



## Referral of proposed action

**Project title:** Calleya Residential Development, Banjup

### 1 Summary of proposed action

**1.1 Short description**

The Stockland WA Development Pty Ltd (Stockland) has approval to develop Lots 1, 868 and 9004 Armadale Road, Lot 9002 Jandakot Road and Lot 132 Fraser Road, Banjup (Calleya Residential Development) in accordance with a Local Structure Plan (LSP) which has been endorsed by the Western Australian Planning Commission (WAPC) and the City of Cockburn (CoC) (Figures 1 and 2).

**1.2 Latitude and longitude**

| location point | Latitude |         |         | Longitude |         |         |
|----------------|----------|---------|---------|-----------|---------|---------|
|                | degrees  | minutes | seconds | degrees   | minutes | seconds |
| 1              | 32       | 6       | 43      | 115       | 52      | 32      |
| 2              | 32       | 6       | 44      | 115       | 52      | 39      |
| 3              | 32       | 6       | 57      | 115       | 52      | 53      |
| 4              | 32       | 7       | 6       | 115       | 53      | 10      |
| 5              | 32       | 7       | 35      | 115       | 52      | 39      |
| 6              | 32       | 7       | 38      | 115       | 52      | 34      |
| 7              | 32       | 7       | 40      | 115       | 52      | 32      |
| 8              | 32       | 7       | 47      | 115       | 52      | 34      |
| 9              | 32       | 7       | 49      | 115       | 52      | 33      |
| 10             | 32       | 7       | 49      | 115       | 52      | 32      |
| 11             | 32       | 7       | 43      | 115       | 52      | 18      |
| 12             | 32       | 7       | 34      | 115       | 52      | 27      |
| 13             | 32       | 7       | 30      | 115       | 52      | 20      |
| 14             | 32       | 7       | 20      | 115       | 52      | 30      |
| 15             | 32       | 7       | 20      | 115       | 52      | 31      |
| 16             | 32       | 7       | 19      | 115       | 52      | 32      |
| 17             | 32       | 7       | 19      | 115       | 52      | 31      |
| 18             | 32       | 7       | 18      | 115       | 52      | 31      |
| 19             | 32       | 7       | 12      | 115       | 52      | 14      |
| 20             | 32       | 7       | 10      | 115       | 52      | 14      |
| 21             | 32       | 7       | 10      | 115       | 52      | 13      |
| 22             | 32       | 7       | 11      | 115       | 52      | 12      |
| 23             | 32       | 7       | 11      | 115       | 52      | 11      |
| 24             | 32       | 7       | 2       | 115       | 52      | 17      |
| 25             | 32       | 6       | 59      | 115       | 52      | 18      |
| 26             | 32       | 6       | 60      | 115       | 52      | 18      |
| 27             | 32       | 6       | 59      | 115       | 52      | 19      |
| 28             | 32       | 6       | 55      | 115       | 52      | 20      |

**1.3 Locality and property description**

Stockland is proposing to implement the Calleya Residential Development in accordance with an endorsed LSP over Lots 1, 868 and 9004 Armadale Road, Lot 9002 Jandakot Road and Lot 132 Fraser Road, Banjup.

**1.4 Size of the development footprint or work area (hectares)**

The Calleya Residential Development site is 144 hectares (ha).

**1.5 Street address of the site**

Armadale Road, Banjup.

|      |   |  |  |
|------|---|--|--|
| 1.5  | <b>Street address of the site</b>                           | Armadale Road, Banjup.   |  |
| 1.6  | <b>Lot description</b>                                      | Lots 1, 868 and 9004 Armadale Road, Lot 9002 Jandakot Road and Lot 132 Fraser Road, Banjup.                              |  |
| 1.7  | <b>Local Government Area and Council contact (if known)</b> | City of Cockburn<br><br>Chris Beaton<br>Environmental Manager<br>Ph: (08) 9411 3465<br>Email: cbeaton@cockburn.wa.gov.au |  |
| 1.8  | <b>Time frame</b>   | N/A  |  |
| 1.9  | <b>Alternatives to proposed action</b>                      | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, you must also complete section 2.2  |
| 1.10 | <b>Alternative time frames etc.</b>                         | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant). |
| 1.11 | <b>State assessment</b>                                     | <input type="checkbox"/>   | No   |
|      |   | <input checked="" type="checkbox"/>  | Yes, you must also complete Section 2.5  |
| 1.12 | <b>Component of larger action</b>                           | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, you must also complete Section 2.7  |
| 1.13 | <b>Related actions/proposals</b>                            | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, provide details:  |
| 1.14 | <b>Australian Government funding</b>                        | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, provide details:  |
| 1.15 | <b>Great Barrier Reef Marine Park</b>                       | <input checked="" type="checkbox"/>  | No   |
|      |   | <input type="checkbox"/>   | Yes, you must also complete Section 3.1 (h), 3.2 (e)   |

## 2 Detailed description of proposed action

### 2.1 Description of proposed action

SPG is proposing to implement the Calleya Residential Project in the City of Cockburn in accordance with an endorsed LSP. The development site consists of land that has predominantly been used for sand mining and has previously been cleared, or contains sparse remnant vegetation. The LSP has been designed to locate urban development within the previously mined area while retaining remnant vegetation extents within Public Open Space reservations.

### 2.2 Alternatives to taking the proposed action

N/A

### 2.3 Alternative locations, time frames or activities that form part of the referred action

N/A

### 2.4 Context, planning framework and state/local government requirements

The site is zoned "Urban" under the Metropolitan Region Scheme (MRS) and "Urban" under the CoC's Town Planning Scheme (TPS) No. 3.

A LSP prepared in 2013 to guide future subdivision and development of the site, was endorsed by the WAPC and CoC. For the purpose of staging development, the site was divided into southern and northern precincts with development certainty for these precincts provided through the approval of Subdivision Applications No. 148012 (southern precinct) and 149633 (northern precinct) by the WAPC.

Seeking to create efficiencies in the urban design framework of the development, SPG modified the endorsed LSP prepared in 2013. In support of the revision of the LSP an Addendum to the Environmental Assessment Report (EAR), prepared in support of Amendment No. 95 (see below), was finalised by RPS (Appendix 2). The revised LSP was endorsed by the CoC on 01 March 2016.

The endorsed 2016 LSP is the definitive planning instrument for the site, which provides guidance, and context for all future subdivision and development applications (Figure 2).

### 2.5 Environmental impact assessments under Commonwealth, state or territory legislation

The development site was formerly zoned "Rural – Water Protection" under the MRS and "Resource" under TPS No. 3. The site was rezoned to "Urban" under the MRS in November 2012 (MRS Amendment 1221/41 Banjup Urban Precinct).

The CoC referred Amendment No. 95 – Rezoning from Resource to Development Lots 1 and 9004 and 9004 Armadale Road, Lot 9002 Jandakot Road and Lot 132 Fraser Road, Banjup to the Environmental Protection Authority (EPA) for assessment under Section 48a of the *Environmental Protection Act 1986* (EP Act).

In support of Amendment No. 95, an EAR was prepared by RPS and submitted to EPA for consideration (Appendix 1).

In November 2012, the Chairman of the EPA considered that the likely environmental impacts of the Scheme Amendment were not so significant as to warrant formal environmental assessment and, subsequently, determined that Amendment No. 95 should be treated as "Scheme Amendment Not Assessed – Advice Given (no appeals)".

The EPA identified that the two key environmental factors requiring management at the site are groundwater and conservation of significant flora.

On 16 September 2013, the Minister for Planning approved Amendment No. 95 to the CoC's TPS No. 3. Public notice was provided by way of Government Gazette on 11 October 2013 with the following provisions included under Schedule 11 of TPS No. 3:

1. *The Structure Plan is to provide for an appropriate mix of residential and non-residential land uses, in order to support the objective for a mixed-use neighbourhood. Non-residential land uses may include compatible commercial and industrial (light and service industry) land uses, as a means to provide an appropriate interface and transition to the western adjoining Solomon Road Development Area 20.*
2. *The Structure Plan is to provide for safe and efficient pedestrian connections between DA37 and the Cockburn Central Railway Station.*
3. *Land uses classified on the Structure Plan apply in accordance with clause 6.2.6.3.*

**2.6 Public consultation (including with Indigenous stakeholders)**

Through the Western Australian rezoning process, preparation of the LSPs and submission of subdivision and development applications extensive consultation has been undertaken with various government regulatory entities including the Office of the EPA, Department of Parks and Wildlife (DPaW), Department of Environmental Regulation (DER), Department of Water, Department of Planning and the CoC.

