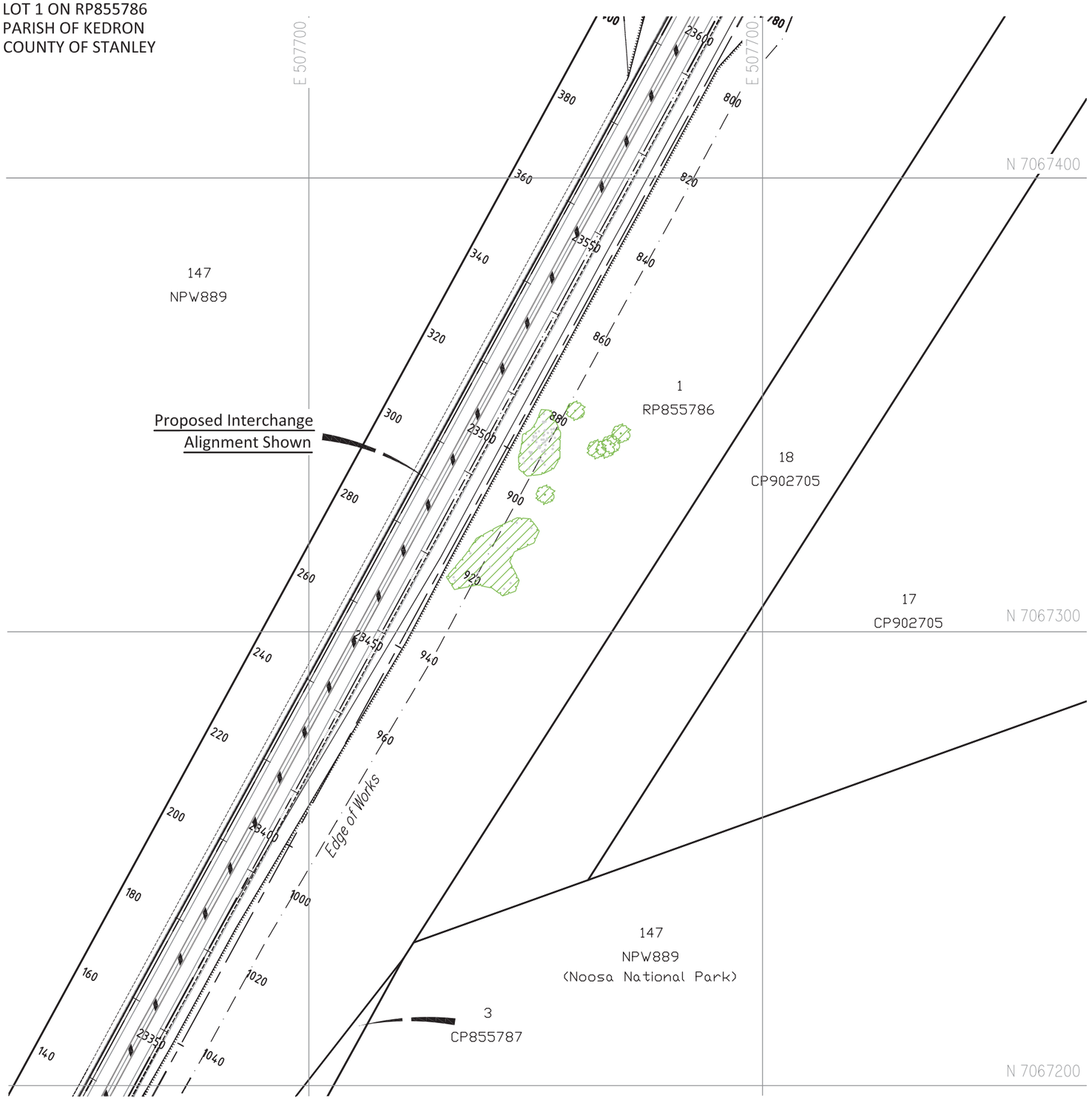
PROPERTY DESCRIPTION
LOT 1 ON RP855786
PARISH OF KEDRON
COUNTY OF STANLEY



LOCALITY PLAN
Scale 1: 5000

NOTES

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12d Project: S:\B2403\Stage Infrastructure\Southern Interchange\12D\Locate_Trees_Eastern_Side_David_Low_Way_With_GPS_150715.project

N

LEGEND
Allocasuarina emuina Population

0 25m
1 : 1 000

SOURCE: JFP Consultants
(Ref: B2403-472A Tree Pickup.pdf)
SCALE: 1 : 1000 @ A3

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FIGURE 7

PREPARED: BW
DATE: 06 August 2015
FILE: Q01058_Emuina.cdr

TITLE
LOCATION OF *ALLOCASUARINA EMUINA* POPULATION

100m buffer

***ALLOCASUARINA EMUINA* LOCATION**

Legend

- Southern Interchange Extent of Works
- Survey Area (100m Buffer)
- Area subject to Clearing Permit (Protected Plants)
- Area subject to Exempt Clearing Notification (Protected Plants)
- *Allocasuarina emuina* Population
- 100m Buffer to *Allocasuarina emuina* Population

N

0 50m 100m

1 : 3500

SOURCE: Calibre Consulting (Ref: X-N07071-BASE.dwg); JFP Consultants (Ref: B2403-472A Tree Pickup.dwg); Google Earth Aug 2014 Aerial

