation will be cleared in this area if the Project proceeds.	
(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.	The Project Area is not intersected by and does not contain any watercourses or wetlands.	The proposal is not at variance with the Principle.
(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.	Land degradation can be caused or exacerbated by uncontrolled runoff and wind or water erosion. Clearing the Project Area would create additional runoff. Drainage design and suitable controls during construction should minimise potential degradation to surrounding land. The condition of the native vegetation *Banksia* Low Open Forest vegetation type within the Project Area where the proposed clearing for the Ellenbrook Tanksite is to occur ranges from Pristine to Excellent. Areas where the proposed inlet and outlet mains are located predominantly follow roads and the sand mine site. Proposed clearing for the Ellenbrook Tanksite would lead to further land degradation of vegetation. However, due to the small size of the Project Area, the degradation impact of clearing the native vegetation is likely to be relatively minimal. Works should be undertaken in accordance with a Construction Environmental Management Plan (CEMP) that will include management measures for weeds, dieback, erosion and sediment contract, hydrocarbon management and runoff.	The proposal is unlikely to be at variance with the Principle. Potential impacts can be minimised with appropriate management plans.
(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.	The Project Area lies within Bush Forever Site No. 399 and is adjacent to Bush Forever Site No. 300, both of which are listed as being part of a regionally significant contiguous bushland/wetland linkage and are of particular significance as they provide corridors through otherwise highly cleared lands and provide linkages of regional significance. It is generally accepted that large consolidated areas are the best options for viable conservation of natural ecosystems and populations and isolated vegetation less than 100 ha in size are of particular concern as this limits the movement and dispersal of fauna, isolates flora and fauna from other populations in	The proposal may be at variance with the Principle.

	the area and results in loss of genetic diversity through inbreeding. Clearing of 15.2 ha of native vegetation would break up a small linkage to Bush Forever Site No. 399 as well as to the surrounding DEC Gnangara-Moore River State Forest. Clearing of the Project Area will have a moderate impact on the environmental values of the surrounding area.	
(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.	The clearing of native vegetation is not considered likely to significantly alter the quality of surface or ground waters within the Project Area. A CEMP to address the potential impacts expected to be experienced during the clearing of native vegetation for the proposed Ellenbrook Tanksite and inlet and outlet mains should make provisions for surface water, groundwater and drainage management actions	The proposal is unlikely to be at variance with the principle.
(j) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.	The clearing of native vegetation is not expected to cause or exacerbate the incidence or intensity of flooding. Road drainage design should ensure that any additional runoff is managed effectively.	The proposal is unlikely to be at variance with the principle.

6. Discussion

6.1 Environmentally Sensitive Areas and Bush Forever

A desktop assessment identified an ESA extending over the Project Area. This ESA is associated with several geomorphic wetlands and a Bush Forever Site in the Project surrounds. No Geomorphic Wetlands are present within the Project Area, however Bush Forever Site 399 is located over the Project Area. This Bush Forever Site is listed as being 'part of a regionally significant contiguous bushland/wetland linkage, which is a contiguous or largely contiguous corridor of bushland/wetland areas' (The Government of Western Australia, 2000).

There are no conservation areas managed by the DEC within the Project Area, however the Project Area is surrounded by the DEC Gnangara-Moore River State Forest.

As there is an ESA and Bush Forever Site located over the Project Area, the exemptions to clearing regulations do not apply and an application to the DEC for a clearing permit will need to be submitted to clear native vegetation within the Project Area.

6.2 Flora and Vegetation

6.2.1 Local and Regional Significance of Vegetation within the Study Area

A vegetation association is considered regionally and locally under-represented if there is less than 30% of its original distribution remaining. Vegetation association mapping undertaken by Heddle *et al*. (1980) identified the Bassendean complexes within the Project Area. These vegetation complexes are present at more than 72 % of the pre-1750 extent and are regarded as *Least Concern*.

Vegetation association mapping undertaken by Beard (1979) identified vegetation associations 1001 and 949 within the Project Area. The remaining extents of the vegetation associations present within the Project Area are considered *Vulnerable* for vegetation association 1001 and of *Least Concern* for vegetation associations 949. A total of 0.68 ha of vegetation association 1001 is located within the Project Area along the road in the south of the Project Area. The area where vegetation association 1001 is located, vegetation condition is *Completely Degraded* and no native vegetation will be cleared in this area if the Project proceeds.

The vegetation survey did not identify the presence of any TECs within the Project Area. However, the PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b, Listed as a Priority 3 PEC by the DEC is present within the northern section of the Project Area and is associated with the vegetation type *Banksia* Low Open Forest. Approximately 14.5 ha of this PEC is located within the Project Area.

6.2.2 Conservation Significant Flora

No Threatened (previously called Declared Rare Flora) or Priority Flora as listed by the DEC (2012a), species of national conservation significance listed under the EPBC Act (DSEWPaC, 2021a) were recorded from the Project Area.

A likelihood of occurrence assessment of conservation significant species determined that five species of conservation significance were determined to be likely to occur within the Project Area (one EPBC Act- and WC Act-listed species and four DEC Priority species). Twelve conservation significant species were identified as possibly occurring within the Project Area.

6.3 Fauna

6.3.1 Fauna Habitats

The *Banksia* Woodland habitat type is the dominant vegetation type present within the Project Area. This habitat type offers particularly high habitat value for fauna species due to the variety of microhabitats and various resource niches available in these areas and it would be expected to support a high diversity of bird species. The *Banksia* woodland is relatively uniform across the site and no large trees were recorded. A small area of mine revegetation of *Banksia* Woodland was located near the proposed outlet and inlet mains. This habitat type would provide limited habitat for ground-dwelling fauna, particularly reptiles and mammals, due to the lack of cover for these species. The Swan Coastal Plain has been extensively cleared and as a result, the habitats present at the Project Area are not well-represented in the area. The Project Area, although small, is potentially an area of important habitat for the fauna species as well as being a habitat corridor. Clearing of the Project Area would lead to a further decrease in habitat available for fauna species.

6.3.2 Conservation Significant Fauna likely to occur

The desktop assessment identified 18 conservation significant species as occurring/potentially occurring within the Project Area. Of these, eight conservation significant fauna species were identified as likely to occur or possibly to occur within the Project Area. Conservation significant species identified from the likelihood of occurrence assessment are:

- Peregrine Falcon (*Falco peregrinus* - State Schedule 4);
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso* - State Threatened, Federally Vulnerable);
- Baudin's Black Cockatoo (*Calyptorhynchus baudinii* - State Threatened, Federally Endangered);
- Carnaby's Black Cockatoo (*Calyptorhynchus latirostris* - State Threatened, Federally Endangered);
- Black-striped Snake (*Neelaps calonotos* – State Priority 3);
- Graceful Sun-moth (*Synemon gratiosa* – State Priority 4, Federally Endangered);
- Southern Brown Bandicoot (*Isoodon obesulus fusciventer* - State Priority 5); and
- Western Brush Wallaby (*Macropus irma* -State Priority 4).

Black Cockatoos were identified from the desktop assessment as likely to occur within the Project Area. A total of 15.2 ha of potential Black Cockatoo feeding habitat was identified. The majority of this area is located within the Ellenbrook Tanksite.

The Project Area is not situated within a riparian environment or forest and it is unlikely that the area is used by Black Cockatoo species for roosting. However, there is one Carnaby's Cockatoo known roosting site located approximately 2 km west of the Project Area, in *Melaleuca* trees (Department of Planning, 2011). Therefore, the Project Area is likely to provide a habitat linkage between other foraging and roosting sites. No trees with a DBH of greater than 500 mm were recorded in the Project Area.

The vegetation type *Banksia* Low Open Forest located within the proposed Ellenbrook Tanksite is considered potential Graceful Sun Moth habitat. *Lomandra hermaphrodita*, a known food source for the moth, was also recorded during the field survey throughout the *Banksia* Low Open Forest. This indicates that the Project Area may be used by the Graceful Sun Moth and there is 14.5 ha of potential GSM habitat within the Project Area.

Database searches indicate that seven bird species listed under the EPBC Act as Migratory and/or Marine occur or potentially occur within 5 km of the Project Area. While there is the potential for a number of terrestrial migratory bird species to occur occasionally within the Project Area, the Project Area is not considered to contain significant habitat for these species.

7. Conclusions and Recommendations

7.1 Conclusions

Based on the results of the flora, vegetation and fauna assessment, the following conclusions and associated recommendations have been made about the proposed Ellenbrook Tank and inlet and outlet Main (Project Area):

Flora and Vegetation

1. The Project Area is located within a much larger ESA, which is associated with several geomorphic wetlands and Bush Forever Sites in the area;
2. There are no conservation areas managed by the DEC within the Project Area, however the Project Area is surrounded by the DEC Gnangara-Moore River State Forest;
3. Bush Forever Site No. 399 is present at the Project Area and Bush Forever Site No. 300 is adjacent to Bush Forever Site No. 399. Both are noted for being corridors through otherwise highly cleared lands and provide linkages of regional significance. Development through this area is likely to fragment the linkage, potentially resulting in limitation of movement and dispersal of fauna, isolation of flora and fauna from other populations in the area and a loss of genetic diversity through inbreeding;
4. The vegetation types present in the Project Area correspond to Beard (1979) vegetation associations 1001 and 949. According to information provided in the Government of Western Australia (2010) these associations are classified as *Vulnerable* for vegetation association 1001 and of *Least Concern* for vegetation associations 949. A total of 0.68 ha of vegetation association 1001 is located within the Project Area in the *Completely Degraded* section along the road in the south of the Project Area;
5. Two vegetation types were identified within the Project Area during the survey: *Banksia* Low Open Forest and *Kunzea, Banksia* and *Jacksonia* Shrubland;
6. The vegetation condition of the Project Area ranged from *Pristine* (1) to *Completely Degraded* (6). The native vegetation located in the northern section of the Project Area rated between *Pristine* (1) to *Excellent* (2). A small section of rehabilitated vegetation in the Project Area rated between *Good* (3) to *Degraded* (5) as signs of clearing in the past were evident. Areas south of the rehabilitated area rated as *Completely Degraded* (6) as the proposed outlet and inlet main traverses previously disturbed /cleared mine and road areas;
7. A preliminary assessment for *Phytophthora* spp. Dieback) as part of the vegetation condition assessment recorded some *Banksia* deaths suspected to be related to Dieback during the field survey;
8. A total of 116 plant taxa were recorded within the Project Area, comprising of 33 plant families and 80 plant genera;
9. A total of 14 introduced (exotic) species were recorded during the survey. No Weeds of National Significance (WONS) listed by the Federal Government or Declared Plants under the Section 37 of the *Agricultural and Related Resources Protection Act 1976* were recorded in the Project Area;
10. No TECs were recorded during the survey;
11. The PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b, listed as a Priority 3 PEC by the DEC, is present within the northern section of

the Project Area and is associated with the vegetation type *Banksia* Low Open Forest. Approximately 14.5 ha of this PEC is located within the Project Area;

12. The buffer zone for the PEC *Banksia ilicifolia* woodlands, SCP22, listed as a Priority 3 PEC at the State level, was identified from desktop assessments as located over the Project Area. The buffer for this PEC is located within the rehabilitated vegetation of *Kunzea, Banksia* and *Jacksonia* Shrubland and other areas that have previously been cleared. *Banksia ilicifolia* was not recorded during the time of the survey. This PEC was not recorded during the field survey;

13. No Threatened Flora (previously called Declared Rare Flora) listed under the *Wildlife Conservation Act 1950,* species of national conservation significance listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), Priority flora listed by the DEC were recorded from the Project Area;

14. A likelihood of occurrence assessment of conservation significant species determined that five species of conservation significance were determined to be likely to occur within the Project Area and 12 conservation significant species were identified as possibly occurring within the Project Area;

15. The Project Area contains two broad fauna habitat types, based on the predominant landforms, soil and vegetation structure of the area. These habitat types are broadly based on the vegetation types identified within the Project Area;

16. A total of 21 fauna species were recorded within the Project Area, consisting of 19 birds and two mammals. All of the species recorded during the survey are typical of the Perth Swan Coastal Plain;

17. A likelihood of occurrence assessment of conservation significant fauna species based on the known locations of and distributions of species and habitat requirements identified eight conservation significant fauna species were identified as likely to occur or possibly to occur within the Project Area;

18. It is likely that the project will trigger referral to the DSEWPaC due to the clearing of Black Cockatoo foraging habitat. A total of 15.2 ha of Black Cockatoo foraging habitat is located within the Project Area. The majority of this area is located within the Ellenbrook Tanksite, where there is 14.5 ha of quality foraging habitat. There is one Carnaby's Cockatoo known roosting site located approximately 2 km west of the Project Area, in *Melaleuca* trees and the Project Area has been identified as likely to provide a habitat linkage between other foraging and roosting sites;

19. There is up to 14.5 ha of potential GSM habitat present within the Ellenbrook Tanksite. Confirmation of this species presence requires a targeted assessment. Should GSM be present, the Project is likely to trigger a referral to DSWEPaC as there is a real chance or possibility that it will modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline; and

20. Database searches indicate that seven bird species listed under the EPBC Act as Migratory and/or Marine occur or potentially occur within 5 km of the Project Area. While there is the potential for a number of migratory bird species to occur occasionally within the Project Area, the Project Area is not considered to be important habitat for any of the migratory species and it is unlikely that listed migratory species would be significantly impacted by the proposed works.

7.2 Recommendations

With respect to the conclusions made in section 7.1, the following recommendations have been made:

Recommendation 1

The proposed clearing of native vegetation for the proposed Ellenbrook Tanksite is to be limited or avoided, as this area of bushland is the PEC Swan Coastal Plain *Banksia attenuata - Banksia menziesii* woodlands, SCP23b, listed as a Priority 3 PEC by the DEC. If clearing for the proposed Ellenbrook Tanksite cannot be avoided, it is recommended the project is discussed with the DEC, in regards to potential environmental offsets as a means to offset the clearing of the *Banksia attenuata - Banksia menziesii* woodlands, SCP23b.

Rehabilitation of cleared areas is recommended, to reinstate the *Banksia attenuata - Banksia menziesii* woodlands, SCP23b.

Recommendation 2

Clearing of the Ellenbrook Tanksite is likely to trigger referral to the DSEWPaC due to the clearing of more than 1 ha of quality Black Cockatoo foraging habitat. A total of 14.5 ha of Black Cockatoo foraging habitat is located within this section of the Project Area. It is recommended the project be discussed with DSEWPaC before a final decision to refer is made.

Recommendation 3

GHD recommends a targeted Graceful Sun Moth survey in the native vegetation proposed to be cleared for the Ellenbrook Tanksite. This survey will determine their presence or absence within the Project Area.

Recommendation 4

As there is an ESA and Bush Forever Site located over the Project Area, the exemptions to clearing regulations do not apply and an application to the DEC for a clearing permit will need to be submitted to clear native vegetation within the Project Area.

Recommendation 5

A formal dieback assessment consistent with DEC requirements should be conducted prior to works to determine if *Phytophthora* spp. are present within native bushland proposed to be cleared in the Project Area. A Dieback Management plan to address issues and the management of the disease should be employed.

Recommendation 6

A Construction Environmental Management Plan (CEMP) to address the potential impacts expected to be experienced during the clearing of native vegetation for the proposed Ellenbrook Tanksite and inlet and outlet mains should include:

- weed control measures such as weed inspections and wash-down procedures for equipment entering the Project Area to ensure that the development of the Project Area does not introduce and/or spread weeds;
- Rehabilitation with native/endemic species;
- Undertake a general fauna clearance program by qualified fauna relocation personnel;
- Ensure drainage design reduces the risk of erosion and flooding;
- Development of an appropriate stormwater management system to protect and enhance the receiving environments located adjacent to the Project Area;

- Surface water, groundwater and drainage management actions and requirements should be incorporated into the project design;
- Dust suppression may be required during clearing and construction activities depending on the timing of the proposed clearing;
- Dieback management to address issues and the management of the disease in the area; and
- A licence for the construction of bores and for the abstraction of groundwater will be required from the Department of Water (DoW), should groundwater be required for dust suppression or construction activities.