**2.7 A staged development or component of a larger project**

N/A

## 3 Description of environment & likely impacts

### 3.1 Matters of national environmental significance

#### 3.1 (a) World Heritage Properties

##### Description

There are no World Heritage Properties in, or adjacent to, the site.

##### Nature and extent of likely impact

N/A

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#### 3.1 (b) National Heritage Places

##### Description

There are no National Heritage Places in, or adjacent to, the site.

##### Nature and extent of likely impact

N/A

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#### 3.1 (c) Wetlands of International Importance (declared Ramsar wetlands)

##### Description

There are no declared Ramsar wetlands within, or adjacent to, the site.

##### Nature and extent of likely impact

N/A

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#### 3.1 (d) Listed threatened species and ecological communities

##### Description

##### Flora

The EPBC Act Protected Matters Report generated nine Threatened flora species as potentially occurring within the site (Table 1).

**Table 1. Threatened Flora Species identified in the EPBC Act Protected Matters Report**

| Species                       | Common Name  | Conservation Status   |
|-------------------------------|--|-----------------------|
| <i>Andersonia gracilis</i>    | Slender andersonia   | Endangered            |
| <i>Caladenia huegelii</i>     | King spider orchid, grand spider orchid, rusty spider orchid | Endangered            |
| <i>Darwinia foetida</i>       | Muchea bell  | Critically Endangered |
| <i>Diuris micrantha</i>       | Dwarf Bee-orchid   | Vulnerable            |
| <i>Diuris purdiei</i>         | Purdie's donkey-orchid                                       | Endangered            |
| <i>Drakaea elastica</i>       | Glossy-leafed hammer-orchid, praying virgin                  | Endangered            |
| <i>Drakea micrantha</i>       | Dwarf hammer-orchid  | Vulnerable            |
| <i>Lepidosperma rostratum</i> | Beaked lepidosperma  | Endangered            |
| <i>Thelymitra dedmaniarum</i> | Cinnamon sun orchid  | Endangered            |

## Fauna

The EPBC Act Protected Matters Report generated ten Threatened fauna species as potentially occurring within the site (Table 2).

**Table 2. Threatened Fauna Species identified in the EPBC Act Protected Matters Report**

| Species                             | Common Name                      | Conservation Status   |
|-------------------------------------|----------------------------------|-----------------------|
| <i>Botaurus poiciloptilus</i>       | Australasian bittern             | Endangered            |
| <i>Calidris ferruginea</i>          | Curlew sandpiper                 | Critically Endangered |
| <i>Calyptorhynchus banksia naso</i> | Forest red-tailed black cockatoo | Vulnerable            |
| <i>Calyptorhynchus baudinii</i>     | Baudin's black cockatoo          | Vulnerable            |
| <i>Calyptorhynchus latirostris</i>  | Carnaby's Black-Cockatoo         | Endangered            |
| <i>Leipoa ocellata</i>              | Malleefowl                       | Vulnerable            |
| <i>Rostratula australis</i>         | Australian painted snipe         | Endangered            |
| <i>Neopasiphae simplicior</i>       | A native bee                     | Critically Endangered |
| <i>Dasyurus geoffroii</i>           | Chuditch, western quoll          | Vulnerable            |
| <i>Pseudocheirus occidentalis</i>   | Western ringtail possum          | Vulnerable            |

## Threatened Ecological Communities

No Threatened Ecological Communities have been recorded within a five kilometre radius of the site.

## Nature and extent of likely impact

### Flora

Approximately 122.97 ha (or 85.9% of the site) was subject to sand mining activities. Within this previously mined extent, approximately 28.12 ha was rehabilitated (post-mining) including planted mixed non-local species with a naturally regenerating mid-understorey of local species. The remaining approximate 21.03 ha (or 14.1% of the site) was comprised of native vegetation in variable condition.

According to a desktop search using DPaW / WAM *NatureMap* database, only one Threatened flora species (*Caladenia huegelii*) has been recorded within 2 kilometres (km) of the site (Appendix 3).

A Level 1 Flora and Vegetation Survey, inclusive of a targeted flora search in September for *C. huegelii*, was undertaken in 2014 (Appendix 2). The Level 1 Survey confirmed the presence of *C. huegelii* within the site. No other Threatened flora species were detected.

A total of 22 *C. huegelii* individuals were recorded within the site, which comprised five disjunct sub-populations of between one and 11 individuals each. Twenty of these individuals were recorded within Banksia woodland in the eastern portion of the site adjacent to Fraser Road. The northernmost record (two individuals) occurred within the rehabilitation works in the north-eastern corner of the site near the corner of Jandakot and Fraser roads.

Three of those populations (19 individuals) occur within the boundary of the retained Banksia woodland vegetation within the endorsed LSP, one population occurs within an isolated stand of remnant Banksia woodland vegetation (one individual) and one population (two individuals) occurs within the rehabilitation works area (Figure 5).

Individuals occurring within the boundary of the retained vegetation within the endorsed LSP are not expected to be impacted by future development of the site. The two sub-populations (three individuals) are isolated from the retained vegetation at a local site scale, and retention of these individuals as part of future development would result in an unviable land use outcome within land zoned for urban development.

The vegetation extents containing the three individuals have been proposed for development (non-retention) in the endorsed LSP. The residual impacts as a result of clearing the vegetation containing the three individuals will be mitigated through the translocation of the plants to a neighbouring land holding (Lot 820) which is under the management of DPaW for conservation purposes and within the mapped extent of Bush Forever Site 390 – *Fraser Road Bushland*.

SPG has lodged an *Application for a Permit to Take Declared Rare Flora in Non-Departmental Management Operation* with DPaW to facilitate the translocation of the three plants.

*C. huegelii* has also been identified within the adjacent landholdings (Lots 820 and 4), Jandakot Regional Park and Ken Hurst Park (all of which are within 5 km of the site), with the latter being considered the most extensive population in the state with 96 individuals recorded.

To progress the Permit to Take application, DPaW has advised that the following mitigation commitments (as proposed by SPG) and a translocation proposal are required to be approved by DPaW, and then implemented:

- a minimum area of rehabilitation of 1.5 ha and associated costing over a three-year period, in an appropriate area discussed with, and approved by, DPaW
- weed control of the proposed rehabilitation area.

SPG has committed to undertaking the rehabilitation works within a 1.5 ha portion of the cleared but unconstructed Fraser Road reserve, which lies directly adjacent to the remnant vegetation extents along the site's eastern boundary. An application for the closure of Fraser Road has been supported by CoC and is currently pending approval. A Landscape Master Plan, which details the extent and treatments for the proposed rehabilitation area, has been prepared by Emerge Associates (Figure 3). The implementation of the Landscape Master Plan will be subject to approval by DPaW and CoC.

The rehabilitation of the cleared but unconstructed Fraser Road reserve will create a contiguous green linkage between the retained vegetation within the site and the regionally significant vegetation contained within the neighbouring Bush Forever Site No. 390 – *Fraser Road Bushland* (Figure 4). The creation of the contiguous green linkage establishes a significant extent of native vegetation reserved for protection. The retained remnant vegetation on the site's eastern boundary, coupled with the proposed revegetation works, increases the extent of vegetation retained locally in the landscape by 8.83 ha (7%) to comprise an approximate 142 ha extent.

In addition, once established the green linkage, will allow for increased terrestrial fauna movement through the local landscape by connecting the remnant vegetation extents within the Calleya site with Bush Forever Site No. 390 – *Fraser Road Bushland*.

SPG is also proposing to install conservation fencing along the boundary on Lot 820 to replace the existing fence, which is currently in a state of disrepair. Lot 820 contains a significant *C. huegelii* population and replacing the existing fence increases the protection of this population.

A *C. huegelii* Translocation and Habitat Rehabilitation Plan is currently being prepared, in accordance with Policy Statement No. 29: *Translocation of Threatened Flora and Fauna* by Tranen Revegetation Systems. The translocation of the two *C. huegelii* sub-populations (three plants) will be implemented in accordance with the DPaW approved plan.

### **Fauna**

According to a desktop search using DPaW / WAM *NatureMap* database, no Threatened fauna species have been recorded within 2 km of the site (Appendix 3).

Remnant banksia woodland vegetation within the site is considered to represent potential foraging habitat for black cockatoos. Additionally, *EPBC Act Referral Guidelines for the Three Threatened Black Cockatoo Species* show the site as being within the known foraging and breeding areas for Carnaby's Black-Cockatoo and the forest red-tailed black cockatoo.