SCALE: 1 : 3500 @ A3

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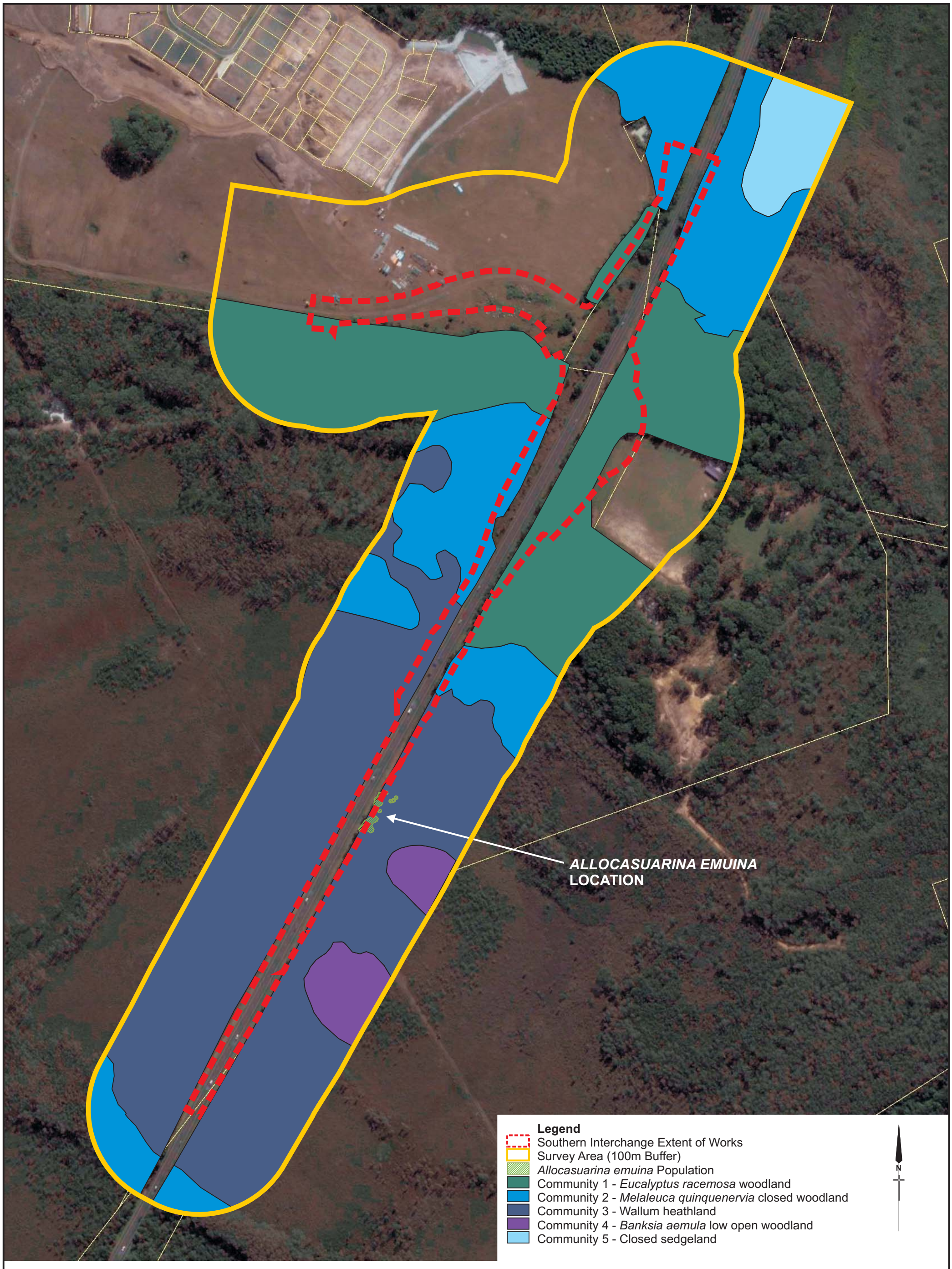
FIGURE 8

PREPARED: BW
DATE: 06 August 2015
FILE: Q01058_Applications.cdr

TITLE
AREAS SUBJECT TO CLEARING PERMIT & EXEMPT CLEARING NOTIFICATION



SOURCE: JWA Site Investigations; Calibre Consulting (X-N07071-BASE.dwg); JFP Consultants (B2403-472A Tree Pickup.dwg); Google Earth Aug 2014 Aerial

SCALE: 1 : 3500 @ A3

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FIGURE 9

PREPARED: BW
DATE: 06 August 2015
FILE: Q01058_Veg v2.cdr

TITLE

VEGETATION COMMUNITIES

Conservation Status
This vegetation is consistent with RE 12.9-10.4 which has a conservation status of Least Concern under the *VMA (1999).*

3.3.3.3 Community 2: *Melaleuca quinquenervia* closed woodland

Location and area
This community is located on both sides of the Sunshine Motorway between the *E. racemosa* woodland and the wallum heathland, adjacent to an unnamed tributary of Stumers Creek in the southern portion of the subject site, and in low-lying areas in the northern section (**FIGURE 9**). Meander 4, 8, 10 and 15 were located within this community, as well as portions of meanders 12, 13 and 14.

Description
This vegetation community is closed woodland with dominant canopy species *Melaleuca quinquenervia* and *Eucalyptus robusta*. Occasional *Eucalyptus racemosa, Lophostemon sauveolens and Corymbia intermedia* was also recorded. Lower trees include *Acacia* spp., *Allocasuarina littoralis, Banksia integrifolia,* and *Glochidion ferdinandi.*

The shrub layer contains *Banksia robur*, *Epacris* spp., *Acacia* spp., *Leptospermum juniperinum, Melaleuca thymifolia, Hakea actites, Xanthorrhoea johnsonii, Hovea acutifolia* and *Melastoma malabathricum.* The ground layer is dominated by *Empodisma minus, Gleichenia mendellii, Pimelea linifolia, Pteridium esculentum, Pultenaea paleacea, Schoenus brevifolius*, and X*anthorrhoea fulva.*

Condition
This community is remnant vegetation in good condition with very few weeds present and no edge effects.

Conservation Status
This vegetation is consistent with RE 12.2.7 which has a conservation status of Least Concern under the *VMA (1999).*

3.3.3.4 Community 3: Wallum heathland

Location and area
This community is located on both sides of the Sunshine Motorway on low-lying and gently undulating ground (**FIGURE 9**). Meanders 5, 8, 12 and 13 were located within this community.

Description
This vegetation community is a closed heathland with emergent canopy species present in some areas comprised of stunted *Melaleuca quinquenervia* and *Eucalyptus robusta.*

The shrub layer contains *Banksia robur, B. oblongifolia*, *Callistemon pachyphyllus, Epacris* spp., *Leptospermum liversidgei, Melaleuca thymifolia, Hakea actites,* and *Philotheca queenslandica.* The ground layer is dominated by *Empodisma minus, Gahnia sieberiana, Gleichenia mendellii, Pimelea linifolia, Sporadanthus interruptus,* and *Xanthorrhoea fulva.*

One area of wallum heath contained *Allocasuarina emuina,* an endangered species under the *NCA* and *EPBC Act.*

Condition
This community is remnant vegetation in good condition with very few weeds present and the edge effects limited to within 5m of the road.

Conservation Status
This vegetation is consistent with RE 12.2.12 which has a conservation status of Least Concern under the *VMA (1999).*

3.3.3.5 Community 4: *Banksia aemula* low open woodland

Location and area
This community is located in several patches surrounded by wallum heathland on the eastern side of the Sunshine Motorway (**FIGURE 9**). Meanders 8 and 12 included this community.

Description
This vegetation community is a low open woodland dominated by *Banksia aemula.*

Condition
This community is remnant vegetation in good condition with very few weeds present and no edge effects.

Conservation Status
This vegetation is consistent with RE 12.2.9 which has a conservation status of Least Concern under the *VMA (1999).*

3.3.3.6 Community 5: Closed sedgeland

Location and area
This community is located on eastern side of the Sunshine Motorway in a low-lying area in the northern portion of the subject site (**FIGURE 9**). Meander 14 included this community.

Description
This vegetation community is a closed sedge community comprised of *Gahnia sieberiana, Empodisma minus, Gleichenia mendellii, Lepironia articulata, Epacris microphylla.* Emergent canopy species are present in some areas comprised of stunted *Melaleuca quinquenervia*.

Condition
This community is remnant vegetation in good condition with very few weeds present and no edge effects.