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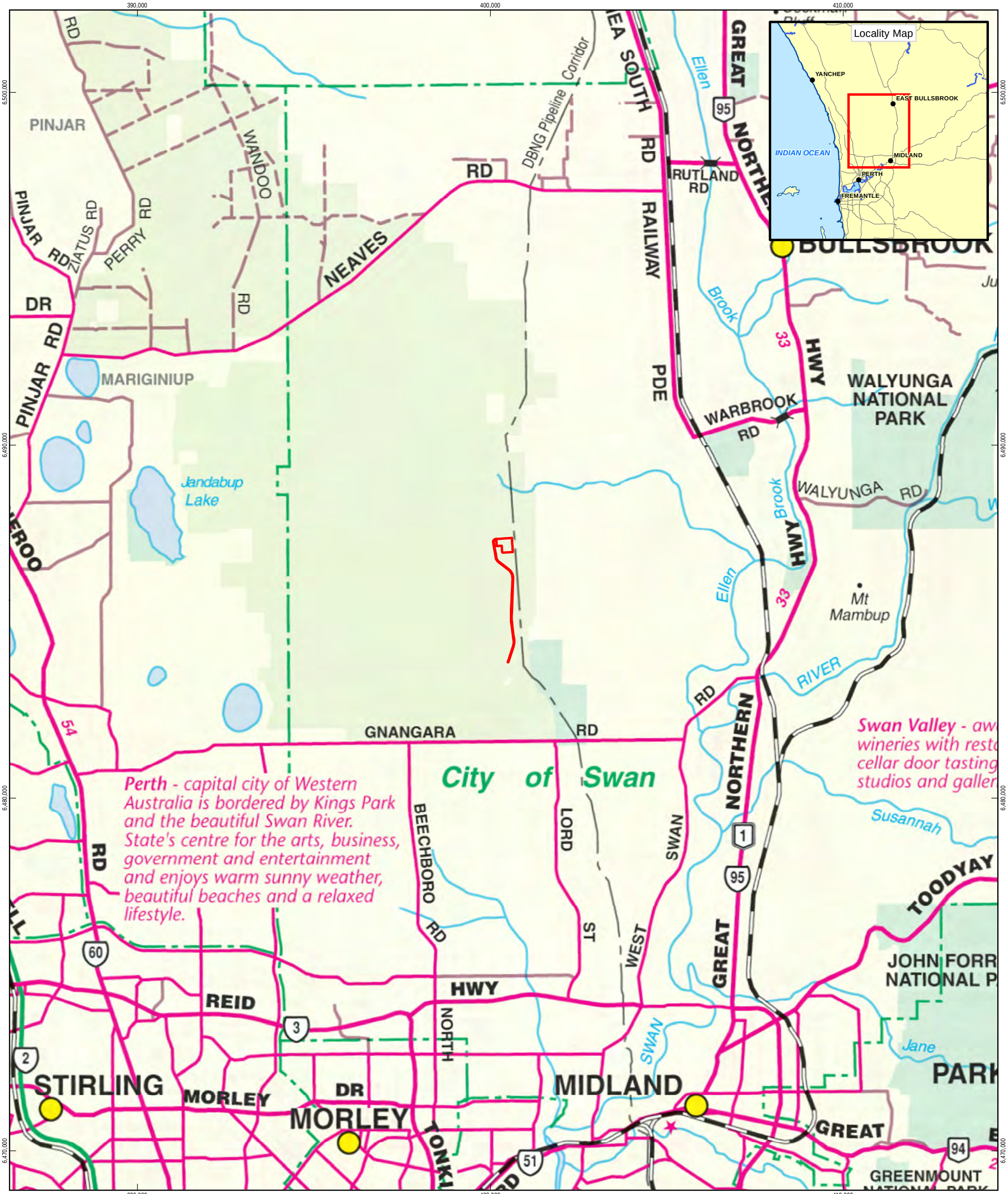
Appendices

Appendix A -Figures



LEGEND

Project Area

1: 100,000 (at A3)

0 0.5 1 2 3 4 5

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Job Number 61-28780
Revision 0
Date 13 Dec 2012

Locality

Figure 1

G:\61\28780\GIS\Maps\MXD\6128780_G001_Fig1_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: GA: Topo 250k Series 3- 2006; Landgate: Traveller's Atlas 2006; GHD: Project Area - 20121018. Created by: bflorczak, vdinh

398,500 400,000 401,500

6,487,500 6,486,000 6,484,500

Warbrook Rd
St Patrick Rd
8398
8553
8408
8665
8811
8664
8659
8660
Site 300
8662
8803
8656
8661
8657
8793
Site 399
Gnangara-Moore River State Forest
8394
8395
8396
Tick Rd
Barlow Lane
Euro Rd
Walton Rd
8540
Dugite Rd
St Patrick Rd
Oakhill Hts
Thetis Tce
Thorold Av
Birkett Cir
8797
Arbor Dr
Delmage Cir
The Broadway
Charlottes Vsta
Moulton Trl
Crossland Av
Arrowsmith Av
8658
Leedon Dr
Milson Tce
Simmonds Pass
Westbrook Pde
Parnham Av
Everard Av
Withnell Dr
Brookmount Dr
Halpin Cir
Granesse Dr
Vegetation Association 949
8397
Vegetation Association 1001
8541
Wetherell Rd
Drumpellier Dr
The Promenade
Brick Lane
Winderie Cr
Trainor Rd
Site 192
Eastman Rd
Nursery Rd
Florac Cl
Mirimas Ct
Vaucluse Cr
Civic Tce
Main St
Main St

398,500 400,000 401,500

LEGEND

Threatened (Declared Rare) & Priority Flora
- (T) Threatened Rare Flora - Extant Taxa
- Priority 1 - Poorly Known Taxa
- Priority 2 - Poorly Known Taxa
- Priority 3 - Poorly Known Taxa
- Priority 4 - Rare Taxa
- Priority 5 - Conservation Dependent Taxa
- Pre European Vegetation Association
- Project Area
- Environmentally Sensitive Areas

Threatened and Priority Ecological Communities
- Threatened Ecological Community
- Priority Ecological Community

Geomorphic Wetlands
- Conservation
- Resource Enhancement
- Multiple Use
- Not Assessed
- Bush Forever Sites

DEC Estates
- Nature Reserve
- State Forest
- Cadastre

1: 15,000 (at A3)

0 75 150 300 450 600 750

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

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Job Number 61-28780
Revision 1
Date 18 Dec 2012

Environmental Constraints

Figure 2

G:\61\28780\GIS\Maps\MXD\6128780_G002_Fig2_Rev1.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022, Cadastre - 20121018; DEC: Geomorphic Wetlands - 20121022, Threatened (Declared Rare) & Priority Flora - 20121023, Threatened and Priority Ecological Communities - 20121105, DEC Estates - 20121022, Environmentally Sensitive Areas - 20121022; DoP: Bush Forever Sites - 20121022; GHD: Vegetation Association - 20121218, Project Area - 20121018. Created by: bflorczak, vdinh

LEGEND

- Quadrats
- Project Area

Vegetation Type

- BaPlAxAcLb : *Banksia* Low Open Forest
- KgRcCa : *Kunzea, Banksia* and *Jacksonia* Shrubland
- HD : Highly Disturbed

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Job Number 61-28780
Revision 0
Date 17 Apr 2013

Sheet 1 of 3

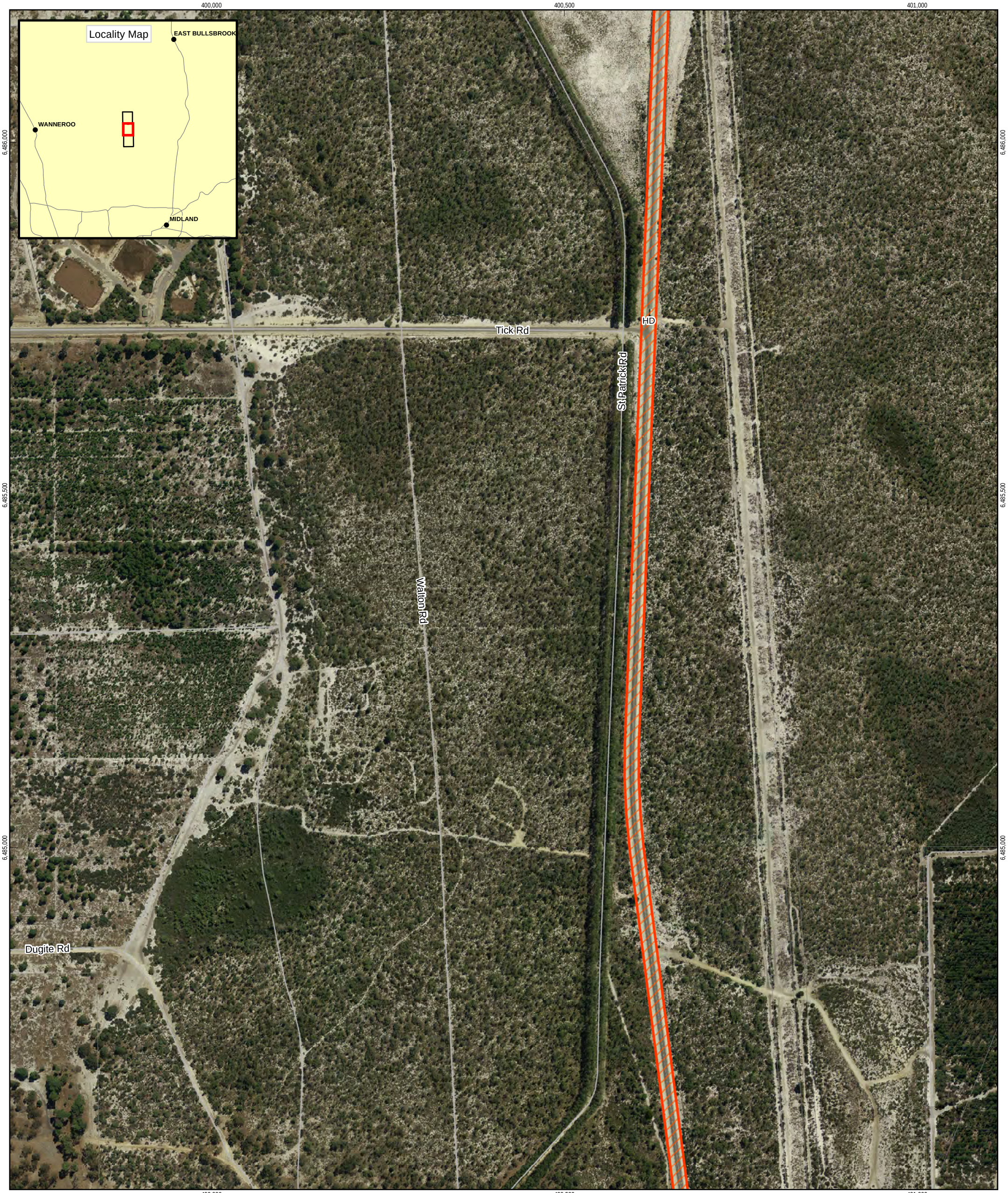
Vegetation Types and Quadrat Locations

Figure 3

G:\61\28780\GIS\Maps\MXD\6128780_G003_Fig3_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD:*Stylidium* ? longitubum (P3) - 20121213, Vegetation Type - 20121211, Quadrats - 20121211, Project Area - 20121018; GA: 250K Topo Series 3 - 2006. Created by: bflorczak, vdinh



LEGEND

- Quadrats
- Project Area

Vegetation Type

- BaPlAxAcLb : *Banksia* Low Open Forest
- KgRcCa : *Kunzea, Banksia* and *Jacksonia* Shrubland
- HD : Highly Disturbed

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Job Number 61-28780
Revision 0
Date 17 Apr 2013

Sheet 2 of 3

Vegetation Types and Quadrat Locations

Figure 3

G:\61\28780\GIS\Maps\MXD\6128780_G003_Fig3_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD:*Stylidium ?* longitubum (P3) - 20121213, Vegetation Type - 20121211, Quadrats - 20121211, Project Area - 20121018; GA: 250K Topo Series 3 - 2006. Created by: bflorczak, vdinh

LEGEND

- Quadrats
- Project Area

Vegetation Type

- BaPlAxAcLb : *Banksia* Low Open Forest
- KgRcCa : *Kunzea, Banksia* and *Jacksonia* Shrubland
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1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Job Number 61-28780
Revision 0
Date 17 Apr 2013

Vegetation Types and Quadrat Locations

Figure 3

G:\61\28780\GIS\Maps\MXD\6128780_G003_Fig3_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD:*Stylidium ?* longitubum (P3) - 20121213, Vegetation Type - 20121211, Quadrats - 20121211, Project Area - 20121018; GA: 250K Topo Series 3 - 2006. Created by: bflorczak, vdinh

LEGEND

- Suspected Dieback Locations
- Project Area

Vegetation Condition

- 1 : Pristine or nearly so
- 1-2
- 2 : Excellent
- 3 : Very good
- 3-4
- 4 : Good
- 4-5
- 5 : Degraded
- 5-6
- 6 : Completely degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

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Vegetation Condition and Suspected Dieback Locations

Job Number	61-28780
Revision	0
Date	13 Dec 2012

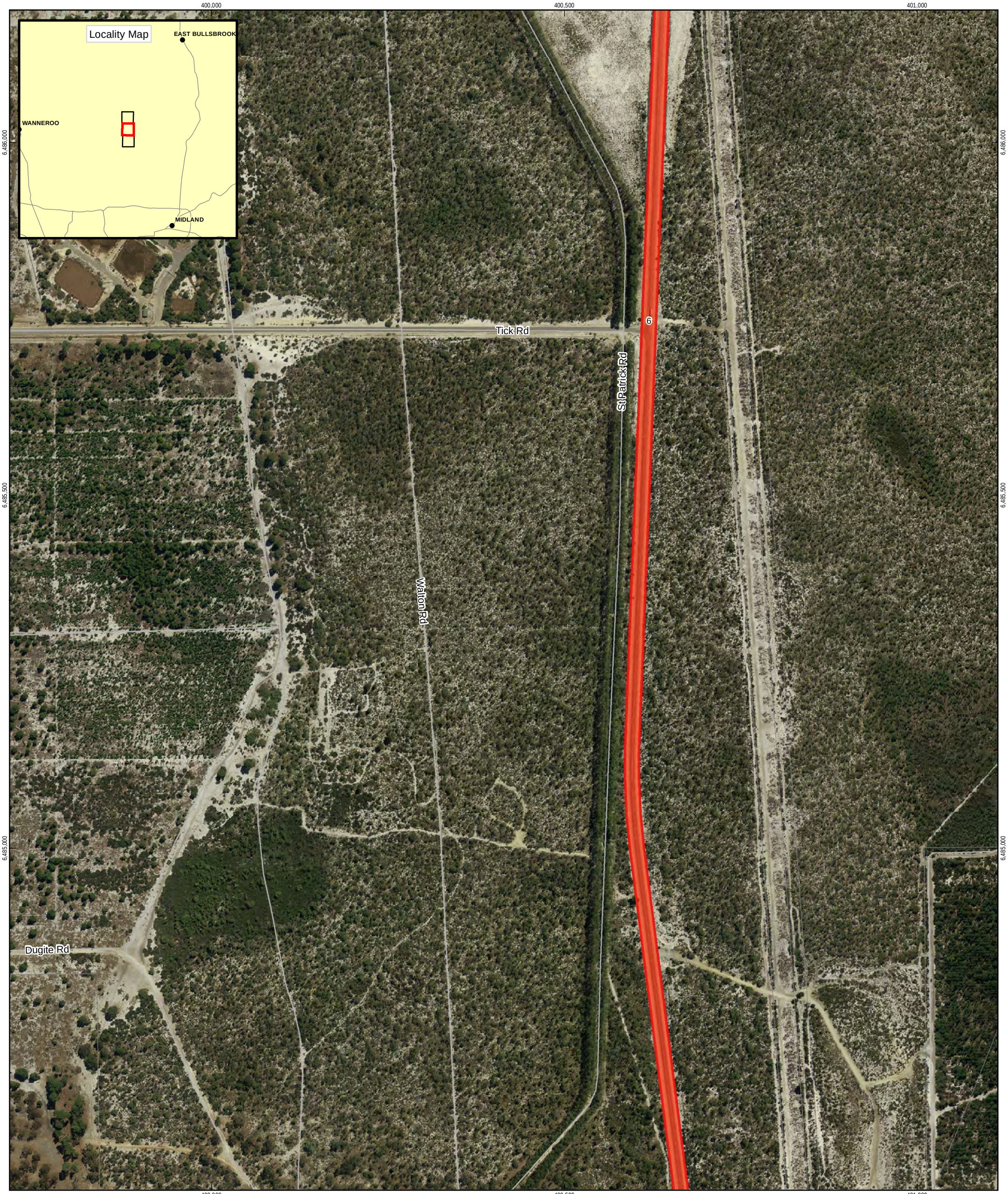
Sheet 1 of 3

Figure 4

G:\61\28780\GIS\Maps\MXD\6128780_G004_Fig4_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD: Suspected Dieback Locations - 20121213, Project Area - 20121018, Vegetation Condition - 20121211; GA: 250k Topo Series 3 - 2006. Created by: bflorczak, vdinh



LEGEND

- Suspected Dieback Locations
- Project Area

Vegetation Condition

- 1 : Pristine or nearly so
- 1-2
- 2 : Excellent
- 3 : Very good
- 3-4
- 4 : Good
- 4-5
- 5 : Degraded
- 5-6
- 6 : Completely degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Vegetation Condition and Suspected Dieback Locations