Two assessments of potential black cockatoo foraging habitat have been undertaken for the site:

- (a) Targeted Habitat Survey (RPS 2010) (Appendix 1).
- (b) Lot 132 Armadale Road, Jandakot - Black Cockatoo Habitat Survey (Bamford Consulting Ecologists 2013) (Appendix 4).

RPS (2010) included a Carnaby's Black-Cockatoo Habitat Assessment, which mapped the vegetation types containing potential foraging habitat, assessed the percentage cover of *Banksia* sp. within these vegetation extents, and searched for evidence of black cockatoo foraging within the site. Bamford Consulting Ecologists (2013) assessed the potential of two areas of remnant vegetation within the site to provide foraging, roosting and nesting habitat for black cockatoo species.

RPS (2010) did not record any evidence of foraging or nesting; however, there was a single *Eucalyptus marginata* (jarrah) tree that contained a potential breeding hollow for Carnaby's Black-Cockatoo. This tree was identified in the LSP and has been retained within a Public Open Space reservation (Figure 5).

Bamford Consulting Ecologists were specifically commissioned to assess two patches of remnant vegetation within the site for significant fauna values with a focus on black cockatoos. Bamford Consulting Ecologists (2013) concluded the site is outside the usual range of Baudin's black cockatoo. Bamford (2013) did not record any signs of foraging by either Baudin's black cockatoo or forest red-tailed black cockatoo. Bamford Consulting Ecologists (2013) identified previous evidence of foraging by Carnaby's Black-Cockatoo within the southern patch of vegetation. Additionally, Bamford Consulting Ecologists (2013) concluded that due to the near absence of the forest red-tailed black cockatoo's preferred native food sources (i.e. *Corymbia callophyla* and *E. marginata*) the site was not of foraging value for these species.

*EPBC Act Referral Guidelines for the Three Threatened Black Cockatoo Species* state that foraging habitat for Carnaby's Black-Cockatoo includes native shrubland, kwongan heathland and woodland dominated by proteaceous species such as *Banksia* spp. (including *Dryandra* spp.), *Hakea* spp. and *Grevillea* spp. Forages is pine plantations (*Pinus* spp.), eucalypt woodland and forest that contains foraging species. Also individual trees and small stands of these species.

Informed by the findings of RPS (2010), Bamford Consulting Ecologists (2013) and the *EPBC Act Referral Guidelines for the Three Threatened Black Cockatoo Species*, RPS undertook an additional site-specific investigation to refine the extent of the remnant banksia woodland vegetation that constituted potential habitat for Carnaby's Black-Cockatoo. The site specific investigation involved traversing the site and further refining pre-existing vegetation mapping, presented in RPS (2010), to determine the extent of the banksia woodland vegetation dominated by banksia (foraging) species.

Figure 5 presents the refined extent of potential Carnaby's Black-Cockatoo foraging habitat (*Banksia* sp. trees) within the site in the context of the endorsed LSP. Approximately, 1.542 ha of the mapped 11.963 ha extent of foraging habitat (or 13%) will be removed by the implementation of the endorsed LSP.

Approximately 429 ha of bushland, contained within Bush Forever Sites<sup>1</sup> within 2 km of the site, support floristic communities considered to be potential Carnaby's Black-Cockatoo foraging habitat. Within 4 km of the site, approximately 1,693 ha (inclusive of the extent contained within 2 km of the site) of bushland containing potential Carnaby's Black-Cockatoo foraging habitat is contained within Bush Forever Sites (Figure 6).

The loss of 1.542 ha from the site represents 0.09% of the bushland containing potential available foraging habitat within 4 km of the site in Bush Forever sites alone.

Additionally, the project will implement key landscape management measures to protect and revegetate areas of open space. Specifically:

- revegetation of an additional 0.96 ha of Public Open Space along Solomon Road using similar species to those identified within the remnant vegetation (e.g. *Eucalyptus marginata*, *E. totiana*, *Allocasuarina fraseriana*, *Banksia attenuata*, *B. menziesii*, *B. ilicifolia*, *Hibbertia hypericoides*, *Stirlingia latifolia*, *Eremaea pauciflora*, *Regelia inops* and *Scholtzia involucreata*) which includes species known to be foraging and breeding habitat for Carnaby's Black-Cockatoo (Appendix 2).

Given that 10.421 ha of potential Carnaby's Black-Cockatoo foraging habitat in "Good" to "Excellent" condition remains within the Public Open Space reservations of the endorsed LSP, the significant extents of potential foraging habitat available within 4 km of the site in Bush Forever sites and the implementation of landscape management measures on site it is not expected that the project will have a significant impact on Carnaby's Black-Cockatoo.

### 3.1 (e) Listed migratory species

#### Description

The EPBC Act Protected Matters Report generated 17 migratory species as potentially occurring within the site (Table 3).

**Table 3. Migratory Species identified in the EPBC Act Protected Matters Report**

| Species  | Common name              |
|--|--------------------------|
| <i>Ardea alba</i>  | Great egret, white egret |
| <i>Ardea ibis</i>  | Cattle egret             |
| <i>Calidris acuminata</i>  | Sharp-tailed sandpiper   |
| <i>Calidris canutus</i>  | Red knot                 |
| <i>Calidris ferruginea</i> *   | Curlew sandpiper         |
| <i>Calidris melantotos</i>   | Pectoral sandpiper       |
| <i>Calidris ruficollis</i>   | Red-necked stint         |
| <i>Calidris subminuta</i>  | Long-toed stint          |
| <i>Charadrius dubius</i>   | Little ringed plover     |
| <i>Limosa lapponica</i>  | Bar-tailed godwit        |
| <i>Merops ornatus</i>  | Rainbow bee-eater        |
| <i>Motacilla cinerea</i>   | Grey wagtail             |
| <i>Pandion haliaetus</i>   | Osprey                   |
| <i>Philomacrus pugnax</i>  | Ruff                     |
| <i>Tringa glareola</i>   | Wood sandpiper           |
| <i>Tringa nebularia</i>  | Common greenshank        |
| <i>Tringa stagnatilis</i>  | Marsh sandpiper          |
| * This species is listed as critically endangered under the EPBC Act |                          |

<sup>1</sup> The area of bushland within each Bush Forever Site has been sourced from Bush Forever, Volume 2: Directory of Bush Forever Sites (Government of Western Australia 2000).



**Nature and extent of likely impact**

Table 4 shows the estimated likelihood that identified migratory species would occur within the site. Migratory species that are known to utilise wetland habitats have been identified as having limited potential habitat associated within the Melaleuca Dampland vegetation association in the north-west corner of the site.

Substantial extents of potential wetland habitat is available for migratory species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons Lakes) therefore, it is considered that the risk of significant impact occurring to migratory species as a result of developing the landholdings for residential purposes is low.

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**Table 4: Likelihood of Occurrence of Migratory Species in the Site**

| Species   | Preferred Habitat   | Extent of Habitat in the Site  | Likelihood of Occurrence   |
|---|---|--|--|
| <i>Ardea alba</i><br>(Eastern great egret)            | The eastern great egret is widespread in southern and eastern Asia and Australasia and is highly mobile, rendering them less susceptible to population fragmentation. The eastern great egret has been reported in a wide range of wetland habitats including swamps and marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds, drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons, and offshore reefs. In Western Australia, breeding colonies nest predominantly in <i>Melaleuca</i> swamps in November and December although breeding is dependent to some extent on rainfall (DotE 2016a).   | A portion of a mapped wetland with associated <i>Melaleuca</i> Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the eastern great egret.       | The potential habitat within the site for the eastern great egret is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.    |
| <i>Ardea ibis</i><br>(Cattle egret)                   | The cattle egret is widespread in southern and eastern Asia and Australasia and is highly mobile, rendering them less susceptible to population fragmentation. This egret has been reported in a wide range of wetland habitats including swamps and marshes, margins of rivers and lakes, damp or flooded grasslands, pastures or agricultural lands, reservoirs, sewage treatment ponds, drainage channels, salt pans and salt lakes, salt marshes, estuarine mudflats, tidal streams, mangrove swamps, coastal lagoons, and offshore reefs. In Western Australia, breeding colonies nest predominantly in <i>Melaleuca</i> swamps in November and December although breeding is dependent to some extent on rainfall (DotE 2016b).                       | A very small portion of a mapped wetland with associated <i>Melaleuca</i> Dampland vegetation association exists in the north-west corner of the site, which may provide limited potential habitat for the cattle egret. | The potential habitat within the site for the cattle egret is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.           |
| <i>Calidris acuminata</i><br>(Sharp-tailed sandpiper) | Sharp-tailed sandpiper spends the non-breeding season in Australia with small numbers occurring regularly in New Zealand. In Western Australia (WA), scattered records occur along the Nullarbor Plain and the southern areas of the Great Victoria Desert. They are widespread from Cape Arid to Carnarvon, around coastal and sub-coastal plains of Pilbara Region to south-west and east Kimberley Division. Inland records indicate the species is widespread and scattered from Newman, east to Lake Cohen, south to Boulder and west to Meekatharra. In Australasia, the sharp-tailed sandpiper prefers muddy edges of shallow fresh or brackish wetlands, with inundated or emergent sedges, grass, salt marsh or other low vegetation (DotE 2016c). | A portion of a mapped wetland with associated <i>Melaleuca</i> Dampland vegetation association exists in the north-west corner of the site, which may provide limited potential habitat for the sharp-tailed sandpiper.  | The potential habitat within the site for the sharp-tailed sandpiper is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low. |
| <i>Calidris canutus</i><br>(Red knot)                 | The red knot is common in all the main suitable habitats around the coast of Australia with very large numbers being regularly recorded in north-west Australia. In Australasia the red knot mainly inhabit intertidal mudflats, sand flats and sandy beaches of sheltered coasts, in estuaries, bays, inlets, lagoons and harbours, sometimes on sandy ocean beaches or shallow pools on exposed wave-cut rock platforms or coral reefs (DotE 2016d).  | The site does not contain habitat for this species.  | Given that the preferred coastal habitat of the red knot does not occur within the site, it is considered unlikely that this species would be recorded within the site.  |