Conservation Status
This vegetation is consistent with RE 12.2.15 which has a conservation status of Least Concern under the *VMA (1999).*

3.3.4 Declared Weed Species

Five (5) declared weeds (assessed for significance under the Queensland *Land Protection (Pest and Stock Route Management) Act 2002*) were recorded on the site including:

- *Asparagus aethiopicus** (asparagus fern) - Class 3 declared weed;
- *Baccharis halimifolia** (groundsel bush) - Class 2 declared weed;

- *Cinnamomum camphora** (camphor laurel) - Class 3 declared weed;
- *Lantana camara** (lantana) - Class 3 declared weed; and
- *Schinus terebinthifolius** (Broad-leaf pepper tree) - Class 3 declared weed.

4 Impacts and Amelioration

4.1 Introduction

The following sections briefly examine the likely direct and indirect impacts of the proposed development on *Allocasuarina emuina* and its habitat. Further details will be provided in an Impact Management Plan which will accompany the Clearing permit (Protected Plants) to be lodged with DEHP in accordance with Section 15 of the *Nature Conservation (Administration) Regulation 2006* for clearing of *A. emuina* and areas of vegetation within 100m.

4.2 Potential Impacts of the Proposed Development

4.2.1 Protected Plants

The development will result in unavoidable impacts on a population of *Allocasuarina emuina*. Seventy-one (71) *A. emuina* plants presently occur in vegetation directly adjacent to the existing Sunshine Motorway. The population generally occurs in two separate clumps, covering a total area of approximately 282m^2, with several individual outliers also present to the east of the main population. The locations of these plants in relation to the proposed vegetation clearing are shown in **FIGURE 7.** Earthworks associated with widening the road will necessitate the removal of a total of fifty-one (51) of these plants (**FIGURE 7**).

4.2.2 Habitat Loss

The proposed development will result in vegetation and habitat loss associated with the construction of the road and associated infrastructure. Habitat for the *Allocasuarina emuina* on the subject site is considered to be comprised of Vegetation Community 3 – Wallum heathland. The impact of the proposed development on this vegetation community is shown in **FIGURE 10**. The proposal will result in the removal of approximately 0.25ha of this habitat.

Additional impacts on *A. emuina* habitat that may occur as a result of the proposed works are summarised as follows:

- Disturbance to the subject site will create opportunities for weeds to colonise both the site and adjacent vegetation. Weeds are likely to be introduced to the subject site and adjacent vegetation in construction materials or by vehicles.
- The removal of vegetation from the subject site will result in a decrease in organic material and biomass on the site.
- Edge effects will be experienced in areas of conserved vegetation adjacent to development zones. In these circumstances, there may be a change in the composition of flora communities and subsequent impacts on fauna species.
- The removal of vegetation will disturb the soil structure and integrity which can reduce the health and longevity of remaining vegetation and result in increased soil erosion which may cause sedimentation of watercourses.

In addition to these potential impacts on *A. emuina* and its habitat, there will be potential direct and indirect impacts on native flora and fauna species generally.

ALLOCASUARINA EMUINA
LOCATION

Legend
Southern Interchange Extent of Works
Survey Area (100m Buffer)
Allocasuarina emuina Population
Potential Habitat for *Allocasuarina emuina*
(Community 3 - Wallum heathland)

N

0 50m 100m
1 : 3500

SOURCE: JWA Site Investigations; Calibre Consulting (X-N07071-BASE.dwg); JFP Consultants (B2403-472A Tree Pickup.dwg); Google Earth Aug 2014 Aerial

SCALE: 1 : 3500 @ A3

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FIGURE 10

PREPARED: BW
DATE: 06 August 2015
FILE: Q01058_Impact Habitat.cdr

TITLE
IMPACT ON POTENTIAL *ALLOCASUARINA EMUINA* HABITAT

4.3 Amelioration Strategies

4.3.1 Protected Plants

An Impact Management Plan which will accompany the Clearing permit (Protected Plants) to be lodged with DEHP in accordance with Section 15 of the *Nature Conservation (Administration) Regulation 2006* for clearing of *A. emuina* and areas of vegetation within 100m. The Impact Management Plan will include details of measures to avoid and minimise impacts, details of the nature of the impact, management measures during construction, justification of impact management and an assessment of the likely survival of the retained plants.

The Impact Management Plan will also include an Offset Strategy prepared in accordance with the *Queensland Environmental Offsets Policy 2014* to offset the unavoidable loss of fifty-one (51) *A. emuina* plants.

The Offset Strategy will generally ensure that seed from the *Allocasuarina emuina* plants within the development footprint will be collected and propagated before the area is cleared. The propagated seedlings will be planted out in a suitable area determined by an ecologist with suitable experience. Similar compensatory habitat construction and management has been undertaken at Coolum Ridges in the past (JWA 2005) with the approval of the Commonwealth.

4.3.2 Habitat Loss

Clearing habitat for endangered plants will require an offset under the *Queensland Environmental Offsets Policy 2014*. The Offset Strategy prepared as part of the Impact Management Plan will be prepared in accordance with the Policy and will describe how the offset will be undertaken and how the relevant conservation outcomes will be achieved.

4.3.3 General Direct/Indirect Impacts

As discussed above, the proposed works will not only impact *A. emuina* and its habitat. The loss of native vegetation on the subject site may also result in direct and indirect impacts on a range of native flora and fauna species. It is assumed that the proposed works will be completed in accordance with an approved Environmental Management Plan (EMP) and associated management recommendations to protect ecological values adjacent to the site.

The following amelioration measures are recommended to be included in any EMP prepared for the site:

- Any landscape or stabilisation plantings should utilise locally endemic native plant species.
- Weeds should be controlled during construction through vehicle, tool and plant hygiene measures.
- Weeds should be controlled in landscaped areas and known environmental weeds (e.g. Setaria grass) should be avoided in landscape and stabilisation plantings.
- The use of appropriate fencing to allow fauna movement between vegetated areas and exclude fauna from hazardous areas should be incorporated into the detailed design.

- Appropriate disposal of rubbish and food scraps should be enforced as it reduces opportunities for non-native predators and disturbance adapted competitors.
- The effects of light on adjoining vegetation could be managed by the capping of night lights to reduce glare into the sky and the careful positioning of lighting and use of screening vegetation.
- Appropriate flora and fauna management strategies including the use of a spotter-catcher and tree protection fencing should be implemented during site clearing operations to minimise potential adverse impacts on flora and fauna.
- Vegetation removed during construction should be mulched for use on the site (with the exception of hollow-bearing trees). This will prevent the introduction of weeds from seeds in mulch brought in from elsewhere and will retain biomass that would otherwise be removed from the system.

5 Summary and Conclusions

JWA Pty Ltd has been engaged by Aveo Group Limited to complete a Protected Plant Survey for the site of the proposed Coolum Ridges Estate southern interchange to the Sunshine Motorway. The purpose of this document is to outline how the flora survey was conducted in order to meet the requirements of the protected plants legislative framework for clearing protected plants under the Nature Conservation (Wildlife Management) Regulation 2006.