Job Number	61-28780
Revision	0
Date	13 Dec 2012

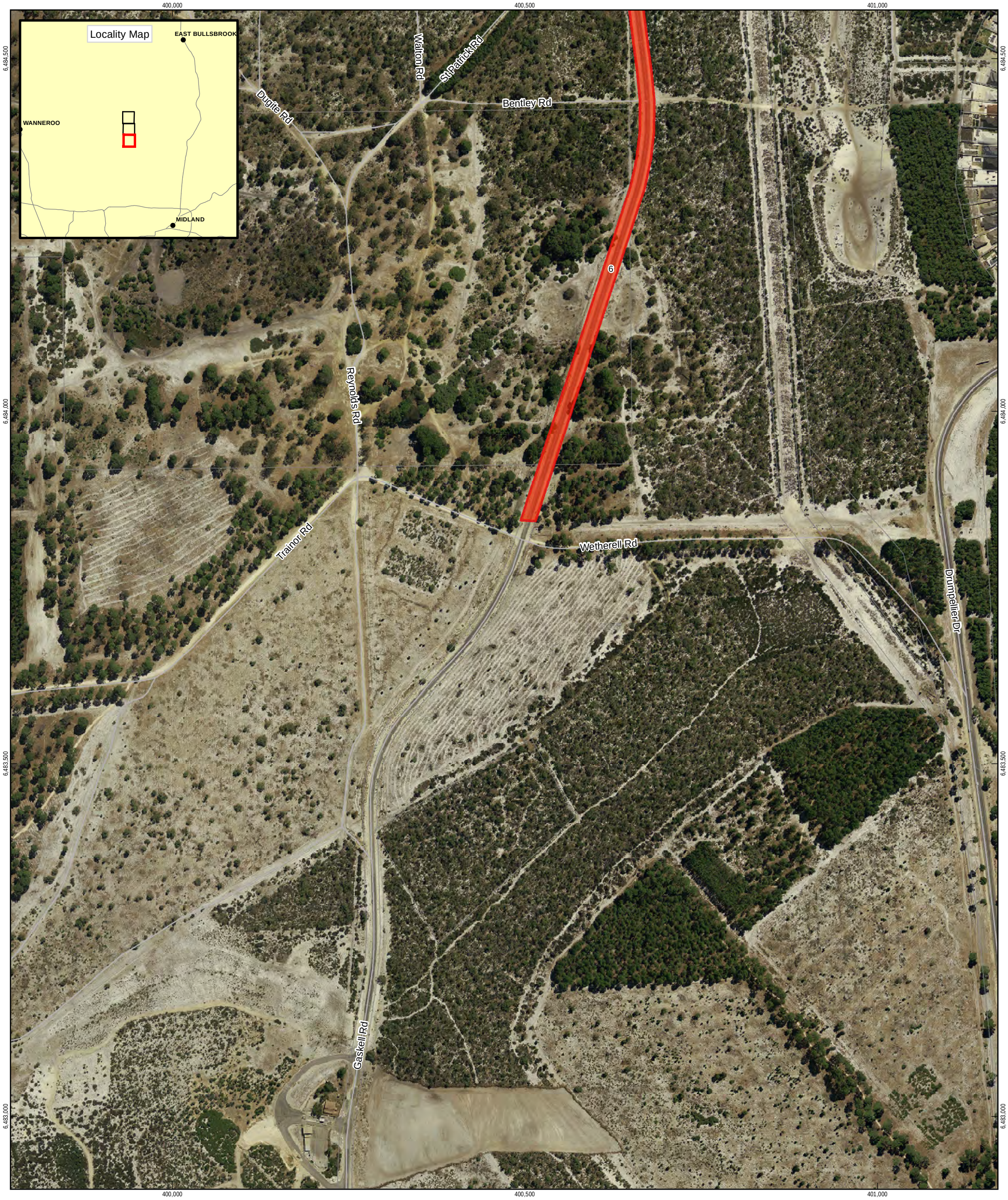
Sheet 2 of 3

Figure 4

G:\61\28780\GIS\Maps\MXD\6128780_G004_Fig4_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD: Suspected Dieback Locations - 20121213, Project Area - 20121018, Vegetation Condition - 20121211; GA: 250k Topo Series 3 - 2006. Created by: bflorczak, vdinh



LEGEND

- Suspected Dieback Locations
- Project Area

Vegetation Condition

- 1 : Pristine or nearly so
- 1-2
- 2 : Excellent
- 3 : Very good
- 3-4
- 4 : Good
- 4-5
- 5 : Degraded
- 5-6
- 6 : Completely degraded

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

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Vegetation Condition and Suspected Dieback Locations

Job Number	61-28780
Revision	0
Date	13 Dec 2012

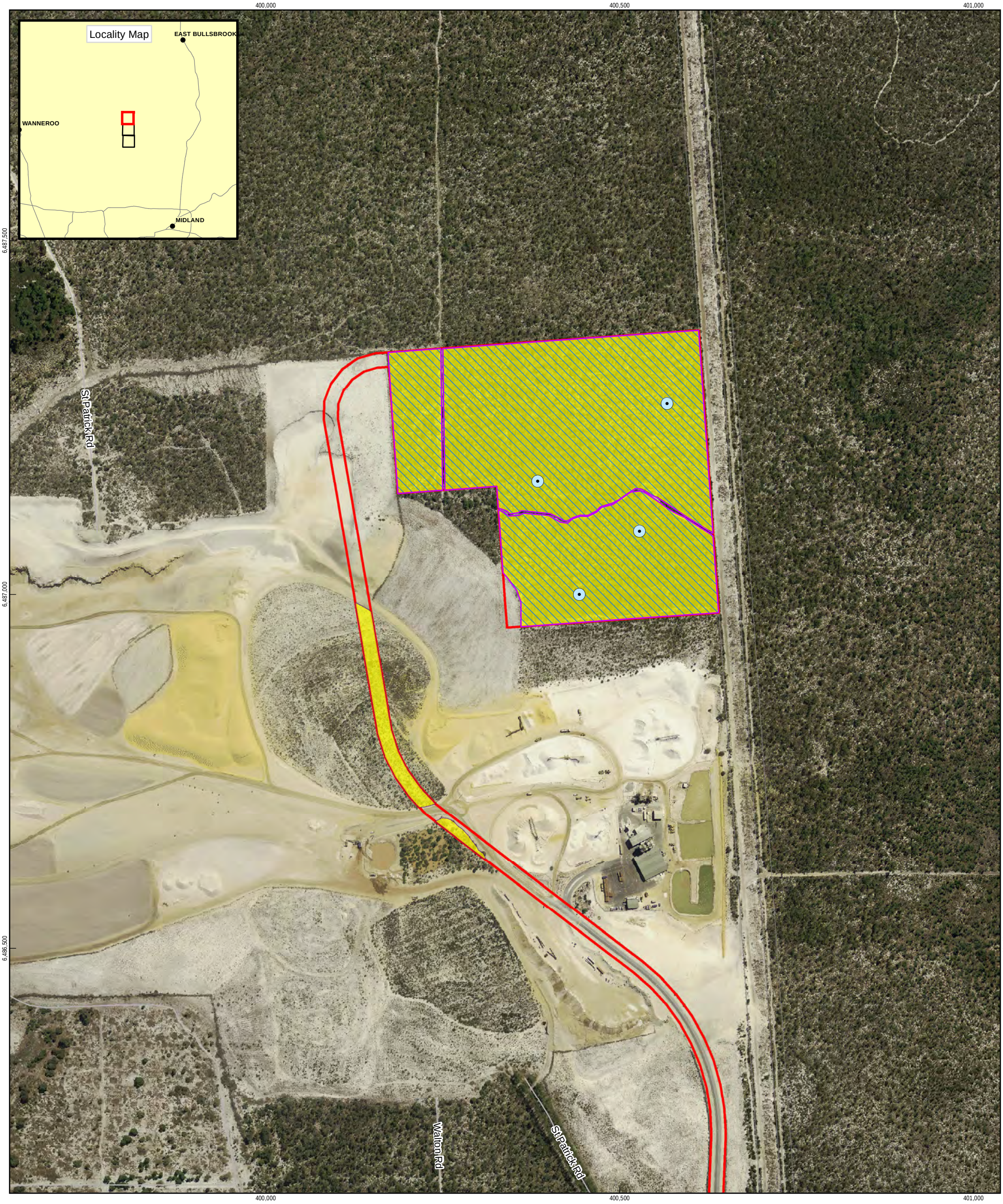
Sheet 3 of 3

Figure 4

G:\61\28780\GIS\Maps\MXD\6128780_G004_Fig4_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022; GHD: Suspected Dieback Locations - 20121213, Project Area - 20121018, Vegetation Condition - 20121211; GA: 250k Topo Series 3 - 2006. Created by: bflorczak, vdinh



LEGEND

- Roads
- Cadastre
- Project Area
- Black Cockatoo Foraging Habitat
- **Graceful Sun Moth Habitat**
- *Lomandra hermaphrodita* Locations
- Graceful Sun Moth habitat

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

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Ellenbrook Tank Flora and Fauna Survey

Black Cockatoo and Graceful Sun Moth habitat

Job Number 61-28780
Revision 0
Date 13 Dec 2012

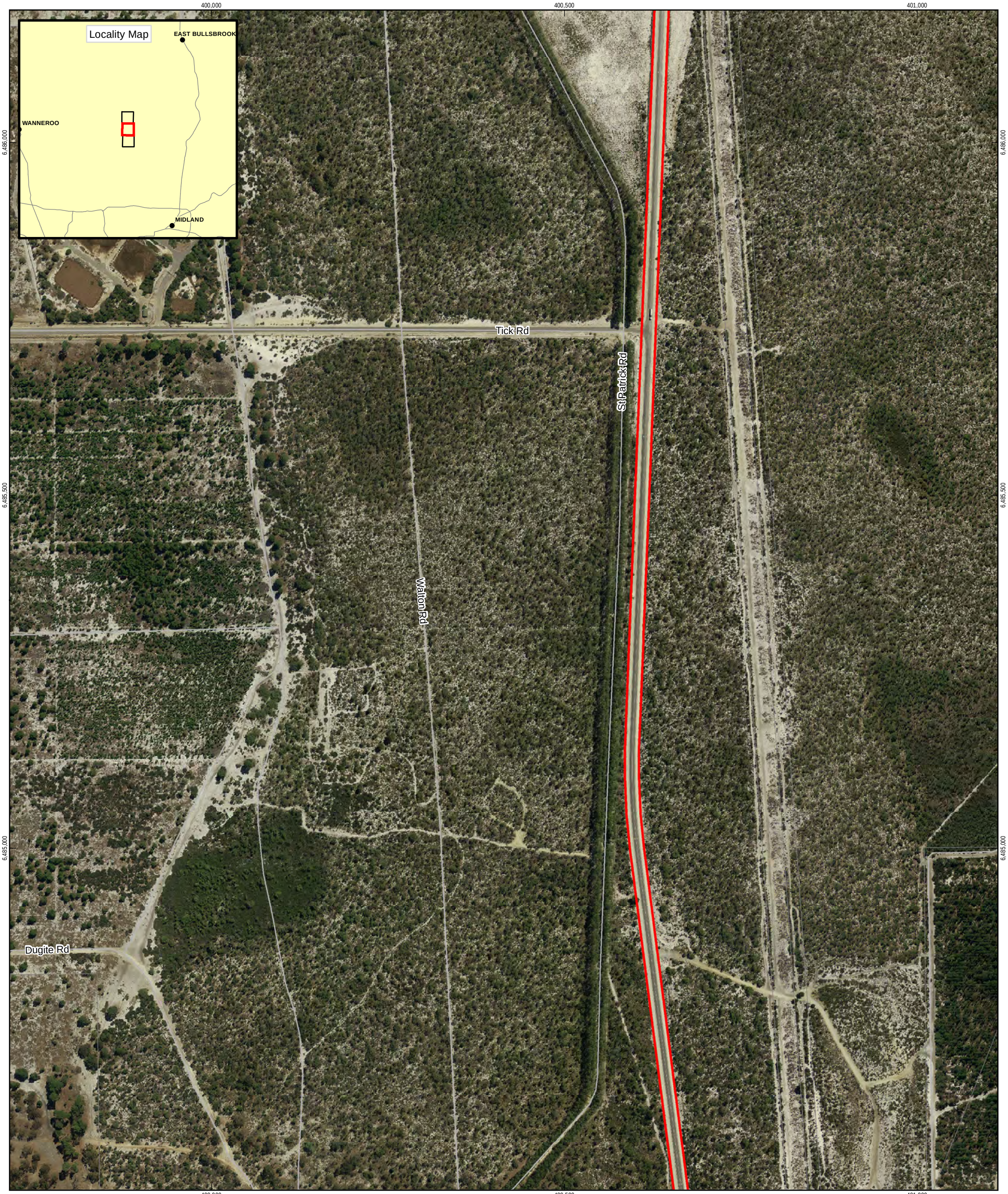
Sheet 1 of 3

Figure 5

G:\61\28780\GIS\Maps\MXD\6128780_G006_Fig5_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022, Cadastre - 20121018; GHD: Project Area - 20121018, Habitat Areas - 20121126; GA: 250K Topo Series 3 -2006. Created by: bflorczak, vdinh



LEGEND

- Roads
- Cadastre
- Project Area
- Black Cockatoo Foraging Habitat
- **Graceful Sun Moth Habitat**
- *Lomandra hermaphrodita* Locations
- Graceful Sun Moth habitat

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

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Ellenbrook Tank Flora and Fauna Survey

Black Cockatoo and Graceful Sun Moth habitat

Job Number	61-28780
Revision	0
Date	13 Dec 2012

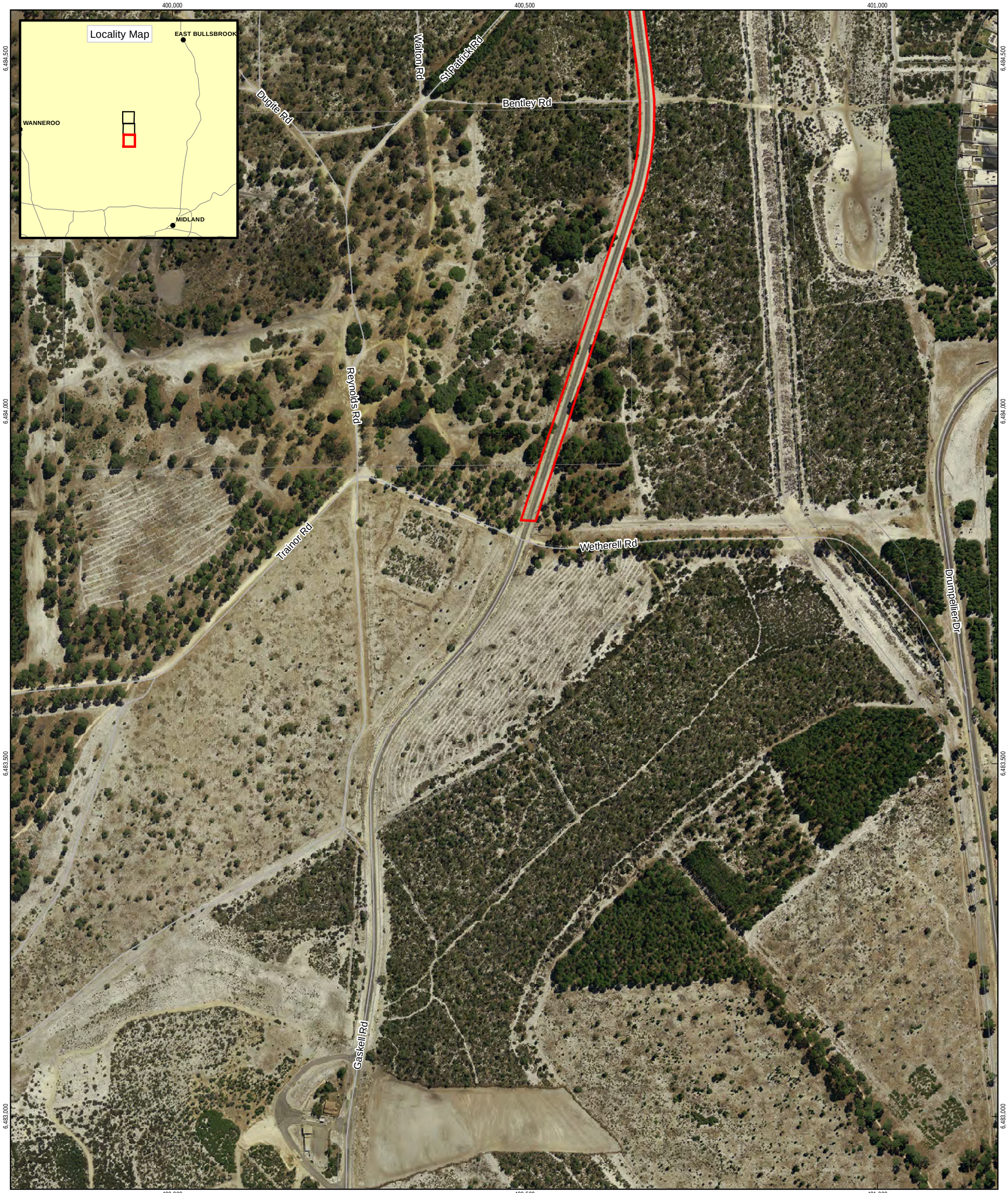
Sheet 2 of 3

Figure 5

G:\61\28780\GIS\Maps\MXD\6128780_G006_Fig5_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022, Cadastre - 20121018; GHD: Project Area - 20121018, Habitat Areas - 20121126; GA: 250K Topo Series 3 -2006. Created by: bflorczak, vdinh