| Species   | Preferred Habitat  | Extent of Habitat in the Site  | Likelihood of Occurrence   |
|---|--|--|--|
| <i>Calidris ferruginea</i><br>(Curlew sandpiper)  | In Australia, curlew sandpipers occur around the coasts and are also quite widespread inland, though in smaller numbers. Records occur in all states during the non-breeding period, and also during the breeding season when many non-breeding one year old birds remain in Australia rather than migrating north. Curlew sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in salt works and sewage farms (DotE 2016e).  | The site does not contain habitat for this species.  | Given that the preferred coastal habitat of the curlew sandpiper does not occur within the site, it is considered unlikely that this species would be recorded within the site.  |
| <i>Calidris melanotos</i><br>(Pectoral sandpiper) | In Western Australia, the pectoral sandpiper is rarely recorded. It has been observed at the Nullarbor Plain, Reid, Stoke's Inlet, Grassmere Lake, Warden Lake, Dalyup and Yellilup Swamp, Swan River, Benger Swamp, Guraga Lake, Wittecarra, Harding River, coastal Gascoyne, the Pilbara and the Kimberley. The pectoral sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, flood plains and artificial wetlands (DotE 2016f).   | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the pectoral sandpiper. | The potential habitat within the site for the pectoral sandpiper is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low. |
| <i>Calidris ruficollis</i><br>(Red-necked stint)  | In Australasia, the red-necked stint is mostly found in coastal areas, including in sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores. Occasionally they have been recorded on exposed or ocean beaches, and sometimes on stony or rocky shores, reefs or shoals. They also occur in salt works and sewage farms, salt marsh, ephemeral or permanent shallow wetlands near the coast or inland, including lagoons, lakes, swamps, riverbanks, waterholes, bore drains, dams, soaks and pools in salt flats (DotE 2016g). | The site does not contain habitat for this species.  | Given that the preferred coastal habitat of the red-necked stint does not occur within the site, it is considered unlikely that this species would be recorded within the site.  |
| <i>Calidris subminuta</i><br>(Long-toed stint)    | In Western Australia, the species is found mainly along the coast, with a few scattered inland records. On the south-west coast, the species is known from the Vasse River estuary, Guraga Lake and the Namming Nature Reserve. The long-toed stint occurs in a variety of terrestrial wetlands. They prefer shallow freshwater or brackish wetlands including lakes, swamps, river floodplains, streams, lagoons and sewage ponds (DotE 2016h).   | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the long-toed stint.    | The potential habitat within the site for the long-toed stint is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.    |

| Species   | Preferred Habitat  | Extent of Habitat in the Site   | Likelihood of Occurrence  |
|---|--|---|---|
| <i>Charadrius dubius</i> (Little ringed plover) | The little ringed plover is fully migratory in much of its range and is known to regularly visit northern Australia in small numbers (Commonwealth of Australia 2014). During the breeding season, this species shows a preference for bare or sparsely vegetated sandy and pebbly shores of shallow standing freshwater pools, lakes or slow-flowing rivers, including river islands, dry, stony riverbeds, sand, shingle or silt flats, dry wadis and dune slacks. This species may also utilise temporary artificial habitats such as gravel pits, sewage works, industrial wastelands and refuse tips, and may use open arable land on clay soil in exceptional circumstances (Birdlife International 2016). | The site does not contain habitat for this species.   | Given that this species is only known to frequent northern Australia, and the preferred riverine habitat of the little ringed plover does not occur within the site, it is considered unlikely that this species would be recorded within the site.   |
| <i>Limosa lapponica</i> (Bar-tailed godwit)     | Bar-tailed godwits have been recorded in the coastal areas of all Australian states. It is widespread in the Torres Strait and along the east and south-east coasts of Queensland, NSW and Victoria, including the offshore islands. Bar-tailed godwits are found mainly in coastal habitats such as large intertidal sand flats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays. (DotE 2016i).  | The site does not contain habitat for this species.   | Given that the preferred coastal habitat of the bar-tailed godwit does not occur within the site, it is considered unlikely that this species would be recorded within the site.  |
| <i>Merops ornatus</i> (Rainbow bee-eater)       | The population size of this species within Australia is not known, but it is assumed to be quite large. It is known to occur across the majority of the mainland. It migrates between Australia, Eastern Indonesia and Japan, and has formed a colony on Rottnest Island. The rainbow bee-eater tends to occupy open forests and woodlands, including cleared or semi-cleared areas and farmland, and prefers timbered landscapes. Their nests consist of an enlarged chamber at the end of a long burrow that is excavated by both the female and male bird from flat or sloping ground, cliff faces or mounds of gravel (DotE 2016j).  | Given the habitat within the site is semi cleared and contains woodland vegetation it is possible that rainbow bee-eaters may be recorded within the landholdings during the summer months. | There is potential habitat within the site for the rainbow bee-eater, however given the substantial extent of potential woodland habitat available for this species in close proximity to the site in Bush Forever Sites, the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.                       |
| <i>Motacilla cinerea</i> (Grey wagtail)         | A widespread species, the grey wagtail is found across much of northern Africa, Europe and Asia, ranging from western Europe to the Far East. Some populations are migratory and travel southwards after the breeding season, such as those populations breeding in central and northern Asia, which winter in north and north-eastern Africa. The grey wagtail is found around fast-flowing mountain streams, often in forested areas, as well as lowland watercourses such as canals and rivers. Outside of the breeding season it is found in a greater variety of habitats, including farmlands, forested tracks, plantations and even town centres (Wildscreen Arkive 2016).                                | There is potential habitat within the site for the grey wagtail.  | Given the relatively small amount of habitat that would be directly impacted by urban development, when compared to the large extent of well represented habitat in similar or better condition remaining locally and within south-west region, the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low. |
| <i>Pandion haliaetus</i> (Osprey)               | The breeding range of the osprey extends around the northern coast of Australia (including many offshore islands) from Albany in Western Australia to Lake Macquarie in NSW, with a second isolated breeding population on the coast of South Australia, extending from Head of Bight east to Cape Spencer and Kangaroo Island. Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water (DotE 2016k).                               | The site does not contain habitat for this species.   | Given that the preferred coastal and open water habitats of the osprey do not occur within the site it is considered unlikely that this species would be recorded within the site.  |