The protected plant survey located one (1) protected plant on the subject site, *Allocasuarina emuina*. Seventy-one (71) specimens of these plants were recorded in vegetation directly adjacent to the existing Sunshine Motorway. The population generally occurs in two separate clumps, covering a total area of approximately 282m^2, with several individual outliers also present to the east of the main population. Earthworks associated with widening the road will necessitate the removal of a total of fifty-one (51) of these plants.

Under the Nature Conservation Act (1992) this species is listed as Endangered. Any clearing of this species, or within 100m of this species, will require approval under the Qld protected plants legislative framework. An application for a Clearing permit (Protected Plants) in accordance with Section 15 of the *Nature Conservation (Administration) Regulation 2006* will need to be lodged with DEHP for assessment and approval. Areas of the subject site not within 100m of these plants can be cleared under exemptions. An Exempt clearing notification (Protected plants) will be lodged to notify DEHP of this clearing which is exempt from the requirement of a permit under Section 261ZA of the Nature Conservation (Wildlife Management) Regulation 2006.

An Impact Management Plan which will accompany the Clearing permit (Protected Plants) to be lodged with DEHP for clearing of A. emuina and areas of vegetation within 100m. The Impact Management Plan will include details of measures to avoid and minimise impacts, details of the nature of the impact, management measures during construction, justification of impact management and an assessment of the likely survival of the retained plants.

The Impact Management Plan will also include an Offset Strategy prepared in accordance with the Queensland Environmental Offsets Policy 2014 to offset the unavoidable loss of fifty-one (51) *A. emuina* plants.

With the proposed offset and amelioration strategy implemented it is anticipated that no net loss of *Allocasuarina emuina* plants or its habitat will occur as a result of this development.

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APPENDIX 1 - Habitat Suitability Assessment for Threatened Flora Species