LEGEND

- Roads
- Cadastre
- Project Area
- Black Cockatoo Foraging Habitat
- **Graceful Sun Moth Habitat**
- *Lomandra hermaphrodita* Locations
- Graceful Sun Moth habitat

1: 5,000 (at A3)

0 25 50 100 150 200 250

Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia
Grid: Map Grid of Australia 1994, Zone 50

N

Water Corporation
Ellenbrook Tank Flora and Fauna Survey

Black Cockatoo and Graceful Sun Moth habitat

Job Number 61-28780
Revision 0
Date 13 Dec 2012

Sheet 3 of 3

Figure 5

G:\61\28780\GIS\Maps\MXD\6128780_G006_Fig5_Rev0.mxd

239 Adelaide Terrace Perth WA 6004 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8555 **E** permail@ghd.com.au **W** www.ghd.com.au

Data source: Landgate: Metro Central 2012 Mosaic - 20121022, Roads - 20121022, Cadastre - 20121018; GHD: Project Area - 20121018, Habitat Areas - 20121126; GA: 250K Topo Series 3 -2006. Created by: bflorczak, vdinh

Appendix B - Desktop Searches

NatureMap
Mapping Western Australia's biodiversity

NatureMap All Flora Report (5km)

Created By Guest user on 23/10/2012

Kingdom Plantae
Current Names Only Yes
Core Datasets Only Yes
Method 'By Line'
Group By Family

Family	Species	Records
Aizoaceae	1	1
Amaranthaceae	1	1
Anarthriaceae	2	14
Apiaceae	3	9
Araliaceae	1	5
Asparagaceae	20	73
Asteraceae	27	57
Campanulaceae	6	13
Cannabaceae	1	1
Caryophyllaceae	3	3
Casuarinaceae	2	3
Celastraceae	2	3
Centrolepidaceae	4	15
Chenopodiaceae	1	1
Colchicaceae	3	6
Commelinaceae	1	1
Crassulaceae	3	6
Cyperaceae	23	54
Dasypogonaceae	3	15
Dennstaedtiaceae	1	1
Dilleniaceae	10	56
Droseraceae	14	44
Elaeocarpaceae	1	3
Ericaceae	21	130
Euphorbiaceae	3	8
Fabaceae	39	116
Gentianaceae	1	2
Geraniaceae	2	2
Goodeniaceae	5	17
Haemodoraceae	16	54
Haloragaceae	1	4
Hemerocallidaceae	8	19
Hypoxidaceae	1	1
Iridaceae	7	23
Lamiaceae	3	6
Lauraceae	6	16
Lentibulariaceae	1	1
Loganiaceae	1	7
Loranthaceae	1	3
Menyanthaceae	1	1
Molluginaceae	2	4
Myrtaceae	42	141
Orchidaceae	29	57
Orobanchaceae	1	1
Oxalidaceae	1	2
Papaveraceae	1	1
Phyllanthaceae	2	7
Phytolaccaceae	1	1
Poaceae	17	49
Polygalaceae	2	3
Portulacaceae	1	2
Primulaceae	1	1
Proteaceae	17	78
Restionaceae	10	43
Rhamnaceae	1	1
Rubiaceae	1	1
Rutaceae	6	18
Santalaceae	2	8
Selaginellaceae	1	2
Solanaceae	2	3
Stylidiaceae	22	98
Thymelaeaceae	2	2
Violaceae	1	1
Xanthorrhoeaceae	1	5
Zamiaceae	1	1
TOTAL	**417**	**1325**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Aizoaceae					
1.	2795	*Carpobrotus edulis (Hottentot Fig)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Amaranthaceae					
2.	2751	*Ptilotus polystachyus (Prince of Wales Feather)*			
Anarthriaceae					
3.	1097	*Lyginia barbata*			
4.	18049	*Lyginia imberbis*			
Apiaceae					
5.	14553	*Eryngium pinnatifidum subsp. palustre*		P3	
6.	6222	*Homalosciadium homalocarpum*			
7.	6289	*Xanthosia huegelii*			
Araliaceae					
8.	6280	*Trachymene pilosa (Native Parsnip)*			
Asparagaceae					
9.	8779	*Asparagus asparagoides (Bridal Creeper)*	Y		
10.	11299	*Chamaescilla corymbosa var. corymbosa*			
11.	1307	*Laxmannia ramosa (Branching Lily)*			
12.	11911	*Laxmannia ramosa subsp. ramosa*			
13.	1309	*Laxmannia squarrosa*			
14.	1223	*Lomandra caespitosa (Tufted Mat Rush)*			
15.	1228	*Lomandra hermaphrodita*			
16.	14542	*Lomandra micrantha subsp. micrantha*			
17.	1234	*Lomandra nigricans*			
18.	1239	*Lomandra preissii*			
19.	1243	*Lomandra sericea (Silky Mat Rush)*			
20.	1312	*Sowerbaea laxiflora (Purple Tassels)*			
21.	1318	*Thysanotus arbuscula*			
22.	1319	*Thysanotus arenarius*			
23.	1338	*Thysanotus manglesianus (Fringed Lily)*			
24.	1339	*Thysanotus multiflorus (Many-flowered Fringe Lily)*			
25.	1351	*Thysanotus sparteus*			
26.	1354	*Thysanotus tenellus*			
27.	1357	*Thysanotus thyrsoideus*			
28.	1358	*Thysanotus triandrus*			
Asteraceae					
29.	7838	*Arctotheca calendula (Cape Weed)*	Y		
30.	7851	*Asteridea pulverulenta (Common Bristle Daisy)*			
31.	7878	*Brachyscome iberidifolia*			
32.	7916	*Centaurea melitensis (Maltese Cockspur)*	Y		
33.	7991	*Gnephosis drummondii*			
34.	28253	*Hedypnois rhagadioloides subsp. cretica*	Y		
35.	12741	*Hyalosperma cotula*			
36.	8086	*Hypochaeris glabra (Smooth Catsear)*	Y		
37.	9352	*Hypochaeris radicata (Flat Weed)*	Y		
38.	8092	*Ixiolaena viscosa (Sticky Ixiolaena)*			
39.	18585	*Lagenophora huegelii*			
40.	8105	*Millotia myosotidifolia*			
41.	8106	*Millotia tenuifolia (Soft Millotia)*			
42.	29418	*Monoculus monstrosus*	Y		
43.	8165	*Pithocarpa pulchella (Beautiful Pithocarpa)*			
44.	18353	*Pithocarpa pulchella var. pulchella*			
45.	8175	*Podolepis gracilis (Slender Podolepis)*			
46.	8182	*Podotheca angustifolia (Sticky Longheads)*			
47.	8183	*Podotheca chrysantha (Yellow Podotheca)*			
48.	8184	*Podotheca gnaphalioides (Golden Long-heads)*			
49.	8195	*Quinetia urvillei*			
50.	13300	*Rhodanthe citrina*			
51.	8224	*Siloxerus filifolius*			
52.	8225	*Siloxerus humifusus (Procumbent Siloxerus)*			
53.	8255	*Ursinia anthemoides (Ursinia)*	Y		
54.	38388	*Ursinia anthemoides subsp. anthemoides*	Y		
55.	8282	*Waitzia suaveolens (Fragrant Waitzia)*			
Campanulaceae					
56.	9289	*Lobelia anceps (Angled Lobelia)*			
57.	7407	*Lobelia rhytidosperma (Wrinked-seeded Lobelia)*			
58.	7408	*Lobelia tenuior (Slender Lobelia)*			
59.	37440	*Monopsis debilis var. depressa*	Y		
60.	7384	*Wahlenbergia capensis (Cape Bluebell)*	Y		
61.	7389	*Wahlenbergia preissii*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Cannabaceae					
62.	18296	*Humulus lupulus*	Y		
Caryophyllaceae					
63.	19825	*Petrorhagia dubia*	Y		
64.	15972	*Silene gallica var. gallica*	Y		
65.	2918	*Stellaria media (Chickweed)*	Y		
Casuarinaceae					
66.	1728	*Allocasuarina fraseriana (Sheoak)*			
67.	1732	*Allocasuarina humilis (Dwarf Sheoak)*			
Celastraceae					
68.	4733	*Stackhousia monogyna*			
69.	4737	*Tripterococcus brunonis (Winged Stackhousia)*			
Centrolepidaceae					
70.	1121	*Centrolepis aristata (Pointed Centrolepis)*			
71.	1125	*Centrolepis drummondiana*			
72.	1131	*Centrolepis inconspicua*			
73.	1133	*Centrolepis pilosa*			
Chenopodiaceae					
74.	2501	*Dysphania glomulifera*			
Colchicaceae					
75.	1383	*Burchardia bairdiae*			
76.	12770	*Burchardia congesta*			
77.	1385	*Burchardia multiflora (Dwarf Burchardia)*			
Commelinaceae					
78.	1162	*Cartonema philydroides*			
Crassulaceae					
79.	17701	*Crassula closiana*			
80.	3137	*Crassula colorata (Dense Stonecrop)*			
81.	11563	*Crassula colorata var. colorata*			
Cyperaceae					
82.	740	*Baumea arthrophylla*			
83.	741	*Baumea articulata (Jointed Rush)*			
84.	747	*Baumea rubiginosa*			
85.	768	*Cyathochaeta avenacea*			
86.	16245	*Cyathochaeta teretifolia*		P3	
87.	792	*Cyperus eragrostis (Umbrella Sedge)*	Y		
88.	894	*Fimbristylis velata*			
89.	917	*Isolepis marginata (Coarse Club-rush)*	Y		
90.	925	*Lepidosperma angustatum*			
91.	936	*Lepidosperma leptostachyum*			
92.	937	*Lepidosperma longitudinale (Pithy Sword-sedge)*			
93.	944	*Lepidosperma scabrum*			
94.	36060	*Lepidosperma sp. Coastal Dunes (R.J. Cranfield 9963)*			
95.	945	*Lepidosperma squamatum*			
96.	946	*Lepidosperma striatum*			
97.	953	*Mesomelaena graciliceps*			
98.	955	*Mesomelaena pseudostygia*			
99.	978	*Schoenus brevisetis*			
100.	979	*Schoenus caespititius*			
101.	984	*Schoenus curvifolius*			
102.	986	*Schoenus efoliatus*			
103.	1002	*Schoenus nanus (Tiny Bog Rush)*			
104.	1018	*Schoenus subfascicularis*			
Dasypogonaceae					
105.	19309	*Calectasia narragara*			
106.	29103	*Calectasia sp. Pinjar (C. Tauss 557)*		P1	
107.	1218	*Dasypogon bromeliifolius (Pineapple Bush)*			
Dennstaedtiaceae					
108.	57	*Pteridium esculentum (Bracken)*			
Dilleniaceae					
109.	5112	*Hibbertia aurea*			
110.	5133	*Hibbertia helianthemoides*		P3	
111.	5134	*Hibbertia huegelii*			
112.	5135	*Hibbertia hypericoides (Yellow Buttercups)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
113.	5153	*Hibbertia pachyrrhiza*			
114.	5154	*Hibbertia perfoliata*			
115.	5162	*Hibbertia racemosa (Stalked Guinea Flower)*			
116.	20034	*Hibbertia sp. Gnangara (J.R. Wheeler 2329)*			
117.	5172	*Hibbertia stellaris (Orange Stars)*			
118.	5173	*Hibbertia subvaginata*			
Droseraceae					
119.	3095	*Drosera erythrorhiza (Red Ink Sundew)*			
120.	13217	*Drosera erythrorhiza subsp. erythrorhiza*			
121.	15453	*Drosera gigantea subsp. gigantea*			
122.	3098	*Drosera glanduligera (Pimpernel Sundew)*			
123.	3106	*Drosera macrantha (Bridal Rainbow)*			
124.	14298	*Drosera macrantha subsp. macrantha*			
125.	11853	*Drosera menziesii subsp. menziesii*			
126.	13216	*Drosera menziesii subsp. penicillaris*			
127.	3114	*Drosera nitidula (Shining Sundew)*			
128.	3117	*Drosera paleacea (Dwarf Sundew)*			
129.	13188	*Drosera paleacea subsp. paleacea*			
130.	3118	*Drosera pallida (Pale Rainbow)*			
131.	3119	*Drosera parvula (Small Sundew)*			
132.	3124	*Drosera pulchella (Pretty Sundew)*			
Elaeocarpaceae					
133.	4524	*Platytheca galioides*			
Ericaceae					
134.	6311	*Andersonia heterophylla*			
135.	6314	*Andersonia lehmanniana*			
136.	11471	*Andersonia lehmanniana subsp. lehmanniana*			
137.	6339	*Astroloma xerophyllum*			
138.	6341	*Brachyloma preissii (Globe Heath)*			
139.	30142	*Brachyloma preissii subsp. obtusifolium*			
140.	6347	*Conostephium minus (Pink-tipped Pearl flower)*			
141.	6348	*Conostephium pendulum (Pearl Flower)*			
142.	6349	*Conostephium preissii*			
143.	13527	*Croninia kingiana*			
144.	6360	*Leucopogon australis (Spiked Beard-heath)*			
145.	6374	*Leucopogon conostephioides*			
146.	6420	*Leucopogon oldfieldii*			
147.	6425	*Leucopogon oxycedrus*			
148.	6434	*Leucopogon polymorphus*			
149.	6436	*Leucopogon propinquus*			
150.	19579	*Leucopogon sp. Murdoch (M. Hislop 1037)*			
151.	40803	*Leucopogon squarrosus subsp. squarrosus*			
152.	6456	*Lysinema ciliatum (Curry Flower)*			
153.	6458	*Lysinema elegans*			
154.	34736	*Lysinema pentapetalum*			
Euphorbiaceae					
155.	4666	*Monotaxis occidentalis*			
156.	4713	*Stachystemon axillaris (Leafy Stachystemon)*			
157.	20666	*Stachystemon sp. Keysbrook (R. Archer 17/11/99)*		P1	
Fabaceae					
158.	15466	*Acacia applanata*			
159.	3374	*Acacia huegelii*			
160.	17861	*Acacia longifolia*	Y		
161.	3502	*Acacia pulchella (Prickly Moses)*			
162.	15481	*Acacia pulchella var. glaberrima*			
163.	15483	*Acacia pulchella var. pulchella*			
164.	30032	*Acacia saligna subsp. saligna*			
165.	3541	*Acacia sessilis*			
166.	3557	*Acacia stenoptera (Narrow Winged Wattle)*			
167.	3686	*Aotus cordifolia*			
168.	3688	*Aotus gracillima*			
169.	3692	*Aotus procumbens*			
170.	3710	*Bossiaea eriocarpa (Common Brown Pea)*			
171.	3807	*Daviesia divaricata (Marno)*			
172.	3832	*Daviesia physodes*			
173.	3845	*Daviesia triflora*			
174.	3872	*Euchilopsis linearis (Swamp Pea)*			
175.	3880	*Eutaxia virgata*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
176.	20475	*Gastrolobium capitatum*			
177.	20473	*Gastrolobium ebracteolatum*			
178.	20483	*Gastrolobium linearifolium*			
179.	10909	*Gompholobium confertum*			
180.	3957	*Gompholobium tomentosum (Hairy Yellow Pea)*			
181.	3966	*Hovea pungens (Devil's Pins)*			
182.	3968	*Hovea trisperma (Common Hovea)*			
183.	12859	*Hovea trisperma var. trisperma*			
184.	14783	*Jacksonia calcicola*			
185.	4010	*Jacksonia floribunda (Holly Pea)*			
186.	4012	*Jacksonia furcellata (Grey Stinkwood)*			
187.	4029	*Jacksonia sternbergiana (Stinkwood)*			
188.	4042	*Kennedia nigricans (Black Kennedia)*			
189.	4044	*Kennedia prostrata (Scarlet Runner)*			
190.	4052	*Latrobea tenella*			
191.	4100	*Mirbelia spinosa*			
192.	4114	*Ornithopus pinnatus (Slender Serradella)*	Y		
193.	4181	*Pultenaea reticulata*			
194.	4211	*Sphaerolobium vimineum (Leafless Globe Pea)*			
195.	17145	*Trifolium angustifolium var. angustifolium*	Y		
196.	17542	*Trifolium arvense var. arvense*	Y		
Gentianaceae					
197.	6543	*Cicendia filiformis (Slender Cicendia)*	Y		
Geraniaceae					
198.	4332	*Erodium botrys (Long Storksbill)*	Y		
199.	4343	*Pelargonium capitatum (Rose Pelargonium)*	Y		
Goodeniaceae					
200.	12724	*Anthotium junciforme*			
201.	7454	*Dampiera linearis (Common Dampiera)*			
202.	7538	*Goodenia pulchella*			
203.	7574	*Lechenaultia floribunda (Free-flowering Leschenaultia)*			
204.	13182	*Scaevola repens var. repens*			
Haemodoraceae					
205.	1409	*Anigozanthos humilis (Catspaw)*			
206.	11434	*Anigozanthos humilis subsp. humilis*			
207.	1411	*Anigozanthos manglesii (Mangles Kangaroo Paw)*			
208.	11261	*Anigozanthos manglesii subsp. manglesii*			
209.	1417	*Blancoa canescens (Winter Bell)*			
210.	1418	*Conostylis aculeata (Prickly Conostylis)*			
211.	11826	*Conostylis aculeata subsp. aculeata*			
212.	11513	*Conostylis aculeata subsp. cygnorum*			
213.	1423	*Conostylis aurea (Golden Conostylis)*			
214.	11438	*Conostylis candicans subsp. candicans*			
215.	1436	*Conostylis juncea*			
216.	1468	*Haemodorum laxum*			
217.	1472	*Haemodorum simplex*			
218.	1475	*Haemodorum spicatum (Mardja)*			
219.	1478	*Phlebocarya ciliata*			
220.	11557	*Phlebocarya pilosissima subsp. pilosissima*		P3	
Haloragaceae					
221.	6161	*Gonocarpus pithyoides*			
Hemerocallidaceae					
222.	1264	*Arnocrinum preissii*			
223.	11283	*Corynotheca micrantha var. micrantha*			
224.	1293	*Hensmania turbinata*			
225.	1295	*Johnsonia acaulis*			
226.	1298	*Johnsonia pubescens (Pipe Lily)*			
227.	1260	*Stypandra glauca (Blind Grass)*			
228.	1361	*Tricoryne elatior (Yellow Autumn Lily)*			
229.	1363	*Tricoryne tenella*			
Hypoxidaceae					
230.	11736	*Hypoxis occidentalis var. occidentalis*			
Iridaceae					
231.	1517	*Gladiolus alatus*	Y		
232.	1520	*Gladiolus caryophyllaceus (Wild Gladiolus)*	Y		
233.	1524	*Gladiolus undulatus (Wild Gladiolus)*	Y		