| Species                                     | Preferred Habitat   | Extent of Habitat in the Site   | Likelihood of Occurrence  |
|---|---|---|---|
| <i>Philomachus pugnax</i> (Ruff)            | In Western Australia, this species has been recorded at the lower King River and it is mostly found in the south-west region of the state. It has been sighted at the Vasse River estuary, north to Namming Lake and Lake McLarty. It has been periodically recorded at Port Hedland, Kununurra and the Argyle Diamond Mine. There are unconfirmed reports at Curlewis Camp, Millstream Chichester, Broome and Roebuck Bay. The ruff is found on generally fresh, brackish or saline wetlands with exposed mudflats at the edges. It is found in terrestrial wetlands including lakes, swamps, pools, lagoons, tidal rivers, swampy fields and floodlands (DotE 2016l).   | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the ruff.                | The potential habitat within the site for the ruff is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.              |
| <i>Tringa glareola</i> (Wood sandpiper)     | The wood sandpiper uses well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes. They are typically associated with emergent, aquatic plants or grass, and dominated by taller fringing vegetation, such as dense stands of rushes or reeds, shrubs, or dead or live trees, especially <i>Melaleuca</i> and river red gums <i>Eucalyptus camaldulensis</i> and often with fallen timber (DotE 2016m).   | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the wood sandpiper.      | The potential habitat within the site for the wood sandpiper is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.    |
| <i>Tringa nebularia</i> (Common greenshank) | The common greenshank does not breed in Australia; however, the species occurs in all types of wetlands and has the widest distribution of any shorebird in Australia. The common greenshank is found in a wide variety of inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass. Habitats include embayments, harbours, river estuaries, deltas and lagoons and are recorded less often in round tidal pools, rock-flats and rock platforms. The species uses both permanent and ephemeral terrestrial wetlands, including swamps, lakes, dams, rivers, creeks, billabongs, waterholes and inundated floodplains, claypans and saltflats (DotE 2015n). | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site, which may provide limited potential habitat for the common greenshank. | The potential habitat within the site for the common greenshank is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low. |
| <i>Tringa stagnatilis</i> (Marsh sandpiper) | The marsh sandpiper is found on coastal and inland wetlands throughout Australia. The marsh sandpiper lives in permanent or ephemeral wetlands of varying salinity, including swamps, lagoons, billabongs, salt pans, salt marshes, estuaries, pools on inundated flood plains, and intertidal mudflats and also regularly at sewage farms and salt works (DotE 2016n).   | A portion of a mapped wetland with associated Melaleuca Dampland vegetation association exists in the north-west corner of the site that may provide limited potential habitat for the marsh sandpiper.     | The potential habitat within the site for the marsh sandpiper is retained by the endorsed LSP. Additionally, given the substantial extent of potential wetland habitat available for this species in relatively close proximity to the site (Ramsar listed Forrestdale and Thompsons lakes) the risk of significant impact occurring to this species as a result of developing the landholdings for residential purposes is considered to be low.   |

**3.1 (f) Commonwealth marine area**

(If the action is in the Commonwealth marine area, complete 3.2(c) instead. This section is for actions taken outside the Commonwealth marine area that may have impacts on that area.)

**Description**

The site is terrestrial and will not impact the Commonwealth marine area.

**Nature and extent of likely impact**

N/A

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**3.1 (g) Commonwealth land**

(If the action is on Commonwealth land, complete 3.2(d) instead. This section is for actions taken outside Commonwealth land that may have impacts on that land.)

**Description**

There are no Commonwealth lands within, or adjacent to, the site.

**Nature and extent of likely impact**

N/A

---

**3.1 (h) The Great Barrier Reef Marine Park****Description**

The action will be undertaken in Perth, Western Australia, approximately 4,000 km from the Great Barrier Reef Marine Park.

**Nature and extent of likely impact**

N/A

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**3.1 (i) A water resource, in relation to coal seam gas development and large coal mining development****Description**

If the action is not a coal seam gas development or large coal mining development.

**Nature and extent of likely impact**

N/A

---

**3.2 Nuclear actions, actions taken by the Commonwealth (or Commonwealth agency), actions taken in a Commonwealth marine area, actions taken on Commonwealth land, or actions taken in the Great Barrier Reef Marine Park**

|         |  |   |                             |
|---------|--|---|-----------------------------|
| 3.2 (a) | Is the proposed action a nuclear action? | X | No                          |
|         |  |   | Yes (provide details below) |

---

**If yes, nature & extent of likely impact on the whole environment**

|         |  |   |                             |
|---------|--|---|-----------------------------|
| 3.2 (b) | Is the proposed action to be taken by the Commonwealth or a Commonwealth agency? | X | No                          |
|         |  |   | Yes (provide details below) |

If yes, nature & extent of likely impact on the whole environment

|         |   |   |                             |
|---------|---|---|-----------------------------|
| 3.2 (c) | Is the proposed action to be taken in a Commonwealth marine area? | X | No                          |
|         |   |   | Yes (provide details below) |

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(f))

|         |  |   |                             |
|---------|--|---|-----------------------------|
| 3.2 (d) | Is the proposed action to be taken on Commonwealth land? | X | No                          |
|         |  |   | Yes (provide details below) |

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(g))

|         |   |   |                             |
|---------|---|---|-----------------------------|
| 3.2 (e) | Is the proposed action to be taken in the Great Barrier Reef Marine Park? | X | No                          |
|         |   |   | Yes (provide details below) |

If yes, nature & extent of likely impact on the whole environment (in addition to 3.1(h))

### 3.3 Other important features of the environment

#### 3.3 (a) Flora and fauna

Please see sections 3.1 (d) and (e).

#### 3.3 (b) Hydrology, including water flows

##### Public Drinking Water Source Areas

The site is located in a Priority 2 (P2) Public Drinking Water Source Area (PDWSA) under the Jandakot Underground Water Protection Control Area. Statement of Planning Policy 2.3 – *Jandakot Groundwater Protection Policy* defines P2 as:

*Priority 2:* Normally includes private rural with few buildings, with low risk, low intensity land use. These areas have a high priority for public water supply use. The management objective is to ensure there is no increased risk of pollution to the water source. Restricted development may take place under specific guidelines.

The objective of PDWSAs, as outlined in the State Planning Policy 2.7 – *Public Drinking Water Source Policy*, is to ensure that land use and development within PDWSAs is compatible with the protection and management of the public water supply. P2 classification areas are managed to ensure that there is no increased risk of water source contamination/pollution with the principle of risk minimisation guiding management decisions.

The appropriateness of urban land use at the site was resolved by the MRS amendment process (rezoning) through demonstration, by way of sound detailed technical studies, that the groundwater quantity and quality could be adequately protected to the satisfaction of the regulatory authorities.

##### Groundwater Depth and Quality

The Addendum to the EAR notes that the majority of the site has been excavated to be approximately 30 metres Australian Height Datum (AHD), and there is, in the order of, three metres clearance to maximum ground water levels (approximately 27.1 m AHD). Groundwater quality beneath the site is reported as generally very high (Appendix 2).



### **Wetlands**

The Addendum to the EAR shows the DPAW's *Geomorphic Wetlands, Swan Coastal Plain* database mapping of Resource Enhancement (RE) wetlands (UFI6881 and UFI6781) within the site in the context of the endorsed LSP (Appendix 2).

The extent of vegetation within the portion of the RE wetland (UFI6881) that intersects the site is primarily described as consisting of a "*Melaleuca preissiana* Low Open Woodland over scattered *Banksia ilicifolia* over *Adenanthos cygnorum* and *Kunzea glabrescens* Tall Shrubland over *Hypocalymma angustifolium* Shrubland" in "Good to Very Good" to "Very Good" condition. The 0.03 ha portion of RE wetland (UFI6781) within the site is primarily unvegetated.

RE wetlands (UFI6881 and UFI6781) are bisected by the existing Solomon and Jandakot Roads, which reduces the hydrological connectivity of the portions of these wetlands mapped within the site to the larger extents of these wetlands outside of the site.

### **3.3 (c) Soil and Vegetation characteristics**

#### **Geology**

The site as consists of "Bassendean Sand", which can be described as white and grey quartz sand plain with low dunes and occasional swamps, iron or humus podzols and areas of complex steep dunes with the sands are being moderately sorted and fine to medium grained.

#### **Vegetation**

A Level 1 Flora and Vegetation Survey of the site was undertaken by RPS (Appendix 2). Four vegetation units were identified:

- (a) Banksia Woodland: Scattered *Eucalyptus marginata*, *E. tottiana*, and/or *Allocasuarina fraseriana* over *Banksia attenuata*, *B. menziesii* and *B. ilicifolia* Low Open Woodland to Low Open Forest over a mixed Open Low Heath including *Hibbertia hypericoides*, *Stirlingia latifolia*, *Eremaea pauciflora*, *Regelia inops* and *Scholtzia involucreta*.
- (b) Melaleuca Dampland: *Melaleuca preissiana* Low Open Woodland over scattered *Banksia ilicifolia* over *Adenanthos cygnorum* and *Kunzea glabrescens* Tall Open Shrubland over *Hypocalymma angustifolium* Shrubland.
- (c) Eucalyptus rudis/Melaleuca Dampland: *Eucalyptus rudis* and *Melaleuca preissiana* Open Forest to Open Woodland over *Astartea affinis* Shrubland to Open Heath over exotic Closed Grassland
- (d) Rehabilitation Works and Natural Regeneration: Mixed planted non-local species with a naturally regenerating mid and understorey of local species.