Scientific Name	Common Name	Likelihood of Occurring on the Site
Acacia attenuata	-	**Possible.** Occurs on flat coastal lowland plains, at altitudes of lower than 30 m above sea level. Typically found in seasonally waterlogged areas of wet heathland or heathland margins, open forest and woodland communities, and specifically on sandy poorly drained soils or peat swamps which are infertile (Dept. Environment 2012). Suitable habitat (heathland vegetation) for this species occurs on site.
Acacia baueri subsp. baueri	Tiny Wattle	**Possible.** Occurs in infertile and often seasonally waterlogged sands in coastal heath (wallum) habitat and adjacent plateaus and low open woodland (DEHP 2013). Suitable habitat (wallum heath) for this species occurs on site.
Allocasuarina defungens	Dwarf Heath Casuarina	**Possible.** Occurs in a humid warm-temperate to sub-tropical climate. The average annual rainfall is 1238 mm. The dwarf heath casuarina is found in coastal areas of wet to dry, dense, low, closed heath land growing on Pleistocene marine aeolian derived soils. Soils are subject to a high water tables during the rainy season. Found mostly in heath habitat (Dept. Environment 2012). Suitable habitat (heathland vegetation) for this species occurs on site. Soils on site are also suitable for this species.
Allocasuarina emuina	Emu Mountain Sheoak	**Known.** Occurs in open and closed heath on fine-grained rhyolite rocky slopes (Mt Peregian) and in wallum heath on undulating coastal plain. The soils range in texture from sands, sandy loams and light to medium clays, usually with a weak acidic reaction. Found in relatively flat, low-lying coastal areas at elevations of between 5 and 70 m above sea level and on a range of inclinations from flat to slopes of 20 degrees. Dominant species of heathland habitat where Emu Mountain she-oak occurs include *Ptilanthium deustum*, *Hakea actites* and *Banksia oblongifolia* (Dept. Environment 2012). This species was located on the site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
Allocasuarina thalassoscopica	-	**Unlikely.** This species is known from only one (1) locality at Mt Coolum, QLD. It is restricted to the low closed heathland community that occurs on the upper slopes of the summit at an altitude of 150-200 m. The slopes are gently to moderately inclined with an easterly, southerly to south-westerly aspect and are exposed to the prevailing winds. The soil is shallow, heavy textured, with outcropping rock (Dept. Environment 2012). Site is outside known range for this species and soil types on site are also unsuitable for this species.
Arthraxon hispidus	Hairy-joint Grass	**Unlikely.** Occurs in or on the edge of rainforest and in wet eucalypt forest, often near creeks or swamps, as well as in woodlands. In south-east Queensland specifically, occurs around freshwater springs in shaded small gullies, on creek banks, and on sandy alluvium creek beds in open forests (Dept. Environment 2012). No suitable habitat for this species occurs on site.
Baloghia marmorata	Marbled Balogia	**Unlikely.** Occurs in subtropical rainforest/notophyll vine forest and wet sclerophyll forest (brush box woodland) with rainforest understorey between 150 and 550 m above sea level. Soils are rich black or dark brown clay and loam derived from basalt. Associated species can include *Eucalyptus microcorys*, *Archontophoenix cunninghamiana*, *Aphananthe philippinensis*, *Capparis arborea*, *Planchonella australis*, *Ficus* spp., *Olea paniculata*, *Planchonella myrsinoides*, *Brachychiton discolor*, *Mallotus claoxyloides*, *Drypetes deplanchei*, and *Calamus muelleri* (Dept. Environment 2012). No suitable habitat for this species occurs on site.
Blandfordia grandiflora	Christmas bells	**Likely.** Occurs in damp sandy and/or peaty soils in coastal and tableland heathland / wallum areas with high water tables (Rbgsyd 2014). Most commonly in treeless heathland with *Xanthorrhoea fulva, Empodisma minus, Leptospermum liversidgei, Gahnia sieberiana*, and the occasional small trees of *Melaleuca quinquenervia*. It has also been recorded in open forest with heath understorey (Australian Government 2014). Suitable habitat, associated species, and soils for this species occur on site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
Bosistoa selwynii	Heart-leaved Bosistoa	**Unlikely.** Occurs in lowland subtropical rainforest up to 300 m above sea level. In the gold coast hinterland it grows on reddish loam over basalt rock on a very steep slope in complex notophyll vine forest with emergent Brush Box (*Lophostemon confertus*). Associated canopy species include White Booyong, Soft Corkwood (*Caldcluvia paniculosa*), Rosewood (*Dysoxylum fraserianum*), Yellow Carabeen (*Sloanea woollsii*) and Giant Water Gum (*Syzygium francisii*). At Buderim, Queensland, it has been found in remnant vine forest pockets within highly disturbed and weed infested habitats on a site with varying slope, from relatively flat to a steep scree slope. The species appears to occur only in areas that have experienced minimal disturbance (Dept. Environment 2012). No suitable habitat for this species occurs on site.
Bosistoa transversa	Three-leaved Bosistoa	**Unlikely.** As above
Cryptocarya foetida	Stinking Cryptocarya	**Unlikely.** Occurs in coastal sands, or close to the coast, occurring in littoral rainforest on old sand dunes and subtropical rainforests over slate and occasionally on basalt to an altitude of 150 m. Associated species include *Syzygium hemilamprum* (Broad-leaved Lilly Pilly), *Acronychia imperforata* (Beach Acronychia*), Cryptocarya triplinervis* (Three-veined Laurel), *Cupaniopsis anacardioides* (Tuckeroo), *Flindersia bennettiana* (Bennet's Ash*), Lophostemon confertus* (Brush Box) and *Syzygium luehmannii* (Small-leaved Lilly Pilly). Distribution, Iluka on the north coast of New South Wales, to Fraser Island in Queensland (Dept. Environment 2012). No suitable habitat for this species occurs on site.
Cryptostylis hunteriana	Leafless Tongue-orchid	**Possible.** This species occurs in a wide range of habitats including heathlands, healthy woodlands, sedgelands, *Xanthorrhoea* spp. plains, dry sclerophyll forests (shrub/grass sub-formation and shrubby sub-formation), forested wetlands, freshwater wetlands, grasslands, grassy woodlands, rainforests and wet sclerophyll forests (grassy sub-formation). Found in soils that are generally considered to be moist and sandy, however, this species is also known to grow in dry or peaty soils (Dept. Environment 2012). Suitable habitat and soils for this species occur on site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
Durringtonia paludosa	Durringtonia	**Possible.** Grows in closed sedgeland communities in coastal swamps (Rbgsyd, 2014). Previously found in Eagers Swamp, behind the beach on the ocean (eastern) side, on Moreton Island (Thompson 2010). Also locate in other coastal location from northern NSW and SEQ in swampy, seepage areas, on the bank of water-ways, and also in low lying swampy areas away from the waterways. Associated species include closed sedgeland of *Gahnia sieberiana, Baumea rubiginosa, Gleichenia mendellii, Empodisma minus* (Australian Government 2014). Suitable habitat and associated species for this species occur on site.
Eucalyptus conglomerata	Swamp Stringybark	**Possible.** Occurs on coastal flats up to 30 m above sea level. It occurs mostly in the ecotone between wet heath (wallum) and tall open forest communities. The soils are infertile, deep and sandy or peaty in texture. Drainage is poor and soils can be seasonally water-logged (Dept. Environment 2012). Suitable habitat exists on the site however no stringy bark eucalypts were recorded on the site.
Lenwebbia sp. (Blackall Range P.R.Sharpe 5387*)*	Blackall Lenwebbia	**Unlikely.** Grows in the Blackall Range (DEHP 2013). Associated species in natural rainforest, *Lomandra* sp., *Syncarpia glomulifera, Planchonella laurifolia, Elaeocarpus eumundi, Schizomeria ovata* and *Zieria smithii.* Also found closed forest of *Melaleuca quinquenervia, E. robusta, Rapanea howittiana,* understorey of *Lomandra, Carex* on wet peaty soil. Sufficient water is likely to be a limiting factor to its distribution (Australian Government 2014). The subject site is outside of the natural range for this species.
Lobelia membranacea	-	**Unlikely**. Occurs on creek flats, riverbanks and disturbed open woodland/forest in proximity to water. Soils are well drained sandy alluvium. Often in association with Lilly pilly, Eucalypt sp. *Corymbia intermedia and Lophostemon sp.* Records of this species occur along all of eastern coast of Qld (Australian Government 2014). No suitable habitat (i.e. open ground cover) for this species occurs on site.
Pararistolochia praevenosa	Richmond birdwing butterfly vine	**Unlikely**. Occurs in NEQ and in south-eastern Queensland and north-eastern New South Wales but not in coastal central Queensland. Grows in upland rainforest on basaltic and metamorphic rocks (CSIRO 2010). Occurs in in subtropical and littoral rainforests and also gallery forests (Sands and Scott 2002). No suitable habitat (rainforest) for this species occurs on site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
Phaius australis	Lesser Swamp-orchid	**Possible.** This species is associated with coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest and often where broad-leaved paperbark (*Melaleuca leucadendra*) or Swamp Mahogany (*Eucalyptus robusta*) are found. Less commonly, this species has been found in drier forest near the coast (Dept. Environment 2012). Suitable habitat and associated species for this species occur on site.
Phebalium distans	Mt Berryman Phebalium	**Unlikely.** Occurs in semi-evergreen vine thicket on red volcanic soils, or in communities adjacent to this vegetation type. Geology of the area in which this species occurs is deeply weathered basalt with undulating to hilly terrain. Soils range from red-brown earths to brown clays (derived from siltstone and mudstones), and lithosols to shallow, gravelly krasnozems (very dark brown loam). Vegetation associations in which Mt Berryman Phebalium occur include microphyll to notophyll vine forest with or without *Araucaria cunninghamii* and low microphyll vine forest and semi-evergreen vine thicket with or without *Araucaria cunninghamii*. Populations are known from near Mt Berryman, Kingaroy (Mt Jones Plateau and surrounds) and Mt Walla (Coalston Lakes) (Dept. Environment 2012). No suitable habitat or soils for this species occurs on site.
Prasophyllum wallum	Wallum Leek-orchid	**Possible.** Occurs in wallum communities and adjacent stabilised dunes and coastal Melaleuca swamp wetlands. Associated species include Broad-leaved Paperbark (*Melaleuca quinquenervia*) and Swamp Banksia (*Banksia robur*). The species is also known to be associated with RE12.2.1 open or dry heath on Quaternary coastal dunes and beaches or sand plains with *Leptospermum* sp., *Leucopogon* sp., Wedding Bush (*Ricinocarpos pinifolius*), *Strangea linearis*, Daphne Heath (*Brachyloma daphnoides*), Small-leaved Geebung (*Persoonia virgata*), Grass Trees (*Xanthorrhoea* sp.), Green Five Corners (*Styphelia viridis*), Prickly Broom Heath (*Monotoca scoparia*), Snow Wreath (*Woollsia pungens*) and stunted Black She-oak (*Allocasuarina littoralis*) (Dept. Environment 2012). Suitable habitat, associated species and soils for this species occur on site, however RE 12.2.1 is not present on site.

Scientific Name	Common Name	Likelihood of Occurring on the Site
Streblus pendulinus	Siah's Backbone	**Unlikely.** Occurs in warmer rainforests, chiefly along watercourses. The altitudinal range is from near sea level to 800 m above sea level. This species grows in well-developed rainforest, gallery forest and drier, more seasonal rainforest (Dept. Environment 2012). No suitable habitat (rainforest) for this species occurs on site.
Symplocos harroldii	hairy hazelwood	**Unlikely.** Occurs in wet eucalypt forest, rainforest, RE 12.2.1, RE 12.9-10.16, and RE 12.9-10.16x1 (Haslam 2014). Often found along creek lines or in gullies. Associated species Araucarian notophyll vine forest also *Schizomeria ovata* and eucalyptus sp. (Australian Government 2014). No suitable habitat for this species occurs on site.
Triunia robusta	-	**Unlikely.** This species is restricted to a small area on Queensland's Sunshine Coast, between Pomona and Woombye, mainly in the Maroochy River catchment area, covering a range of approximately 40 km. Occurs mainly in notophyll vine forest, or mixed tall open forest developing a rainforest understorey in the absence of fire. Most populations occur within 25 m of streams, on south or south-east facing slopes or river terraces, with a few populations at higher topographic positions away from watercourses. Occurs on well-drained soil, either clayey sand, loamy sand or loams, derived from felsite substrate, alluvium or arenite mudrock (Dept. Environment 2012). No suitable habitat for this species occurs on site.