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
234.	19180	*Moraea miniata (Two-leaf Cape Tulip)*	Y		
235.	11749	*Orthrosanthus laxus var. laxus (Morning Iris)*			
236.	1550	*Patersonia occidentalis (Purple Flag)*			
237.	14924	*Romulea rosea var. communis*	Y		
Lamiaceae					
238.	6838	*Hemiandra linearis (Speckled Snakebush)*			
239.	6839	*Hemiandra pungens (Snakebush)*			
240.	6930	*Stachys arvensis (Staggerweed)*	Y		
Lauraceae					
241.	2951	*Cassytha flava (Dodder Laurel)*			
242.	2952	*Cassytha glabella (Tangled Dodder Laurel)*			
243.	11211	*Cassytha glabella forma dispar*			
244.	2956	*Cassytha pomiformis (Dodder Laurel)*			
245.	11242	*Cassytha racemosa forma pilosa*			
246.	11799	*Cassytha racemosa forma racemosa*			
Lentibulariaceae					
247.	7138	*Utricularia inaequalis*			
Loganiaceae					
248.	16177	*Phyllangium paradoxum*			
Loranthaceae					
249.	2401	*Nuytsia floribunda (Christmas Tree)*			
Menyanthaceae					
250.	36177	*Ornduffia albiflora*			
Molluginaceae					
251.	2838	*Macarthuria apetala*			
252.	2839	*Macarthuria australis*			
Myrtaceae					
253.	5330	*Astartea fascicularis*			
254.	20283	*Astartea scoparia*			
255.	5382	*Beaufortia elegans*			
256.	5415	*Calothamnus lateralis*			
257.	5429	*Calothamnus sanguineus (Silky-leaved Blood flower)*			
258.	5439	*Calytrix angulata (Yellow Starflower)*			
259.	5458	*Calytrix flavescens (Summer Starflower)*			
260.	5460	*Calytrix fraseri (Pink Summer Calytrix)*			
261.	5461	*Calytrix glutinosa*			
262.	5476	*Calytrix sapphirina*			
263.	5498	*Chamelaucium uncinatum (Geraldton Wax)*			
264.	5541	*Eremaea pauciflora*			
265.	14104	*Eremaea pauciflora var. pauciflora*			
266.	5542	*Eremaea purpurea*			
267.	13547	*Eucalyptus marginata subsp. marginata (Jarrah)*			
268.	5790	*Eucalyptus todtiana (Coastal Blackbutt)*			
269.	5817	*Hypocalymma angustifolium (White Myrtle)*			
270.	5825	*Hypocalymma robustum (Swan River Myrtle)*			
271.	5832	*Kunzea ericifolia (Spearwood)*			
272.	15498	*Kunzea glabrescens (Spearwood)*			
273.	5835	*Kunzea micrantha*			
274.	5847	*Leptospermum erubescens (Roadside Teatree)*			
275.	5850	*Leptospermum laevigatum (Coast Teatree)*	Y		
276.	5926	*Melaleuca lateritia (Robin Redbreast Bush)*			
277.	5952	*Melaleuca preissiana (Moonah)*			
278.	5959	*Melaleuca rhaphiophylla (Swamp Paperbark)*			
279.	19365	*Melaleuca ryeae*			
280.	5964	*Melaleuca seriata*			
281.	5978	*Melaleuca teretifolia (Banbar)*			
282.	5983	*Melaleuca trichophylla*			
283.	6006	*Pericalymma ellipticum (Swamp Teatree)*			
284.	16477	*Pericalymma ellipticum var. ellipticum*			
285.	6012	*Regelia ciliata*			
286.	6014	*Regelia inops*			
287.	6033	*Scholtzia involucrata (Spiked Scholtzia)*			
288.	20135	*Taxandria linearifolia*			
289.	15431	*Verticordia acerosa var. acerosa*			
290.	15432	*Verticordia densiflora var. densiflora*			
291.	6077	*Verticordia drummondii (Drummond's Featherflower)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
292.	14714	*Verticordia lindleyi subsp. lindleyi*		P4	
293.	6101	*Verticordia nitens (Morrison Featherflower)*			
294.	6103	*Verticordia ovalifolia*			
Orchidaceae					
295.	11136	*Caladenia denticulata*			
296.	1586	*Caladenia discoidea (Dancing Orchid)*			
297.	1592	*Caladenia flava (Cowslip Orchid)*			
298.	15348	*Caladenia flava subsp. flava*			
299.	1596	*Caladenia huegelii (Grand Spider Orchid)*		T	
300.	1599	*Caladenia latifolia (Pink Fairy Orchid)*			
301.	1605	*Caladenia marginata (White Fairy Orchid)*			
302.	15503	*Caladenia paludosa*			
303.	18019	*Caladenia vulgata*			
304.	19649	*Disa bracteata*	Y		
305.	12943	*Diuris brumalis*			
306.	11049	*Diuris corymbosa*			
307.	1645	*Epiblema grandiflorum (Babe-in-a-cradle)*			
308.	1653	*Leporella fimbriata (Hare Orchid)*			
309.	12761	*Microtis media subsp. densiflora*			
310.	15419	*Microtis media subsp. media*			
311.	23500	*Paracaleana hortiorum*			
312.	1667	*Paracaleana nigrita (Flying Duck Orchid)*			
313.	1680	*Prasophyllum parvifolium (Autumn Leek Orchid)*			
314.	1686	*Pterostylis barbata (Bird Orchid)*			
315.	1693	*Pterostylis recurva (Jug Orchid)*			
316.	12217	*Pterostylis sanguinea*			
317.	19342	*Pterostylis sp. clubbed snail orchid (R. Davis 8088)*			
318.	18658	*Pterostylis sp. short sepals (W. Jackson BJ259)*			
319.	1698	*Pterostylis vittata (Banded Greenhood)*			
320.	16367	*Pyrorchis nigricans (Red beaks)*			
321.	1702	*Thelymitra campanulata (Shirt Orchid)*			
322.	1705	*Thelymitra crinita (Blue Lady Orchid)*			
323.	20731	*Thelymitra vulgaris*			
Orobanchaceae					
324.	7090	*Parentucellia viscosa (Sticky Bartsia)*	Y		
Oxalidaceae					
325.	4356	*Oxalis pes-caprae (Soursob)*	Y		
Papaveraceae					
326.	2969	*Fumaria capreolata (Whiteflower Fumitory)*	Y		
Phyllanthaceae					
327.	4689	*Poranthera ericoides (Heath Poranthera)*			
328.	4691	*Poranthera microphylla (Small Poranthera)*			
Phytolaccaceae					
329.	2793	*Phytolacca octandra (Red Ink Plant)*	Y		
Poaceae					
330.	184	*Aira caryophyllea (Silvery Hairgrass)*	Y		
331.	200	*Amphipogon turbinatus*			
332.	17234	*Austrostipa compressa*			
333.	17240	*Austrostipa flavescens*			
334.	17241	*Austrostipa hemipogon*			
335.	8661	*Brachypodium distachyon (False Brome)*	Y		
336.	244	*Briza maxima (Blowfly Grass)*	Y		
337.	245	*Briza minor (Shivery Grass)*	Y		
338.	346	*Ehrharta brevifolia (Annual Veldt Grass)*	Y		
339.	347	*Ehrharta calycina (Perennial Veldt Grass)*	Y		
340.	485	*Microlaena stipoides (Weeping Grass)*			
341.	492	*Neurachne alopecuroidea (Foxtail Mulga Grass)*			
342.	40424	*Pentameris airoides subsp. airoides*	Y		
343.	40422	*Pentameris pallida*	Y		
344.	571	*Poa annua (Winter Grass)*	Y		
345.	582	*Polypogon monspeliensis (Annual Beardgrass)*	Y		
346.	724	*Vulpia myuros (Rat's Tail Fescue)*	Y		
Polygalaceae					
347.	4554	*Comesperma flavum*			
348.	4564	*Comesperma virgatum (Milkwort)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Portulacaceae					
349.	2856	*Calandrinia liniflora (Parakeelya)*			
Primulaceae					
350.	36375	*Lysimachia arvensis (Pimpernel)*	Y		
Proteaceae					
351.	1775	*Adenanthos cygnorum (Common Woollybush)*			
352.	11837	*Adenanthos cygnorum subsp. cygnorum (Common Woollybush)*			
353.	1791	*Adenanthos obovatus (Basket Flower)*			
354.	1800	*Banksia attenuata (Slender Banksia)*			
355.	1822	*Banksia ilicifolia (Holly-leaved Banksia)*			
356.	1830	*Banksia littoralis (Swamp Banksia)*			
357.	1834	*Banksia menziesii (Firewood Banksia)*			
358.	1876	*Conospermum incurvum (Plume Smokebush)*			
359.	1882	*Conospermum stoechadis (Common Smokebush)*			
360.	15520	*Conospermum stoechadis subsp. sclerophyllum*			
361.	14408	*Grevillea curviloba subsp. curviloba*		T	
362.	2229	*Isopogon dubius (Pincushion Coneflower)*			
363.	2273	*Persoonia saccata (Snottygobble)*			
364.	2299	*Petrophile linearis (Pixie Mops)*			
365.	2316	*Stirlingia latifolia (Blueboy)*			
366.	2329	*Synaphea spinulosa*			
367.	15532	*Synaphea spinulosa subsp. spinulosa*			
Restionaceae					
368.	1056	*Alexgeorgea nitens*			
369.	17833	*Chordifex microcodon*			
370.	31112	*Chordifex sp. Ellenbrook (M. Trudgen MET 20790)*			Y
371.	17663	*Desmocladus asper*			
372.	16595	*Desmocladus flexuosus*			
373.	17838	*Dielsia stenostachya*			
374.	1070	*Hypolaena exsulca*			
375.	17622	*Hypolaena robusta*		P4	
376.	17694	*Meeboldina scariosa*			
377.	17843	*Meeboldina tephrina*			
Rhamnaceae					
378.	4809	*Cryptandra pungens*			
Rubiaceae					
379.	18255	*Opercularia vaginata (Dog Weed)*			
Rutaceae					
380.	4437	*Boronia purdieana (Winter Boronia)*			
381.	17665	*Boronia purdieana subsp. purdieana*			
382.	4438	*Boronia ramosa*			
383.	11381	*Boronia ramosa subsp. anethifolia*			
384.	11564	*Boronia ramosa subsp. ramosa*			
385.	18529	*Philotheca spicata (Pepper and Salt)*			
Santalaceae					
386.	2344	*Leptomeria empetriformis*			
387.	2350	*Leptomeria pauciflora (Sparse-flowered Currant Bush)*			
Selaginellaceae					
388.	6	*Selaginella gracillima (Tiny Clubmoss)*			
Solanaceae					
389.	6988	*Solanum americanum (Glossy Nightshade)*	Y		
390.	7022	*Solanum nigrum (Black Berry Nightshade)*	Y		
Stylidiaceae					
391.	7676	*Levenhookia pusilla (Midget Stylewort)*			
392.	7677	*Levenhookia stipitata (Common Stylewort)*			
393.	30278	*Stylidium androsaceum*			
394.	25831	*Stylidium araeophyllum*			
395.	7693	*Stylidium brunonianum (Pink Fountain Triggerplant)*			
396.	7696	*Stylidium calcaratum (Book Triggerplant)*			
397.	7699	*Stylidium carnosum (Fleshy-leaved Triggerplant)*			
398.	7709	*Stylidium crossocephalum (Posy Triggerplant)*			
399.	7713	*Stylidium dichotomum (Pins-and-needles)*			
400.	7716	*Stylidium diuroides (Donkey Triggerplant)*			
401.	7745	*Stylidium junceum (Reed Triggerplant)*			
402.	7756	*Stylidium longitubum (Jumping Jacks)*		P3	

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
403.	25829	*Stylidium neurophyllum*			
404.	25800	*Stylidium paludicola*			
405.	7773	*Stylidium petiolare (Horn Triggerplant)*			
406.	7774	*Stylidium piliferum (Common Butterfly Triggerplant)*			
407.	7785	*Stylidium repens (Matted Triggerplant)*			
408.	20521	*Stylidium rigidulum*			
409.	25806	*Stylidium scariosum*			
410.	7798	*Stylidium schoenoides (Cow Kicks)*			
411.	20603	*Stylidium trudgenii*		P3	
412.	7806	*Stylidium utricularioides (Pink Fan Triggerplant)*			
Thymelaeaceae					
413.	5254	*Pimelea leucantha*			
414.	5268	*Pimelea sulphurea (Yellow Banjine)*			
Violaceae					
415.	5216	*Hybanthus calycinus (Wild Violet)*			
Xanthorrhoeaceae					
416.	1256	*Xanthorrhoea preissii (Grass tree)*			
Zamiaceae					
417.	85	*Macrozamia riedlei (Zamia)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap All fauna Report (5km)

Created By Guest user on 23/10/2012

Kingdom Animalia
Current Names Only Yes
Core Datasets Only Yes
Method 'By Line'
Group By Family

Family	Species	Records
Acanthizidae	6	87
Accipitridae	3	9
Agamidae	2	45
Anatidae	2	2
Artamidae	2	14
Campephagidae	1	39
Castniidae	1	1
Columbidae	3	17
Corvidae	2	110
Cracticidae	2	130
Cuculidae	1	4
Dasyuridae	1	2
Dicaeidae	1	3
Dicruridae	3	16
Diplodactylidae	1	1
Elapidae	4	8
Falconidae	5	13
Felidae	1	1
Halcyonidae	2	25
Hirundinidae	1	2
Hylidae	2	11
Limnodynastidae	1	18
Macropodidae	1	3
Maluridae	2	35
Meliphagidae	7	318
Meropidae	1	24
Muridae	4	21
Myobatrachidae	5	51
Neosittidae	1	2
Pachycephalidae	3	86
Pardalotidae	2	29
Peramelidae	1	92
Petroicidae	1	22
Phalangeridae	1	2
Podargidae	1	1
Psittacidae	7	36
Pygopodidae	3	7
Scincidae	14	71
Strigidae	1	1
Tarsipedidae	1	4
Threskiornithidae	2	2
Turnicidae	1	1
Typhlopidae	1	1
Varanidae	1	1
Zosteropidae	1	47
TOTAL	**109**	**1415**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Acanthizidae					
1.	24260	*Acanthiza apicalis (Broad-tailed Thornbill)*			
2.	24261	*Acanthiza chrysorrhoa (Yellow-rumped Thornbill)*			
3.	24262	*Acanthiza inornata (Western Thornbill)*			
4.	25530	*Gerygone fusca (Western Gerygone)*			
5.	25534	*Sericornis frontalis (White-browed Scrubwren)*			
6.	30948	*Smicrornis brevirostris (Weebill)*			
Accipitridae					
7.	25535	*Accipiter cirrocephalus (Collared Sparrowhawk)*			
8.	25536	*Accipiter fasciatus (Brown Goshawk)*			
9.	24285	*Aquila audax (Wedge-tailed Eagle)*			
Agamidae					
10.	30899	*Ctenophorus adelaidensis (Southern Heath Dragons)*			
11.	25510	*Pogona minor*			
Anatidae					