### **3.3 (d) Outstanding natural features**

Approximately 122.97 ha (or 85.9% of the site) was subject to sand mining activities which means that there are no outstanding natural features.

### **3.3 (e) Remnant native vegetation**

Approximately, 21.03 ha (or 14.1% of the site) was comprised of remnant vegetation native vegetation which was primarily situated along the site's perimeter as a buffer to sand mining. The endorsed LSP has been designed to retain the remaining remnant vegetation which has resulted in approximately 14.24 ha (or 67%) of native vegetation being retained.

### **3.3 (f) Gradient (or depth range if action is to be taken in a marine area)**

The site has been historically used as a sand quarry, therefore the natural landform and topography has been significantly altered. Natural ground levels remain around the perimeter of the site adjacent to Solomon, Jandakot, Fraser and Armadale roads with the remaining bulk of the site being excavated to 30 metres Australian Height Datum forming a broad sand plain.

### **3.3 (g) Current state of the environment**

Approximately 122.97 ha (or 85.9% of the site) was previously subject to sand mining activities which has resulted in extensive areas of bare sand within the site.

Nineteen introduced flora taxa (weeds) were recorded for the site, which is 17% of the total flora taxa recorded. The majority of the weed species were from the Poaceae (grass) family (Appendix 2).

The presence of the European red fox (*Vulpes vulpes*) and rabbits have been detected within the site by RPS (Appendix 1).

### **3.3 (h) Commonwealth Heritage Places or other places recognised as having heritage values**

N/A

### **3.3 (i) Indigenous heritage values**

A portion of the mapped spatial extent of Other Heritage Place: ReadyMix Sandpit 1 (ID: 4108), an artefact scatter, was identified within the site. As part of the LSP process, a field assessment of this site was undertaken which established that there were no Aboriginal artefacts in the site.



**3.3 (j) Other important or unique values of the environment**

The site is within one kilometre of the Gibbs Road Swamp System, which is a Nationally Important Wetland. The portion of the Gibbs Road Swamp System, which is spatially mapped to the south of site, has been predominantly developed for the residential purposes. It is not expected that the development of the site will impact this wetland.

**3.3 (k) Tenure of the action area (e.g. freehold, leasehold)**

The site is owned by SPG.

**3.3 (l) Existing land/marine uses of area**

The site has formerly been used for sand mining since the 1970's.

**3.3 (m) Any proposed land/marine uses of area**

The site is to be developed for residential land uses in accordance with the endorsed LSP.

## 4 Environmental outcomes

### **Flora**

Development of the site in accordance with the endorsed LSP will result in the retention of 3 sub-populations of *C. huegelii* (19 individuals) within the remnant vegetation extents reserved as Public Open Space, whilst two sub-populations (3 individuals) will be translocated to Lot 820 which is under DPaW management and within the mapped extent of Bush Forever Site 390 – *Fraser Road Bushland*.

### **Fauna**

Development of the site in accordance with the endorsed LSP will result in the retention of approximately 10.421 ha of potential Carnaby's Black-Cockatoo foraging habitat in 'Good' to 'Excellent' condition, and one potential breeding tree within the remnant vegetation reserved as Public Open Space, whilst 1.542 ha of potential Carnaby's Black-Cockatoo foraging habitat will be cleared.

## 5 Measures to avoid or reduce impacts

As part of the LSP design, clearing of remnant vegetation identified as potential Carnaby's Black-Cockatoo foraging and breeding habitat has been avoided, to the greatest possible degree. The impacts to potential Carnaby's Black-Cockatoo foraging habitat will be mitigated through the:

- revegetation of an additional 0.96 ha of Public Open Space along Solomon Road using similar species to those identified within the remnant vegetation (e.g. *Eucalyptus marginata*, *E. tottiana*, *Allocasuarina fraseriana*, *Banksia attenuata*, *B. menziesii*, *B. ilicifolia*, *Hibbertia hypericoides*, *Stirlingia latifolia*, *Eremaea pauciflora*, *Regelia inops* and *Scholtzia involucrata*) which includes species known to be foraging and breeding habitat for Carnaby's Black-Cockatoo (Appendix 2).
- planting species used by Carnaby's Black-Cockatoo as foraging and breeding habitat within the Calleya site for street tree planting within street verges and landscape treatments within Public Open Space reservations (Figure 2).

The LSP has also been designed to avoid vegetation containing the identified sub-populations of *C. huegelii* within the site. The residual impacts as a result of clearing the vegetation containing the three individuals will be mitigated through the:

- translocation of the three individuals to a neighbouring land holding (Lot 820) which is under the management of the DPaW for conservation purposes and within the mapped extent of Bush Forever Site 390 – *Fraser Road Bushland*
- rehabilitation of the 1.5 ha of unconstructed Fraser Road reserve
- installation conservation fencing along the boundary on Lot 820 to replace the existing fence to increase the protection of a *C. huegelii* population.

## 6 Conclusion on the likelihood of significant impacts

### 6.1 Do you THINK your proposed action is a controlled action?

|                                     |                           |
|-------------------------------------|---------------------------|
| <input checked="" type="checkbox"/> | No, complete section 5.2  |
| <input type="checkbox"/>            | Yes, complete section 5.3 |

### 6.2 Proposed action IS NOT a controlled action.

The development of the site in accordance with the endorsed LSP is not considered a controlled action due to the fact that no significant, unmanaged impacts are expected to occur to Matters of National Environmental Significance (MNES). Those MNES that may potentially be affected by the development of the site will be protected through the avoidance and mitigation of impacts as listed below.

#### Flora

Only one flora species listed under the EPBC Act, *Caladenia huegelii*, has been identified within the site. Three sub-populations, containing 19 individuals, are retained within remnant vegetation extents within Public Open Space reservations. Two sub-populations, containing three individuals, will be translocated to Lot 820, which is under the management of the DPaW for conservation purposes and within the mapped extent of Bush Forever Site 390 – Fraser Road Bushland.

Additionally, SPG will rehabilitate 1.5 ha of the unconstructed Fraser Road reserve and install conservation fencing along the boundary on Lot 820 to replace the existing fence to increase the protection of a *C. huegelii* population.

#### Fauna

Extents of the Banksia Woodland vegetation type, which is dominated by banksia (foraging) species, are considered to be potential foraging habitat for Carnaby's Black-Cockatoo. Approximately, 1.542 ha of the mapped 11.963 ha extent of foraging habitat (or 13%) will be removed by the implementation of the endorsed LSP.

Given that 10.421 ha of potential Carnaby's Black-Cockatoo foraging habitat in 'Good' to 'Excellent' condition remains within the Public Open Space reservations of the endorsed LSP, the significant extents of potential foraging habitat available within 4 km of the site in Bush Forever sites and the implementation of landscape management measures onsite it is not expected that the project will have a significant impact on Carnaby's Black-Cockatoo.

In terms of the identified flora and fauna values, it is therefore considered that development of the site in accordance with the endorsed LSP will not:

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

### 6.3 Proposed action IS a controlled action

#### **Matters likely to be impacted**

|                          |  |
|--------------------------|--|
| <input type="checkbox"/> | World Heritage values (sections 12 and 15A)                              |
| <input type="checkbox"/> | National Heritage places (sections 15B and 15C)                          |
| <input type="checkbox"/> | Wetlands of international importance (sections 16 and 17B)               |
| <input type="checkbox"/> | Listed threatened species and communities (sections 18 and 18A)          |
| <input type="checkbox"/> | Listed migratory species (sections 20 and 20A)                           |
| <input type="checkbox"/> | Protection of the environment from nuclear actions (sections 21 and 22A) |

|  |   |
|--|---|
|  | Commonwealth marine environment (sections 23 and 24A)   |
|  | Great Barrier Reef Marine Park (sections 24B and 24C)   |
|  | A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E) |
|  | Protection of the environment from actions involving Commonwealth land (sections 26 and 27A)                        |
|  | Protection of the environment from Commonwealth actions (section 28)  |
|  | Commonwealth Heritage places overseas (sections 27B and 27C)  |