APPENDIX 2 – Curricula Vitae

Adam McArthur

Principal Ecologist/Queensland Operations Manager

B.App.Sc.

Expertise

- Ecological Assessment Reporting/Impact Assessment
- Wildlife Ecology and Management
- Flora Survey, Vegetation Mapping and Conservation Assessment
- Threatened Species Survey and Management
- Licensing and Approvals (State and Federal)
- Environmental Monitoring
- Offset Management Strategies

Biography

Adam has 11 years' experience as an ecological consultant/environmental scientist throughout NSW & Qld. In addition to aptitude in a broad environmental management role, he possesses expertise in wildlife biology and is also proficient in flora & fauna assessments and vegetation mapping. He has prepared baseline ecological surveys, impact assessments, rehabilitation plans, offset assessments/offset area management plans, bushfire assessments, due diligence investigations and threatened species management plans. He has completed environmental monitoring programs and compliance audits for numerous urban development, resource extraction and linear infrastructure projects.

Adam has managed teams of scientists, coordinated numerous ecological field surveys and authored/reviewed/approved countless technical reports.

Adam is proficient in the assessment of local government planning schemes, State and Commonwealth legislation, including the preparation of referrals under the EPBC Act, responses to Information Requests, and also the preparation of court evidence.

Adam's work has contributed to several major projects including:

- High Road Wind Farm – assisted in the design and implementation of targeted threatened fauna surveys for 37 proposed wind turbines on the southern Atherton Tablelands, north Qld;
- Collinsville Solar Project – completed flora and fauna assessments as part of a feasibility study for converting an existing 180MW coal-fired power station into a 30-50MW hybrid solar thermal/gas power station;
- Ross to Millchester Powerline Duplication – undertook comprehensive flora and fauna surveys to inform the proposed construction of a new 132kV overhead powerline over a distance of 94km;

- Cloncurry Multi-user Rail Loading Facility – prepared the IAS and EMP for the 400ha site including comprehensive dry season and wet season flora and fauna surveys;
- Mt Emerald Wind Farm Project – assisted in the preparation of an EIS for this project which proposes up to 75 wind turbines near Mareeba in north Qld generating up to 225MW of power;
- Nelly Bay to Horseshoe Bay Powerline – designed and implemented targeted threatened species surveys for 2.5km powerline proposed by Ergon Energy through Magnetic Island National Park;
- Collinsville Substation to Drake Coal Mine Powerline – completed baseline flora and fauna surveys and impact assessments for a 26km stretch of powerline proposed by Ergon Energy;
- Mt Margaret Mining Project – assisted with the design and implementation of targeted threatened fauna surveys over Xstrata owned tenements near Cloncurry, Qld;
- Flinders Grove (Master Planned Residential Community) – prepared ecological constraints assessments including targeted surveys for threatened flora and fauna species over this 4,000ha site within the Greater Flagstone Structure Plan Area, Qld;
- Kings Forest (Master Planned Residential Community) – prepared ecological assessments, EPBC referrals, targeted flora and fauna surveys and a multitude of management plans for 10,000 proposed dwellings near Kingscliff, northern NSW;
- Coolum Ridges (Master Planned Residential Community) – prepared and implemented a detailed monitoring program for threatened flora and fauna species as part of the development of 1,500 lots on the Sunshine Coast, Qld;
- Cobaki Estate (Master Planned Residential Community) - prepared ecological assessments, EPBC referrals, targeted flora and fauna surveys and a multitude of management plans 5,500 proposed dwellings near Tweed Heads, northern NSW;
- Pacific View Estate Residential Development - prepared ecological constraints assessments, including targeted surveys for threatened flora and fauna species, and assisted in the identification, securing and preparation of management plans for potential vegetation offsets for this 340ha site on the Gold Coast, Qld;
- Solomon Island Nickel Project – designed and implemented baseline terrestrial flora and fauna surveys over 19,200ha on Choiseul Island and 12,200ha on Santa Isabel Island, Solomon Islands;
- Peregian Springs (Master Planned Residential Community) - prepared and implemented a detailed monitoring program for threatened flora and fauna species as part of the development of 1,500 lots on the Sunshine Coast, Qld.

Professional Experience

March 2015 - Present	Principal Ecologist/Qld Operations Manager JWA Pty Ltd
July 2014 – March 2015	Senior Environmental Scientist DFS Group
March 2014 – June 2014	Environmental Advisor (Contract) Northern Stevedoring Services

May 2012 – March 2014	Senior Environmental Scientist RPS Group
Sept 2007 – April 2012	Senior Environmental Scientist James Warren & Associates
July 2004 – August 2007	Environmental Scientist James Warren & Associates

Education

2002 Bachelor of Applied Science (Environmental Resource Management)
Southern Cross University

Short Courses/Training

- Biocondition Assessment training – Determining equivalency in habitats (Queensland Herbarium).
- Regional Ecosystem training – Identification and classification of regional ecosystems in QLD and vegetation condition assessment (Queensland Herbarium).
- Advanced first aid certificate.
- 4x4 driving and recovery course.
- Blue card (Course in General Safety Induction – Construction Industry).
- GIQ Coal Safety Induction – Standard 11 (Surface).
- Venomous snake handling.
- Translocation of threatened plants.
- Environmental Expert training course.
- Chainsaw operations (Level 1).
- Occupational Health & Safety in the workplace.
- Wildlife Rescue & Rehabilitation – Basic Training.

Kirsty Macpherson

Senior Ecologist

M.Env.Sc
GC. Scientific Communication
B.Sc. (Honours)
B.App.Sc.

Expertise

- Environmental site assessments including regional ecosystems, species identification and equivalence assessment
- Monitoring and evaluation (strategies and on ground)
- Experience with State and Federal environmental legislation
- Threatened species quantification surveys
- Offset management strategies
- Threatened species management plans and monitoring programs
- Research design and implementation

Biography

Kirsty is a highly qualified scientist with a Masters of Environmental Science and ten years' experience in environmental research and assessment.

Her work has contributed to several major projects including:

- Wesley Road Development, 457 Lot residential subdivision for Fairmont Group, Morton Bay.
- Flinders Development, 997 ha (7,250 Lot) Neighbourhood development for Pacific Group, Logan
- Monitoring and Compliance reporting for Coolum Ridges and Peregian Springs Conservation Areas for FKP Pty Ltd, Peregian Beach.
- Ecological consultant for QGC on well placement for the QCLNG Surat Basin CSG fields.
- Environmental planning study for QRN Ltd on the Hatfield to Coppabella rail triplication project.
- Subsidence Impact Assessment and Management Plan for Vale Pty Ltd Ellensfield coal mine.
- Biodiversity Offset Management Plan for the BMA Caval Ridge coal mine.
- Ecological Values Studies for Orica Pty Ltd at their Yarwun chemical plant.