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
12.	24316	*Anas superciliosa (Pacific Black Duck)*			
13.	24321	*Chenonetta jubata (Australian Wood Duck)*			
Artamidae					
14.	25566	*Artamus cinereus (Black-faced Woodswallow)*			
15.	24353	*Artamus cyanopterus (Dusky Woodswallow)*			
Campephagidae					
16.	25568	*Coracina novaehollandiae (Black-faced Cuckoo-shrike)*			
Castniidae					
17.	33992	*Synemon gratiosa (Graceful Sunmoth)*		T	
Columbidae					
18.	24407	*Ocyphaps lophotes (Crested Pigeon)*			
19.	24409	*Phaps chalcoptera (Common Bronzewing)*			
20.	25590	*Streptopelia senegalensis (Laughing Turtle-Dove)*			
Corvidae					
21.	24416	*Corvus bennetti (Little Crow)*			
22.	25592	*Corvus coronoides (Australian Raven)*			
Cracticidae					
23.	25595	*Cracticus tibicen (Australian Magpie)*			
24.	25596	*Cracticus torquatus (Grey Butcherbird)*			
Cuculidae					
25.	25598	*Cacomantis flabelliformis (Fan-tailed Cuckoo)*			
Dasyuridae					
26.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
Dicaeidae					
27.	25607	*Dicaeum hirundinaceum (Mistletoebird)*			
Dicruridae					
28.	24443	*Grallina cyanoleuca (Magpie-lark)*			
29.	25610	*Myiagra inquieta (Restless Flycatcher)*			
30.	25614	*Rhipidura leucophrys (Willie Wagtail)*			
Diplodactylidae					
31.	25518	*Strophurus spinigerus*			
Elapidae					
32.	25251	*Echiopsis curta (Bardick)*			
33.	25249	*Neelaps calonotos (Black-striped Snake)*		P3	
34.	25253	*Parasuta gouldii*			
35.	25259	*Pseudonaja affinis subsp. affinis (Dugite)*			
Falconidae					
36.	25621	*Falco berigora (Brown Falcon)*			
37.	25622	*Falco cenchroides (Australian Kestrel)*			
38.	24472	*Falco cenchroides subsp. cenchroides*			
39.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
40.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
Felidae					
41.	24041	*Felis catus (Cat)*			
Halcyonidae					
42.	30901	*Dacelo novaeguineae (Laughing Kookaburra)*			
43.	25549	*Todiramphus sanctus (Sacred Kingfisher)*			
Hirundinidae					
44.	24491	*Hirundo neoxena (Welcome Swallow)*			
Hylidae					
45.	25378	*Litoria adelaidensis (Slender Tree Frog)*			
46.	25388	*Litoria moorei (Motorbike Frog)*			
Limnodynastidae					
47.	25410	*Heleioporus eyrei (Moaning Frog)*			
Macropodidae					
48.	24133	*Macropus irma (Western Brush Wallaby)*		P4	
Maluridae					
49.	25652	*Malurus leucopterus (White-winged Fairy-wren)*			
50.	25654	*Malurus splendens (Splendid Fairy-wren)*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Meliphagidae					
51.	24560	*Acanthorhynchus superciliosus (Western Spinebill)*			
52.	24561	*Anthochaera carunculata (Red Wattlebird)*			
53.	24562	*Anthochaera lunulata (Western Little Wattlebird)*			
54.	24581	*Lichenostomus virescens (Singing Honeyeater)*			
55.	25661	*Lichmera indistincta (Brown Honeyeater)*			
56.	24583	*Manorina flavigula (Yellow-throated Miner)*			
57.	24596	*Phylidonyris novaehollandiae (New Holland Honeyeater)*			
Meropidae					
58.	24598	*Merops ornatus (Rainbow Bee-eater)*		IA	
Muridae					
59.	24215	*Hydromys chrysogaster (Water-rat)*		P4	
60.	24223	*Mus musculus (House Mouse)*			
61.	24230	*Pseudomys albocinereus (Ash-grey Mouse)*			
62.	24245	*Rattus rattus (Black Rat)*			
Myobatrachidae					
63.	25398	*Crinia georgiana (Quacking Frog)*			
64.	25399	*Crinia glauerti (Clicking Frog)*			
65.	25400	*Crinia insignifera (Squelching Froglet)*			
66.	25420	*Myobatrachus gouldii (Turtle Frog)*			
67.	25433	*Pseudophryne guentheri (Crawling Toadlet)*			
Neosittidae					
68.	25673	*Daphoenositta chrysoptera (Varied Sittella)*			
Pachycephalidae					
69.	25675	*Colluricincla harmonica (Grey Shrike-thrush)*			
70.	25679	*Pachycephala pectoralis (Golden Whistler)*			
71.	25680	*Pachycephala rufiventris (Rufous Whistler)*			
Pardalotidae					
72.	25681	*Pardalotus punctatus (Spotted Pardalote)*			
73.	25682	*Pardalotus striatus (Striated Pardalote)*			
Peramelidae					
74.	24153	*Isoodon obesulus subsp. fusciventer (Quenda, Southern Brown Bandicoot)*		P5	
Petroicidae					
75.	24659	*Petroica goodenovii (Red-capped Robin)*			
Phalangeridae					
76.	25521	*Trichosurus vulpecula (Common Brushtail Possum)*			
Podargidae					
77.	25703	*Podargus strigoides (Tawny Frogmouth)*			
Psittacidae					
78.	25714	*Cacatua pastinator (Western Long-billed Corella)*			
79.	24729	*Cacatua tenuirostris (Eastern Long-billed Corella)*			
80.	25717	*Calyptorhynchus banksii (Red-tailed Black-Cockatoo)*			
81.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo (long-billed black-cockatoo))*		T	
82.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo (short-billed black-cockatoo))*		T	
83.	24738	*Neophema elegans (Elegant Parrot)*			
84.	25723	*Trichoglossus haematodus (Rainbow Lorikeet)*			
Pygopodidae					
85.	25005	*Lialis burtonis*			
86.	25509	*Pletholax gracilis (Keeled Legless Lizard)*			
87.	25007	*Pletholax gracilis subsp. gracilis*			
Scincidae					
88.	25011	*Acritoscincus trilineatum*			
89.	30893	*Cryptoblepharus buchananii*			
90.	25039	*Ctenotus fallens*			
91.	25047	*Ctenotus impar*			
92.	25096	*Egernia kingii (King's Skink)*			
93.	25115	*Hemiergis initialis subsp. initialis*			
94.	25128	*Lerista christinae*			
95.	25133	*Lerista elegans*			
96.	25165	*Lerista praepedita*			
97.	25184	*Menetia greyii*			
98.	25191	*Morethia lineoocellata*			
99.	25192	*Morethia obscura*			
100.	25519	*Tiliqua rugosa*			

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
101.	25207	*Tiliqua rugosa subsp. rugosa*			
Strigidae					
102.	25748	*Ninox novaeseelandiae (Boobook Owl)*			
Tarsipedidae					
103.	24167	*Tarsipes rostratus (Honey Possum)*			
Threskiornithidae					
104.	24843	*Plegadis falcinellus (Glossy Ibis)*		IA	
105.	24845	*Threskiornis spinicollis (Straw-necked Ibis)*			
Turnicidae					
106.	24851	*Turnix velox (Little Button-quail)*			
Typhlopidae					
107.	25288	*Ramphotyphlops waitii*			
Varanidae					
108.	25218	*Varanus gouldii (Bungarra or Sand Monitor)*			
Zosteropidae					
109.	25765	*Zosterops lateralis (Grey-breasted White-eye)*			

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Australian Government

Department of Sustainability, Environment, Water, Population and Communities

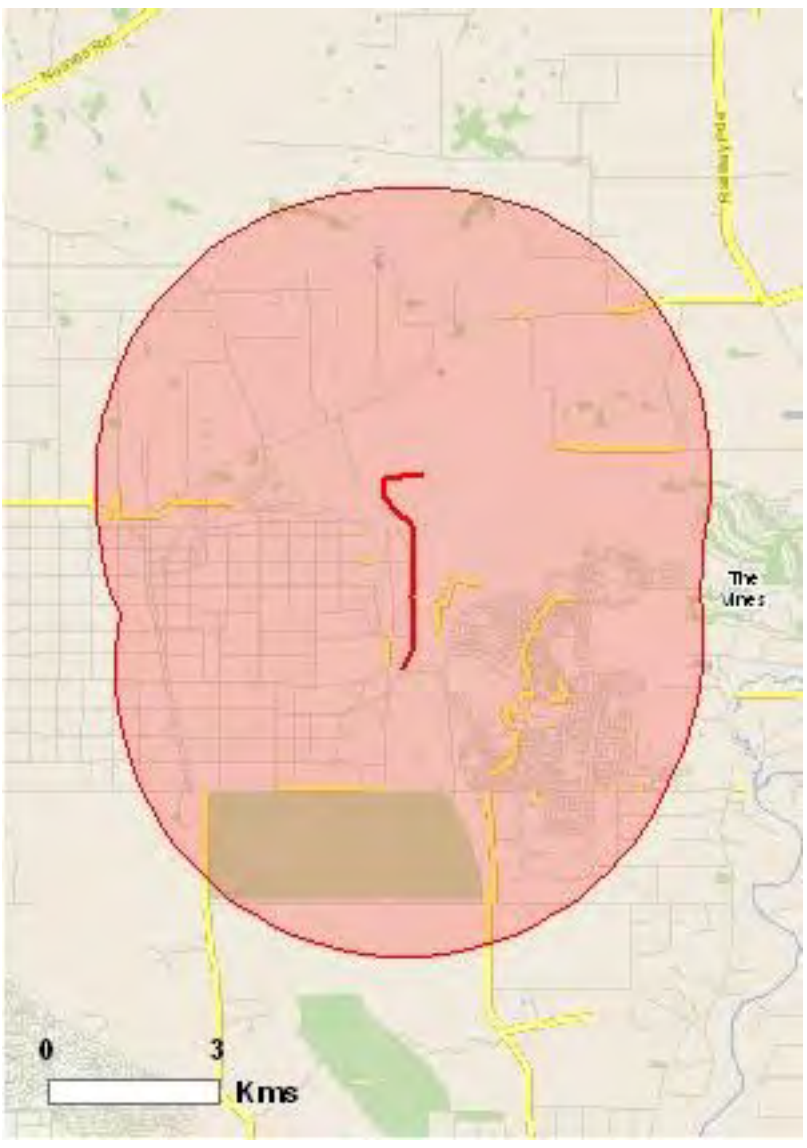
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

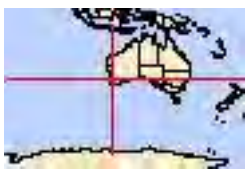
Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 23/10/12 12:53:01



Coordinates

Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Areas:	None
Listed Threatened Ecological Communities:	2
Listed Threatened Species:	19
Listed Migratory Species:	9

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place and the heritage values of a place on the Register of the National Estate.

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	6
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

Place on the RNE:	3
State and Territory Reserves:	4
Regional Forest Agreements:	None
Invasive Species:	16
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Ecological Communities [Resource Information]

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Assemblages of plants and invertebrate animals of tumulus (organic mound) springs of the Swan Coastal Plain	Endangered	Community known to occur within area
Shrublands and Woodlands on Muchea Limestone of the Swan Coastal Plain	Endangered	Community known to occur within area

Listed Threatened Species [Resource Information]

Name	Status	Type of Presence
Birds		
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo [67034]	Vulnerable	Species or species habitat may occur within area
Calyptorhynchus baudinii Baudin's Black-Cockatoo, Long-billed Black-Cockatoo [769]	Vulnerable	Species or species habitat likely to occur within area
Calyptorhynchus latirostris Carnaby's Black-Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Breeding likely to occur within area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Vulnerable	Species or species habitat may occur within area
Insects		
Synemon gratiosa Graceful Sun Moth [66757]	Endangered	Species or species habitat may occur within area
Mammals		
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Plants		
[Andersonia gracilis](#) Slender Andersonia [14470]	Endangered	Species or species habitat likely to occur within area
[Centrolepis caespitosa](#) [6393]	Endangered	Species or species habitat likely to occur within area
[Chamelaucium sp. Gingin (N.G.Marchant 6)](#) Gingin Wax [64649]	Endangered	Species or species habitat may occur within area
[Darwinia foetida](#) Muchea Bell [83190]	Critically Endangered	Species or species habitat likely to occur within area
[Epiblema grandiflorum var. cyaneum](#) Baby Blue Orchid, Blue Babe-in-the-cradle Orchid, Blue Babe-in-a-cradle [67182]	Endangered	Species or species habitat may occur within area
[Grevillea curviloba subsp. curviloba](#) Curved-leaf Grevillea [64908]	Endangered	Species or species habitat likely to occur within area
[Grevillea curviloba subsp. incurva](#) Narrow curved-leaf Grevillea [64909]	Endangered	Species or species habitat likely to occur within area
[Hydatella dioica](#) One-sexed Hydatella [4898]	Endangered	Species or species habitat likely to occur within area
[Lepidosperma rostratum](#) Beaked Lepidosperma [14152]	Endangered	Species or species habitat likely to occur within area
[Thelymitra manginii K.Dixon & Batty ms.](#) [67443]	Endangered	Species or species habitat likely to occur within area
[Thelymitra stellata](#) Star Sun-orchid [7060]	Endangered	Species or species habitat likely to occur within area
[Villarsia calthifolia](#) Mountain Villarsia [10886]	Endangered	Species or species habitat likely to occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		
[Apus pacificus](#) Fork-tailed Swift [678]		Species or species habitat likely to occur within area
[Ardea alba](#) Great Egret, White Egret [59541]		Species or species habitat may occur within area
[Ardea ibis](#) Cattle Egret [59542]		Species or species habitat may occur within area
Migratory Terrestrial Species		
[Haliaeetus leucogaster](#) White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Leipoa ocellata		
Malleefowl [934]	Vulnerable	Species or species habitat may occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Migratory Wetlands Species		
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land [Resource Information]

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name
Commonwealth Land -

Listed Marine Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardea alba		
Great Egret, White Egret [59541]		Species or species habitat may occur within area
Ardea ibis		
Cattle Egret [59542]		Species or species habitat may occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Merops ornatus		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
Rostratula benghalensis (sensu lato)		
Painted Snipe [889]	Vulnerable*	Species or species habitat may occur within area

Extra Information

Places on the RNE [Resource Information]

Note that not all Indigenous sites may be listed.

Name	State	Status
Natural		
Ellenbrook National Estate Area	WA	Registered
Melaleuca Park	WA	Registered
Historic		
Belhus Estate	WA	Registered

State and Territory Reserves [Resource Information]

Name	State
Unnamed WA46875	WA
Unnamed WA46919	WA
Unnamed WA46920	WA
Unnamed WA49300	WA

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Mammals		
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Brachiaria mutica Para Grass [5879]		Species or species habitat may occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]		Species or species habitat may occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lantana camara Lantana, Common Lantana, Kamara Lantana, Large-leaf Lantana, Pink Flowered Lantana, Red Flowered Lantana, Red-Flowered Sage, White Sage, Wild Sage [10892]		Species or species habitat likely to occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat may occur within area

Name	Status	Type of Presence
Olea europaea Olive, Common Olive [9160]		Species or species habitat may occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]		Species or species habitat likely to occur within area
Salvinia molesta Salvinia, Giant Salvinia, Aquarium Watermoss, Kariba Weed [13665]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Coordinates

-31.776439 115.949246,-31.773088 115.950845,-31.771185 115.950921,-31.765322 115.95054,-31.759459 115.950692,-31.75451 115.950921,-31.753139 115.950083,-31.751997 115.948408,-31.74956 115.946124,-31.747352 115.946048,-31.746667 115.9462,-31.746286 115.948865,-31.74621 115.952291

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World Heritage and Register of National Estate properties, Wetlands of International Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

For species where the distributions are well known, maps are digitised from sources such as recovery plans and detailed habitat studies. Where appropriate, core breeding, foraging and roosting areas are indicated under 'type of presence'. For species whose distributions are less well known, point locations are collated from government wildlife authorities, museums, and non-government organisations; bioclimatic distribution models are generated and these validated by experts. In some cases, the distribution maps are based solely on expert knowledge.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Department of Environment, Climate Change and Water, New South Wales
-Department of Sustainability and Environment, Victoria
-Department of Primary Industries, Parks, Water and Environment, Tasmania
-Department of Environment and Natural Resources, South Australia
-Parks and Wildlife Service NT, NT Dept of Natural Resources, Environment and the Arts
-Environmental and Resource Management, Queensland
-Department of Environment and Conservation, Western Australia
-Department of the Environment, Climate Change, Energy and Water
-Birds Australia
-Australian Bird and Bat Banding Scheme
-Australian National Wildlife Collection
-Natural history museums of Australia
-Museum Victoria
-Australian Museum
-SA Museum
-Queensland Museum
-Online Zoological Collections of Australian Museums
-Queensland Herbarium
-National Herbarium of NSW
-Royal Botanic Gardens and National Herbarium of Victoria
-Tasmanian Herbarium
-State Herbarium of South Australia
-Northern Territory Herbarium
-Western Australian Herbarium
-Australian National Herbarium, Atherton and Canberra
-University of New England
-Ocean Biogeographic Information System
-Australian Government, Department of Defence
-State Forests of NSW
-Geoscience Australia
-CSIRO
-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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Appendix C - Conservation Codes

EPBC Act Fauna Conservation Categories

Listed threatened species and ecological communities

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a species listed in any of the following categories:

- extinct in the wild,
- critically endangered,
- endangered, or
- vulnerable.