## 7 Environmental record of the responsible party

|  | Yes | No |
|--|-----|----|
| <p><b>7.1 Does the party taking the action have a satisfactory record of responsible environmental management?</b></p> <p><b>Provide details</b></p> <p>Stockland is well recognised for its commitment to excellence in sustainability and the delivery of real and tangible sustainability outcomes that are voluntary and beyond compliance. Stockland is a member of the Dow Jones Sustainability Index, FTSE4Good and has been included on the leadership index of the Carbon Disclosure Project. Our Managing Director, Mark Steinert, is a Board Member of the Green Building Council of Australia.</p> <p>Our four sustainability priority areas within our residential development business have been developed through close engagement with our stakeholders:</p> <ol style="list-style-type: none"> <li>1. <u>Societal cohesion</u>: maintaining a focus on housing affordability, economic contribution and job creation – fundamental components for strong, vibrant, healthy, sustainable and economically viable communities</li> <li>2. <u>Community development</u>: investing in soft and hard infrastructure, amenity and services to create sustainable and well-supported communities</li> <li>3. <u>Climate change and energy</u>: maintaining energy management approaches appropriate to a low-carbon future and developing a portfolio of assets resilient to current and future climate change impacts</li> <li>4. <u>Natural resources (water and biodiversity)</u>: recognising the importance of effective water management approaches and reducing our impact on biodiversity through environmentally sound developments.</li> </ol> <p><u>Biodiversity</u></p> <p>In terms of leading practice in biodiversity protection, enhancement and management, Stockland has demonstrated commitment to meeting conservation obligations and exceeding mandatory requirements.</p> <p>This has been illustrated in the following projects:</p> <ul style="list-style-type: none"> <li>• <b>Brightwater (Queensland):</b> <ul style="list-style-type: none"> <li>➢ Establishment of 46 hectare conservation zone, which involved the largest relocation of sensitive coastal wallum heath land in the southern hemisphere</li> <li>➢ The \$5 million relocation project involved moving 12.2 hectares of heath land vegetation intact to a reserve at the nearby University of the Sunshine Coast campus</li> <li>➢ Involved transporting slabs to the reserve intact and reconstructing the heath land</li> <li>➢ Plant canopy, stems, roots and soil were relatively undisturbed</li> <li>➢ Relocation has been 100 per cent successful.</li> </ul> </li> <li>• <b>North Shore (Queensland):</b> <ul style="list-style-type: none"> <li>➢ Responsible management of a threatened species (black throated finch and stripe-tailed delma)</li> <li>➢ Achieved through establishment of a 330 ha conservation area, improved fire management processes, collection of seeds for re-vegetation and conservation and enhancement of project area river ecosystems to protect receiving waters, specifically Halifax Bay and the Great Barrier Reef</li> <li>➢ A Trust was also established to provide funds to research and improve the habitat of the black throated finch.</li> </ul> </li> <li>• <b>Amberton (Western Australia):</b> <ul style="list-style-type: none"> <li>➢ Establishment of 18 hectare coastal dune conservation area</li> <li>➢ Around 13 hectares of habitat established to protect the Graceful Sun Moth and Carnaby's Black-Cockatoo.</li> </ul> </li> <li>• <b>Brooks Reach (New South Wales):</b> <ul style="list-style-type: none"> <li>➢ Protection of eight hectares of Illawarra Lowlands Grassy Woodland.</li> </ul> </li> <li>• <b>Vale (Western Australia):</b> <ul style="list-style-type: none"> <li>➢ Protection of locally important species, including through fauna underpasses and predator management programs.</li> </ul> </li> <li>• <b>Stone Ridge (Queensland):</b> <ul style="list-style-type: none"> <li>➢ Partnership with Wildlife Warriors, established through Australia Zoo</li> <li>➢ Checking trees approved for removal to ensure wildlife are tagged and released prior to clearing.</li> </ul> </li> </ul> | X   |    |

|  |   |   |
|--|---|---|
| <ul style="list-style-type: none"> <li>• <b>Greening Australia:</b> <ul style="list-style-type: none"> <li>➤ Stockland is working with Greening Australia on six rehabilitation projects across the country</li> <li>➤ Involves working with local communities to engage and raise awareness of local biodiversity issues.</li> </ul> </li> </ul>  |   |   |
| <p><b>7.2 Has either (a) the party proposing to take the action, or (b) if a permit has been applied for in relation to the action, the person making the application - ever been subject to any proceedings under a Commonwealth, State or Territory law for the protection of the environment or the conservation and sustainable use of natural resources?</b></p> <p><b>If yes, provide details</b></p>  |   | X |
| <p><b>7.3 If the party taking the action is a corporation, will the action be taken in accordance with the corporation's environmental policy and planning framework?</b></p> <p><b>If yes, provide details of environmental policy and planning framework</b><br/>SPG implements its land development projects in accordance with its overarching Sustainability Strategy and is committed to protecting and enhancing the natural and built environment through its Environmental Policy.</p>  | X |   |
| <p><b>7.4 Has the party taking the action previously referred an action under the EPBC Act, or been responsible for undertaking an action referred under the EPBC Act?</b></p> <p><b>Provide name of proposal and EPBC reference number (if known)</b></p> <ul style="list-style-type: none"> <li>• 2015/7501 – Bokarina Beach residential development (Qld)</li> <li>• 2013/7068 – Amberton West urban development (WA)</li> <li>• 2013/7067 – Caloundra Road to Caloundra South, Kawana Arterial Extension (Qld)</li> <li>• 2013/6992 – Residential development at Bong Bong Road, West Dapto (NSW)</li> <li>• 2013/6982 – Residential and commercial development, Alexander Dr &amp; Lot 152 Gngara Rd, Landsdale (WA)</li> <li>• 2013/6907 – Stone Ridge residential estate development (Qld)</li> <li>• 2013/6864 – Paradise Waters Residential Estate, Grampian Drive, Deebling Heights (Qld)</li> <li>• 2013/6718 – Bahrs Scrub residential community development (Qld)</li> <li>• 2013/6717 – Pallara Residential Community Development (Qld)</li> <li>• 2012/6597 – Parkhurst Master Planned Community (Qld)</li> <li>• 2011/6040 and 2008/4676– East Lansdale residential subdivision development (WA)</li> <li>• 2011/5987 – Caloundra South Master Planned Community (Qld)</li> <li>• 2010/5772 – East Wanneroo Cell 9 residential subdivision (WA)</li> <li>• 2010/5428 – Bellvista II Mixed Use Residential Development (Qld)</li> <li>• 2008/4161 – Residential Development Craigieburn (Vic)</li> <li>• 2008/4125 – Malcolm Creek Bridge and Highlands Residential Development (Vic)</li> <li>• 2007/3712 – Edmund Barton Building Upgrade and Refurbishment Works (ACT)</li> <li>• 2007/3412 – Wallarah Peninsula, Northern Precinct residential development (NSW)</li> <li>• 2006/2927 – Residential Subdivision and Town Centre Development, Vincentia (NSW)</li> <li>• 2006/2810 – Wallarah Peninsula residential development - Coastal Sector (NSW)</li> <li>• 2004/1610 – Thuringowa Residential development adjacent to Bohle River and Bruce Highway (Qld)</li> <li>• 2004/1606 – Freshwater Development, Brays Road (Qld)</li> <li>• 2004/1333 – Upper Coomera Residential subdivision (Qld)</li> <li>• 2003/1144 – Point Lonsdale residential and golf course development (Vic)</li> <li>• 2003/1044 – Kennedy Park Estate Residential Development (WA)</li> <li>• 2002/803 – Former CSIRO Clunies Ross Research Station (NSW)</li> <li>• 2001/458 – Sandon Point Residential Development (NSW)</li> <li>• 2001/360 – Wastewater Lead-Out Line Kellyville (NSW)</li> </ul> | X |   |

## 8 Information sources and attachments

(For the information provided above)