Professional Experience

Oct 2013 - Present	Senior Scientist JWA Pty Ltd
March 2013 – Sept 2013	Consulting Ecologist QGC

March 2013 – Sept 2013	Consulting Ecologist QGC
Nov 2010 – Jan 2013	Senior Ecologist URS
March 2010 – Nov 2010	Ecosystem Analyst Ecofund Queensland Pty Ltd
Nov 2006 – March 2010	Research Officer for the Macadamia Group CSIRO Plant Industry
Jan 2006 – Nov 2006	Monitoring and Evaluation Officer Burdekin Dry Tropics Natural Resource Management
Nov 2004 – Nov 2005	Research Assistant for the Sustainable Farming Group CSIRO Sustainable Ecosystems

Education

2008 Master of Environmental Science
Australian National University

2002 Graduate Certificate in Scientific Communication
Australian National University

1999 Bachelor of Science (Honours)
Australian National University

1995 Bachelor of Applied Science
University of Tasmania

Short Courses/Training

- Biocondition Assessment training – Determining equivalency in habitats (Queensland Herbarium).
- Regional Ecosystem training – Identification and classification of regional ecosystems in QLD and vegetation condition assessment (Queensland Herbarium).
- Advance first aid certificate.
- Contaminated Machinery Certification (weed inspections).
- 4x4 driving and recovery course.
- Open water dive certificate.
- White card (to work in the construction industry).
- Generic coal induction (including gas test atmosphere certification and Coal Board medical).
- Origin inductions (Module 0 and 1).
- APLNG DA inductions.
- BMA induction and safety.
- Santos inductions (work permit procedures, revision 7.3, 4WD [operate vehicle in field] and heat stress management).
- Mobil approved specialist.

APPENDIX 3 – Flora Species List

Scientific Name	Common Name	Meander Sites
Acacia cincinnata	coin spot wattle	6, 9
Acacia complanata	flat stemmed wattle	1, 2, 7
Acacia concurrens	black wattle	1, 2, 3, 4, 5, 6, 11, 15, 16
Acacia disparrima	Hickory wattle	2, 6, 9
Acacia fimbriata	Brisbane wattle	2, 5, 6, 9
Acacia flavescens	primrose ball wattle	3, 4, 7, 11, 16
Acacia longissima	long leaf wattle	4, 7, 9
Acacia maidenii	Maiden's wattle	4, 7, 15
Acacia penninervis	mountain hickory	2, 3, 7, 9, 16
Acacia suaveolens	sweet wattle	3, 4, 6, 7, 11, 15, 16
Acrotriche aggregata	Red Cluster Heath	3, 11, 16
*Ageratum houstonianum**	blue billygoat weed	2, 9, 15
Alectryon sp.		2
Allocasuarina emuina□	emu mountain sheoak	8
Allocasuarina littoralis		3, 4, 9, 11, 15, 16
Alphitonia excelsa	red ash	1, 3, 4, 5, 7, 9, 11, 16
*Andropogon viginicus**	whisky grass	9
Angophora leiocarpa	smooth bark apple	2, 3, 7, 16
Angophora woodsiana	rough-barked apple	7
Archontophoenix cunninghamiana	bangalow palm	1
*Asparagus aethiopicus**	asparagus fern	2
Austromyrtus dulcis	midyim berry	2, 3, 4, 11, 16
*Baccharis halimifolia**	groundsel bush	1, 2, 4, 6, 15
Baeckea imbricata	spindly baeckea	8, 12, 13
Banksia aemula	wallum banksia	3, 8, 12
Banksia integrifolia	coast honeysuckle	3, 4, 6, 7, 9, 11
banksia oblongifolia	dwarf banksia	5, 8, 12, 13
Banksia robur	swamp banksia	1, 2, 4, 5, 6, 8, 10, 12, 13, 14, 15
Bauera capitata	dog rose	5, 8, 12, 13
*Bidens pilosa**	cobblers pegs	1, 2, 6, 9
Billardiera scandens	apple berry	3, 7, 11, 16
Blechnum indicum	bungwall	1, 4, 5, 6, 8, 10, 14, 15
Boronia falcifolia	wallum boronia	8, 12, 13
Boronia rosmarinifolia	forest boronia	7, 16
Brachyloma daphnoides	daphne Heath	3, 7, 11, 16
Calanthe triplicata	christmas orchid	4, 7, 11, 15, 16
Callistemon pachyphyllus	wallum bottle brush	1, 4, 5, 6, 8, 12, 13, 14, 15
Calochlaena dubia	soft bracken	1, 15
Cassytha sp.	dodder	1, 3, 4, 5, 7, 8, 12, 13, 14, 15
Caustis blakei	fox tails	3, 16

Scientific Name	Common Name	Meander Sites
Caustis recurvata	curly sedge	7, 8, 10, 11, 12, 13, 14, 15
*Cestrum nocturnum**	night-blooming jasmine	6
*Cinnamomum camphora**	Camphor laurel	3, 10
Cissus hypoglauca	5-leaf water vine	3, 4, 11, 16
Clerodendrum floribundum	Lolly Bush	3, 16
Corymbia intermedia	pink bloodwood	2, 3, 4, 7, 11, 16
Cupaniopsis anacardioides	Tuckeroo	9
Cyperus polystachyos		6, 9, 14
Dampiera sylvestris	wallum dampiera	4, 7, 8, 14
Daviesia ulicifolia	gorse bitter pea	3, 7, 14, 16
Daviesia umbellulata	bitter pea	3, 8, 12, 13, 16
Desmodium rhytidophyllum	siratro	1, 2, 9, 15
*Desmodium uncinatum**	Silver leaf desmodium	6, 9, 15
Dianella congesta	beach flax herb	2, 3, 4, 7, 11, 15, 16
Dianella sp.		3
Dodonaea triquetra	hop bush	2, 6, 9, 15
Dodonaea viscosa	sticky hop bush	6, 9, 15
Duboisia myoporoides	soft cork wood	3, 16
Elaeocarpus reticulatus	blueberry ash	4, 7, 11, 15
Eleocharis equisetina		6, 9, 14
Empodisma minus	wire sedge	1, 4, 5, 8, 12, 13, 14, 15
Endiandra discolor	rose walnut	4, 16
Endiandra sieberi	corkwood	3, 4, 11, 16
Entolasia stricta	wiry panic	1, 3, 4, 7, 9, 11, 15, 16
Epacris microphylla	coral heath	3, 4, 5, 7, 8, 12, 13, 14, 16
Epacris pulchella	wallum heath	3, 4, 8, 12, 16
Eriocaulon australe	pipewort	5, 8, 12, 13, 14, 16
Eriostemon australasius	Cooloola wax flower	5, 8, 12, 13, 14, 16
Eucalyptus racemosa	scribbly gum	2, 3, 4, 7, 9, 11
Eucalyptus robusta	swamp mahogany	1, 2, 4, 5, 6, 8, 9, 14
Eustrephus latifolius	wombat berry	3, 11, 16
Exocarpos cupressiformis	native cherry	2, 5, 11, 16
Fuirena umbellata		6, 9
Gahnia sieberiana	red-fruited saw sedge	1, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16
Geitonoplesium cymosum	scrambling lilly	3, 11, 16
Geodorum sp	orchid	4, 7
Gleichenia mendellii	coral fern	1, 4, 5, 6, 8, 10, 12, 13, 14, 16
Glochidion ferdinandi	cheese tree	1, 2, 3, 4, 6, 9, 10, 14, 15, 16
Glycine tomentella	woolly glycine	4, 7, 9
Gomphocarpus physocarpus	balloon cotton bush	2, 9
Gompholobium pinnatum	Pinnate Wedge Pea	4, 8
Grevillea banksii	Bank's grevillea	11
Gymnostachys anceps	settlers flax	7, 11