Critically endangered and endangered species

An action has, will have, or is likely to have a significant impact on a critically endangered or endangered species if it does, will, or is likely to:

- lead to a long-term decrease in the size of a population, or
- reduce the area of occupancy of the species, or
- fragment an existing population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of a population, or
- modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat*, or
- interfere with the recovery of the species.

*Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a critically endangered or endangered species by direct competition, modification of habitat, or predation.

Vulnerable species

An action has, will have, or is likely to have a significant impact on a vulnerable species if it does, will, or is likely to:

- lead to a long-term decrease in the size of an important population of a species, or
- reduce the area of occupancy of an important population, or
- fragment an existing important population into two or more populations, or
- adversely affect habitat critical to the survival of a species, or
- disrupt the breeding cycle of an important population, or
- modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline, or
- result in invasive species that are harmful a vulnerable species becoming established in the vulnerable species' habitat*, or

- interferes substantially with the recovery of the species.
- An important population is one that is necessary for a species' long-term survival and recovery. This may include populations that are:
- key source populations either for breeding or dispersal,
- populations that are necessary for maintaining genetic diversity, and/or
- populations that are near the limit of the species range.

*Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a vulnerable species by direct competition, modification of habitat, or predation.

Listed migratory species

The EPBC Act protects lands and migratory species that are listed under International Agreements.

- Appendices to the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animals) for which Australia is a Range State under the Convention;
- The Agreement between the Government of Australia and the Government of the Peoples Republic of China for the Protection of Migratory Birds and their Environment (CAMBA);
- The Agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); and
- The Agreement between the Government of Australia and the Government of the Republic of Korea on the Protection of Migratory Birds (ROKAMBA).
- other international agreements approved by the Commonwealth Environment Minister.

An action will require approval from the Environment Minister if the action has, will have, or is likely to have a significant impact on a listed migratory species. Note that some migratory species are also listed as threatened species.

The criteria below are relevant to migratory species that are not threatened.

An action has, will have, or is likely to have a significant impact on a migratory species if it does, will, or is likely to:

- substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat of the migratory species, or
- result in invasive species that is harmful to the migratory species becoming established* in an area of important habitat of the migratory species, or
- Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of the species.
- An area of important habitat is:
- habitat utilized by a migratory species occasionally or periodically within a region that supports an ecologically significant proportion of the population of the species, or
- habitat utilized by a migratory species which is at the limit of the species range, or
- habitat within an area where the species is declining.

Listed migratory species cover a broad range of species with different life cycles and population sizes. Therefore, what is an ecologically significant proportion of the population varies with the species (each circumstance will need to be evaluated).

*Introducing an invasive species into the habitat may result in that species becoming established. An invasive species may harm a migratory species by direct competition, modification of habitat, or predation.

Conservation categories and definitions for *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) listed flora and fauna species

Conservation Category	Definition
Extinct	Taxa not definitely located in the wild during the past 50 years
Extinct in the Wild	Taxa known to survive only in captivity
Critically Endangered	Taxa facing an extremely high risk of extinction in the wild in the immediate future
Endangered	Taxa facing a very high risk of extinction in the wild in the near future
Vulnerable	Taxa facing a high risk of extinction in the wild in the medium-term
Near Threatened	Taxa that risk becoming Vulnerable in the wild
Conservation Dependent	Taxa whose survival depends upon ongoing conservation measures. Without these measures, a conservation dependent taxon would be classified as Vulnerable or more severely threatened.
Data Deficient (Insufficiently Known)	Taxa suspected of being Rare, Vulnerable or Endangered, but whose true status cannot be determined without more information.
Least Concern	Taxa that are not considered Threatened

Conservation codes for Western Australian Flora and Fauna listed under the *Wildlife Conservation Act 1950* (WC Act) and the Department of Environment and Conservation

Code	Conservation Category	Description
T	Schedule 1 under the WC Act	Threatened Fauna (Fauna that is rare or is likely to become extinct Threatened Flora (Declared Rare Flora – Extant) Taxa that 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. CR: Critically Endangered – considered to be facing an extremely high risk of extinction in the wild. EN: Endangered – considered to be facing a very high risk of extinction in the wild. VU: Vulnerable – considered to be facing a high risk of extinction in the wild.
X	Schedule 2 under the WC Act	Presumed Extinct Fauna Presumed Extinct Flora (Declared rare Flora – Extinct) Taxa which have been adequately searched for and there is no reasonable doubt that the last individual has died, and have been gazetted as such.
IA	Schedule 3 under the WC Act	Birds protected under an international agreement Birds that are subject to an agreement between governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction.
S	Schedule 4 under the WC Act	Other specially protected fauna Fauna that is in need of special protection, otherwise than for the reasons mentioned in the above schedules.
1	Priority One: Poorly-known taxa	Taxa that are known from one or a few collections or sight records (generally less than five), all on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, Shire, Westrail and Main Roads WA road, gravel and soil reserves, and active mineral leases and under threat of habitat destruction or degradation. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes.
2	Priority Two: Poorly-known taxa	Taxa that are known from one or a few collections or sight records, some of which are on lands not under imminent threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. Taxa may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes.
3	Priority Three: Poorly-known taxa	Taxa that are known from collections or sight records from several localities not under imminent threat, or from few but widespread localities with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Taxa may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and known threatening processes exist that could affect them.
4	Priority Four: Rare, Near Threatened and other taxa in need of	(a) Rare. Taxa that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.

Code	Conservation Category	Description
	monitoring	(b) Near Threatened. Taxa that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (c) Taxa that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.
5	Priority 5: Conservation Dependent taxa	Taxa that are not threatened but are subject to a specific conservation program, the cessation of which would result in the taxon becoming threatened within five years.

Conservation Codes for Threatened Ecological Communities (TECs) under the EPBC Act and Western Australia

Western Australia Conservation Categories		Federal Government Conservation Categories (EPBC Act)	
Presumed Totally Destroyed (PD)	The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.	Critically Endangered (CR)	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated	Endangered (EN)	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.	Vulnerable (VU)	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.		

Appendix D – Flora data

Flora species recorded within the Project Area during the spring 2012 field survey

Family	Species	Status
Anarthriaceae	*Lyginia barbata*	
Apiaceae	*Xanthosia huegelii*	
Araliaceae	*Trachymene pilosa*	
Asparagaceae	*Laxmannia squarrosa*	
Asparagaceae	*Lomandra hermaphrodita*	
Asparagaceae	*Lomandra* sp.	
Asparagaceae	*Thysanotus patersonii/manglesianus*	
Asparagaceae	*Thysanotus thyrsoideus*	
Asteraceae	*Conyza* sp.	*
Asteraceae	*Hypochaeris* sp.	*
Asteraceae	*Podotheca chrysantha*	
Asteraceae	*Podotheca gnaphalioides*	
Asteraceae	*Sonchus oleraceus*	*
Asteraceae	*Ursinia anthemoides*	*
Campanulaceae	*Wahlenbergia* sp.	
Caryophyllaceae	*Silene gallica*	*
Casuarinaceae	*Allocasuarina fraseriana*	
Casuarinaceae	*Allocasuarina humilis*	
Colchicaceae	*Burchardia congesta*	
Crassulaceae	*Crassula sp.*	
Cyperaceae	*Schoenus curvifolius*	
Dasypogonaceae	*Dasypogon bromeliifolius*	
Dilleniaceae	*Hibbertia ? spicata*	
Dilleniaceae	*Hibbertia huegelii*	
Dilleniaceae	*Hibbertia hypericoides*	
Dilleniaceae	*Hibbertia* sp.	
Dilleniaceae	*Hibbertia* sp. Gnangara (J.R. Wheeler 2329)	
Dilleniaceae	*Hibbertia subvaginata*	
Ericaceae	*Andersonia ? gracilis*	
Ericaceae	*Astroloma xerophyllum*	
Ericaceae	*Croninia kingiana*	
Ericaceae	*Ericaceae* sp.	
Ericaceae	*Leucopogon polymorphus*	
Ericaceae	*Leucopogon* sp.	
Ericaceae	*Lysinema ? pentapetalum*	
Euphorbiaceae	*Euphorbia* sp.	
Fabaceae	*Acacia pulchella*	
Fabaceae	*Bossiaea eriocarpa*	
Fabaceae	*Daviesia hakeoides*	

Family	Species	Status
Fabaceae	*Daviesia triflora*	
Fabaceae	*Gastrolobium capitatum*	
Fabaceae	*Gompholobium tomentosum*	
Fabaceae	*Hovea chorizemifolia*	
Fabaceae	*Jacksonia furcellata*	
Fabaceae	*Trifolium angustifolium*	*
Geraniaceae	*Pelargonium capitatum*	*
Goodeniaceae	*Dampiera linearis*	
Goodeniaceae	*Lechenaultia biloba*	
Goodeniaceae	*Scaevola repens*	
Haemodoraceae	*Anigozanthos ? viridis*	
Haemodoraceae	*Anigozanthos* sp.	
Haemodoraceae	*Blancoa canescens*	
Haemodoraceae	*Conostylis ? aculeata*	
Haemodoraceae	*Conostylis aculeata* subsp. *aculeata*	
Haemodoraceae	*Conostylis candicans*	
Iridaceae	*Gladiolus caryophyllaceus*	*
Iridaceae	*Patersonia occidentalis*	
Lauraceae	*Cassytha sp.*	
Loranthaceae	*Nuytsia floribunda*	
Molluginaceae	*Macarthuria australis*	
Myrtaceae	*Calothamnus quadrifidus*	
Myrtaceae	*Calytrix flavescens*	
Myrtaceae	*Calytrix fraseri*	
Myrtaceae	*Calytrix* sp.	
Myrtaceae	*Calytrix strigosa*	
Myrtaceae	*Eremaea pauciflora*	
Myrtaceae	*Eucalyptus rudis*	
Myrtaceae	*Eucalyptus todtiana*	
Myrtaceae	*Hypocalymma angustifolium*	
Myrtaceae	*Hypocalymma robustum*	
Myrtaceae	*Kunzea glabrescens*	
Myrtaceae	*Kunzea micrantha*	
Myrtaceae	*Melaleuca ? trichophylla*	
Myrtaceae	*Melaleuca parviceps*	
Myrtaceae	*Melaleuca preissiana*	
Myrtaceae	*Melaleuca trichophylla*	
Myrtaceae	*Myrtaceae* sp.	
Myrtaceae	*Regelia ciliata*	
Myrtaceae	*Regelia inops*	
Myrtaceae	*Scholtzia involucrata*	
Myrtaceae	*Verticordia ovalifolia*	
Onagraceae	*Oenothera* sp.	
Phyllanthaceae	*Poranthera microphylla*	
Poaceae	*Aira* sp.	*
Poaceae	*Amphipogon turbinatus*	
Poaceae	*Austrostipa compressa*	
Poaceae	*Avena barbata*	*
Poaceae	*Briza maxima*	*

Family	Species	Status
Poaceae	*Bromus ? diandrus*	
Poaceae	*Ehrharta longiflora*	*
Poaceae	*Lolium rigidum*	*
Poaceae	*Rytidosperma caespitosum*	
Primulaceae	*Lysimachia arvensis*	*
Proteaceae	*Adenanthos cygnorum*	
Proteaceae	*Banksia attenuata*	
Proteaceae	*Banksia menziesii*	
Proteaceae	*Conospermum acerosum*	
Proteaceae	*Conospermum stoechadis* subsp. *stoechadis*	
Proteaceae	*Petrophile linearis*	
Proteaceae	*Stirlingia latifolia*	
Restionaceae	*Alexgeorgea nitens*	
Restionaceae	*Desmocladus flexuosus*	
Restionaceae	*Hypolaena exsulca*	
Rutaceae	*Boronia ramosa* subsp. *anethifolia*	
Rutaceae	*Philotheca spicata*	
Stylidiaceae	*Levenhookia stipitata*	
Stylidiaceae	*Stylidium ? araephyllum*	
Stylidiaceae	*Stylidium brunonianum*	
Stylidiaceae	*Stylidium crossocephalum*	
Stylidiaceae	*Stylidium diuroides*	
Stylidiaceae	*Stylidium divaricatum*	
Stylidiaceae	*Stylidium repens*	
Stylidiaceae	*Stylidium piliferum*	
Stylidiaceae	*Stylidium rigidulum*	
Stylidiaceae	*Stylidium* sp.	
Zamiaceae	*Macrozamia fraseri*	

Definitions for flora and fauna likelihood of occurrence assessment

Likelihood of occurrence	Definition
Known	Species definitely recorded within the Project Area from previous records or field survey results.
Likely	Species previously recorded within 5 km and suitable habitat occurs at the Project Area.
Possible	Species previously recorded within 5 km with marginally suitable habitat occurring at the Project Area. OR Species not previously recorded within 5 km, but suitable habitat occurs at the Project Area.
Unlikely	Species previously recorded within 5 km but suitable habitat does not occur at the Project Area.
Highly unlikely	Species not previously recorded within 5 km, suitable habitat does not occur at the Project Area and/ or Project Area is outside the species' natural distribution.

Flora likelihood of assessment for the Ellenbrook Project Area

Family	Species	Status		Source		Details and Habitat	Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC		
Apiaceae	*Eryngium pinnatifidum* subsp. *palustre*	P3		X		-	Possible
Centrolepidaceae	*Centrolepis caespitosa*	P4	E		X	Tufted annual, herb (forming a rounded cushion up to 25 mm across). Fl. Oct–Dec. White sand, clay. Salt flats, wet areas	Unlikely - habitat not present
Cyperaceae	*Cyathochaeta teretifolia*	P3		X		Rhizomatous, clumped, robust perennial, grass-like or herb (sedge), to 2 m high, to 1.0 m wide. Fl. brown. Grey sand, sandy clay. Swamps, creek edges.	Unlikely - habitat not present
Cyperaceae	*Lepidosperma rostratum*	T	E		X	Rhizomatous, tufted perennial, grass-like or herb (sedge), 0.5 m high. Fl. brown. Peaty sand, clay	Unlikely - habitat not present
Dasypogonaceae	*Calectasia* sp. Pinjar	P1		X		Perennial, herb, to 0.4 m high, with multiple stems and roots. Deep grey quartz soils. Gentle slopes, above damplands.	Possible - some habitat present and recorded within 5 km of the Project Area

Family	Species	Status		Source		Details and Habitat	Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC		
Dilleniaceae	*Hibbertia helianthemoides*	P3		X		Spreading to erect, low or prostrate shrub, to 0.3 m high. Fl. yellow, Jul or Sep to Oct. Clayey sand over sandstone or loam over quartzite. Hills and scree slopes.	Unlikely - habitat not present
Ericaceae	*Andersonia gracilis*	T	E		X	Slender erect or open straggly shrub, 0.1–0.5(–1) m high. Fl. white, pink, purple, Sep–Nov. White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	Unlikely - habitat not present
Euphorbiaceae	*Stachystemon* sp. Keysbrook	P1		X		Flowers Oct	Possible
Haemodoraceae	*Phlebocarya pilosissima* subsp. *pilosissima*	P3		X		Shortly rhizomatous, compactly tufted perennial, grass-like or herb, 0.15-0.4 m high. Fl. cream-white, Aug to Oct. White or grey sand, lateritic gravel.	Likely - habitat present and has been recorded within 5 km of Project Area

Family	Species	Status		Source		Details and Habitat	Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC		
Menyanthaceae	*Villarsia calthifolia* (Name changed to *Ornduffia calthifolia*)	T	E		X	Upright tuberous rhizomatous herb 0.1—1.2 m. Fl. yellow. Granite slopes with brown sandy loam over granite	Unlikely - habitat not present
Myrtaceae	*Chamelaucium* sp. Gingin	T	E		X	This species is restricted to the Gingin area. The species occurs on white/yellow sand supporting open low woodland over open scrub, with *Eucalyptus todtiana*, *Banksia attenuata* and *Hibbertia* sp. *Chamelaucium* sp.	Possible - habitat present
Myrtaceae	*Darwinia foetida*	T	CE		X	-	Possible
Myrtaceae	*Verticordia lindleyi* subsp. *Lindleyi*	P4		X		Erect shrub, 0.2–0.75 m high. Fl. pink, May/Nov–Jan. Sand, sandy clay. Winter-wet depressions.	Possible - some habitat present and has been recorded within 5 km of Project Area