### 8.1 References

- Birdlife International. 2016. Little Ringed Plover *Charadrius dubius* Accessed on 18 February 2016 <http://www.birdlife.org/datazone/speciesfactsheet.php?id=3119>
- Commonwealth of Australia. 2014. Draft Wildlife Conservation Plan for Migratory Shorebirds. Canberra: Australian Capital Territory.
- Department of the Environment. 2016a. *Ardea modesta* — Eastern Great Egret in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=59541](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59541)
- Department of the Environment. 2016b. *Ardea ibis* — Cattle Egret in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=59542](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=59542)
- Department of the Environment. 2016c. *Calidris acuminata* — Sharp-tailed Sandpiper in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=874](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=874)
- Department of the Environment. 2016d. *Calidris canutus* — Red Knot in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=855](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=855)
- Department of the Environment. 2016e. *Calidris ferruginea* — Curlew Sandpiper in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=856](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=856)
- Department of the Environment. 2016f. *Calidris melanotos* — Pectoral Sandpiper in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=858](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=858)
- Department of the Environment. 2016g. *Calidris ruficollis* — Red-necked Stint in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=860](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=860)
- Department of the Environment. 2016h. *Calidris subminuta* — Long-toed Stint in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=861](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=861)
- Department of the Environment. 2016i. *Limosa limosa* — Black-tailed Godwit in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=845](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=845)
- Department of the Environment. 2016j. *Merops ornatus* — Rainbow Bee-eater in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=670](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=670)
- Department of the Environment. 2016k. *Pandion cristatus* — Eastern Osprey in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=952](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=952)
- Department of the Environment. 2016l. *Philomachus pugnax* — Ruff (Reeve) in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=850](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=850)
- Department of the Environment. 2016m. *Tringa glareola* — Wood Sandpiper in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=829](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=829)

Department of the Environment. 2016n. *Tringa nebularia* — Common Greenshank, Greenshank in Species Profile and Threats Database, Department of the Environment, Canberra. Accessed on 18 February 2016 [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=832](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=832)

Government of Western Australia. 2000. Bush Forever, Volume 2: Directory of Bush Forever Sites. Perth: Western Australia.

Wildscreen Arkive. 2016. Grey wagtail (*Motacilla cinerea*) Accessed 04 January 2016 <http://www.arkive.org/grey-wagtail/motacilla-cinerea/>

## 8.2 Reliability and date of information

Information in this submission is based upon field surveys conducted to inform state-based environmental assessment of the site under the *Environment Protection Act 1986* by the EPA as part of the MRS rezoning and by the CoC and WAPC as part of the assessment of the LSP. Additional, information has been provided by technical specialists and government database searches.

1. Environmental Assessment Report (Appendix 1) was prepared by RPS submitted to the EPA in support of MRS Amendment 1221/41 Banjup Urban Precinct
2. Addendum to Environmental Assessment Report (Appendix 2) was prepared by RPS submitted to the CoC in support of the revision of the LSP
3. Search in Appendix 3 was obtained from DPAW / WAM *Naturebase* database
4. Lot 132 Armadale Road, Jandakot - Black Cockatoo Habitat Survey (Appendix 4) was prepared by specialist fauna consultancy Bamford Consulting Ecologists for RPS to assist in the quantification of potential Black Cockatoo Habitat within the site.
5. Figures 1, 4- 6 were prepared by RPS for the purpose of this referral
6. Figure 2 was prepared by project planners Creative Planning + Design and endorsed by the WAPC and the CoC.
7. Figure 3 was prepared by project landscape architects Emerge Associates in accordance with discussions held with DPAW and CoC.



### 8.3 Attachments

|                            |  | ✓<br>attached | Title of attachment(s)  |
|----------------------------|--|---------------|---|
| <b>You must attach</b>     | figures, maps or aerial photographs showing the project locality (section 1)   | ✓             | Figure 1  |
|                            | GIS file delineating the boundary of the referral area (section 1)   |               |   |
|                            | figures, maps or aerial photographs showing the location of the project in respect to any matters of national environmental significance or important features of the environments (section 3) | ✓             | Figures 4 - 6   |
| <b>If relevant, attach</b> | copies of any state or local government approvals and consent conditions (section 2.5)   |               |   |
|                            | copies of any completed assessments to meet state or local government approvals and outcomes of public consultations, if available (section 2.6)   | ✓             | Environmental Assessment Report (Appendix 1) and Addendum to Environmental Assessment Report (Appendix 2).  |
|                            | copies of any flora and fauna investigations and surveys (section 3)   | ✓             | Targeted Habitat Survey forms an appendix within the Environmental Assessment Report (Appendix 1), Level 1 Flora and Vegetation Survey, inclusive of the findings of the targeted search for <i>Caladenia huegelii</i> , forms an appendix within Addendum to Environmental Assessment Report (Appendix 2) and Lot 132 Armadale Road, Jandakot - Black Cockatoo Habitat Survey is provided as Appendix 4. |
|                            | technical reports relevant to the assessment of impacts on protected matters that support the arguments and conclusions in the referral (section 3 and 4)                                      | ✓             | Environmental Assessment Report (Appendix 1), Addendum to Environmental Assessment Report (Appendix 2), Naturebase database search (Appendix 3), and Lot 132 Armadale Road, Jandakot - Black Cockatoo Habitat Survey (Appendix 4).  |
|                            | report(s) on any public consultations undertaken, including with Indigenous stakeholders (section 3)   |               |   |

## 9 Contacts, signatures and declarations

**Project title:** Calleya Residential Development, Banjup

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### 9.1 Person proposing to take action

1. Name and Title: Damian Shephard, Regional Manager

2. Organisation (if applicable): Stockland WA Development Pty Ltd

3. EPBC Referral Number (if known):

4: ACN / ABN (if applicable): ABN 16 000 097 825  
ACN 000 097 825

5. Postal address: Level 12, Durack Centre, 263 Adelaide Terrace, Perth, 6000, Australia

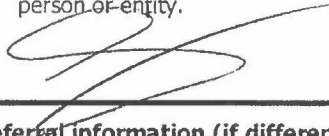
6. Telephone: (08) 6141 8000

7. Email: damian.shephard@stockland.com.au

Declaration

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.  
I understand that giving false or misleading information is a serious offence.  
I agree to be the proponent for this action.  
I declare that I am not taking the action on behalf of or for the benefit of any other person or entity.

Signature



Date 20.05.16

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### 9.2 Person preparing the referral information (if different from 8.1)

Name: Giles Glasson

Title: Managing Scientist

Organisation: RPS

ACN / ABN (if applicable): ABN: 45 108 680 977

Postal address: PO Box 465, Subiaco WA 6904

Telephone: (08) 9288 0834

Email: giles.glasson@rpsgroup.com.au

Declaration

I declare that to the best of my knowledge the information I have given on, or attached to this form is complete, current and correct.  
I understand that giving false or misleading information is a serious offence.

Signature



Date 20.05.16

# REFERRAL CHECKLIST

## HAVE YOU:

- ☒ Completed all required sections of the referral form?
- ☒ Included accurate coordinates (to allow the location of the proposed action to be mapped)?
- ☒ Provided a map showing the location and approximate boundaries of the project area?
- ☒ Provided a map/plan showing the location of the action in relation to any matters of NES?
- ☒ Provided a digital file (preferably ArcGIS shapefile, refer to guidelines at [Attachment A](#)) delineating the boundaries of the referral area?
- ☒ Provided complete contact details and signed the form?
- ☒ Provided copies of any documents referenced in the referral form?
- ☒ Ensured that all attachments are less than three megabytes (3mb)?
- ☒ Sent the referral to the Department (electronic and hard copy preferred)?

## **Geographic Information System (GIS) data supply guidelines**

If the area is less than 5 hectares, provide the location as a point layer. If the area greater than 5 hectares, please provide as a polygon layer. If the proposed action is linear (e.g. a road or pipeline) please provide a polyline layer.

GIS data needs to be provided to the Department in the following manner:

- Point, Line or Polygon data types: ESRI file geodatabase feature class (preferred) or as an ESRI shapefile (.shp) zipped and attached with appropriate title
- Raster data types: Raw satellite imagery should be supplied in the vendor specific format.
- Projection as GDA94 coordinate system.

Processed products should be provided as follows:

- For data, uncompressed or lossless compressed formats is required - GeoTIFF or Imagine IMG is the first preference, then JPEG2000 lossless and other simple binary+header formats (ERS, ENVI or BIL).
- For natural/false/pseudo colour RGB imagery:
- If the imagery is already mosaiced and is ready for display then lossy compression is suitable (JPEG2000 lossy/ECW/MrSID). Prefer 10% compression, up to 20% is acceptable.
- If the imagery requires any sort of processing prior to display (i.e. mosaicing/colour balancing/etc.), then an uncompressed or lossless compressed format is required.

Metadata or 'information about data' will be produced for all spatial data and will be compliant with ANZLIC Metadata Profile. ([http://www.anzlic.org.au/policies\\_guidelines#guidelines](http://www.anzlic.org.au/policies_guidelines#guidelines)).

The Department's preferred method is using ANZMet Lite, however the Department's Service Provider may use any compliant system to generate metadata.

All data will be provide under a Creative Commons license  
(<http://creativecommons.org/licenses/by/3.0/au/>)