Scientific Name	Common Name	Meander Sites
Haemodorum tenuifolium	bloodroot	3, 16
Hakea actites	Wallum Hakea	1, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 16
Hakea florulenta		6, 11, 12, 13
Hardenbergia violacea	native sarsparilla	1, 15, 16
Hibbertia salicifolia	half guineas	5, 7, 16
Hibbertia scandens	twining guinea flower	1, 2, 3, 4, 7, 11, 16
Hibbertia vestita		3, 7, 11, 16
Hovea acutifolia	sharp leaf hovea	2, 3, 4, 5, 6, 7, 8, 9, 11, 12, 13, 14, 16
Hypericum gramineum	small St. John's wort	8, 12, 13, 14
Imperata cylindrica	blady grass	2, 3, 4, 7, 9, 11, 15, 16
Juncus prismatocarpus		6, 9, 10, 14
*Lantana camara**	lantana	1, 2, 3, 4, 7, 9, 10, 11, 15, 16
Lepidosperma longitudinale	pithy sword-sedge	4, 6, 9, 15
Lepironia articulata	grey sedge	10, 12, 13, 14
Leptocarpus tenax	slender twine rush	4, 5, 6, 8, 9, 12, 13
Leptospermum juniperinum	prickly tea-tree	1, 3, 4, 8
Leptospermum liversidgei		5, 8
Leptospermum polygalifolium	tantoon	3, 16
Leptospermum speciosum		4, 5, 8
Lepyrodia scariosa	scale rush	4, 6, 9
*Leucaena leucocephala**	Leucaena	2, 9
Leucopogon pimeleoides	bushy whitebeard	4, 8
Lindsaea linearis	screw fern	5, 6, 8
Lomandra confertifolia		3, 11, 16
Lomandra longifolia	mat rush	2, 7, 9, 11
Lomatia silaifolia	crinkle bush	3, 4, 7, 11
Lophostemon sauveolens		1, 2, 3, 4, 7, 16
Lygodium microphyllum	climbing maiden hair	1, 6, 8, 10, 14, 15
Macaranga tanarius	macaranga	2, 3, 9
Melaleuca nodosa	prickly-leaved paperbark	8
Melaleuca quinquenervia	broad leaf paperbark	1, 3, 4, 5, 6, 8, 9, 10, 12, 13, 14, 15, 16
Melaleuca sieberi		6
Melaleuca thymifolia	thyme leaf honey myrtle	4, 5, 8, 12, 13, 14
Melastoma malabathricum	blue tongue	1, 2, 3, 4, 6, 10, 14, 15, 16
Melicope elleryana	pink flowered doughwood	3, 7, 16
Melinis minutiflora	molasses grass	3, 4, 9
*Melinis ripens**	red natal	6, 9
Monotoca scoparia	prickly broom heath	3, 4, 8, 16
Nephrolepis cordifolia	fishbone fern	9
Notelaea ovata		3, 7, 16
Omalanthus populifolius	native bleeding heart	9
Parsonsia straminea	monkey vine	1, 8, 9, 12, 15

Scientific Name	Common Name	Meander Sites
Paspalidium distans		3, 16
*Passiflora suberosa**	corky passion flower	2, 3, 4, 6
Persoonia stradbrokensis	Stradbroke geebung	7, 9, 11
Persoonia virgata	geebung	1, 3, 6, 7, 8, 12, 16
Petalostigma pubescens	quinine bush	3, 11
Philotheca queenslandica	Queensland wax flower	5, 8, 12, 13
Philydrum lanuginosum	frogsmouth	6, 9
Phragmites australis	common reed	10, 14
Pimelea linifolia	Flax-leafed Riceflower	3, 4, 5, 6, 8, 12, 13, 16
*Pinus elliottii**	slash pine	1, 2, 3, 9, 11, 16
Platylobium formosum	handsome flat pea	3, 4, 7, 11
Polyscias elegans	celery wood	2, 4, 11
Pteridium esculentum	Bracken	2, 3, 4, 7, 9, 11, 16
Pultenaea paleacea	chaffy swamp pea	1, 4, 5, 6, 12, 13, 14
Pultenaea villosa	hairy bush-pea	2
Rhynchospora corymbosa		1, 15
Sacciolepis indica	Indian Cupscale Grass	2, 9
Schefflera actinophylla	umbrella tree	3, 4, 11
*Schinus terebinthifolius**	Broad-leaf pepper tree	1, 2, 15
Schizaea bifida	forked comb fern	7, 8, 11, 16
Schizomeria ovata	crab-apple	2, 9
Schoenoplectus tabernaemontani		6, 9
Schoenus brevifolius	zigzag bog sedge	4, 5, 6, 9, 12, 13, 15
Selaginella sp		5, 8, 12, 13
*Setaria sp.**		1, 2, 3, 6, 9, 11, 15, 16
Sida cordifolia	flannel weed	1, 2
Smilax australis	smile and relax	3, 4, 11
Sporadanthus interruptus		5, 6, 12, 13
Sprengelia sprengelioides	pink heath	4, 5, 8, 12, 13, 14
Stephania japonica	snake vine	2, 11
*Syagrus romanzoffiana**	coccus palm	1, 9
Symplocos stawellii	white hazelwood	1, 2, 3
Themeda triandra	kangaroo grass	3, 4, 7, 11
Tricoryne elatior	yellow autumn-lily,	8, 12
*Typha orientalis**	bulrush	1, 5, 6, 10, 14, 15
Westringia tenuicaulis		5, 8, 12, 13
Xanthorrhoea fulva	swamp grass tree	3, 4, 5, 8, 12, 13, 14
Xanthorrhoea johnsonii	forest grass tree	3, 4, 7, 11, 16
Zieria minutiflora	lanoline bush	11

* Weed
† Threatened species