Family	Species	Status		Source		Details and Habitat	Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC		
Orchidaceae	*Caladenia huegelii*	T	E	X		Tuberous, perennial, herb, 0.25-0.6 m high. Fl. green & cream & red, Sep to Oct. Grey or brown sand, clay loam	Likely - habitat present and has been recorded within 5 km of Project Area
Orchidaceae	*Epiblema grandiflorum* var. *cyaneum* (more recently known as *Epiblema grandiflorum)*	No listing (previously T)	E		X	Tuberous herb, 0.3-0.65 m high, 0.03 m wide. Fl. purple, pale blue. Black peaty sand over clay, grey white peaty sand. Swamp, in shallow water	Unlikely - habitat not present
Orchidaceae	*Thelymitra manginii* (more recently known as *Thelymitra dedmaniarum*)	T	E		X	Tuberous, perennial, herb, to 0.8 m high. Fl. yellow, Nov to Dec or Jan. Granite.	Unlikely - habitat not present
Orchidaceae	*Thelymitra stellata*	T	E		X	Tuberous, perennial, herb, 0.15–0.25 m high. Fl. yellow, brown, Oct–Nov. Sand, gravel, lateritic loam.	Possible - habitat present
Proteaceae	*Grevillea curviloba subsp. curviloba*	T	E	X	X	Prostrate to erect shrub, 0.1–2.5 m high. Fl. white, cream, Oct. Grey sand. Winter-wet heath.	Unlikely - habitat not present
Proteaceae	*Grevillea curviloba* subsp. *incurva*	T	E		X	Prostrate to erect shrub, 0.1–2.5 m high. Fl. white, cream, Aug–Sep. Sand, sandy loam. Winter-wet heath.	Unlikely - habitat not present

Family	Species	Status		Source		Details and Habitat	Likelihood of Occurrence Assessment
		State	Federal	DEC/NatureMap	EPBC		
Restionaceae	*Hypolaena robusta*	P4		X		Dioecious rhizomatous, perennial, herb, ca 0.5 m high. Fl. Sep to Oct. White sand. Sandplains.	Likely - habitat present and has been recorded within 5km of Project Area
Stylidiaceae	*Stylidium longitubum*	P3		X		Erect annual (ephemeral), herb, 0.05-0.12 m high. Fl. pink, Oct to Dec. Sandy clay, clay. Seasonal wetlands.	Unlikely - habitat is not present
Stylidiaceae	*Stylidium trudgenii*	P3		X		Caespitose perennial, herb, 0.05-0.5 m high. Grey sand, dark grey to black sandy peat. Margins of winter-wet swamps, depressions.	Unlikely - habitat not present

Ellenbrook tank flora & fauna survey Site Q01

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400567 mN 6487270 E S

Habitat Banksia woodland

Soil Grey sand

Vegetation

Veg Condition Pristine - Excellent

Fire Age Moderate (<5 years)

Notes Top of hill sloping E-W.
Weeds, fire in past.
Rock 0%
Bare ground 10-30%
Logs 0%
Twigs 2-10%
Leaves 30-70%

SPECIES LIST:

Species	COVER	HEIGHT
Stylidium crossocephalum	<2	0.15
Calytrix sp.	10-30	0.2
Dampiera linearis	<2	0.2
Andersonia ? gracilis	2-10	0.3
Gompholobium tomentosum	<2	0.3
Hibbertia sp. Gnangara (J.R. Wheeler 2329)	<2	0.3
Hibbertia subvaginata	<2	0.3
Lechenaultia biloba	<2	0.3
Leucopogon sp.	<2	0.3
Melaleuca parviceps	2-10	0.3
Stirlingia latifolia	<2	0.3
Croninia kingiana	30.70	0.4
Dasypogon bromeliifolius	<2	0.4
Astroloma xerophyllum	30-70	0.8
Hovea chorizemifolia	<2	0.8
Petrophile linearis	2-10	0.8
Scholtzia involucrata	30-70	1.1
Banksia attenuata	30-70	4
Banksia menziesii	2-10	4
Cassytha sp.	<2	creeper
Alexgeorgea nitens	ADJ	
Anigozanthos sp.	ADJ	
Eremaea pauciflora	ADJ	
Eremaea pauciflora	ADJ	

Eucalyptus todtiana	ADJ
Lomandra hermaphrodita	ADJ
Macarthuria australis	<2
Schoenus curvifolius	ADJ
Stylidium ? araephyllum	ADJ

Ellenbrook tank flora & fauna survey Site Q02

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400528 mN 6487090 E S

Habitat Banksia woodland

Soil Grey sand

Vegetation

Veg Condition Pristine - Excellent

Fire Age Old (5-20 years)

Notes Slope N-S.
Weeds.
Rock 0%
Bare ground 10-30%
Logs 0%
Twigs 2-10%
Leaves 30-70%

SPECIES LIST:

Species	COVER	HEIGHT
Laxmannia squarrosa	<2	0.15
Lechenaultia biloba	<2	0.15
Lyginia barbata	<2	0.15
Andersonia ? gracilis	<2	0.2
Calytrix flavescens	2-10	0.2
Conostylis candicans	<2	0.2
Gompholobium tomentosum	<2	0.2
Hibbertia subvaginata	2-10	0.2
Lomandra hermaphrodita	<2	0.2
Melaleuca ? trichophylla	<2	0.2
Petrophile linearis	2-10	0.2
Ursinia anthemoides	<2	0.2
Patersonia occidentalis	<2	0.4
Stylidium brunonianum	<2	0.4
Bossiaea eriocarpa	<2	0.5
Astroloma xerophyllum	30-70	0.7
Conospermum acerosum	<2	0.7
Regelia ciliata	<2	0.8
Croninia kingiana	10-30	1.1
Stirlingia latifolia	2-10	1.6
Scholtzia involucrata	30-70	1.8
Hovea chorizemifolia	2-10	2
Banksia attenuata	30-70	3.5
Cassytha sp.	<2	creeper

Andersonia ? gracilis	ADJ
Astroloma xerophyllum	ADJ
Austrostipa compressa	ADJ
Conospermum acerosum	ADJ
Dasypogon bromeliifolius	ADJ
Hypolaena exsulca	ADJ
Leucopogon polymorphus	
Rytidosperma caespitosum	ADJ
Verticordia ovalifolia	ADJ

Ellenbrook tank flora & fauna survey Site Q03

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400384 mN 6487160 E S

Habitat Banksia woodland

Soil Grey sand

Vegetation

Veg Condition Pristine - Excellent

Fire Age Old (5-20 years)

Notes Side of dune.
S aspect.
Ursinia, ?dieback.
Rock 0%
Bare ground 30-70%
Logs 2-10%
Twigs 2-10%
Leaves 10-30%

SPECIES LIST:

Species	COVER	HEIGHT
Austrostipa compressa	<2	0.2
Banksia attenuata	10-30	4
Calytrix sp.	10-30	0.2
Conostylis aculeata subsp. aculeata	<2	0.3
Daviesia hakeoides	<2	0.15
Eremaea pauciflora	30-70	0.7
Ericaceae sp.	2-10	0.2
Hibbertia huegelii	<2	0.5
Hibbertia sp.	<2	0.5
Hibbertia subvaginata	30-70	0.3
Hovea chorizemifolia	<2	1
Hypocalymma robustum	2-10	0.7
Lechenaultia biloba	30-70	0.2
Leucopogon sp.	<2	1
Levenhookia stipitata	2-10	0.25
Lomandra hermaphrodita	<2	0.2
Lyginia barbata	<2	0.5
Lyginia barbata	<2	0.3
Lysinema ? pentapetalum	<2	0.5
Macrozamia fraseri	<2	1.9
Patersonia occidentalis	<2	0.3
Petrophile linearis	<2	0.3
Regelia ciliata	30-70	1.2
Stirlingia latifolia	<2	1

Stylidium brunonianum	<2	0.3
Ursinia anthemoides	2-10	0.3

Ellenbrook tank flora & fauna survey Site Q04

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400212 mN 6487260 E S

Habitat Banksia woodland

Soil White/grey sand

Vegetation

Veg Condition Pristine - Excellent

Fire Age Old (5-20 years)

Notes Weeds, ?dieback.

SPECIES LIST:

Species	COVER	HEIGHT
Levenhookia stipitata	<2	0.15
Podotheca chrysantha	<2	0.15
Stylidium rigidulum	<2	0.15
Ursinia anthemoides	<2	0.15
Bossiaea eriocarpa	<2	0.2
Calytrix flavescens	<2	0.2
Conostylis aculeata subsp. aculeata	<2	0.2
Hibbertia huegelii	<2	0.2
Hibbertia subvaginata	2-10	0.2
Lechenaultia biloba	2-10	0.2
Stylidium brunonianum	<2	0.2
Leucopogon sp.	2-10	0.3
Gastrolobium capitatum	<2	0.4
Gompholobium tomentosum	<2	0.4
Hibbertia hypericoides	<2	0.4
Patersonia occidentalis	<2	0.4
Daviesia hakeoides	2-10	0.5
Macarthuria australis	<2	0.5
Croninia kingiana	30-70	0.6
Petrophile linearis	10-30	1.1
Stirlingia latifolia	2-10	1.1
Acacia pulchella	<2	1.2
Hovea chorizemifolia	<2	1.2
Nuytsia floribunda	30-70	1.3
Regelia ciliata	2-10	1.4
Banksia menziesii	30-70	4
Banksia attenuata	2-10	5

Ellenbrook tank flora & fauna survey Site Q05

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400148 mN 6486870 E S

Habitat Shrubland - rehab

Soil White/grey sand

Vegetation

Veg Condition Very Good - Good

Fire Age Old (5-20 years)

Notes Flat area, was mined in the past 10 years.
Rehab - no weeds evident.
Rock 0%
Bare ground 30-70%
Logs <2%
Twigs 2-10%
Leaves 10-30%

SPECIES LIST:

Species	COVER	HEIGHT
Levenhookia stipitata	<2	0.05
Stylidium divaricatum	<2	0.05
Scaevola repens	<2	0.1
Laxmannia squarrosa	<2	0.15
Ursinia anthemoides	<2	0.15
Wahlenbergia sp.	<2	0.15
Bossiaea eriocarpa	<2	0.2
Conostylis ? aculeata	<2	0.2
Gastrolobium capitatum	<2	0.2
Regelia ciliata	10-30	0.2
Hibbertia subvaginata	30-70	0.3
Melaleuca trichophylla	<2	0.3
Calothamnus quadrifidus	<2	0.4
Conostylis aculeata subsp. aculeata	<2	0.4
Daviesia hakeoides	<2	0.6
Gompholobium tomentosum	<2	0.6
Acacia pulchella	<2	0.7
Gladiolus caryophyllaceus	<2	0.7
Allocasuarina fraseriana	<2	0.8
Calothamnus quadrifidus	<2	0.8
Patersonia occidentalis	<2	0.8
Regelia ciliata	30-70	0.8
Hovea chorizemifolia	2-10	1.5
Banksia attenuata	2-10	1.9

Kunzea glabrescens	30-70	1.9
Jacksonia furcellata	2-10	3.5
Aira sp.	ADJ	
Briza maxima	ADJ	
Lomandra sp.	ADJ	
Stylidium crossocephalum	ADJ	

Ellenbrook tank flora & fauna survey Site Q06

Described by GO Date 30/10/2012 Type Q

Location

MGA Zone mE 400199 mN 6486730 E S

Habitat Shrubland rehab

Soil White sand

Vegetation

Veg Condition Very Good - Good

Fire Age

Notes Flat.
Rehab. Some minor weeds.
Rock 0%
Bare ground 30-70%
Logs <2%
Twigs 10-30%
Leaves 30-70%

SPECIES LIST:

Species	COVER	HEIGHT
Allocasuarina fraseriana	<2	0.7
Dampiera linearis	<2	0.15
Laxmannia squarrosa	<2	0.15
Hibbertia sp. Gnangara (J.R. Wheeler 2329)	<2	0.2
Kunzea glabrescens	2-10	0.2
Melaleuca trichophylla	<2	0.2
Anigozanthos ? viridis	<2	0.3
Hibbertia huegelii	<2	0.3
Melaleuca parviceps	<2	0.3
Patersonia occidentalis	<2	0.3
Regelia ciliata	<2	0.3
Conostylis aculeata subsp. aculeata	<2	0.4
Gastrolobium capitatum	<2	0.4
Petrophile linearis	<2	0.4
Regelia ciliata	10-30	0.4
Burchardia congesta	<2	0.5
Gladiolus caryophyllaceus	<2	0.5
Bossiaea eriocarpa	<2	0.7
Acacia pulchella	<2	0.8
Daviesia hakeoides	<2	0.8
Gompholobium tomentosum	2-10	0.8
Hypocalymma angustifolium	<2	1
Stirlingia latifolia	<2	1
Banksia attenuata	10-30	1.1

Adenanthos cygnorum	30-70	1.5
Jacksonia furcellata	10-30	2.5
Bromus ? diandrus	ADJ	
Ehrharta longiflora	ADJ	
Melaleuca preissiana	ADJ	

Ellenbrook tank flora & fauna survey Site Opportunistic Collections

Described by Date Type O

Location

MGA Zone mE mN E S

Habitat

Soil

Vegetation

Veg Condition

Fire Age

Notes

SPECIES LIST:

Name	Cover	C Class	Height
Allocasuarina humilis			
Amphipogon turbinatus			
Avena barbata			
Avena barbata			
Blancoa canescens			
Boronia ramosa subsp. anethifolia			
Calytrix fraseri			
Calytrix strigosa			
Conospermum stoechadis subsp. stoechadis			
Conyza sp.			
Crassula sp.			
Daviesia triflora			
Desmocladus flexuosus			
Eucalyptus rudis			
Euphorbia sp.			
Hibbertia ? spicata			
Hypochaeris sp.			
Kunzea micrantha			
Lolium rigidum			
Lysimachia arvensis			
Myrtaceae sp.			
Oenothera sp.			
Pelargonium capitatum			
Philotheca spicata			
Podotheca gnaphalioides			
Poranthera microphylla			
Poranthera microphylla			
Regelia inops			
Silene gallica			
Sonchus oleraceus			
Stylidium diuroides			
Stylidium longitubum			
Stylidium piliferum			
Stylidium sp.			
Thysanotus patersonii/manglesianus			
Thysanotus thyrsoideus			
Trachymene pilosa			
Trifolium angustifolium			
Xanthosia huegelii			

Appendix E - Fauna data

Summary of fauna desktop investigation results – Fauna Species of Conservation Significance

Family	Species	Common name	Status (State)	Status (Federal)	NatureMap (5 km)	EPBC (5 km)
Birds						
Accipitridae	*Haliaeetus leucogaster*	White-bellied Sea-Eagle	S3	Mi		X
Apodidae	*Apus pacificus*	Fork-tailed Swift	S3	Mi, Ma		X
Ardeidae	*Ardea ibis*	Cattle Egret	S3	Mi, Ma		X
Ardeidae	*Ardea modesta*	Great Egret	S3	Mi, Ma		X
Falconidae	*Falco peregrinus subsp. macropus*	Australian Peregrine Falcon	S4		X	
Megapodiidae	*Leipoa ocellata*	Malleefowl	T	Vu, Mi		X
Meropidae	*Merops ornatus*	Rainbow Bee-eater	S3	Mi	X	X
Psittacidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black-Cockatoo	T	Vu		X
Psittacidae	*Calyptorhynchus baudinii*	Baudin's Cockatoo	T	Vu	X	X
Psittacidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	T	Vu	X	X
Rostratulidae	*Rostratula benghalensis australis*	Australian Painted Snipe	T	Vu, Mi		X
Threskiornithidae	*Plegadis falcinellus*	Glossy Ibis	S3		X	
Mammals						
Dasyuridae	*Dasyurus geoffroii*	Chuditch, Western Quoll	T	Vu	X	X
Macropodidae	*Macropus irma*	Western Brush Wallaby	P4		X	
Muridae	*Hydromys chrysogaster*	Water-rat	P4		X	
Peramelidae	*Isoodon obesulus subsp. fusciventer*	Quenda, SouthernBrown Bandicoot	P5		X	
Reptiles						
Elapidae	*Neelaps calonotos*	Black-striped Snake	P3		X	
Insects						
Castniidae	*Synemon gratiosa*	Graceful Sunmoth	P4	En	X	X

Fauna species recorded during the field survey for the Ellenbrook Project Area

Family	Species	Common Name	Status
Birds			
Acanthizidae	*Smicrornis brevirostris occidentalis*	Weebill	
Acanthizidae	*Gerygone fusca*	Western Gerygone	
Cacatuidae	*Eolophus roseicapilla*	Galah	
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	
Casuariidae	*Dromaius novaehollandiae*	Emu	
Columbidae	*Ocyphaps lophotes*	Crested Pigeon	
Corvidae	*Corvus coronoides perplexus*	Australian Raven	
Cracticidae	*Cracticus tiibicen dorsalis*	Australian Magpie	
Dicruridae	*Rhipidura leucophrys leucophrys*	Willie Wagtail	
Dicruridae	*Grallina cyanoleuca*	Magpie-lark	
Dicruridae	*Rhipidura fuliginosa*	Grey Fantail	
Hirundinidae	*Hirundo neoxena*	Welcome swallow	
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird	
Meliphagidae	*Lichenostomus virescens virescens*	Singing Honeyeater	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater	
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater	
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	
Psittacidae	*Platycercus zonarius semitorquatus*	Twenty-eight Parrot	
Threskiornithidae	*Threskiornis spinicollis*	Straw-necked Ibis	
Mammals			
Leporidae	*Oryctolagus cuniculus*	European Rabbit	*
Macropodidae	*Macropus fuliginosus*	Western Grey Kangaroo	

*Introduced species

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